VIRTUAL SPECIAL MEETING
PLANNING COMMISSION
REVISED AGENDA

April 30, 2020

The public is invited to watch the meeting online through the City of Lebanon's YouTube page at https://www.youtube.com/watch?v=syhhvsLYBJ0 on April 30, 2020 at 6:00pm. The City of Lebanon thanks you for your support in slowing the spread of COVID-19 by attending this public meeting **online**. **In compliance with the Governor's Executive Order No. 20-16, this meeting will only be held virtually, there will be no physical location for persons to attend to participate in the meeting.**

Chair:
Jeremy Salvage

Vice Chair:
Don Robertson

Commissioners:
David McClain
Todd Prenoveau
Samuel Brackeen
Joshua Galka
Josh Port

Community Development Director
Kelly Hart

Meeting Location:
Santiam Travel Station
750 S Third Street
Lebanon, Oregon 97355

Special Meeting:
6:00 p.m.

1. Call to Order / Flag Salute
2. Roll Call
3. Minutes: February 19, 2020
4. Commission Review:

    a. **Planning File AR-20-03, VAR-20-01**
    - Administrative Review and Class II Variance

    b. **Planning File CU-20-01**
    - Conditional Use

5. Commission Business & Comments
6. Adjournment

Public Comments:

The City will be accepting public comments in a number of ways to afford interested persons and the general public an opportunity to give testimony on the subject matter. Written and verbal testimony will be accepted upon issuance of this notice, **until 5:00pm on Tuesday, May 5, 2020**. Written testimony may be emailed to khart@ci.lebanon.or.us, or may be mailed to the City at 925 S. Main Street, Lebanon, OR 97355, or delivered to the City and dropped in the white mail box in front of City Hall. Please note for mailed testimony, the letter must be received by the City no later than 5:00pm on Tuesday, May 5, 2020. For verbal testimony, a recording may be provided to the City, or you may call (541) 258-4252 and leave a voice message. **There will be no testimony accepted in person.**

City of Lebanon

Planning Commission

Meeting Minutes
February 18, 2020

Members Present: Vice-Chair Don Robertson and Commissioners John Brown, David McClain, and alternate Commissioner Samuel Brackeen.

Staff Present: Community Development Director Kelly Hart; City Engineer Ron Whitlatch and Tre' Kennedy, City Attorney.

1. CALL TO ORDER/ FLAG SALUTE

Vice-Chari Robertson called the meeting of the Lebanon Planning Commission to order at 6:00 pm in the Santiam Travel Station Board Room at 750 3rd Street and led the assembly in the flag salute.

2. ROLL CALL

Roll call was taken. Chairman Salvage, Commissioner Galka, Commissioner Prenoveau and Commissioner Port were excused.

3. APPROVAL OF MEETING MINUTES

January 15, 2020 minutes were approved as submitted.

4. CITIZEN COMMENTS - *None*

5. PUBLIC HEARINGS

A. Planning File A-20-01 – Annexation Request (E Grant Street – 3A Construction, LLC)

Vice-Chair Robertson opened the hearing for Planning File No. A-20-01. City Attorney Kennedy identified the hearings procedures as part of the record and asked the Commission if there was any ex-parte communication, conflict of interest or bias regarding the application. All Commissioners indicated there was no ex-parte communications, conflicts or bias.

Director Hart presented staff's report for the proposed application. The subject property is located on East Grant Street, on the east side of the South Santiam River.

For the site, the subject property comprises of a 1.96 acre parcel, and maintains a

30-foot frontage on Grant Street, which is within city limits, along with the properties to the south, therefore the subject site is contiguous and eligible for annexation.

The Applicant has requested to be annexed and accept the designated first zoning of Residential Mixed Density. The surrounding properties include a mix of vacant and residential land, as well as farmland to the north. Property to the north is outside the City's UGB and maintains an exclusive farm use designation. To the east and west is land in the UGB with a comprehensive plan designation of Residential mixed use; and to the south is land in the city limits with a zoning designation of residential mixed density. At this time, there is no development proposal associated with the annexation.

Director Hart continued, Portions of the property are located within the steep slope overlay, with the eastern portion ranging between 20 to over 40% incline. The remaining portions of the property maintain a slope of approximately 12% or less and is developable.

The Department mailed notice of application to affected agencies, area property owners and the DLCD. There were no comments submitted on this application.

Director Hart reviewed the decision criteria for an annexation found in the Lebanon Development Code. Chapter 16.26 incorporates the City Annexation Ordinance and Lebanon Comprehensive Plan, addressing both the private property and right-of-way. Regarding findings, specific criteria are contained in the staff report and summarized as follows:

1. The property lies within UGB
2. City limits are located to the south. Being within the UGB the Plan recognizes this property as necessary to accommodate urban growth.
3. There is currently water service available in Grant Street, and the site maintains an existing septic system for waste management. Upon development, storm drainage would need to be accommodated.
4. There is sufficient area of the site, outside the steep slope overlay to accommodate urban development.

Director Hart concluded the staff report with recommended actions for the Planning Commission to consider.

Vice-Chair Robertson opened the conversation to questions from the Planning Commission.

Commissioner Brackeen indicated he did not see anything out of the ordinary for the application and all the recommended findings seemed to be in order. Project is in the UBG, and the applicant is accepting the initial zoning.

Vice-Chair Robertson requested clarification on the location of the UBG line and the purpose for the annexation. Director Hart indicated the purpose was to be able to connect to City water service and identified the UGB boundary to run along the northern property line of the subject property.

Seeing no public comment, Vice-Chair Robertson entertained a motion.

Commissioner Brown motioned to recommend approval of the annexation to the City Council based on the written recommended findings in the staff report. Commissioner McClain seconded the motion.

The motion passed 4-0.

6. WORK SESSION - *None*

7. COMMISSION BUSINESS & COMMENTS

Director Hart indicated that there were currently between two to three items on the schedule for the March meeting, with some potential large projects, so it is anticipated to be a longer meeting.

Commissioner Brown indicated that after many years of service on the Planning Commission, that he resigns from his position, effective immediately.

Planning Commissioners and staff all were surprised by the resignation and made a number of comments of appreciation for Commissioner Brown and wishing him well.

8. ADJOURNMENT:

There being no further business, the meeting was adjourned at 6:20pm.

[Meeting minutes prepared by Kelly Hart, Community Development Director]

AGENDA ITEM

5.a.

OREGON
Lebanon

925 S. Main Street
Lebanon, Oregon 97355

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cdc@ci.lebanon.or.us
www.ci.lebanon.or.us

MEMORANDUM

Community Development

To: Charmain Salvage and Planning Commissioners Date: April 10, 2020

From: Kelly Hart, Community Development Director

Subject: Development proposal for a 48-unit affordable apartment complex at the intersection of Airport Road and Stoltz Hill Road, inclusive of construction of a new public street, and a request for a reduction in the parking requirements.
Applications: AR-20-03 and VAR-20-01

I. BACKGROUND

The subject property is generally located on the north side of the intersection of Airport and Stoltz Hill Roads. The total site area was previously 8.19 acres with frontage on Airport Road and Strawberry Lane. Through an application for a Minor Land Partition (Planning File No. 19-12-69), the property was divided into three parcels, with the subject property totaling 2.37 acres. The Land Partition was processed to separate the development site from the remainder of the property.

The Applicant, Applegate Landing LLC, is proposing the development of a 48-unit affordable housing apartment complex, 47 of the units designated to be income restricted, including 12 of the units being restricted for veterans, and one managers unit. As part of the development, the Applicant is requesting a reduction in the required parking on the basis that the project is fully restricted for affordable units. The development would also include the construction of a new public street to provide access to the development.

Under consideration is an application for an Administrative Review (AR-20-03) for the development of the apartment complex, and a Class II Adjustment (VAR-20-01) for the reduction in the required parking.

II. CURRENT REPORT

Project Location and Zoning Designation – The subject parcel is 2.37 acres and located approximately 600 feet north of Airport Road, and approximately 150 feet east of Strawberry Lane, which is a County road. The property is zoned Residential Mixed-Density (Z-RM). Surrounding the property to the north is a vacant parcel within the RM zone; to the south is a legal non-conforming grocery store, and a single-family residential dwelling located within the County with a comprehensive plan designation of Residential Mixed-Density (C-RM); and to the east, across Burkhart Creek, and to the west are single-family dwellings located within the County with a comprehensive plan designation of C-RM.

Development Proposal – The Applicant is proposing to development a 48-unit affordable housing apartment complex. As indicated on the site plan, there would be a total of four 3-story apartment buildings, and a large community building proposed. Two buildings would be situated on the west side of the property, and the remaining two apartment buildings and the community building would be situated to the east of the property, with the parking lot oriented in the center of the property.

In terms of setbacks, per Section 16.05.090 of the Lebanon Development Code (LCD), the minimum observed setbacks shall be a 10-foot front setback, 5-foot side setbacks, and a 20-foot rear setback. As indicated on the site plan, the front setback would be approximately 50-feet for the community building and 85-feet for the closest apartment building. The western side setback, and the rear setback would be 20-feet. For the east side setback, the property runs along Burkhart Creek. A 5-foot setback to the proposed fence line is provided, which is approximately 5-feet from the top of bank and approximately 20-feet from the centerline of the creek. A wetland delineation has been completed, and Department of State Lands (DSL) has concurred the accuracy of the delineation to determine the basis for the building setbacks.

For Density, the minimum lot size for a multifamily use in the RM zone is 9,000 square feet. At 2.37 acres, the subject property exceeds this standard. Section 16.05.160 of the LDC indicates the minimum site area for different unit sizes: 1,100 square feet for a studio; 1,550 square feet for a one-bedroom unit; 2,000 square feet for a two-bedroom unit; and 2,425 square feet for a three-bedroom unit.

Unit Type	Number of Units	Total Square Footage
Studio	6	6,600 sq. ft. required
One-Bedroom	18	27,900 sq. ft. required
Two-Bedroom	18	36,000 sq. ft. required
Three- Bedroom	6	14,550 sq. ft. required
TOTAL		**85,050 sq. ft. or 1.9 acres**

Open space requirements identified in Section 16.05.170 of the LDC include 25% of the project development area to be designated for open space with a minimum common open space requirement of 1,000 square feet, and a designated children's play area with playground equipment. Credits to reduce the percentage of open space required are permissible when developed recreation areas are provided such as a community room, sports court, and swimming pools. The site area is 93,364 square feet, which requires a minimum 23,341 square feet of open space to be provided, inclusive of the common open space requirements. As indicated on the site plan, 16,689 square feet of common open space is provided in two main areas located near the front of the property and includes the large 3,000 square foot community building. 25,652 square feet of additional open space is provided throughout the development.

The project is also identified as an affordable housing project. As indicated in the project narrative, 32 units would be restricted to income qualified residents earning 60% or less of the area median income (AMI); 10 units would be restricted to 50% AMI; four units at 30% AMI; one unit at below 30% AMI; and one manager's unit. In addition, the project would include 12 of the 48 units as restricted to Veteran's, with the remaining units with Veteran preference.

Based on the designation of the entire development as an affordable housing project, the Applicant is requesting a reduction in the standard parking requirement of 2.25 spaces per unit to 1.5 spaces per unit. This would provide a total of 74 parking spaces on-site.

If calculating the parking demand for the project with no concessions, a total of 108 spaces would be required at 2.25 spaces per unit. Section 16.14.030 of the LDC allows for up to a 15% reduction of required vehicle spaces for bicycle parking: including one vehicle reduction for every eight bicycle parking spaces, and one vehicle space for every 4 additional covered spaces. Per Section 16.14.070.B of the LDC, a total of 24 bicycle parking spaces are required as part of the development. 32 bicycle spaces are provided, 14 of which are covered, equating to a reduced vehicle demand of three spaces, or 105 total vehicle parking demand. Based on the required parking per the LDC, the Applicant is proposing a reduction of 30% of the parking requirement.

For affordable housing projects, there is a correlation that demonstrates households with lower AMI result in fewer vehicles per household. In the Applicant's narrative, a number of studies and resources have been provided which demonstrates a lower vehicle per household standard when associated with an affordable housing development. Based on the studies provided, the applicant contends that 1.5 spaces per unit would provide sufficient parking to accommodate the residents. The Applicant anticipates based on calculation associated with the AMI and unit type, 60 parking spaces would be required to accommodate resident vehicles. Which would leave 12 spaces available for visitors of residents, service providers, and any extra cars for residents.

Under the Oregon Affordable Housing Pilot Project State program, the City of Bend adopted an affordable housing parking requirement at 1.5 spaces per unit. The Applicant's proposal is equivalent to an adopted standard from an Oregon city, which provides a consistent application of standard for an affordable project. In addition, a bus stop would be provided at the entrance of the development to provide for use of the public transit system.

Project Access – The site is located approximately 600 feet north of Airport Road. As part of the development, the Applicant would build a new public street to full City standard (including sidewalks, landscaping and curb and gutter) that would provide access to Airport Road and terminate in a cul-de-sac at the southwest corner of the subject development. At the end of the cul-de-sac, a 20-foot emergency access road to Strawberry Lane would be provided and restricted to emergency vehicle access only. Strawberry Lane would only be utilized for temporary access during construction of the new public street. Upon completion of the public street, access to Strawberry Lane would be limited to emergency vehicle access. Linn County Road Authority reviewed the development proposal and determined the restriction of use of Strawberry Lane was appropriate based on the lack of existing street improvements, and inability to develop the street to urban standards due to restriction in available right-of-way.

For the intersection of Airport and Stoltz Hill Roads, the Applicant has aligned the new public street segment with the existing intersection. The Engineering Department has reviewed the alignment and determined it to be appropriate for the existing configuration.

According to the adopted Transportation System Plan, Airport Road will need to be signalized within the vicinity of Stoltz Hill Road. As part of the project, a Traffic Impact Analysis (TIA) was completed by DKS, Inc. and concurred by the City's contract traffic analysis consultant. The TIA indicated that based on the current and projected traffic impacts of the project, a signal is not immediately warranted. However, it is anticipated that a signal would become appropriate based on traffic increases as early as 2022. Based on the adopted TSP, Engineering staff's understanding of the existing street network, and the expansion of the intersection as proposed by this development, it is anticipated that the signalization of Airport Road would likely occur at Stoltz Hill Road.

The current configuration of the intersection of Airport and Stoltz Hill Road is a 3-leg T-intersection. The development proposal as provided to the City by the developer would include the continuation of Stoltz Hill Road, north from the intersection into the development, with the terminus of the road via a cul-de-sac to provide access to the development site, and property owned by the developer for a potential future project.

As proposed, the road extension would only provide access to the development, with no through access provided to any other collector or local street. As such, the only beneficiary to the road and 4th leg of the intersection at Stoltz Hill and Airport Road would be the development.

Without the development, if the ADT on Airport and Stolz Hill currently warranted a signal, the construction of the signal would include three mast arms and associated improvements for a 3-way intersection. With the development and the expansion of the roadway, the intersection would turn into a 4-way signalized intersection including a fourth master arm and associated improvements. This additional cost for design and materials is only required due to the development and use of the 4th leg of the intersection by the development.

Based on the direct physical impact of the development on the intersection, not the proportion of ADT added by the development, the developer's proportional allotment of improvement costs associated with the intersection would be 25%.

Overlays – The subject property is located within the Airport Safety Overlay. Preliminary analysis of the site within the conical surface zone identifies the project is within the allowable height restrictions based on the distance from the airport. If the project were to be developed, a permit through the Oregon Department of Aviation would be required for each building as part of the development.

For Burkhart Creek, although not included in the Riparian Overlay, the Applicant would be required to obtain all appropriate permits through DSL for development near the identified wetland. In addition, for the expansion of the Lebanon Trail System, if the development is approved, the Developer would be required to install a multi-use path along the creek. However, construction of the path would be deferred until such time as the properties to the south of the subject site are developed.

Utilities – Sanitary Sewer, Water, and Storm Drain facilities are all currently available in Airport Road. As part of the proposed development, the Applicant would develop a northern extension of Stoltz Hill Road to provide access to the site. All utilities would also be provided within the new public right-of-way for use by the development. Placement of a new fire hydrant along the new public roadway would be required for fire protection services.

III. REVIEW CRITERIA AND RECOMMENDED FINDINGS

The Applicant is requesting consideration of two applications: An Administrative Review for the development of an affordable housing apartment complex; and a Class II Adjustment for the reduction in the required parking for the development proposal. Below is an analysis of the review criteria and recommended findings:

Class II Adjustment Criteria and Recommended Findings (Section 16.29.040.C.2 of the LDC):

1. The individual characteristics of the use at that location require more or less parking than is generally required for a use of this type and intensity, or modified parking dimensions, as demonstrated by a parking analysis or other facts provided by the applicant.

   RECOMMENDED FINDING: The use is an affordable housing development with all units restricted as affordable at 60% AMI or lower. The Applicant has provided several studies as part of the record to demonstrate a correlation of lower income households maintaining fewer vehicles per household. The City of Bend has also adopted a parking standard for affordable housing developments at a rate of 1.5 spaces per unit. Based on the resources provided by the Applicant and the concurrent standards from other Oregon cities, the characteristic of an affordable housing development warrants a lower parking demand.

2. The need for additional parking cannot reasonably be met through provision of shared parking with adjacent or nearby uses.

   RECOMMENDED FINDING: The development site is 600 feet from Airport Road and is surrounded by private single-family residential properties with no developed parking lots. Based on the location of the development, and the surrounding uses, there are no opportunities for shared parking.

3. All other applicable code standards are met.

   RECOMMENDED FINDING: The development proposal complies with the minimum development standards identified in Chapter 16.05 of the LDC, including setbacks, lot coverage, common open space requirements, building height restrictions, and public facility improvements. The only adjustment to the development proposal is the reduction in parking.

Administrative Review Decision Criteria and Recommended Findings (Section 16.20.040.D of the LDC):

1. The proposal shall conform to use, height limits, setbacks and similar development requirements of the underlying zone.

   RECOMMENDED FINDING: The underlying zone of the property is Residential Mixed Density. Minimum setbacks include 10-foot front, 20-foot rear, and 5-foot side setbacks; the maximum height permissible in the zone is 40-feet; and the maximum lot coverage is 60%. For multi-family development, a minimum 25% of the development site shall be open space, including a children's play area and common open space. The development proposal conforms with all these standards, observing setbacks that meet or exceed the minimum standard with a 50-85-foot front setback, 20-foot side setback on the western boundary line, 20-foot rear setback, and 5-foot setback to the fence line to the east. The lot coverage for the project is 17.4% which is well below the maximum coverage. The maximum proposed building height within the development is 38-feet, below the maximum permissible. Finally, the development provides 40.5% of the site as open space. A community room, and area for a children's play area has also been provided to meet the required common open space requirements.

2. The proposal shall comply with applicable access and street improvement requirements in Chapters 16.12 and 16.13, respectively.

   RECOMMENDED FINDING: The project includes the development of a new public street to provide appropriate access to the site from Airport Road. The street would be built to full city standard including an ultimate right-of-way of 51-feet, with street, curb and gutter, sidewalk, and landscape strip. Access to the site from the new public road would be from a 25-foot driveway, and all internal access for vehicle maneuvering for the Fire District has met the minimum standards, based on the provided site plan. For the intersection of Airport and Stoltz Hill Road, the new road extension would be aligned with Stoltz Hill to create a functioning intersection. A Traffic Impact Analysis has been completed for the project. At current condition, including the project proposal, a traffic signal is not yet warranted, but based on the study, a traffic signal on Airport Road would be warranted by 2022. Based on the near future demand for a signal, and the likely location of the signal being at Stoltz Hill Road, the applicant would be required to pay a portion of the improvements to the intersection for the signalization. Bike facilities have also been provided on-site, and the new public road is of sufficient width per Table 16.13.020-2 of the LDC to provide bike and pedestrian access.

3. The proposal shall comply with applicable parking requirements in Chapter 16.14.

   RECOMMENDED FINDING: As indicated in the findings for the Class II Adjustment, there is sufficient justification to warrant a reduction in the number of parking spaces for the development. Aside from the reduces number of parking spaces, the project exceeds the minimum bicycle parking standards, provides the appropriate number of ADA restricted parking spaces, and appropriate circulation to ensure all the vehicles enter a public street in a forward motion. As such, the project complies with the applicable requirements in Chapter 16.14.

4. The proposal shall comply with applicable screening and landscaping provisions in Chapter 16.15.

   RECOMMENDED FINDING: The project provides for perimeter fencing along the entire perimeter of the project. To provide screening of adjacent properties, site obscuring fencing is provided along the northern and western property lines. A landscape plan has been conditioned as part of the development to ensure all required landscaping and screening meets the minimum requirements of Chapter 16.15, including the design and placement of the children's play area required in Chapter 16.05.

5. Any required public facility improvements shall comply with provisions in Chapter 16.16.

   RECOMMENDED FINDING: New sewer, water, and storm drain improvements are included as part of the development proposal. Sewer and water lines would be connected from Airport Road and extended through the new public street to provide connection to the development site. All required improvements as a condition of development shall be designed and installed to the satisfaction of the Engineering Department prior to construction of the development project.

6. Where applicable, the proposal shall comply with development requirements within identified hazard areas and/or overlay zones.

   RECOMMENDED FINDING: The subject property is located within the Airport Safety Overlay. Preliminary analysis of the site within the conical surface zone identifies the project is within the allowable height restrictions based on the distance from the airport. A permit through the Oregon Department of Aviation would be required for each building as part of the development.

7. The proposal shall comply with the supplementary zone regulations contained in Chapter 16.19 or elsewhere in the Development Code.

   RECOMMENDED FINDING: All accessory structures, uses, and building projects fully comply within the minimum setback standards identified in Chapter 16.05 and Chapter 16.19.

IV. PUBLIC NOTIFICATION AND COMMENTS

A public notification for this project was originally issued on February 28, 2020. During the public notification period, the City received one comment letter from a resident on 9th Street. Included in the comments were a request to: require a privacy fence between the development and adjoining properties, require grass for each unit for pet care purposes, and requests for the variance to not be approved, siting parking issues on 9th Street.

Under consideration includes conditions of development that would require site obscuring fencing along property lines with adjacent development. In addition, the project exceeds the minimum open space requirement to provide appropriate areas for residents to utilize for pet care purposes. For the variance, and impact of parking on 9th Street, due to the location of the development, and the distance to 9th Street, the project is not anticipated to have any parking conflicts with 9th Street. Materials have been provided by the Applicant to corroborate the parking reduction on-site. In addition, on-street parking would be provided on the new public street, which would accommodate any overflow parking.

Prior to submittal of the application, the City received a letter from surrounding neighbors that utilize Airport Road and stated significant concerns about existing traffic on Airport Road and how the addition of the proposed development would cause significant increases in traffic. It was suggested that an alternative site location in a less traveled area of the City would be more appropriate. A total of 30 individuals signed on to the letter.

As part of the application process, a Traffic Impact Analysis (TIA) was conducted for the development to determine whether any improvements would be required to improve or maintain traffic conditions in the vicinity. The TIA determined that the development would not trigger any required improvements to the road network, and Airport Road would not trigger the need for a signal until approximately 2022. However, the City is aware of the traffic congestion patterns in the area, and the Transportation System Plan identifies that a traffic signal is warranted in the area. As such, the development would be required to contribute towards the installation of a traffic signal on Airport Road and Stoltz Hill Road. Conditions of development have been included to require such contribution.

Due to the COVID-19 outbreak, the original public hearing scheduled for March 18, 2020 was canceled. On April 10, 2020 a public notice was issued to advertise the public hearing to be opened on April 30, 2020. Due to the modified meeting procedures, the Planning Commission agenda was also posted on April 10, 2020. Public comment will be received until May 5, 2020, and all comments will be provided to the Planning Commission and the public for review prior to a second hearing date on May 7, 2020.

V. CONCLUSION AND RECOMMENDED CONDITIONS FOR DEVELOPMENT

Staff finds the proposal complies with the decision criteria for an Administrative Review and Class II Adjustment, and recommends approval of the application subject to the adoption of the following Conditions of Development:

1. The Planning Department conditions include, but may not be limited to:

   a. All units, except the one designated manager's unit shall be restricted as affordable residential units. An affordability covenant identifying such income restriction shall be filed against the property. Proof of recordation shall be provided to the City prior to issuance of certificate of occupancy.
   b. A parking system shall be established and managed by the apartment complex. A restriction of the number of vehicles per residential unit shall be identified and included as part of the lease agreement for each unit.
   c. Sight obscuring fencing shall be constructed to a minimum of six feet in height along the western and northern property lines, with the exception of designated vision clearance areas.
   d. A landscape plan shall be submitted and approved prior to the issuance of building permits. As part of the landscape plan, all trees with a measurement of 12-inch caliper for deciduous and 18-inch caliper for evergreen trees shall be cataloged and preserved where possible.
   e. A Children's play area shall be provided in compliance with Section 16.05.170.F. Any and all playground equipment shall comply with the International Play Equipment Manufacturers Association standards. The children's play area shall be included for review as part of the landscape plan.
   f. All required permits through the Oregon Department of Aviation shall be obtained prior to issuance of building permits.

g. A minimum of 74 vehicle parking spaces shall be maintained on-site at all times. A minimum of 32 bicycle spaces, including 14 covered spaces shall be permanently maintained.
h. An application for a Property Line Adjustment shall be filed and approved for the modification to the site property lines and the street dedication prior to issuance of Building Permits.

2. The Linn County Road Department conditions include, but may not be limited to:

    a. Strawberry Lane may be utilized for temporary access to the development site until such time as the new public street and cul-de-sac are constructed.
    b. Upon completion of the new public street, use of Strawberry Lane for the development shall be limited to emergency vehicle access only.
    c. The Applicant shall obtain a right-of-way encroachment permit from Linn County Road Department.

3. The Lebanon Fire District conditions include, but may not be limited to:

    a. Plans shall be submitted for review and approval by the Lebanon Fire Marshal that demonstrates full compliance with the Oregon Fire Code and local amendments. Lebanon Fire Marshal approval shall be obtained prior to issuance of building permits.

4. The Engineering Department conditions include, but may not be limited to:
General

    a. All public improvements shall:
        i. conform to the latest "City of Lebanon Standards for Public Improvements."
        ii. require completion of a Drawing Review Application and a Public Improvements Permit prior to beginning construction.
        iii. be designed by a professional engineer registered in the State of Oregon.
        iv. Prior to final plat approval, a bond or other approved form of assurance is required for all incomplete public improvements.
    b. An engineered site plan shall be submitted for review and approval for the site. The site plan must be submitted with an Application for Site Plan Review and associated fee. The site plan shall detail all site improvements necessary for the proposed development together with a grading and drainage plan.
    c. All elevations shown on plans submitted to the City must be on the NAVD 88 vertical datum to provide compatibility with the City computer aided mapping system.
    d. All private, onsite utilities must be reviewed and approved by the City Building Official.
    e. Provide a landscape and illuminate plan as part of the engineering site plan review plan set.

Transportation

    a. This project proposed public street for access to all proposed lots. All lots will front the proposed street and individual lot driveway access to Airport is prohibited. Provide a Geotech report for the proposed street section.

b. Cul-de-sacs must have sufficient turning radius to allow the operations of emergency vehicles and Albany-Lebanon Sanitation vehicles. Fire Marshall approval of turnaround and emergency access. Minimum cul-de-sac radius must comply with the City's transportation plan.
c. To address the operational impacts of the Lebanon Veterans Housing project on the Airport Road/Stoltz Hill Road intersection, the City will require a proportional share contribution based on the development's bearing to the intersection. *The developer shall enter into an agreement with the City to pay a 25% share of the signal costs at Stoltz Hill Road and Airport Road intersection. The agreement shall be on a form acceptable to the City and paid prior to occupancy.* The contribution amount will be based on a construction cost estimate including design for the traffic signal that will be developed by the City.
d. Sidewalks, paths and driveway approaches must comply with ADA requirements.
e. Provide City standard sidewalks and ADA access ramps access along lot frontage of Airport Road.
f. Provide City standard street trees in compliance with the City of Lebanon street tree policy.
g. With engineering drawings, indicate the location of street and path lights, mailboxes, utility pedestals, signs.
h. Mailbox locations must be also be reviewed and approved by the Postmaster.
i. Provide City standard streetlights at all intersections and along proposed public street.
j. Street names must be approved by the City Engineer, Linn County 911 and the County Surveyor.
k. Site lighting shall not glare or shine onto adjacent public streets or neighboring properties.
l. Provide verification of Republic Services approval of location and access to garbage and recycling containers shown on site plans prior to approval of detailed engineering site plans.
m. Obtain a permit for Linn County for any utilities or improvements located on Strawberry Lane.
n. Provide one bus shelter to provide access to City transportation system and the Lebanon Community School District.
o. Provide a 10-foot wide paved with 1-foot gravel shoulders, multi-use path for the length of the property along the top of bank of the drainage ditch. Construction of the path may be deferred until the future development of the properties to the south are developed.

Water

a. Identify any on-site wells on the engineered drawings. Back flow prevention devises will be required on any lot that is also serves by the city water system.
b. Fire suppression will be under the Fire Marshal review and approval. The number and location of fire hydrants shall be approved by the Lebanon Fire Marshal. All new hydrants must be operational and accepted by the City prior to storage of combustible materials on site.

Sewer System

a. Identify any on-site septic systems on the engineering drawings. Provide Linn County approval for all septic systems.

b. Sewer lateral connections are not allowed to the new constructed sewer main without a permit and payment of applicable fees.

Storm Drainage

a. The drainage system and grading plan shall be designed so as not to adversely impact drainage to or from adjacent properties. Storm drainage facilities must be designed and constructed to ensure historical rates of site discharge are not exceeded. Storm drain capacity shall be determined by the Rational Method for a 10-year event with a 15-minute minimum durations time using the curve (fig 5.3) in the master plan. A detailed design including engineering calculations shall be submitted as part of site plan review.
b. With the engineering drawings, provide a grading plan for the sites that indicates existing and proposed elevations. Drainage improvements (ditches and or piping) may be required at the site boundaries to prevent adverse impacts. The engineering drawings must provide a detailed design (including calculations) of the drainage improvements and mitigation of any impacts to adjacent properties.
c. Provide verification of Oregon DEQ NPDES 1200C permit issuance and all condition of permit issuance prior to construction.
d. Provide correspondence from the appropriate state and federal regulatory agencies regarding wetland identification and required fill-removal permits, if any. Any wetlands identified as being impacted by public improvements shall be mitigated prior to the final acceptance of public improvements.
e. With engineering drawings provide a construction erosion prevention plan.
f. Dedicate to the City a storm easement from the west top of bank to the east property line for a potential regional detention basin identified in the City's Storm Water Master Plan.

Landscaping

a. Submit a landscape and irrigation plan for any proposed landscape improvements to the City Engineer for review. Any landscaping proposed in the public right of way shall have a maximum mature height of no more than 24 inches above the street grade and at least 3 feet from any fire hydrant. All landscaping proposed in the yard setback areas adjacent to public streets shall have a maximum mature height of no more than 36 inches above the street grade.
b. Vision clearance areas shall be provided at intersections of all streets and at intersections of driveways and alleys with streets to promote pedestrian, bicycle, and vehicular safety per Subsection 16.12.030.H of the Lebanon Development Code. A clear-vision area shall contain no plantings, fences, walls, structures, utility pedestals, or temporary or permanent obstruction exceeding 2-1/2 feet in height, measured from the top of the curb.

V. RECOMMENDED ACTIONS

1. Evaluate the public testimony and the record established before the Planning Commission

2. Commission options:

1. Approve the proposed Administrative Review (AR-20-03) and Class II Adjustment (VAR-20-01) for the development of a 48-unit affordable housing development with a reduction in the parking requirement, adopting the written findings for the decision criteria contained in the staff report with the conditions of development; or

2. Approve the proposed Administrative Review (AR-20-03) and Class II Adjustment (VAR-20-01) for the development of a 48-unit affordable housing development with a reduction in the parking requirement, adopting modified findings for the decision criteria and conditions of development; or

3. Deny the proposed Administrative Review (AR-20-03) and Class II Adjustment (VAR-20-01) for the development of a 48-unit affordable housing development with a reduction in the parking requirement, specifying reasons why the proposal fails to comply with the decision criteria; and

4. Direct staff to prepare an Order of Recommendation for the Chair or Vice Chair's signature incorporating the adopted findings as approved by the Planning Commission.

VIRTUAL SPECIAL MEETING
NOTICE OF PUBLIC HEARING
LEBANON PLANNING COMMISSION

Lebanon OREGON

NOTICE IS HEREBY GIVEN that a public hearing will be held before the Lebanon Planning Commission on **Thursday, April 30, 2020 at 6:00 p.m. and Thursday, May 7, 2020 at 6:00pm** through a virtual (online) meeting to afford interested persons and the general public an opportunity to be heard and give testimony concerning the following matter:

Planning Case No.:	AR-20-03 & VAR-20-01
Applicant:	Applegate Landing, LLC
Location:	Airport Road
Map & Tax Lot No.:	12S02W15BD00301
Request:	Administrative Review & Class II Variance
Decision Criteria:	Lebanon Development Code Chapters: 16.05 & 16.20

Request: The applicant is requesting Administrative Review approval to construct a 48-unit multifamily development with access from Airport Road. The applicant is also requesting a Variance to the minimum parking standards for off-street parking.

Virtual Meeting: Due to the COVID-19 pandemic, the City will be hosting a virtual Planning Commission meeting and following the procedural guidance provided by the Oregon Department of Land Conservation and Development (DLCD) in compliance with Oregon Public Meeting Laws.

The public hearing will occur in two phases: on April 30, 2020 at 6:00pm, the Planning Commission will open the public hearing, receive Staff's report, and allow for the applicant to present. The Planning Commission will then postpone the public hearing to a date certain of Thursday, May 7, 2020 at 6:00pm. This will provide time to receive written and verbal comment from the public. The written and verbal comment will be received by City Staff until 5:00pm on Tuesday, May 5, 2020. The comments will then be read into the record and played for the Planning Commission at the May 7, 2020 meeting. The applicant will then be able to respond to the public comments. Once all comments are recorded as part of the meeting, and the applicant responds, the Planning Commission will close the public hearing, and deliberate on the application.

The public is invited to watch the meeting online through the City of Lebanon's YouTube page at https://www.youtube.com/watch?v=syhhvsLYBJ0 on April 30, 2020, and https://www.youtube.com/watch?v=-yEop1w5dgY on May 7, 2020. The City of Lebanon thanks you for your support in slowing the spread of COVID-19 by attending this public meeting digitally. For those that do not have access to a computer, there will be limited seating available at the Santiam Travel Station located at 750 S 3rd Street.

The Agenda and application materials will be available for review on the City's website at https://www.ci.lebanon.or.us/meetings by the end of the day on April 10, 2020.

Providing Comments: The City will be accepting public comment on this item in a number of ways to afford interested persons and the general public an opportunity to give testimony on the subject matter. Written and verbal testimony will be accepted upon issuance of this notice, **until 5:00pm on Tuesday, May 5, 2020**. Written testimony may be emailed to khart@ci.lebanon.or.us, or may be mailed to the City at 925 S. Main Street, Lebanon, OR 97355, or delivered to the City and dropped in the white mail box in front of City Hall. Please note for mailed testimony, the letter must be received by the City no later than 5:00pm on Tuesday, May 5, 2020. For verbal testimony, a recording may be provided to the City, or you may call (541) 258-4252 and leave a voice message. There will be no testimony accepted in person.

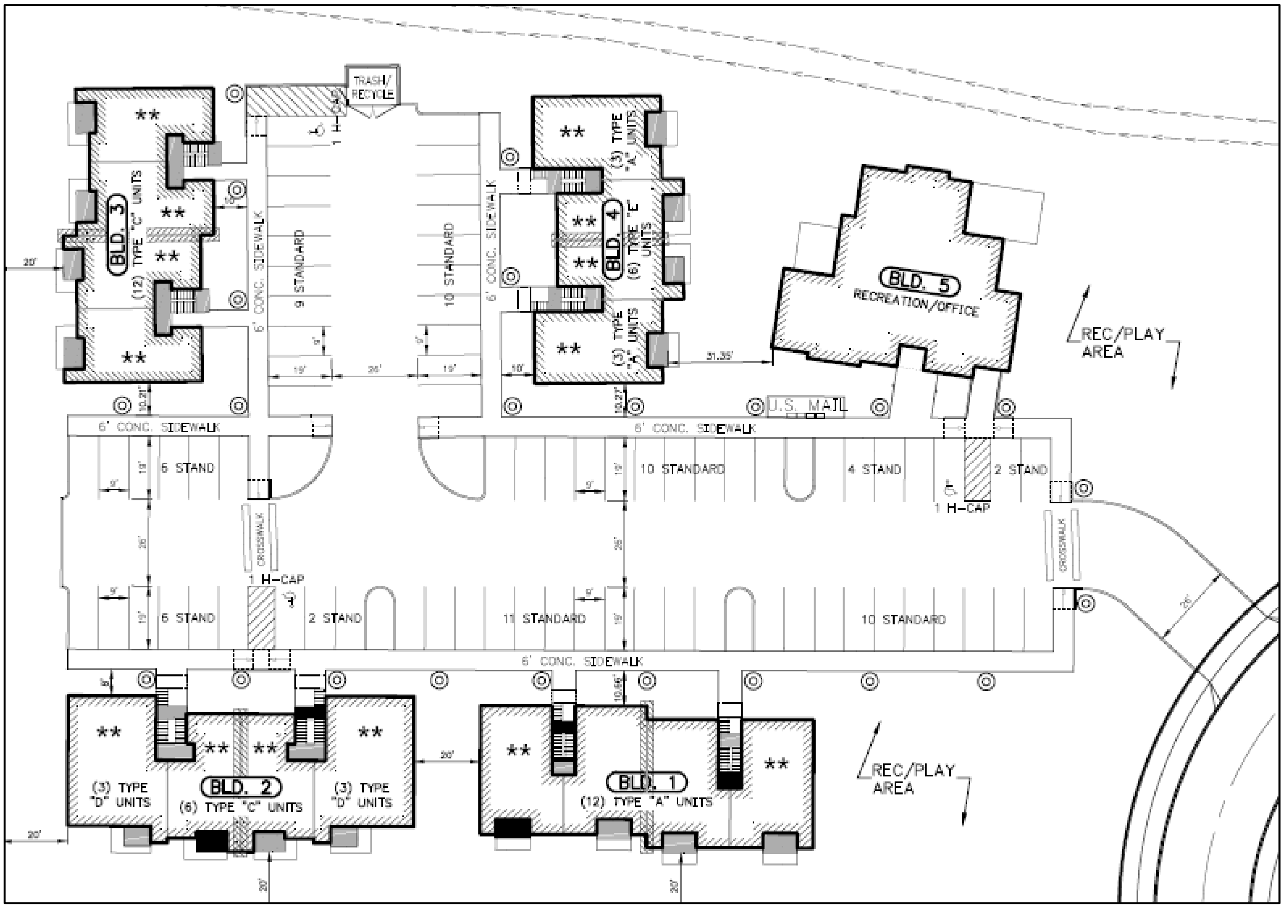
CITIZENS ARE INVITED TO PARTICIPATE in the public hearings and give written or oral testimony as described above that addresses applicable decision criteria during that part of the hearing process designated for testimony in favor of, or opposition to, the proposal. If additional documents or evidence are provided in support of the application subsequent to notice being sent, a party may, prior to the close of the hearing, request that the record remain open for at least seven days so such material may be reviewed.

Appeals: Failure to raise an issue in the hearings, in person or by letter, or failure to provide sufficient specificity to afford the decision makers an opportunity to respond to the issue precludes appeal to the Land Use Board of Appeals based on that issue. Decisions of the Planning Commission may be appealed to the Lebanon City Council within 15 days following the date the Commission's final written decision is mailed. Only the applicant, a party providing testimony, and/or a person who requests a copy of the decision has rights to appeal a land use decision. The appeal must be submitted on the appeals form as prescribed by City Council with appropriate fee paid and must set forth the criteria issues that were raised which the applicant or party deems itself aggrieved. Please contact our office should you have any questions about our appeals process.

Obtain Information: A copy of the application, all documents and evidence relied upon by the applicant, and applicable criteria are available online in the Planning Commission Agenda Packet at https://www.ci.lebanon.or.us/meetings. The materials are also available for inspection in person at no cost and will be provided at the cost of 25 cents per single-sided page. If you have questions, would like additional information, or would like to schedule a time to view the application materials in person, please contact City of Lebanon Community Development Department, 925 Main Street; phone 541-258-4252; email khart@ci.lebanon.or.us.

The meeting location is accessible to persons with disabilities. A request for an interpreter for the hearing impaired or for other accommodations for persons with disabilities should be made at least 48 hours before the meeting to 541-258-4906.

PROPOSED SITE PLAN & STREET ALIGNMENT



Donna Beamer
1760 Strawberry Lane
Lebanon, Oregon 97355

September 4, 2019

Department of Transportation
355 Capitol Street NE
Salem, OR 97301

Linn County Commissioners
3010 Ferry Street SW
Albany, OR 97322

City of Lebanon
Building and Planning
925 Main Street
Lebanon, OR 97355

Democrat Herald
600 Lyon Street St SW
Albany, OR 97321

Re: Veteran's Apartments, Lebanon

To Those Addressed Above

This morning at 7:02, while waiting to get out onto Airport Road from Strawberry Lane, I thought of the Veteran's Apartment buildings that are to be built in the wetlands near Stoltz Hill. It took me 15 minutes of unending traffic before there was a space big enough to squeeze into to make my left turn onto Airport Road. The busy times used to be from 6:30am to 8:30am and 3:30pm to 7:30pm; now it is almost all day long with very infrequent lapses in traffic when a left turn can be safely made. I have several friends who also live off Airport Road who are experiencing identical problems. Traffic comes from Second Street past the High School (which includes school busses) and from the freeway via Denny School Road, and in addition, an abundance of cars from Stoltz Hill Road.

While this is a worthwhile project, how can you in good conscience allow even more traffic to stop the flow along Airport Road between Second and Twelfth Streets. By putting a large apartment complex right in the middle of an already overcrowded area, you congest Airport Road even more, making it a traffic hazard. Does someone have to be killed before something is done to alleviate this congestion and long lines of cars? By adding more traffic with this complex, even with a signal somewhere in the equation, it will not be safe. There is property located nearer the freeway or in the general area where there is already a Vereran's facility, why not utilize it? Please reconsider the possibilities.

Donna Beamer

Donna Beamer

Following are others who have had similar problems at Airport Road.

Lou Ella Preston
Barbara Cleveland
[illegible]
Aline Pulliam
Donna J Sternberg
Marion Merrill
Janna Barnes
Delano J Eggert
Lara Eggert
Katy Elam
James Burnett
C Durkee
[illegible]
Doug Watkins
Wilma Watkins
Shari Pennington
Jas Pennington

[illegible]
[illegible]
[illegible]
[illegible]
Linda L Griffin
Vickie Hubbard
Betty M. Hodges
Konnie Lawrence
[illegible]
Nancy A. Smith
Ken Smith
Stephen [illegible]
[illegible] Walkercurry

Others have made comments in agreement with this letter.

MARCH 2, 2020

Lebanon Planning Commission:

re: case no AR-20-03 & VAR-20-01

As a neighbor to this property I would like to request the following:

1.Require a privacy fence between the development and adjoining properties

2. require grass for each unit so that dogs are not "taken for a walk" on neighboring properties (This has been a problem with current rentals in the area.)

3. Do not allow variance to minimum parking. We currently have a problem on 9th street because people are parking in the street on an already narrow road. Adequate parking needs to be mandatory for rental units.

Nancy Chlarson

1796 S 9th

Lebanon

LAND USE APPLICATION

PROPERTY INFORMATION	
Site Address(es): No Address at this time	
Assessor's Map & Tax Lot No.(s): 12S02W15BD Tax Lot # 301	
Comprehensive Plan Designation / Zoning Designation: Mixed Use	
Current Property Use: Inactive.	
Project Description: 48 Unit Affordable Veterans Housing Apartments with Community Building	
APPLICANT / PRIMARY CONTACT INFORMATION	
Applicant: Applegate Landing LLC, James Lutz	Phone: 541-230-4536
Address: 39596 Griggs Dr.	Email: james.cpcm@outlook.com
City/State/Zip: Lebanon, Oregon, 97355	
I hereby certify that the statements, attachments, exhibits, plot plan and other information submitted as a part of this application are true; that the proposed land use activity does not violate State and/or Federal Law, or any covenants, conditions and restrictions associated with the subject property; and, any approval granted based on this information may be revoked if it is found that such statements are false.	
APPLICANT SIGNATURE	Date: January 28th, 2020
PROPERTY OWNER INFORMATION (IF DIFFERENT THAN ABOVE)	
Owner: Strawberry Lane LLC	Phone: 541-230-4536
Address:	Email: james.cpcm@outlook.com
City/State/Zip:	
OWNER SIGNATURE	Date: January 28th, 2020
ADDITIONAL CONTACT INFORMATION	
Engineer / Surveyor: Multi-Tech Engineering Services, Inc	Phone: 1-503-363-9227
Address: 1155 13th Street SE	Email: mgrenz@mtengineering.net
City/State/Zip: Salem Oregon, 97302	

Architect: Same as above	Phone:
Address:	Email:
City/State/Zip:	

Other:	Phone:
Address:	Email:
City/State/Zip	

January 31, 2020

Applegate Landing
Affordable Housing for Veterans and Low-Income Families

TO: City of Lebanon, Community Development

FROM: James C. Lutz
Applegate Landing LLC
39596 Griggs Dr.
Lebanon, OR 97355

RE: Submission to the City of Lebanon:
Request for Administrative Review of adjustment under City Code 16.29.040 – Adjustments (Class 2), in relation to City Code *16.14.070 – Off-Street parking requirements for motor vehicles and bicycles*

The Project:

Applegate Landing is a proposed, cost effective, 48-unit, Veteran-focused, affordable housing complex in the City of Lebanon, OR. According to State data, Lebanon is currently underserved, with only 80% of its ideal, equitable distribution of affordable units, while Linn County as a whole is even lower, at 56% of the affordable units needed to meet demand. Greater than a third of the City's population is considered rent burdened, and this condition will only continue to worsen as Lebanon is well outpacing the State's average population growth.

Applegate Landing LLC is an Oregon limited liability company created to meet the housing and related service needs of Oregon Veterans and their families, and low-income families in and around Lebanon. Applegate Landing's commitment to affordable housing is the heart of the organization and we have, and will continue, working closely with the City of Lebanon, Linn County, and local service providers to ensure the provision of housing that supports residents, Veteran and civilian, and sets them up for stable housing and future success. The members of Applegate Landing LLC bring significant construction management experience and building expertise to the project. Applegate Landing LLC will combine this experience with strong community ties, and an experienced team to deliver a project rich in amenities and supportive services.

The Applegate property will have 12 units set aside specifically for Veteran households, with the remainder of units having a Veteran preference. Because Applegate will serve Oregon's Veteran population, the property will have more than the base requirement of accessible units and have onsite service provision and referral through a nonprofit partner, Crossroads Communities, which specializes in serving Veterans. The property will also include one project based-voucher unit funded through the HUD 811 program available to a person or household with a serious or persistent mental illness.

Crossroads Communities, a Lebanon-based nonprofit, will be integral to the Applegate project, partnering with Applegate Landing LLC to provide residents with service connections, and direct, onsite supportive services. Crossroads specializes in after-treatment care to individuals with mental health and substance use disorders with a focus on services for Veterans. Crossroads will provide case management for such individuals and households who live on site, while providing support, and service referrals to the broader resident population of Applegate Landing. This will include overseeing or assisting with peer support, rental stability, financial skills, vocational and workforce training, and more.

The Property:

Applegate Landing will include four 3-story residential buildings, consisting of 48 units mixed between studio, 1, 2, and 3 bedrooms. The units will consist of two studios, thirteen 1-bedroom, fourteen 2-bedroom, and two 3-bedroom units at 60% of Area Median Income (AMI); Two studios, three 1-bedroom, three 2-bedroom and two 3-bedroom units renting at 50% AMI; and two studios, one 1-bedroom, and one 2-bedroom units renting at 30% AMI. One 3-bedroom unit will be set aside for the property manager, and one 1-bedroom unit with HUD 811 rental assistance, affordable to a household at or below 30% AMI. Applegate will have 4 accessible units on the ground floor. All remaining ground floor units will be designed to be easily adaptable to full accessibility, and will be visitable to persons with mobility impairments.

Applegate Landing is using existing building plans, tweaked for the needs of the population being served. These plans are designed to be simple to build, saving on time, labor and materials, and their use reduces the project's design costs. This allows the project to deliver a wealth of in-unit and community amenities while still committing to energy efficiency and green building goals. Applegate will be Solar and Electric Vehicle charging installation ready, and will meet at least Earth Advantage Silver certification level, and expects to meet Gold certification requirements.

The standard unit amenities will include washer dryer hookups, a range/oven, refrigerator, a patio/balcony, air conditioning, and in-unit storage. Applegate Landing will include a community building that will include a leasing office, laundromat, kitchenette, large community gathering space, exercise room, small rooms for onsite counseling, medical exams, and other service provision, and outdoor grill/patio area.

The Applegate property will be adjacent to a portion of land that will remain undeveloped as open space. Currently the City requires the portion of the current parcel east of Burkhart Creek to remain open for three years as part of the City's storm water management plan. This open, green space will also provide residents access to walking trails that will be part of a 54-mile trail system through the City of Lebanon, and connecting to a larger regional system of trails and greenways. At the end of the three-year period Applegate Landing LLC hopes to turn the parcel into park space, preserving it as a more official amenity for residents.

Request for Adjustment under 16.29.040:

Applegate Landing is requesting an adjustment of standard parking requirements that apply to the project under 16.14.070. Under this code standard, Applegate Landing would be required to provide 2.25 parking spaces per unit. Under code standard 16.29.040 the City may approve adjustments to the minimum standards for off street parking provided that individual characteristics of the use of the location require less parking than is generally required for this type of use, and the need cannot reasonably be met through provision of shared parking with nearby uses. All other applicable code standards will be met.

We believe that this requirement would create an unnecessary excess of parking spaces given the individual characteristics of this project, in particular, the expected resident population, and the unit mix of the property. Because the Applegate project's ability to provide below market housing is dependent in part on our ability to keep project development costs as low as possible, the increased cost to provide unused parking represents an unnecessary burden to the project's finances. The estimated cost of moving from 72 parking spaces to 108 is $200,000.

The Resident Population:

Applegate Landing will serve low, and very low-income populations. Studies have long shown that vehicle ownership per household, and per capita, decreases with income, and that requiring affordable developments to meet the minimum parking requirements of market rate rental housing is unnecessary and increases cost without benefit to residents. Some examples of this research are outlined below.

Specifically, Todd Litman, of the Victoria Transport Policy Institute has shown, using BLS data, that households below the US median income own cars at half the rate of the upper 20% of income earners, and that rates of car ownership among households in the bottom 40% of incomes are even lower, at 1.5 cars per household and below, averaged among all household sizes.

The income delineation of units at Applegate is as follows:
6 units renting to households making at or below 30% of Area Median Income
10 units renting to households making at or below 50% of Area Median Income
31 units renting to households making at or below 60% of Area Median Income
1 managers unit.

Applegate will also have a higher likelihood than a comparable market rate apartment to serve individuals with physical disabilities, as the project serves both Veterans, and low-income households. According to Census data, about 40% of the Veteran population of Linn County served in the Vietnam era, making them likely to be seniors. All of these factors further reduce the likelihood of car ownership among residents.

A 2011 study by the City of San Diego that surveyed residents of affordable housing, and reviewed the allowances in parking rules for affordable housing projects found that 47.5% of residents had no car, 38.7% had one car, and only 13.7% had more than one car. Units serving seniors and residents with disabilities averaged below 0.4 cars per household.

The Unit Mix:

The Applegate Landing apartment complex will have a higher than typical number of units designed for single person households. This stems from the household make-up of the individuals Crossroads Communities has been serving and working with in Lebanon and Linn County, particularly the Veteran population they serve.

Because of this, the unit mix of Applegate Landing will be as follows:
6 Studio Units
18 One Bedroom Units
18 Two Bedroom Units
6 Three Bedroom Units

It is highly likely that the studio units and most of the one bedroom units are occupied by singe person households. We then assume that this population, in correlation with being low-income, is likely to own, on average between 0.5 and 1 car per household.

The two and three bedroom units are more likely to have 2+ person households, though it's unlikely, given the populations discussed previously, that any of these households will have more than 2 cars. We expect the residents of the 2 and 3 bedroom units to own between 1.5 and 2 cars on average.

Taking the middle of each range, 0.75 and 1.75 and multiplying by the number of units in each group (24) comes to total of 60 spaces expected to be used by residents on a daily basis. Under the current designs this leaves about 12 spaces available for visitors of residents, service providers, and any extra cars for residents.

Not all of these parking needs will overlap, with most service traffic to the community building occurring during the day, and the heaviest periods of resident parking need being during the evening. It is likely that during the day, there will be much more than these 12 available spots for any visitors to the site.

Possibility of Shared Parking with Nearby Facilities

Standard 16.29.040 also addresses the possibility of shared parking to meet the requirement. Applegate Landing is currently surrounded by low-density single family homes, undeveloped land. There is no adjacent or nearby multifamily housing or large commercial facilities with which it makes sense to explore shared parking arrangements. The closest similar facilities would require walking distances that make shared parking unfeasible.

While we believe that increasing the on-site parking will be an undue burden on the project, as part of the overall development of the parcel of land identified for this project, street parking will be available along the planed city street that runs from Airport Rd to Strawberry Ln. While we do not believe there will be any parking issues on the Applegate Landing project site with the proposed 72 spaces, these additional street spaces will allow for overflow.

Transportation Considerations for Residents:

Understanding that Applegate Landing will serve many households without personal vehicles we have taken steps to ensure Resident's access to transportation.

Coordinated between Onsite property management and Crossroads Communities onsite staff, all residents who do not have access to their own vehicle will receive assistance as needed in making use of Lebanon's LINX Dial-a-Bus service.

Applegate Landing LLC is also working with the Linn Shuttle to ensure bus service as close as possible to the property.

Examples of Research on Parking Needs of Affordable Housing Residents:

Litman, Todd. "Parking Requirements Impacts on Affordable Housing." Researchgate
https://www.researchgate.net/publication/235360401_Parking_Requirement_Impacts_on_Housing_Affordability

City of San Diego, *Affordable Housing Parking Study, Fact Sheet #2: Understanding Parking Demands for Affordable Housing.* 2011
https://www.sandiego.gov/sites/default/files/legacy/planning/programs/transportation/pdf/ahpsfactsheet2.pdf

Howell, et. al. "Transportation impacts of affordable housing: Informing development review with travel behavior analysis. " Journal of Transport and Land Use, 2018.
https://www.jtlu.org/index.php/jtlu/article/view/1129/986

Shoup, Donald. "Cutting the Cost of Parking Requirements." Access Magazine, UC Berkely, 2016.
https://escholarship.org/content/qt9n17r6c6/qt9n17r6c6.pdf

www.vtpi.org

Info@vtpi.org

Phone & Fax: 250-360-1560

VICTORIA Transport Policy INSTITUTE
EFFICIENCY • EQUITY • CLARITY

Parking Requirement Impacts on Housing Affordability

24 August 2016

Todd Litman
Victoria Transport Policy Institute


Current development practices result in generous parking supply at most destinations, which reduces housing affordability, increases vehicle ownership and stimulates sprawl. This is regressive, since lower-income households tend to own fewer than average vehicles, and unfair, because it forces residents to pay for parking they don't need. Alternative policies can increase housing affordability and help achieve other transportation and land use planning objectives.

Abstract

Most zoning codes and development practices require generous parking supply, forcing people who purchase or rent housing to pay for parking regardless of their demands. Generous parking requirements reduce housing affordability and impose various economic and environmental costs. Based on typical affordable housing development costs, one parking space per unit increases costs approximately 12.5%, and two parking spaces can increase costs by up to 25%. Since parking costs increase as a percentage of rent for lower priced housing, and low income households tend to own fewer vehicles, minimum parking requirements are regressive and unfair. Various parking management strategies can increase affordability, economic efficiency and equity.

Contents

Preface

Hey, I've got a terrific idea! Let's pass a law requiring all residential buildings to have gasoline pumps that provide free fuel to residents and their guests. Fuel costs would be incorporated into residential rents. Think of the benefits! No more worry about money to pay for gas. No delays at gas stations. Everybody would be better off, especially poor folks. Great idea, right?

Wrong. It's a foolish idea. Somebody would have to pay for the pump and gasoline. It would increase everybody's housing costs. It would be unfair to anybody who drives less than average, who would be forced to subsidize their neighbors' gasoline consumption.

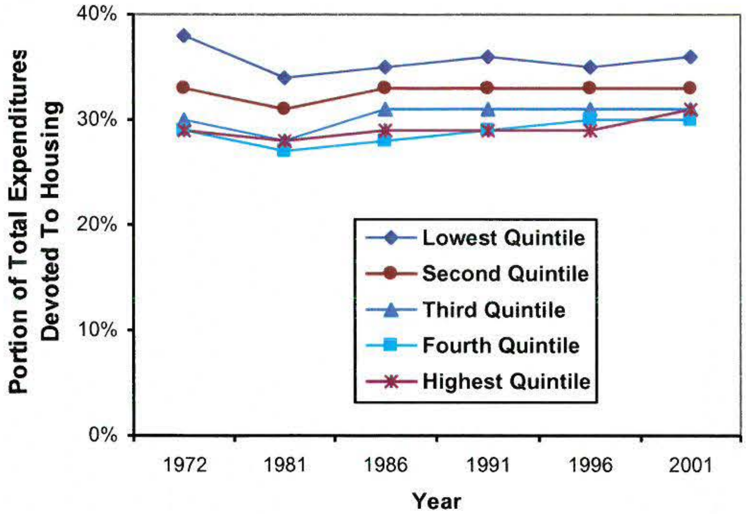
Free gasoline would also encourage wasteful habits. It would increase motor vehicle use, leading to more congestion, pollution, accidents, and sprawl, and it would continue the decline in non-automotive transportation choices, leaving non-drivers worse off. The gasoline tanks would take up space. Gasoline spilled from the pumps would degrade the environment.

Although requiring free gasoline is obviously unfair, wasteful and foolish, it is economically little different from current residential parking standards. Both residential parking and gasoline typically cost about $50 per month per automobile. Current practices of requiring generous free residential parking contradict society's goals to provide affordable housing, reduce environmental impacts, conserve resources and develop a more efficient and diverse transportation system.

Introduction

Adequate housing is essential for individual and community welfare. There are few trends more tragic than the growing housing problems many people face. An unacceptable number of people are homeless, and many lower-income households devote an excessive portion of their income to housing.

Figure 1 **Housing Portion of Consumer Expenditures** (BLS, Various Years)



This figure shows the portion of household expenditures devoted to housing by income quintile. Housing averages more than a third of expenditures for the lowest income quintile households.

This report examines the impacts of residential parking requirements (the number of off-street parking spaces mandated at a particular location) on housing affordability. Increasing parking requirements increase housing development costs, which has reduced the supply of lower priced housing and raised costs to consumer. This report does not question the need for some off-street parking. The question issue is how best to determine parking requirements and manage available parking supply. It describes more efficient and equitable strategies that support social and environmental goals.

The parking problem is ultimately simple. Motorists have come to expect generous amounts of free parking at most destinations, and planning practices attempt to provide this. The result is more-than-adequate parking supply at most destinations, but high costs in terms of resources consumed and distortions to development patterns. Current parking practices are comparable to about a 10% tax on development, and much more for lower-priced housing in areas with high land costs. These practices are regressive because lower-income people tend to own fewer than average vehicles: we force five lower-income households to purchase more parking than they need, to insure that one higher income household can park all of its vehicles with no extra cost. Described more positively, more efficient parking practices can provide large savings, increased affordability and improved community design.

Current Residential Parking Requirements

Automobiles typically spend 95% of their existence parked, using either on-street parking supplied free by the community or privately supplied off-street parking. Since on-street parking is an expensive and limited public resource it seems fair to mandate off-street parking. Most local governments require building owners to provide a certain minimum amount of parking based on the assumption that buildings create parking demand. Building owners are forced to include parking costs when selling or renting housing.

Table 1 **Typical Parking Standards** ("Parking Evaluation," VTPI, 2005)

Housing Type	Spaces Per Unit
Single family	2.0
"Efficiency" apartments	1.0
1 to 2 bedroom apartments	1.5
3+ bedroom apartments	2.0
Condominiums	1.4

These standards are considered sufficient to meet typical residential parking

These parking requirements are based on recommended standards published by professional organizations such as the *Institute of Transportation Engineers* (www.ite.org) and the *American Planning Association* (www.planning.org). Table 1 shows typical recommended off-street standards. Many municipalities impose even higher parking requirements than these recommended standards, as illustrated in Table 2. These standards tend to be excessive in many situations, resulting in parking facilities that are seldom or never fully used, particularly in areas where per capita vehicle ownership and use tends to be low (Shoup, 1999).

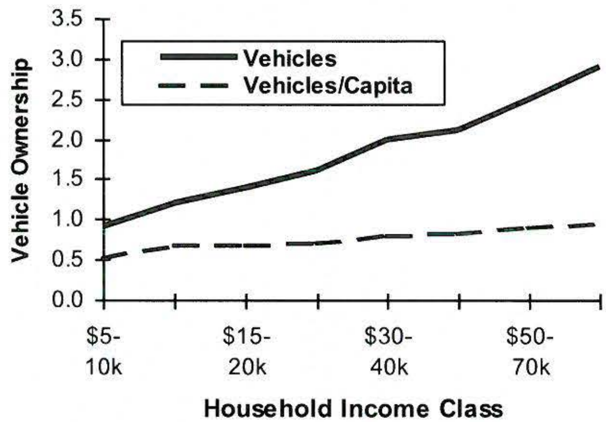
Table 2 **Typical Residential Off-Street Parking Standards** (Stover & Koepke, 2002)

Multifamily, Studio "One space per dwelling unit." (Orange Co., CA) "1.2 spaces per unit." (Bellevue, WA) "1.25 per dwelling unit." (Savannah, GA) *Multifamily, One Bedroom* "One space for each dwelling." (Bay City, MI) "1.5 spaces for efficiency units." (Schaumburg, IL) *Multifamily, Two Bedrooms* "1.6 spaces per unit." (Bellevue, WA) "1.75 spaces per dwelling unit." (Savannah, GA) "Two spaces per dwelling unit." (Hillsborough, FL) *Multifamily, Three Bedrooms* "1.8 spaces per unit." (Bellevue, WA) "2.33 spaces per unit." (Lake Forest, IL) *Multifamily, Four Bedrooms* "Two spaces per unit." (Albany, OR)	*Manufactured Housing* "One space per unit." (Fairbanks, AK) "1.25 spaces per mobile home site."(Durham, NC) "1.5 spaces per unit." (Albemarle Co. VA) "Two spaces per unit, plus one per five units for guest parking." (Prescott, AZ) *Townhouse* "1.5 spaces per dwelling unit." (Clifton Forge, VA) "Two spaces per dwelling unit." (Lexington Co. SC) "2.25 spaces for each dwelling unit." (Plano, TX) *Single Family* Nearly all codes require two off-street spaces per unit. "Detached two spaces per dwelling if access to the lot is on a public street; 2.5 spaces per dwelling if access to the lot is from a private street, common drive, or common parking court." (Leesburg, VA)

Parking Demand by Households

Automobile ownership varies significantly, and is affected by demographic, geographic and management factors ("Parking Evaluation," VTPI, 2005; Hexagon Transportation Consultants 2008; San Diego 2011; Metro Vancouver 2012). Twelve percent of U.S. households do not own a motor vehicle, with higher rates of zero-vehicle households in larger cities and lower-income communities (BLS, 2003). Motor vehicle ownership rates tend to increase with income and household size, as indicated in figures 2 through 5 (also see Rice, 2004; CNU, 2008).

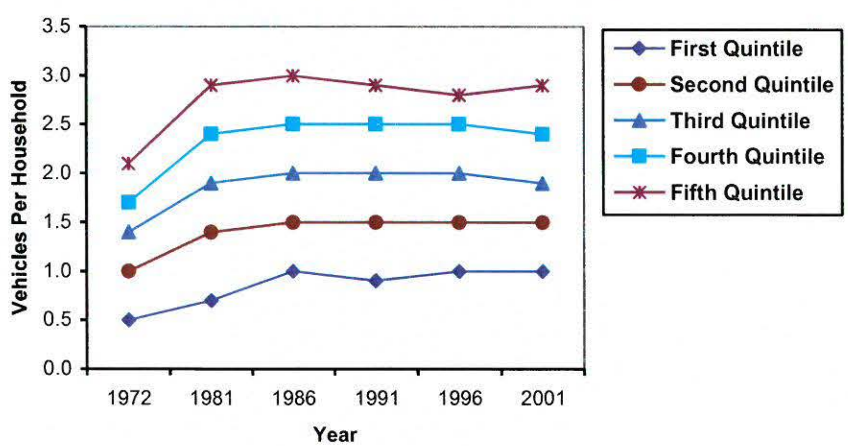
Figure 2 **Vehicle Ownership by Household Income** (BLS, 2003)



Lower income households own fewer automobiles than wealthier households.

Figure 3 shows how per household vehicle ownership varies by income class and over time. Average vehicle ownership rates grew during the 1970s and 1980s, but this leveled off and even declined in some classes during the 1990s.

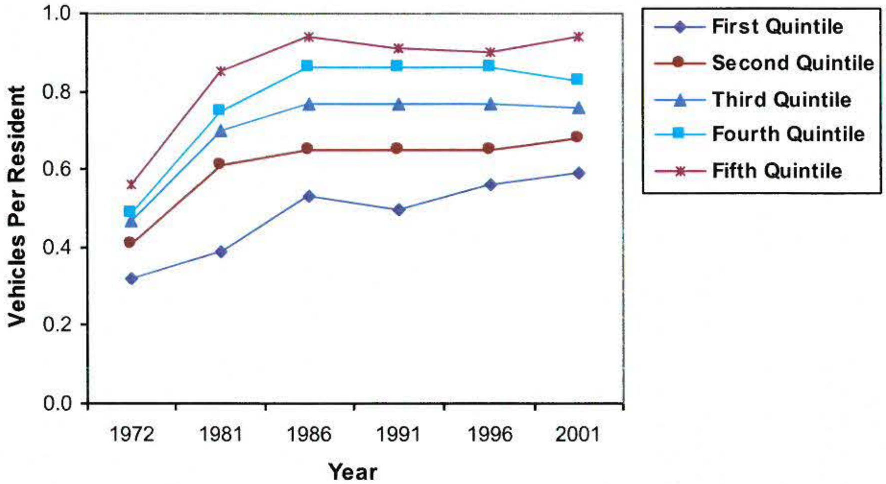
Figure 3 **Vehicles Per Household By Income Class** (BLS, Various Years)



This figure shows how household vehicle ownership varies by income. Vehicle ownership grew during the 1970s, but has since leveled off and even declined for some income groups.

Differences in vehicle ownership between different income classes results, in part, from differences in household size, since household population increases with income. Figure 4 compared vehicle per household resident.

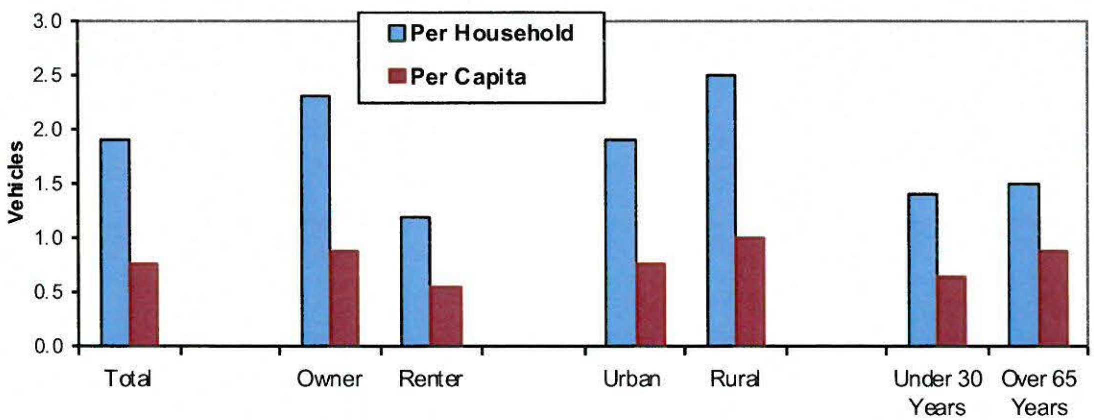
Figure 4 **Vehicles Per Resident By Income Class** (BLS, Various Years)



This figure shows the average number of vehicles per capita by income quintile.

Figure 5 illustrates how factors such as home tenure, location and age affect vehicle ownership and therefore parking demand.

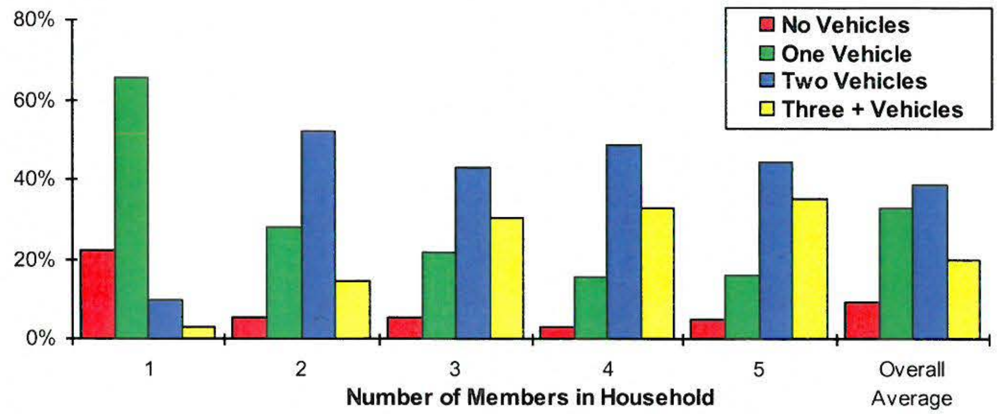
Figure 5 **Vehicles Per Household** (BLS, 2002)



Household vehicle ownership rates vary depending on factors such as home tenure, location and resident age.

Vehicle ownership varies with household size, as illustrated in Figure 6. Even a two or three bedroom home may only require one parking space because it is occupied by an adult who uses an extra bedroom as a study, a single parent with children, or two or three adults who share a vehicle.

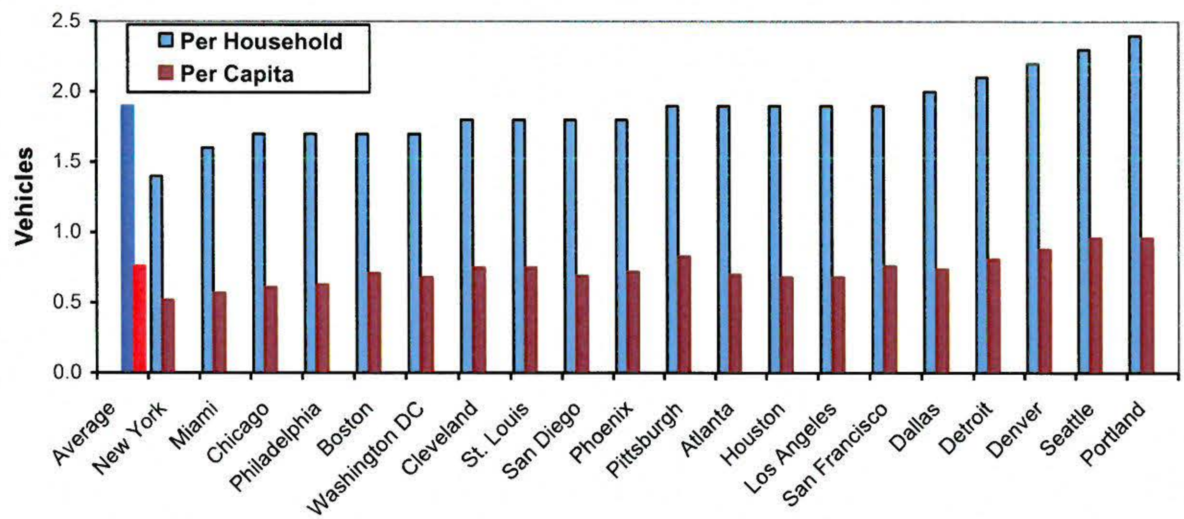
Figure 6 **Vehicle Ownership by Household Size** (Hu and Young, 1993, Table 3.17)



Smaller households tend to own fewer vehicles than larger households.

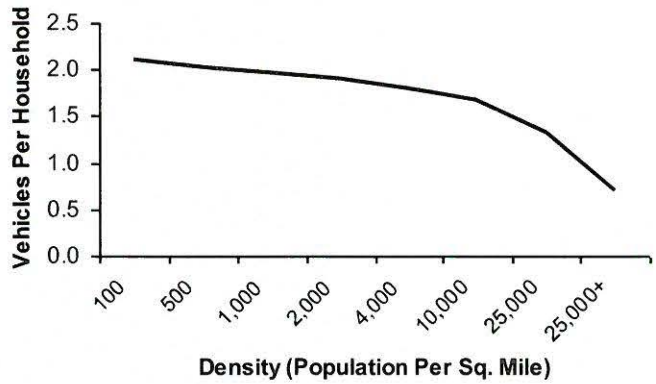
Automobile ownership is also affected by geographic factors such as city size, population density and transit service quality ("Land Use Impacts On Transportation," VTPI, 2005). Figure 7 shows how vehicle ownership rates vary between different U.S. cities. Figure 8 shows how vehicle ownership is affected by population density.

Figure 7 **Vehicles Per Household For Various U.S. Cities** (BLS, 2002)



Vehicle ownership varies from one city to another. Even greater variations exist within an urban region, such as between central and suburban neighborhoods.

Figure 8 **Vehicles Per Household by Population Density** (NPTS, 1995)



Vehicle ownership rates decline with population density.

Residents of communities with more diverse transport systems tend to own fewer cars and take fewer vehicle trips than in more automobile-dependent areas (Litman 2005). Holtzclaw (1994) developed a model for predicting how density and transit service availability affect vehicle ownership and use, summarized in the box below. This formula is incorporated in the *This View of Density Calculator* (www.sflcv.org/density).

Household Vehicle Ownership and Use By Land Use Formula (Holtzclaw, 1994)

Household Vehicle Ownership $= 2.702 * (\text{Density})^{-0.25}$

Household Annual Vehicle Miles Traveled $= 34{,}270 * (\text{Density})^{-0.25} * (\text{TAI})^{-0.076}$

Density = households per residential acre.

TAI (Transit Accessibility Index) = 50 transit vehicle seats per hour (about one bus) within ¼-mile (½-mile for rail and ferries) averaged over 24 hours.

Bunt and Joyce (1998) surveyed parking demand around the city of Vancouver's SkyTrain stations. They found:

- Nearly a quarter of households living near transit stations own no vehicles.
- Households located within 300 metres of a station owned about 10% fewer vehicles on average than households located more than 1,000 meters from the station.
- Average household vehicle ownership is 31% lower within the SkyTrain corridor than at suburban locations a few miles away.

Carsharing (vehicle rental services designed to substitute for private vehicle ownership) tends to reduce vehicle ownership and parking demand (Filosa, 2006). Cervero and Tsai (2003) found that when people join a San Francisco carsharing organization, nearly 30% reduce their household vehicle ownership and two-thirds avoided purchasing another car, indicating that each carshare vehicle in that program substitutes for 5-10 private vehicles.

The elasticity of vehicle ownership with respect to price is typically -0.4 to -1.0, so a 10% increase in total vehicle costs reduces vehicle ownership 4-10% ("Transportation Elasticities," VTPI, 2005). Table 3 and Figure 9 indicate the reduction in vehicle ownership that can be expected from various residential parking fees and unbundling. Unbundling allows residents to choose how much parking to rent with building space, rather than automatically including a set number of parking spaces. For example, rather than renting an apartment with two parking spaces for $1,000 per month, the apartment could rent for $850 per month, plus $75 per month for each parking space the renter chooses. This is more equitable and efficient, since occupants are not forced to pay for parking they do not need. It allows consumers to adjust their parking supply to reflect their needs.

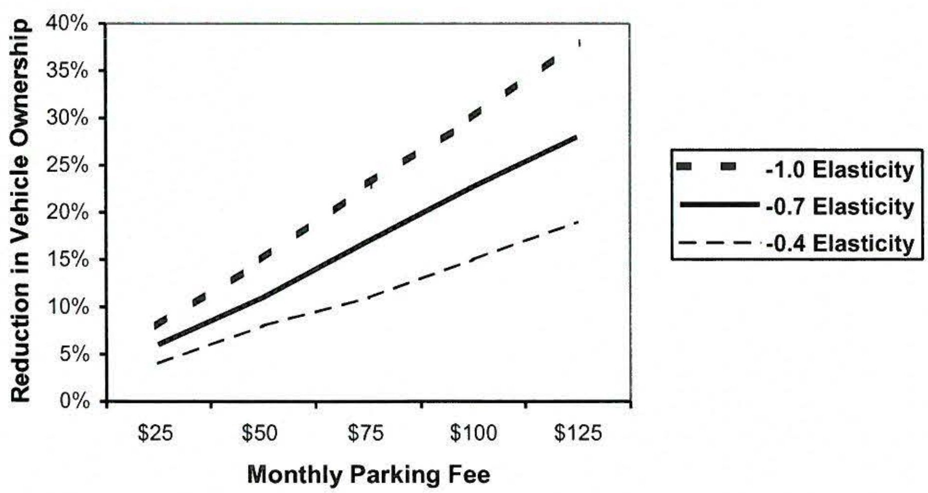
For example, a $600 annual residential parking fee is likely to reduce vehicle ownership by 8-15%, and a $1,200 annual fee reduces vehicle ownership 15-30%, assuming free parking is unavailable nearby.

Table 3 **Vehicle Ownership Reductions From Residential Parking Pricing**

Annual (Monthly) Fee	-0.4 Elasticity	-0.7 Elasticity	-1.0 Elasticity
$300 ($25)	4%	6%	8%
$600 ($50)	8%	11%	15%
$900 ($75)	11%	17%	23%
$1,200 ($100)	15%	23%	30%
$1,500 ($125)	19%	28%	38%

This table indicates reductions in vehicle ownership resulting from various residential parking fees, assuming that total vehicle ownership costs average $4,000 per year.

Figure 9 **Reduction in Vehicle Ownership From Residential Parking Prices**



This figure illustrates typical vehicle ownership reductions due to residential parking pricing, assuming that the fee is unavoidable (free parking is unavailable nearby). Based on Table 3.

Parking Facility Costs

If a municipal government doubled residential property taxes to finance free public parking there would surely be considerable debate about the efficiency and equity of such a tax. At least some critics would probably suggest that such taxes are inefficient and unfair, and there would surely be arguments over the facilities' aesthetic and environmental design features. A 2-space per residence parking standard imposes similar costs yet there is often little discussion when city officials set such requirements. Parking requirements are a large but nearly invisible cost that is seldom evaluated as a separate expense. The total cost of parking consists of several components.

1. Land

Each off-street parking space requires about 300 square feet of surface area (including access lanes). One acre of land can hold about 125 spaces, fewer if major landscaping and screening are provided ("Parking Evaluation," VTPI, 2005). Land costs are about $4,200 per space, assuming 120 parking spaces and $500,000 per acre. Parking consumes a major portion of developed land, typically equal to or exceeding the land devoted to the buildings it serves. Expenses that occur early during project development, such as increased land acquisition and preparation costs, add construction financing costs, so parking facility expenses tend to incur higher financing costs than expenses incurred later in the development process.

Residential parking standards are calculated per unit, so parking land costs are a greater percentage of total costs for smaller units. For example, increasing parking from one to two spaces per unit increases land requirements for a small 1,000 square foot, two-story apartment or condominium from 800 to 1,100 square feet per unit, a 37% increase, resulting in more land devoted to parking than to housing. The same doubling of parking requirements only increases the land requirement for a 2,400 square foot one story house by 12.5%.

3. Construction and Maintenance

Paving costs average about $1,600 per parking space in 1994 dollars, excluding land costs. Parking structure costs average approximately $10,000 per space, and underground parking $15,000 to $20,000 per space, which makes these options uneconomic except where land prices are very high. Annual maintenance costs range from about $20 to $100 per year.

Table 4 illustrates the total cost per space for parking facilities in various conditions. Typical off-street residential parking costs range from about $400 annually in suburban locations where land is considered to have no opportunity cost, to more than $2,000 per year where underground parking is provided. Annual costs of $800 to $1,200 per space is probably typical for urban residential parking. Gabbe and Pierce (2016) estimate renter households' garage parking costs average approximately $1,700 per year, or an additional 17% of rents, imposing $440 million annually in total costs to carless renter households.

Table 4 **Typical Parking Facility Financial Costs** ("Parking Evaluation," VTPI, 2005)

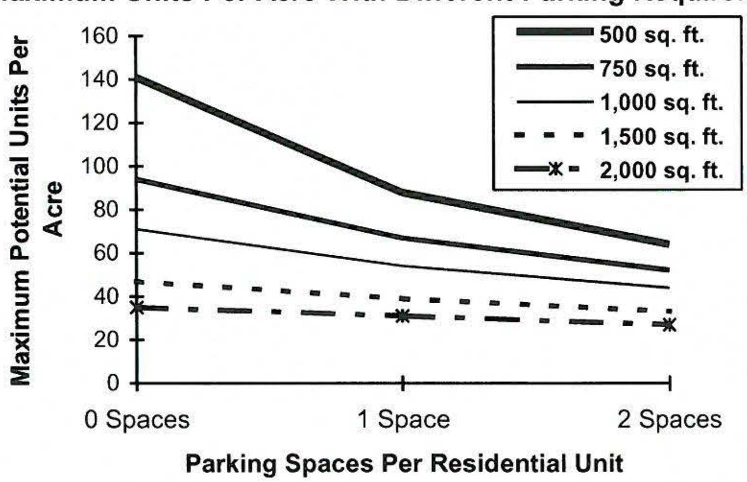
Type of Facility	Land Costs	Land Costs	Construction Costs	O & M Costs	Annual Cost	Monthly Cost
	Per Acre	*Per Space*	*Per Space*	*Annual, Per Space*	*Annual, Per Space*	*Monthly, Per Space*
Suburban, On-Street	$50,000	$200	$2,000	$200	$408	$34
Suburban, Surface, Free Land	$0	$0	$2,000	$200	$389	$32
Suburban, Surface	$50,000	$455	$2,000	$200	$432	$36
Suburban, 2-Level Structure	$50,000	$227	$10,000	$300	$1,265	$105
Urban, On-Street	$250,000	$1,000	$3,000	$200	$578	$48
Urban, Surface	$250,000	$2,083	$3,000	$300	$780	$65
Urban, 3-Level Structure	$250,000	$694	$12,000	$400	$1,598	$133
Urban, Underground	$250,000	$0	$20,000	$400	$2,288	$191
CBD, Surface	$2,000,000	$15,385	$3,000	$300	$2,035	$170
CBD, 4-Level Structure	$2,000,000	$3,846	$15,000	$400	$2,179	$182
CBD, Underground	$2,000,000	$0	$25,000	$500	$2,645	$220

This table illustrates the costs of providing a parking space under various conditions. (CBD = Central Business District; Assumes 7% annual interest rate, amortized over 20 years)

4. Reduced Development Density

By increasing the land needed per residential unit, increased surface parking reduces the maximum potential development density (units per acre). In other words, parking squeezes out housing. This impact is proportionally greatest for smaller units. For example, increasing parking requirements from one to two spaces per unit reduces the maximum potential density for two story, 500 square foot bachelor apartments from 88 to 64 units per acre, representing a 37% decline, but only causes a 13% reduction in maximum density for 2,000 square foot townhouses. Figure 10 illustrates this impact.

Figure 10 **Maximum Units Per Acre With Different Parking Requirements**



Maximum potential density declines as the number of surface parking spaces increases. This impact is proportionally largest for smaller units. (Assumes 300 sq. ft. per parking space, 90% land coverage, 10% common areas, 2 story buildings.)

5. Higher Retail Price Targets
Construction financing agencies often require that new building retail prices be at least 3 times original land costs. Each additional dollar of land costs for parking therefore increases housing prices by three dollars. Developers cannot afford to build a simple, lower priced housing when their land costs increase, so they target higher end markets.

6. Environmental and Aesthetic Costs.
Undeveloped land, farmland and urban landscaping (greenspace) provide a variety of environmental and aesthetic benefits, both to the land's owners and to society in general (Litman, 1997). Paved land, biologically barren and unattractive, tends to reduce adjacent property values, increases water pollution and stormwater flooding, reduces visual and acoustic privacy, and causes urban heat island (increased local temperatures).

7. Urban Sprawl and Increased Automobile Dependency.
Increased parking requirements increase land costs per area of developed floor space, making development at the urban periphery relatively more attractive due to lower land costs (Willson, 1995). Some studies suggest that such regulations discourage urban infill development (Burby, 2000). Increased parking also creates lower density urban and suburban land use patterns that are unsuitable for walking, bicycling and transit. Development densities under about 12 units per acre cannot effectively support public transit service and neighborhood amenities such as small shops within walking distance that substitute for driving. Since off-street parking is a fixed cost (households must pay it whether or not they own a car), fixed parking standards encourage automobile ownership and use.

Each of these impacts contributes to urban sprawl and automobile dependency (defined as increased automobile ownership and use, reducing travel choices, and increasing disadvantage of non-drivers compared with drivers. See "Automobile Dependency," VTPI, 2005). These exacerbate problems such as congestion, accidents, and pollution. Automobile dependency is highly inequitable to non-drivers.

8. Increased Curb Cuts
Offstreet parking requires curb cuts. This imposes at least two specific costs. It degrades the pedestrian environment (and therefore the retail environment in commercial areas) by causing vehicles to cross sidewalks, and it reduces capacity for on-street parking. A typical curb cut uses almost the same amount of curb space as a parked car, so a single-vehicle off-street parking space provides no net increase in parking capacity if it eliminates an on-street parking space. A double off-street parking space provides a net gain of one space.

Development Cost Example

Each increment of increased parking increases all of the costs described above as demonstrated by the following example: A developer wishes to construct 2 bedroom, 1,250 square foot, two-story, wood frame multi-family housing with $100,000 per unit construction costs on a $500,000, 1 acre parcel. Her costs are summarized in Table 5.

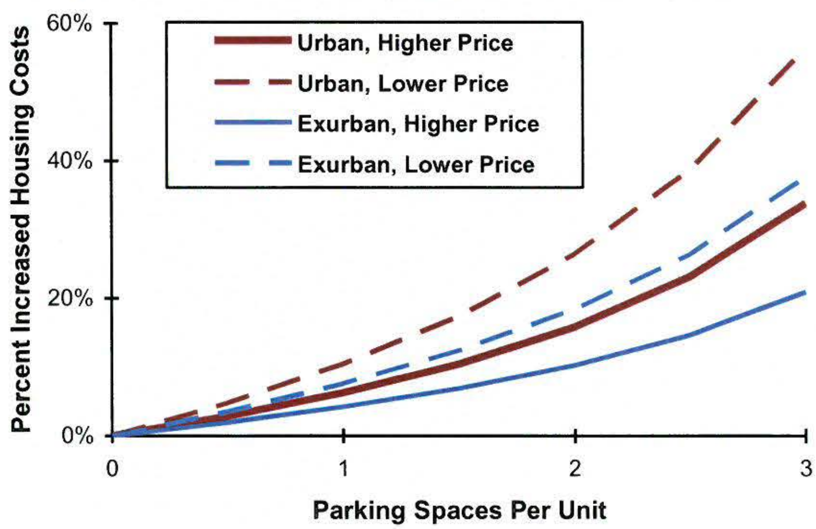
Table 5 **Parking Impacts on Development Costs**

Parking Spaces Per Unit:	0	1	2	3
Units / Acre	20	16	12	8
Land Cost / Unit	$25,000	$31,250	$41,667	$62,500
Paving costs.	$0	$1,600	$3,200	$4,800
Housing construction costs / Unit.	$100,000	$100,000	$100,000	$100,000
Land, parking & construction costs.	$125,000	$132,850	$144,867	$167,300
Construction financing (12%).	$15,000	$15,942	$17,384	$20,076
Total construction costs.	$140,000	$148,792	$162,251	$187,376
Developer's profit (10%).	$14,000	$14,879	$16,225	$18,738
Retail price per unit.	$154,000	$163,671	$178,476	$206,114
Parking as percentage of retail price.	0%	6.3%	15.9%	33.8%
Developers' profit per acre.	$280,000	$238,067	$194,701	$149,901

(Assuming Two-Story, 1,200 Square Foot, Multi-Family Housing)

Requiring one off-street parking space adds about 6% to the unit cost, two spaces add about 16%, and 3 spaces adds about 34% compared with no parking. These percentages vary depending on construction and land costs. Figure 11 illustrates incremental costs of parking for standard and affordable housing ($100,000 and $50,000 per unit construction costs), with urban and suburban land costs ($500,000 and $250,000 per acre).

Figure 11 **Increased Per Unit Housing Price Due to Parking Costs**

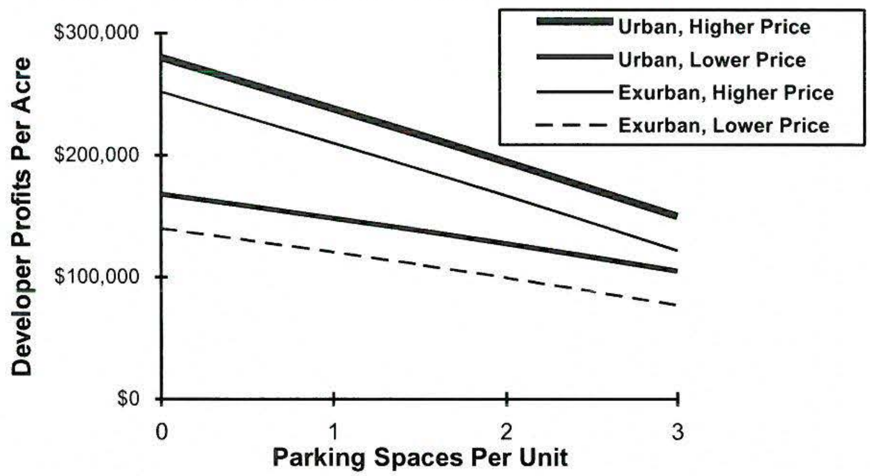


This shows parking costs as a percentage of housing costs for different construction and land costs. The percentage is greatest for lower price urban housing. This does not include additional indirect costs and non-market, such as reduced greenspace.

This shows that generous minimum parking requirements significantly increase housing costs, especially when land prices are high and housing construction costs are relatively low, such as affordable, urban infill housing. Based on typical affordable urban housing development costs, one parking space per unit increases total development costs by about 12.5%, and two parking spaces increase costs by about 25%.

Parking requirements reduce developers' profits per acre, as illustrated in Figure 12. In this case, a developer is equally rewarded for producing 10 high priced housing units with 3 parking spaces per unit or 20 affordable housing units with no parking spaces, but has 30% less profit for lower priced housing with 3 parking spaces. Parking requirements reduce developers' incentive to produce affordable housing.

Figure 12 **Effect of Parking Costs on Developer Profits Per Acre**



Developer profits per acre decline with increasing parking due to increased costs and reduced units. This reduces developers' incentive to build affordable housing.

According to a study by Shoup, these generous parking requirements are the largest of all regulatory burdens placed on developers, about four times greater than all other development fees combined, such as levies for schools, parks and roads (Shoup, 1999).

Developers' most common response to the high incremental costs of increased parking is to stop building affordable urban housing. One case study from the early 1960's found that requiring one off-street parking space per unit reduced dwelling units per acre in new multi-family developments by 30%, and increased construction costs by 18% (Smith, 1964). This significantly reduced the amount of urban land available for infill housing and gave developers an incentive to develop fewer, larger and lower quality units. The resulting reduction in affordable housing construction increased local rents (Shoup, 2005 contains more examples of parking requirement cost impacts).

Parking imposes similar costs for non-profit developments. To provide housing that can be purchased at $80,000 per unit (for a monthly mortgage of about $700, the maximum recommended house payment for a family earning $30,000 annually), a subsidy of only $4,000 would be needed if no parking is required, a $12,792 subsidy is required for one parking space per unit, $26,251 for two parking spaces, and $51,376 for three (based on Table 5 values). In this case a given housing budget could benefit about 6.5 times as many households that don't have parking spaces compared with 2 spaces per unit.

Empirical research indicates that generous parking requirements really do affect housing supply and affordability. Manville (2010) found that when parking requirements were removed in downtown Los Angeles, developers provide more housing and less parking, and a greater variety of housing types: housing in older buildings, in previously disinvested areas, and lower-priced housing with unbundled parking that is marketed toward non-drivers. The research also indicates that allowing developers to provide parking off-site can allow more affordable infill housing.

Analysis of 23 recently completed Seattle-area multifamily housing developments reveals that parking subsidies increase monthly rents approximately 15% or $246 per month for each occupied unit; that approximately 20% of occupants own no motor vehicles, and during peak periods 37% of parking spaces are unoccupied (London and Williams-Derry 2013). The authors conclude that "the practice of providing abundant "cheap" parking actually makes rental housing more expensive."

A study found that San Francisco housing prices increased significantly (an average of $39,000 or 13% for condominiums, and $46,000, or 12% for single-family units) if they include off-street parking (Jia and Wachs 1998). Only unit size and number of bathrooms have a greater effect on sales price. Based on standard mortgage requirements, a typical household would need to earn $76,000 annually to purchase a single-family home with off-street parking, compared with $67,000 for the same housing without parking.

Similarly, Jung (2009) used hedonic pricing to estimate the marginal effect of an additional parkade-style parking space on condominium prices. His results indicate that the value of a parking space is statistically significant but substantially less than the typical cost of supplying that space. The results suggest that if the retail price is increased to include the costs of additional parking spaces, the higher price does not fully reflect the cost to the developer of providing those parking spaces. This adversely affects housing affordability because developers must charge more per unit, and to the degree that the additional parking costs cannot be recovered by higher prices, are likely to provide less housing, leading to a higher market-clearing price, particularly in lower price ranges.

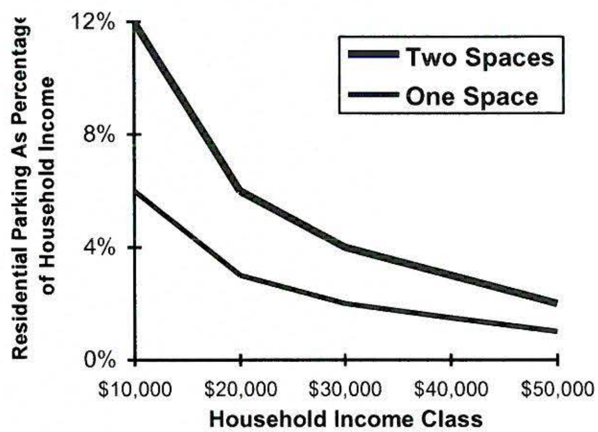
Impacts on Lower Income Households

Who is disadvantaged most by generous parking requirements? Since they are based on average parking demand they represent approximately what middle income, able-bodied households would choose. Various groups tend to own fewer than average automobiles, value the potential savings that result from reduced parking requirements, and live in higher-density, multi-family housing, including low-income households, young adults, single parents, first time home buyers, older people, and people with disabilities.

As discussed earlier, vehicle ownership and use tends to increase with income. Lower-income households are directly harmed by generous off-street parking requirements, since they tend to own fewer vehicles and pay more for parking as a percentage of housing costs. For example, the $100 per month direct cost of two parking spaces represents only 5% of a $2,000 per month luxury condominium rent, but 20% of the $500 per month rent of a basic apartment. Poor households also spend a greater share of their income on housing than wealthier households, as shown in Figure 1.

Since parking is a relatively fixed expense, it represents a proportionally greater burden for lower income households. Figure 13 illustrates parking costs as a percentage of household expenditures, showing a much greater impact on poor families.

Figure 13 **Residential Parking Costs as a Percentage of Household Income**



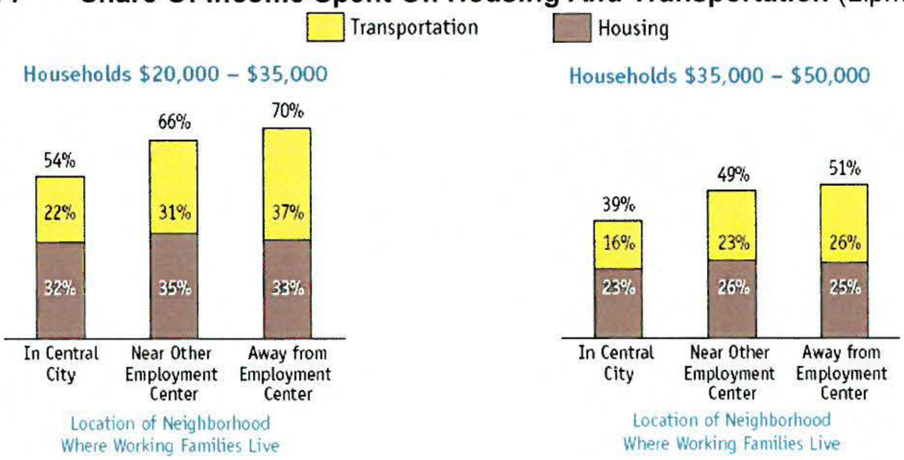
Parking costs typically constitute a greater portion of household expenditures for poor than for wealthier households, indicating they are regressive. (Based on $50 monthly parking space cost.)

Dense development has a bad reputation, so some reductions in density caused by increased parking requirements could be considered an benefit to poor households. But an amenity that consumers only buy due to an external requirement is seldom a true benefit. In practice, paved surfaces, such as parking lots, provide few of the amenities that make lower densities desirable, such as privacy, noise reduction, aesthetics and access to greenspace. Thus, increased parking results in the worst of all worlds: lower density, automobile oriented communities with degraded environments.

Some communities use restrictive zoning laws to exclude lower-income households, because they are considered "undesirable" neighbors. This is inequitable. As researcher Jonathan Levine concludes, "Land use controls enforcing low-density, large-lot, automobile dependent development styles are a subsidy for those who choose to and can afford to live in the housing produced; by reducing the prevalence of other forms of residential development, they increase the supply of the standardized product. Those who pay the cost of this subsidy are those who would have chosen to – and might have afforded to – reside in those locales if more alternative housing forms had been allowed there," (Levine, 1998, p. 147).

Current housing markets harm lower-income households by forcing them to choose between urban residential locations, which tend to be either in undesirable neighborhoods or have high prices, and suburban or exurban residential locations, which have lower housing costs but much higher transportation costs (CTOD and CNT, 2006; Lipman, 2006). Many lower income households would be financially better off if affordable housing were available in more accessible, multi-modal urban locations where their combined housing and transportation costs were lower. More flexible parking requirements can help provide such housing by reducing housing development costs in areas with higher land prices.

Figure 14 **Share Of Income Spent On Housing And Transportation** (Lipman, 2006)



Lower income households often choose more distant residential locations to find affordable housing, but but bear higher transport costs as a result. More flexible parking requirements can help increase overall affordability.

Impacts on Automobile Ownership and Use

Forcing households to pay for residential parking increases vehicle ownership rates. Average income households spend an average of $3,800 annually per vehicle, and lower-income households spend an average of $3,000 annually per vehicle (BLS, 2002). Assuming that residential parking spaces cost $800 per year, parking costs add 21% to vehicle costs for an average income household, and 27% to the cost of a lower-income household. Assuming a vehicle price elasticity of –0.7 for average income households and–0.1 lower income households (Table 3), generous minimum parking requirements increase urban vehicle ownership about 14% overall and about 25% among lower-income urban residents. The resulting increase in vehicle ownership and use increases various external costs such as congestion, traffic accidents and pollution.

Some people might conclude that poor households are better off owning these cars. This is a misreading of the analysis. The additional automobiles owned as a result of parking requirements are marginal vehicles that the owners would give up if they had the option. It is comparable to a law forbidding the sale hamburger, forcing poor families to eat more steak. Steak may taste better than hamburger, but its higher cost means that households must forego other goods that it values more. If poor families really valued steak that much they would not have bought hamburger in the first place, so no law would be needed. From a household's perspective, minimum residential parking requirements remove flexibility and choices that can make the family overall better off. This constraint is experienced most by lower income households that tend to own fewer than average automobiles, and value highly potential savings in housing and transportation costs.

Possible Mitigating Factors

Some people may be skeptical of this analysis. After all, most low-income families do own vehicles and most do find housing. Are there mitigating factors that reduce the impacts described here? Yes, but they create their own set of problems.

1. Even poor families, *can* afford $500 to $1,500 per year to pay for residential parking, but it significantly reduces their wealth and options.
2. Urban decay reduces property values in some locations, which creates virtually no-cost parking. Poor households can therefore afford to meet generous parking requirements provided they live in undesirable neighborhoods. But such "throw-away" land use patterns impose tremendous costs. They force poor households to live in dangerous and hopeless neighborhoods, creating class and racial segregation.
3. Public agencies subsidize some housing to maintain affordability. But this creates significant financial and social costs. Few communities can afford to provide good housing to all low-income households. Generous parking requirements reduce the amount of affordable housing that can be provided with a given budget.
4. An abundance of used automobiles and low fuel prices in North America allow even low-income families to buy an "old beater" and live in the suburbs where land values (and therefore parking costs as an increment of housing expenses) remain low. This, however, exacerbates various problems, including increased environmental impacts, a lack of travel options for non-drivers, and household dependency on unreliable private transportation. Poor drivers often have no insurance, imposing financial and legal costs on other road users.

Although these mitigating factors reduce some impacts of parking requirements on housing costs, they are economically inefficient and inequitable. They fail to actually reduce the cost and increase the productivity with which housing is provided, and they exacerbate social and environmental problems.

Solutions

There is much that can be done to manage parking to increase housing affordability. For more information see Arigoni, 2001; Russo, 2001; SPUR, 2002; VTPI, 2005; CTOD, 2008.

A paradigm shift (a change in the way problems are defined and solutions evaluated) is occurring in transportation planning. The old paradigm relied primarily on supply-oriented solutions (expanding road and parking facility capacity). It assumed that parking problems should generally be solved by increasing parking supply, usually by raising the minimum parking requirements for new development. From this perspective, parking demand is an unchangeable force that must be satisfied, and parking should generally be provided free, with costs incorporated in building and roadway construction budgets.

The new paradigm places more emphasis on management solutions ("Parking Management," VTPI, 2005). It recognizes the need to provide adequate parking, but values strategies which result in more efficient use of parking resources and reduce the amount of parking needed at a particular location. From this perspective, too much parking supply is as harmful as too little. With this approach, parking demand can often be managed in ways that reduce costs and the need to subsidize parking facilities.

Rather than establishing generous parking requirements to satisfy the maximum potential demand that may occur during the lifetime of a facility, parking management allows contingency-based planning, which means that various solutions are identified which can be deployed if needed. For example, rather than providing 150 parking spaces at a 100 unit apartment building, as required by conventional standards, the developer might initially supply 80 spaces, along with various parking management strategies, and perhaps some land banked for constructing additional parking if needed. This approach saves costs and is more responsive to community needs.

Parking management involves both government agencies (which allow more accurate and flexible minimum parking requirements, and enforce parking management agreements) and building developers and managers (which develop and implement parking management programs). An effective parking management plan usually involves several components. Examples of parking management strategies are described below. For more information see VTPI, 2005.

More Accurate and Flexible Requirements

Minimum parking requirements can be more accurate and flexible to better reflect the demand at a particular location and time. Standards can be adjusted to reflect demographic, geographic and management factors. For example, standards can be reduced for housing that serves lower-income people, students and elderly; for housing in more accessible locations (such as near transit stations and in mixed-use neighborhoods); in buildings that have carshare services, and where parking is priced. This gives developers and building operators an incentive to use parking management solutions, by allowing them to save money when they reduce parking demand.

Shared Parking
It is often possible for motorists and buildings to share parking facilities, to increase efficiency and flexibility. For example, 100 residents or employees can often share 70-80 parking spaces, since at any period in time some are likely to be away. Similarly, an apartment and an office building can share parking facilities, since the office peak demand occurs during weekdays, while the apartment's peak occurs during evenings and weekends.

Local governments can allow developers to pay "in lieu" fees, which help fund off-site municipal parking facilities, as an alternative to providing on-site parking (Shoup, 1999). This gives developers more flexibility (allowing better site design and preservation of unique and historic resources that cannot otherwise accommodate on-site parking), allows parking facilities to be located where they most optimal for the sake of urban design, and results in more efficient and cost effective shared parking facilities.

Unbundling
Rather than automatically including a certain amount of parking with building space, parking costs can be borne directly by users by "unbundling," which means that parking is rented or sold separately. For example, rather than renting an apartment with two parking spaces for $1,000 per month, the apartment could rent for $850 per month, plus $75 per month for each parking space. This is more equitable and efficient, since occupants are not forced to pay for parking they do not need, and allows consumers to adjust their parking supply to reflect their needs.

Parking can be unbundled in several ways:

- Facility managers can unbundle parking when renting building space.
- Developers can make some or all parking optional when selling buildings. For example, a condominium can be sold with no parking or just one space, with additional spaces available for purchase or rent if desired.
- In some cases it may be easier to offer a discount to renters who use fewer than average parking spaces, rather than charging an additional fee. For example, an office or apartment might rent for $1,000 per month with two "free" parking spaces, but renters who only use one space receive a $75 monthly discount.
- Lease agreements can itemize parking costs. To facilitate unbundling some communities require that parking be a separate line-item in lease contracts, even if spaces are automatically included. Once renters become aware of what they pay for parking they may decide to negotiate changes, perhaps renting fewer spaces or trading parking spaces with other residents.
- Minimum parking requirements can be reduced for developments with unbundled parking, which recognizes that, given a choice, many residents will reduce their parking demand.
- An informal approach to unbundling parking is to help create a secondary market for available spaces. For example, office, apartment and condominium managers can maintain a list of residents who have excess parking spaces that are available for rent.

Location Efficient Development
Current lending policies mistakenly treat automobiles owned by a household as financial assets rather than liabilities, which encourages home buyers to choose automobile-dependent suburban location over urban locations. Owning one less vehicle saves a household an estimated $3,000 annually in vehicle costs and $50 per month in parking costs (Hare, 1993). "Location Efficient Mortgages" recognize these saving in housing loans, eliminating a bias that makes suburban housing appear more affordable than urban housing, despite greater total (transport and housing) expenses. Cevero (1996) finds that there is unmet market demand for such housing, particularly near transit stations. CTOD (2008) describe various ways to maximize the value of transit-oriented, infill development.

Carsharing
Carsharing refers to automobile rental services intended to substitute for private vehicle ownership. It makes occasional use of a vehicle affordable, even for low-income households, while providing an incentive to minimize driving and rely on alternative travel options as much as possible. Where carsharing services are available, some households reduce their vehicle ownership, either shifting from two to one vehicle, or from one to zero vehicles. Residential developers and building operators can encourage carsharing by providing free or discounted parking for carshare vehicles, or by offering subsidized memberships in carshare organizations to residents.

Carfree Planning ("Car-Free Planning," VTPI, 2005)
Some planners are experimenting with "car free" housing developments specifically designed to accommodate households that do not own a motor vehicle and take advantage of community benefits of reduced vehicle traffic (such as using land that would be needed for parking in an automobile-dependent area for common greenspace).

Overflow Parking
It is often possible to reduce parking requirements by identifying ways to manage occasional peak demands. For example, a building operator may provide information to residents on "overflow" parking options for guests (for example, when they have a party), or for residents who purchase addition vehicles, such as a trailer or collector car. This may involve sharing agreements with other buildings nearby, or information on commercial parking and storage facilities in the area.

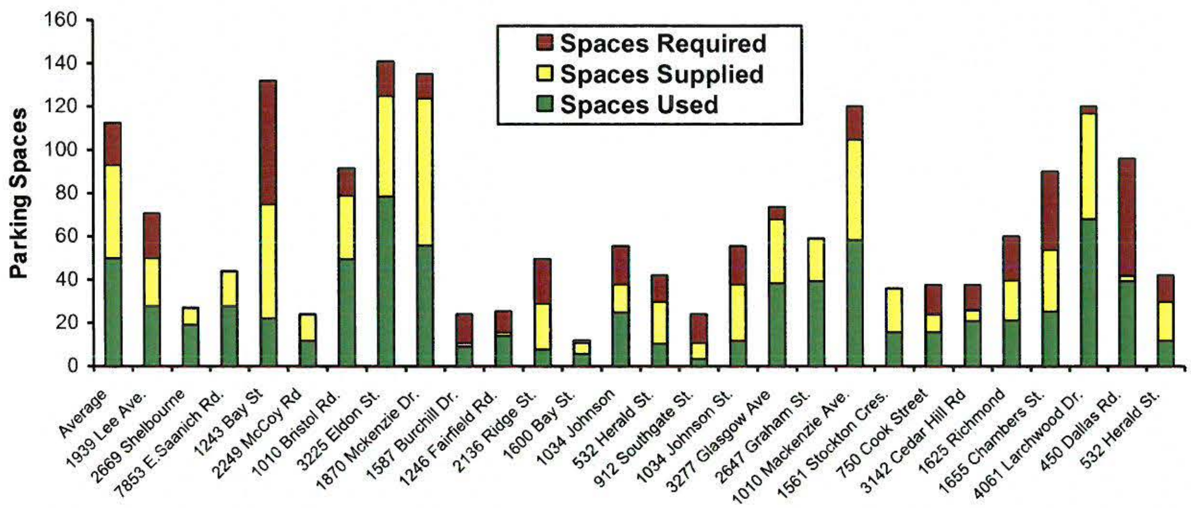
Transportation Management Associations
Transportation Management Associations (TMAs) are private, non-profit, member-controlled organizations that provide transportation services in a particular area. TMAs provide an institutional framework for transportation and parking management programs, including parking brokerage services which help building operators share, trade, lease and rent parking facilities. They are usually more cost effective than programs managed by individual businesses.

Parking Utilization Studies

To evaluate the appropriateness of current parking requirements it is useful to perform parking utilization studies, that is, surveys of parking facilities to determine how many spaces are occupied during peak demand periods. For information on such studies see *Parking Generation* (ITE, 2004). For residential uses, peak demand occurs during weekday evenings or on weekends.

Students in a University of Victoria planning course performed residential utilization studies of multi-family residential buildings as an assignment (this was easy since most lived in such buildings or had friends that did). These surveys indicate that, for the 33 buildings studied, only 54% of the available parking spaces were occupied during peak periods, and if these buildings had the number of parking spaces required by current minimum parking requirements (based on a standard of 1.5 parking spaces per unit), only 46% of those parking spaces would be occupied. Figure 15 illustrates the results.

Figure 15 **Parking Utilization Versus Supply and Requirements**



This figure shows the number of parking spaces used, currently supplied, and required for new construction at various multi-family residential buildings in Victoria, British Columbia.

Several sites have peak-period parking utilization below 50%, and many parking facilities have spaces that are obviously never used. Investigators reported that some motorists park on the street to avoid using less convenient spaces behind buildings. Only five of the 33 sites report frequent conflicts over parking, and these often involve particular spaces (i.e., those considered most convenient or safe), not overall parking supply. Some investigators reported, based on their own or friends' experiences, that some residents will use a parking space if it is supplied with the unit, but if a fee is charged they will reduce their vehicle ownership or storing their vehicle at their family home during the school year.

Affordable Housing Opportunities

There are many possible ways to make housing more affordable, including direct housing subsidies for lower-income people, indirect subsidies such as rent controls, and various ways of reducing housing production costs. Some of these strategies are more efficient and equitable than others. Subsidies by themselves tend to be unfair and inadequate. In a typical community 10-20% of households face housing affordability problems, including those who are working poor or on a fixed income. It is unrealistic to provide full subsidies to all who want and deserve more affordable housing. As a result, such programs are often arbitrary, favoring some disadvantaged groups but not others.

A much more effective way to provide affordable housing is to reduce construction costs for moderately-priced new units. This increases housing affordability both directly (by reducing the costs of new housing) and indirectly by increasing affordable housing supply. The added units do not all need to be "affordable" themselves, but they free up the older stock of housing to be truly affordable. In urban area where land costs are high, the best way to increase affordability is to minimize land requirements per unit by increasing density and reducing parking facility requirements. Table 6 illustrates how density and parking affect the amount of land required per unit and the number of units per acre for various number of floors, with and without surface parking. This shows how even modest increases in density (say, from two to three or four stories) and reductions in surface parking can significantly reduce land requirements.

Table 6 **Land Area Per Unit**

Housing Type	Without Surface Parking		With Surface Parking	
	Sq. Feet	Units Per Acre	Sq. Feet	Units Per Acre
1/2 Acre Single-family	21,780	2	21,780	2
1/4 Acre Single-family	10,890	4	10,890	4
Small-lot Single-family	5,445	8	5,445	8
Two-Story Duplex	3,630	12	3,630	12
Three-Story Townhouse	1,000	44	1,333	33
Four-story Condominium	450	97	783	56
Medium-Rise Condominium	225	194	558	78
High-Rise Condominium	113	387	446	98

Increased density and reduced parking requirements significantly reduce unit land requirements. This assumes that one-third of parcel is devoted to setback, and 333 square feet per surface parking space.

Table 7 illustrates the cost of providing these units and the number that could be subsidized with a $10 million budget, assuming land costs average $1,000,000 per acre and each units costs $100,000 to construct. The number of units that can be provided with a given subsidy increases more than five hundred percent with increased density and reduced parking. The largest cost reductions occur with shifts from low- to medium-density, indicating that affordability does not require high-density, high-rise housing.

Table 7 **Costs Per Unit and Subsidized Households**

Housing Type	With Surface Parking		Without Surface Parking	
	Cost Per Unit	Subsidized Units	Cost Per Unit	Subsidized Units
1/2 Acre Single-family	$1,100,000	17	$1,100,000	17
¼ Acre Single-family	$600,000	29	$600,000	29
Small-lot Single-family	$350,000	44	$350,000	44
Two-Story Duplex	$266,667	55	$266,667	55
Three-Story Townhouse	$161,203	77	$145,914	81
Four-story Condominium	$135,950	85	$120,661	91
Medium-Rise Condominium	$125,620	89	$110,331	95
High-Rise Condominium	$120,455	91	$105,165	97

Increased density and reduced parking requirements significantly reduce the costs of producing housing and the number of units that can be produced for a given subsidy.

These benefits increase further if subsidy is distributed as a match grand. For example, if we ask occupants to pay $100,000, either toward purchasing the unit or about $400 per month in rent, the number of units that can be provided by the subsidy increases to many hundreds.

Table 8 **Subsidized Household With Matching Grants**

Housing Type	With Surface Parking		Without Surface Parking	
	Subsidy Per Unit	Subsidized Units	Subsidy Per Unit	Subsidized Units
1/2 Acre Single-family	$1,000,000	20	$1,000,000	20
1/4 Acre Single-family	$500,000	40	$500,000	40
Small-lot Single-family	$250,000	80	$250,000	80
Two-Story Duplex	$166,667	120	$166,667	120
Three-Story Townhouse	$61,203	327	$45,914	436
Four-story Condominium	$35,950	556	$20,661	968
Medium-Rise Condominium	$25,620	781	$10,331	1,936
High-Rise Condominium	$20,455	978	$5,165	3,872

Increased density and reduced parking requirements significantly increase the number of households that can benefit, assuming that lower-income residents pay a share of costs. ("Sub. Units" = Subsidized Units)

The benefits of infill, density and reduced parking costs become even larger and more logical if we evaluate affordability in terms of combined housing and transportation costs. Location decisions often involve trade-offs between housing and transportation costs: land and therefore housing costs are often lower at the urban fringe where transportation costs are highest. Residents of such locations typically pay several thousand dollars a year in vehicle expenses. Increased density and reduced parking requirements allow more moderate- and low-income households to choose homes in accessible locations where their transportation costs are minimized, saving thousands of dollars. True affordability is therefore where housing is affordable and automobile ownership and use can be reduced.

Current, generous levels of parking supply in growing urban areas provide an unintended land bank that, with more efficient management could be used to create location-efficient housing (Shoup, 2005). With improved design and management many retail malls, commercial districts and other urban centers could reduce the amount of land devoted to parking facilities by 20-40%, or even more ("Parking Management," VTPI, 2005). Parking lots are often the largest single largest land use in such areas, typically using 30-50% of land area. In many situations, more efficient management would allow many acres of land to be developed within or near these urban centers, which is ideal for location-efficient, truly affordable housing, that is, housing located in accessible, multi-modal areas where residents can minimize their transportation costs by relying on walking, cycling, public transit, taxi and carsharing. Such locations are also appropriate for people with disabilities or other constraints on their ability to drive. Similarly, land currently used for urban parking may be appropriate for mixed-use residential, commercial and institutional development, allowing more compact retail and employment centers that are more accessible by walking and public transit. This type of infill development reflects *Smart Growth* and *New Urbanist* planning principles ("Smart Growth" and "New Urbanism," VTPI, 2005; King, 2008).

Figure 16 **Urban Land Devoted To Parking**

With better design and management, much of the urban land currently devoted to parking could be used for other purposes. It is ideal for location-efficient infill residential and mixed-use development, creating truly affordable housing where residents can minimize their transport costs. People with limited mobility can particularly benefit by living close to public services.

Examples and Case Studies

Examples of parking management for residential affordability are described below.

Condominium Parking Requirements (Energy Pathways 1994)

Since 1979 Mississauga, Ontario's zoning code required 2.0 parking spaces per condominium unit, 1.75 for residents and 0.25 for visitors, estimated to be 7-17% of the total housing costs. A detailed study conducted at 34 typical condominiums tracked parking supply and demand, unit occupancy, transit proximity, surrounding land uses, and concerns about parking. Questionnaires were mailed to all 5,600 residents, of which 800 were returned, and all building managers, of which 16 were returned. It found that parking supply was 20% higher, and the existing standard was 35% higher, than residents' vehicle ownership. The study recommended revised parking standards illustrated in Table 9 which were adopted in 1994.

Table 9 **Recommended Parking Standards**

Unit Type	Resident Spaces	Visitor Spaces	Total Spaces
Studio	1.0	0.25	1.25
Bachelor	1.0	0.25	1.25
One Bedroom	1.16	0.25	1.41
One Bedroom Plus Den	1.3	0.25	1.55
Two Bedroom	1.5	0.25	1.75
Two Bedroom Plus Den	1.70	0.25	1.95
Three Bedroom	1.75	0.25	2.0

Affordable Residential Development (SPUR 1998)

Table 10 illustrates how tradeoffs between housing and parking affect the costs of medium-rise (four stories maximum) housing on a 3-acre parcel in an urban neighborhood. As the number of surface parking spaces increases, the number of housing units declines and costs rise. Using underground parking reduces land requirements but significantly increases construction costs. As a result, it is impossible to provide affordable rents while meeting conventional parking requirements.

Table 10 **Residential Development Options**

	Option 1	Option 2	Option 3	Option 4
Housing Units	50	40	30	50
Parking	25 (surface)	40 (surface)	40 (surface)	50 (underground)
Cost Per Unit	$50,000	$60,000	$75,000	$80,000
Monthly Rent	$312	$375	$468	$500

Generous minimum parking requirements also impose costs on non-profit developments (Nelson/Nygaard, 2002). To provide housing priced at $80,000 per unit (for a monthly mortgage of about $700), a subsidy of only $4,000 would be needed if no parking is required, a $12,792 subsidy would be required for one parking space per unit, and a $26,251 subsidy for two parking spaces. A given housing subsidy fund can benefit about 6.5 times as many households with no parking spaces compared with 2 spaces per unit.

Parking Impacts On Apartment Affordability (London and Williams-Derry 2013)

Analysis of 23 recently completed Seattle-area multifamily housing developments reveals that the practice of providing abundant "cheap" parking actually makes housing more expensive, particularly for lower-income tenants who don't own cars. This analysis shows that:

- *Seattle-area apartment developers build far more parking than their tenants need.* Across all developments in our sample, 37% of parking spaces remained empty during the night, the time of peak demand for residential parking. Every development had nighttime parking vacancies, and four developments had more than twice as many parking spots as parked cars.
- *Many tenants don't own cars.* On average, the developments in our sample had 20% more occupied apartments than occupied parking spaces—a rockbottom estimate for the share of apartments whose tenants don't park on-site. In all, 21 of the 23 developments had more occupied apartments than parked cars.
- *Multifamily developments lose money on parking.* No development in our sample was able to recover enough parking fees to recover the full estimated costs of building, operating, and maintaining on-site parking facilities. Car-free tenants still pay for parking.
- Landlords' losses on parking—calculated as the difference between total parking costs and total parking fees collected from tenants—add up to roughly 15% of monthly rents in our sample, or $246 per month for each occupied apartment. Because landlords typically recoup these losses through apartment rents, all tenants—even those who don't own cars—pay a substantial hidden fee for parking as part of their monthly rents.

Harris Green Redevelopment (www.city.victoria.bc.ca)

In 1997 the city of Victoria, BC sponsored a community planning project to encourage redevelopment in the Harris Green neighborhood near downtown. Minimum parking requirements were eliminated there. In subsequent years numerous condominiums and apartments were constructed. To minimize costs and accommodate the large portion of residents who own no vehicles, most units are sold or rented without parking. Residents rent parking spaces if they need them. Developers find that they need only about 0.5 parking spaces per unit, as opposed to 1.0 to 2.0 in conventional multi-family buildings.

Soma Studios and Apartments (www.dbarchitect.com)

The new five-story building at 8th and Howard in San Francisco combines 74 affordable family apartments and 88 small studios, a child care center and a market, providing 246 bedrooms and 24,000 square feet of commercial space on one acre. The building contains a 66-space parking garage, 0.38 spaces per unit, with parking rented separately from housing units. Unbundled parking freed up space for the childcare center and neighborhood retail, and significantly reduced apartment rents.

Redeveloping Transit-Station Area Parking Lots (CNT 2006)
The study, *Paved Over: Surface Parking Lots or Opportunities for Tax-Generating, Sustainable Development?"* (www.cnt.org/repository/PavedOver-Final.pdf), evaluates the potential economic and social benefits if surface parking lots around rail transit stations were developed into mixed-use, pedestrian friendly, transit-oriented developments. The analysis concludes that such development could help to meet the region's growing demand for affordable, workforce, senior, and market rate housing near transit, and provide a variety of benefits including increased tax revenues and reduced per capita vehicle travel. The parking lots in nine case studies are estimated to be able to generate 1,188 new residential units and at least 167,000 square feet of new commercial space, providing additional tax revenues, plus significant reductions in trip generation and transportation costs compared with more conventional development.

9-x-18 Affordable Housing Research (www.pro-arch.com/9-x-18-AFFORDABLE-HOUSING-RESEARCH)
9x18 is a study of how current New York City parking requirements conflict with the City's urban design and affordable housing goals, and it asks whether code change could help create more affordable housing. The project estimates the potential of existing surface parking lots on New York City Housing Authority (NYCHA) land in strategic locations throughout the city as an untapped resource for development. It estiamtes that there is 20,360,000 square feet of surface level parking on NYCHA sites, much of which is under-utilized. The project considers several ways that this land can help address affordable housing goals by reducing parking requirement burdens on developers and generating revenue to help preserve affordable housing. At the same time, strategic infill developments present opportunities to better integrate NYCHA sites into the surrounding urban context and neighborhood. The study visualized an analysis of existing zoning regulations and proposed fine-grained alternatives that consider the size and type of unit, proximity to transit, the level of affordability, and other relevant factors to further refine parking regulations in new construction.

Renter Parking Costs
Gabbe and Pierce (2016), used national American Housing Survey data to investigate parking costs imposed on renter households. They estimate that renter households garage parking costs average approximately $1,700 annually, or an additional 17% of a housing unit's rent, imposing $440 million direct deadweight loss for carless renters. They suggest that cities reduce or eliminate minimum parking requirements, and allow and encourage landlords to unbundle parking costs from housing costs.

Residential Garage Conversions (www.ci.santa-cruz.ca.us/pl/hcd/ADU/adu.html)
Santa Cruz, CA has a special program to encourage development of *Accessory Dwelling Units* (ADUs, also known as *mother-in-law* or *granny* units), which often consist of converted or expanded garages, to increase housing affordability and urban infill. The city has ordinances, design guidelines and information materials for such conversions. *Smallworks* (http://smallworks.ca) is a Vancouver, BC construction firm that specializes in small lane-way (alley) housing, which are often converted garages.

Parking Management for More Affordable Housing (www.huduser.org/rbc/newsletter/vol7iss2more.html)

A variety of parking management strategies are being adopted to increase housing affordability and help achieve other planning objectives. These strategies include reduction or elimination of minimum parking requirements based on density, car ownership rates, and availability of public transit; allowing shared parking; and unbundling parking from housing. Specific examples are discussed below.

San Francisco, California

San Francisco is a transit-friendly city that has retained its historic character and walkable neighborhoods. According to the 2000 Census, 30% of total San Francisco households, and more than 50% of households in transit-rich areas, are car-free. A 1997 University of California study found that single-family housing without off-street parking sold for an average of $46,391 less than housing with off-street parking, and so were affordable to 24% more area households. The city revised its parking requirements to help reduce traffic congestion and increase downtown area housing affordability. Revisions eliminated minimum parking requirements for downtown housing, and established maximum parking of one space for four units. Other strategies include car-sharing programs and requiring developers to unbundle parking from housing costs. Reduced parking requirements for Rich Sorro Commons, a mixed-use project with 100 affordable units for low-income families, resulted in additional space for a childcare center and retail stores, generating about $132,000 in additional revenue. The childcare center is especially beneficial to low-income families, and the additional revenue makes housing units more affordable.

Seattle, WA

Half the households in Press Apartments on Capitol Hill's Pine Street in Seattle, WA own no vehicles, leaving 60% of its parking spots unoccupied. In 2006, Seattle reduced parking required in mixed-use neighborhoods, and eliminated minimum parking requirements in downtown areas to increase housing opportunities and encourage pedestrian-friendly neighborhoods. Minimum parking required for affordable housing was reduced to 0.33 – 1.0 space per unit, depending on location and unit size. The city maximum parking requirements for downtown offices, allows reduced parking for elderly and disabled housing, and for multifamily developments with car-sharing programs.

Portland, Oregon

Portland, Oregon has implemented various parking management strategies designed to increase housing density, promote transit-oriented neighborhoods, and support existing and new economic development. Portland eliminated minimum parking requirements in the central city district and for sites located within 500 feet of a high-capacity transit station. The city's zoning ordinance specifies maximum parking requirements for areas outside the central city district, which vary depending on the use and the distance from a light rail station. Other parking measures include shared parking, and reduction from minimum requirements for car sharing, transit access, and availability of bicycle parking. Two mixed-use projects located outside Portland's central city, Buckman Heights and Buckman Terrace, were able to keep development costs low and increase the number of affordable housing units by utilizing the city's reduced parking requirements.

GreenTRIP Parking Database (http://database.greentrip.org)

The GreenTRIP Parking Database measures the number of parking spaces per unit, their occupancy rates, and the cost of that unused spaces for various residential buildings in the San Francisco Bay area. The results indicate that there is a significant amount of unused, costly parking supply which residents must pay for but do not actually want. This reduces housing affordability. This information can help developers, planners and policy makers better determine the number of parking spaces that are actually required in a particular type of development, and therefore avoid unnecessary costs.

Conclusions

This report indicates that generous, inflexible parking requirements are inefficient and inequitable, since they fail to provide an expensive resource (parking) in proportion to need (vehicle ownership). Parking demand varies between households, between neighborhoods, and over time for individual households. Smaller, lower income households located in accessible areas tend to own fewer cars. A typical house or apartment unit may at various times house residents with zero, one, two or three vehicles.

Parking is a costly resource. Parking typically represents 10-20% of the cost of housing. This cost may be acceptable to most middle and upper income households, which tend to own multiple vehicles and can afford the extra expense, but for lower income families generous parking requirements impose significant financial burdens.

Excessive parking requirements impose several costs on society. They increase development costs of lower-priced housing, reducing housing affordability. Minimum parking requirements are regressive because they force residents to pay for parking facilities, even if they do not own a vehicle. They increase vehicle ownership, and therefore problems such as traffic congestion, accidents and pollution emissions. Generous parking requirements discourage infill development and increase sprawl, increasing impervious surface coverage and per capita vehicle travel. They shift lower-income households to suburban and exurban areas where land prices are low but transport and public service costs are high.

For typical affordable housing in urban locations, where parking represents 20% of residential build costs and parking demand is less than 50% of conventional parking standards, applying more accurate and flexible parking requirements can reduce housing costs by 10%, and even more if additional parking management strategies are implemented. For households that do not own an automobile, more accurate parking requirements and unbundling parking costs can reduce rents by 10-20%.

Most households, including those with low incomes, own at least one vehicle and therefore need residential parking. Even non-drivers want parking for visitors. It is therefore important that parking policy reforms be realistic and avoid creating new problems. Better parking management practices have proven successful at reducing residential parking costs, increasing housing affordability and supporting other strategic land use objectives, such as supporting infill development, improving community accessibility and reducing sprawl. This involves creating more accurate and flexible parking standards, unbundling parking from building space so residents pay for parking facilities based on the number of spaces they actually use, and appropriate enforcement to minimize spillover problems.

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- *Parking Solutions* (130 pages) includes six documents that describe modern approaches to parking management.
- *Shared Parking* (133 pages) includes more than thirty documents concerning shared parking, parking in-lieu fees, parking requirement reductions and exemptions, and downtown district special parking requirements.
- *Green Parking Lot Design* (66 pages) includes three documents that describe ways to improve parking lot environmental performance including landscaping, stormwater management and reduced heat island effects.
- *Permeable Pavement and Bicycle Parking* (38 pages) includes five documents concerning the use of permeable parking lot pavement materials and five documents concerning bicycle parking requirements and design.

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Strategies for Meeting Parking Demands for Affordable Housing Developments

Strategy	City	Details
Reduced Parking Minimum for Affordable Housing Units	Los Angeles, CA	Up to 50% reduction in parking for affordable housing units
	San Leandro, CA	25% parking reduction for affordable housing units
	Santa Barbara, CA	1 space per dwelling unit for affordable housing parking maximum
	Pasadena, CA	25% parking reduction for affordable housing units
	Boulder, CO	Reduction in parking minimum for affordable housing based on site
	Denver, CO	25% parking reduction for affordable housing units
	Eugene, OR	0.67 spaces per affordable housing habitable room or 3 spaces total for dwelling unit, whichever is greater based on total available units
Reduced Parking Minimum for Senior Housing	Berkeley, CA	75% parking reduction for senior or disabled living facility
	San Leandro, CA	50% parking reduction for senior or disabled living facility
Reduced Parking Minimum for Affordable Housing in Proximity to Transit	Los Angeles, CA	Reduced parking minimum to 1 parking space per unit, for a project located within 1,500 ft of transit and having less than 3 habitable rooms per unit
	Portland, OR	No parking minimums for sites within 500 ft of transit service that has less than 20-minute headways
	San Leandro, CA	Additional parking reductions for affordable housing and/or senior/disable living dwelling units near transit
	Santa Clara, CA	25% parking reduction for affordable housing units for developments near transit stations, containing mixed uses, or participating in a TDM plan
	Seattle, WA	20% reduction in parking minimums if development is located within 80 ft of a transit station
Reduced Parking Minimum for Affordable Housing by Specific Location	Seattle, WA	Parking requirement reduced in urban areas
	Pasadena, CA	Alternative-parking requirement for all developments that contain affordable housing units located in Parking Benefit Districts
Parking Maximum for Affordable Housing	Seattle, WA	Parking maximum of 1 parking space per 2 affordable single-family dwelling units

Minimum Required Parking Spaces per Unit for Multi-Family Developments

City	Studio	AH Studio	1 BR	AH 1BR	2 BR	AH 2BR	3 BR	AH 3BR
Boulder, CO	1.0/DU	1.0/DU	1.0/DU	1.0/DU	1.0/DU	1.0/DU	1.5/DU	1.0/DU
Eugene, OR	1.0/DU	0.67 per AH habitable room	1.0/DU	0.67 per AH habitable room	1.5/DU	0.67 per AH habitable room or 3 spaces total for dwelling unit	1.5/DU	3 spaces total for dwelling unit
Denver, CO	1.0/DU	0.8/DU	1.0/DU	0.8/DU	1.25/DU	1.0/DU	1.5/DU	1.0/DU
Long Beach, CA	1.0/DU	Based on District	1.5/DU	Based on District	2.0/DU	Based on District	2.0/DU	Based on District
Los Angeles, CA	1.0/DU	1.0/DU*	1.0/DU	1.0/DU*	1.5/DU	1.0/DU*	2.0/DU	1.5/DU*
Pasadena, CA	1.0/DU	1.0/DU	2.0/DU	1.0/DU	2.0/DU	2.0/DU	2.0/DU	2.0/DU
San Leandro, CA	1.25/DU	1.0/DU	1.25/DU	1.0/DU	1.25/DU	1.0/DU	1.5/DU	1.0/DU
Santa Barbara, CA	1.25/DU	1.0/DU	1.5/DU	1.0/DU	2.0/DU	1.0/DU	2.0/DU	1.0/DU
Santa Clara, CA	1.0/DU	0.75/DU*^	1.0/DU	1.0/DU*^	2.0/DU	1.5/DU*^	2.0/DU	1.5/DU*^
Seattle, WA	1.0/DU	Based off District	1.0/DU	Based off District	1.0/DU	Based off District	1.0/DU	Based off District

AH = Affordable Housing / * = if near transit station / ^ = with TDM plan

Affordable Housing Parking Study

Fact Sheet #2: Understanding Parking Demands for Affordable Housing

Introduction

To understand parking conditions at existing affordable housing developments, the City of San Diego surveyed residents of existing affordable housing developments about the number of vehicles available to each household, vehicle use, travel patterns, number of persons per household, and the demographic characteristics of the residents of each household. In addition, a profile of each housing complex was developed based upon neighborhood characteristics (land use and transit) and characteristics of each housing complex. The on-site and off-site parking conditions were also identified and analyzed. About 2,750 surveys were distributed to 34 affordable housing developments, with a 37% return rate. Of those returned, 875 surveys from 21 sites were analyzed. The results of the analysis provide a foundation for evaluating potential modifications to parking requirements for future affordable housing developments.

Key Concepts

To understand parking demand at affordable housing developments, the study sought to measure the number of cars, trucks, and motorcycles that are owned, leased, rented, or provided by employers for each housing unit. This measure is referred to as "household vehicle availability." The number of vehicles available to each household is important because it is roughly equal to the number of parking spaces that would be required. Additional parking needs for on-site staff and visitors were also analyzed as part of the study. Although household vehicle availability is an important measure of the needed number of parking spaces, other factors such as proximity to transit and neighborhood walkability were found to have an impact on parking demand and should be considered in making decisions about parking requirements. Environmental impacts and costs associated with providing the parking, the surrounding neighborhood, and policy goals are also important.

City of San Diego Base Parking Requirements

Type of Unit	Base Parking	Transit Area or Very Low Income	Parking Impact Zone
Single-Family Residences			
Detached single dwelling unit	2 per dwelling unit	na	na
Detached housing for senior citizens	1 per dwelling unit	na	na
Multi-Family Residences			
Studio up to 400 sf	1.25 per dwelling unit	1.0 per dwelling unit	1.5 per dwelling unit
1 bedroom / studio over 400 sf	1.5 per dwelling unit	1.25 per dwelling unit	1.75 per dwelling unit
2 bedrooms	2.0 per dwelling unit	1.75 per dwelling unit	2.25 per dwelling unit
3-4 bedrooms	2.25 per dwelling unit	2.0 per dwelling unit	2.5 per dwelling unit
5+ bedrooms	2.25 per dwelling unit	2.0 per dwelling unit	2.5 per dwelling unit
Rooming houses	1.0 per tenant	0.75 per tenant	1.0 per tenant
Boarder and lodger accommodations	1.0 per two boarders or lodgers	1.0 per two boarders or lodgers	1.0 per boarders or lodger in beach impact area
Residential care facility (6 or fewer persons)	1 per 3 beds or per permit	1 per 4 beds or per permit	1 per 3 beds or per permit
Transitional housing (6 or fewer persons)	1 per 3 beds or per permit	1 per 4 beds or per permit	1 per 3 beds or per permit
Residential accessory uses: retail sales	2.5 per 1,000 sf	2.5 per 1,000 sf	2.5 per 1,000 sf
Residential accessory uses: eating and drinking establishments	5 per 1,000 sf	5 per 1,000 sf	5 per 1,000 sf

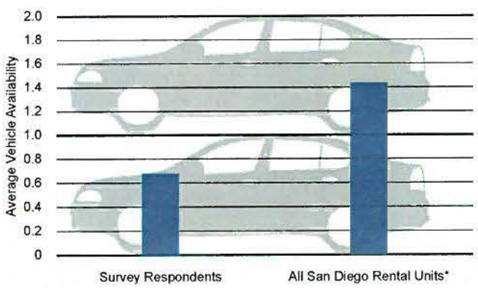
Source: San Diego Municipal Code, Chapter 14, Article 2, Division 5

Results From Affordable Housing Resident Survey

Average Household Vehicle Availability

On average, residents of affordable housing do not require as much parking as is typically required for rental housing in San Diego, which may justify the use of different parking requirements.

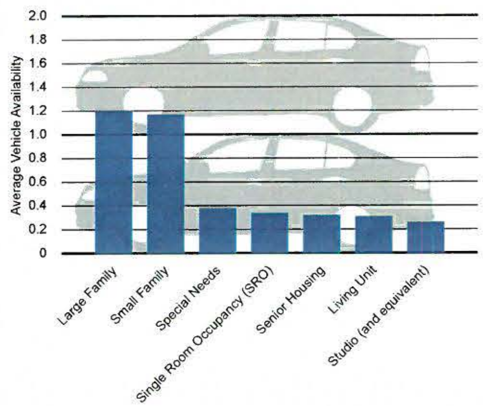
The results of the study show that the average level of household vehicle availability among survey respondents is almost half the average level for all rental housing units in San Diego.*



* Source: 2005-2009 U.S. Census American Community Survey

Average Vehicle Availability by Housing Type

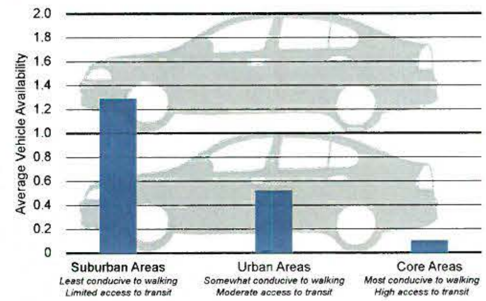
Large family and small family affordable housing have significantly higher average vehicle availability than all other housing types.



Average Vehicle Availability by Land Use and Transportation Context

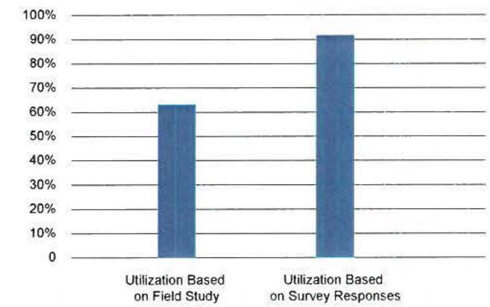
Neighborhood characteristics may influence vehicle ownership levels in affordable housing developments because people may not need cars if they can take transit or walk to destinations. The survey results showed that household vehicle availability is higher in areas that are less conducive to walking and have more limited access to transit.

As defined by a combined measure of the land use and transportation context, suburban areas have the highest mean vehicle availability and core areas have the lowest, with urban areas falling in the middle.



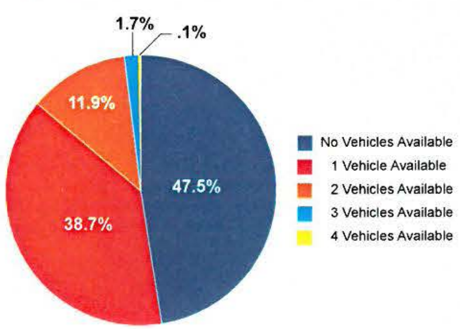
Parking Utilization

Overall, most of the affordable housing developments surveyed have unused parking. On-site parking utilization data indicated parking was less utilized than the household survey responses indicated. This is likely because data were collected at one point in time and the survey was based on the residents' aggregate experience. Overall, this indicates parking is oversupplied.



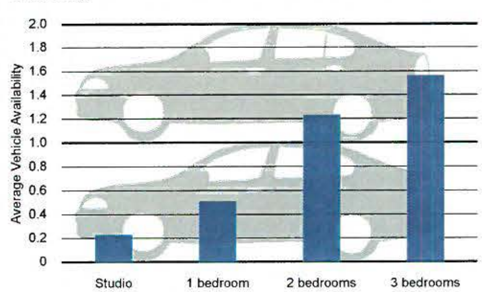
Distribution of Residents' Household Vehicle Availability

Almost half the households surveyed had no vehicle and 38.7% had only one vehicle. Only 13.7% of households had more than one vehicle.



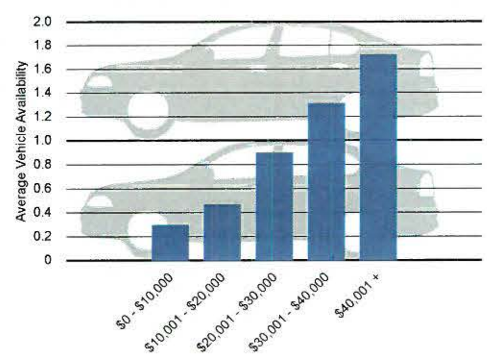
Average Vehicle Availability by Unit Size

Larger housing units, measured by number of bedrooms, are likely to have more residents, more drivers, and higher average vehicle availability.



Average Vehicle Availability by Household Income Range

Vehicle availability is higher in households with greater annual income.



Other Results

- Average vehicle availability decreases in affordable housing developments with a higher percentage of residents over the age of 65. However, this is not considered individually significant because a senior housing development is likely to have a lower number of bedrooms AND more residents over 65 years of age.

Policy Considerations

- The interrelationship of factors affecting parking demand at affordable housing is important when making decisions (e.g., housing type, unit size, location, and walkability).
- Priority should be given to distinct, measurable factors that are typically evaluated in the project development review process (e.g., unit size or location).

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Transportation impacts of affordable housing: Informing development review with travel behavior analysis

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Abstract: Planning for affordable housing is challenged by development policies that assess transportation impacts based on methodologies that often do not distinguish between the travel patterns of residents of market-rate housing and those living in affordable units. Given the public goals of providing affordable housing in areas with good accessibility and transportation options, there is a need to reduce unnecessary costs imposed by the potential overestimation of automobile travel and its associated impacts. Thus, the primary objective of this paper is to examine and quantify the influences of urban characteristics, residential housing type, and income on metrics commonly used to assess the transportation impacts of new development, namely total home-based trips and home-based vehicle trips. Using the 2010-2012 California Household Travel Survey, we regressed these metrics on urban place type, regionally adjusted income, and housing type, controlling for household size, weekday travel, and home location. The results indicate significant reductions in vehicle trip making with lower incomes and increasing urbanization. These findings support more differentiation of affordable and market-rate housing in the development review process and emphasize the need for development standards to be more sensitive to the characteristics of future residents and location.

Keywords: Trip generation, affordable housing, transportation impact analysis, low-income, land use

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1 Introduction

The development-review process generally requires an evaluation of the anticipated additional transportation demand that new development places on the system and an assessment of fees or improvements to mitigate of these impacts. However, industry standard guidelines for assessment of travel demand are

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outlined within the Institute of Transportation Engineers (ITE) *Trip Generation Handbook* (Institute of Transportation Engineers, 2014) with data provided by the *Trip Generation Manual* (Institute of Transportation Engineers, 2012). These professional resources have been focused solely on vehicle trip rates for these traffic impact analyses.

This approach has long been criticized as having limitations regarding the insensitivity of these sources to urban contexts, socio-demographics of system users, and non-automobile transportation choices, despite the wealth of research accumulated on their importance in shaping travel behavior (Clifton, Currans, & Muhs, 2013; Weinberger, Dock, Cohen, Rogers, & Henson, 2015; Millard-Ball, 2015). As a result of this insensitivity, there may be undue costs placed on affordable housing projects, as methods may inaccurately estimate higher levels of vehicle use than are actually realized by residents. In addition, an overestimation of automobile demand may misdirect resources and create environments that are not supportive of the modes they do use.

There is a need to identify and analyze the extent to which these travel outcomes vary by these important characteristics. Using the 2010-2012 California Household Travel Survey, this paper explores how income, built environment measures, household size, and housing type relate to observed travel behavior, specifically in terms of trip generation (or trip frequency). The goal is to inform the current affordable housing policy debate by providing the anticipated differences in transportation outcomes between residents of affordable and market-rate units across different urban contexts. Specifically, we demonstrate how development policies may unduly penalize these projects if they do not account for the significantly lower rates of trip generation and use by their residents. Further, our analysis points to some key considerations for efficiently locating these units in areas that provide greater transportation choices.

The remainder of the paper is organized as follows. The next section of the paper provides a review of the policy context and the literature, followed by a description of the methodological approach. The results of two multivariate models examining travel outcomes are described in the fourth section, and finally a discussion of the trends in the conclusion.

2 Background

Households of limited means have fewer choices in both where they can afford to live and how they can travel. Nationally, the share of households residing in rental housing rose from 31% in 2005 to 37% in 2015, while household incomes receded back to 1995 levels (Joint Center for Housing Studies, 2015). The current supply of affordable rental housing has not matched this growing demand, as the rental vacancy rate has steadily declined while the rental market has tightened (Steffen et al., 2015). Most developers cannot build new affordable housing stock for low-income households without subsidies to close the growing gap between their construction costs and tenants' affordable rents (Joint Center for Housing Studies, 2015). Moreover, while low-income residents of these rental units may participate in programs to ease some of the burden of increasing housing costs, they are also likely to face higher transportation costs or more limited access to employment opportunities, medical needs, and other necessities (The Center for Neighborhood Technology, 2012).

For example, income is a key determinant of auto ownership (Pucher & Renne, 2003; Giuliano & Dargay, 2006; Blumenberg & Pierce, 2012). Given their limited access to personal automobiles, low-income adults are more likely to travel regularly by public transit (Giuliano, 2005). Beyond auto ownership, Ong and Houston (2002) found public transit use for commuting and job-searching purposes corresponds with an inability of low-income adults to access a vehicle and having poor or limited local bus service. Low-income households reported the cost of transit as a larger problem than households earning a higher annual income (Giuliano, 2005). As such, low-income groups also tend to walk more often for transportation (Pucher & Renne, 2003; Tal & Handy, 2010). Travel patterns resulting from the limited set of transportation options and household needs of priority populations include fewer person trips and less distance traveled (Murakami & Young, 1997; Pucher & Renne, 2003).

Constructing affordable housing developments in location-efficient neighborhoods, or those with environments that support non-automobile travel options, is a strategy for improving the access of low-income residents to both work and non-work activities. Travel to destinations becomes convenient as residential densities, public transit accessibility, mixed uses, and supports for pedestrian and cycling increase and as a result, vehicle ownership and use decline (Holtzclaw, Clear, Dittmar, Goldstein, & Haas, 2002). In a recent California-based study aimed at addressing the issue of affordable housing as a climate strategy, Newmark and Haas (2015) found low-income households are likely to reside within location-efficient areas characterized by smaller dwellings, greater transit accessibility, and lower vehicle ownership rates. Chatman (2013) suggested that higher development density, greater local access to shops and services, and less parking could induce households of all income levels to drive less.

Unfortunately, the cost to construct affordable multifamily sites within location-efficient areas is becoming exceedingly expensive. Regulatory (e.g., zoning restrictions) and financing (e.g., insufficient government subsidies) obstacles limit the ability of rental housing developers to significantly add affordable multifamily housing stock. Accordingly, several cities are currently experimenting with reduced parking requirements to offer some regulatory relief to developers (Joint Center for Housing Studies, 2015). The construction of multifamily housing with less onsite parking allows developers to build more housing units for low-income households who are less likely to own vehicles and in urban contexts where non-automotive travel is feasible (Manville, 2013). Parking construction costs reduce the affordable housing supply and result in more expensive housing since these additional costs may be passed on to renters and/or households may have to pay for a parking space regardless of auto ownership status (Rowe, Morse, Ratchford, Haas, & Becker, 2014). Together, the impact of space devoted to parking and parking costs present two major barriers to providing persons of low-income with affordable housing options with strong regional and local access (Rogers, et al., 2016).

While the travel patterns and needs of low-income households have been documented in research, this information has yet to be incorporated into methods for reviewing the impacts of new housing development (Clifton et al., 2013; Schneider, Shafizadeh, Sperry, & Handy, 2013; Dock et al., 2015) and builds off of research focusing on housing and commercial land uses previously completed in California (Kimley-Horn and Associates, Inc., Economic & Planning Systems, & Gene Bregman & Associates, 2009; Schneider et al. 2015). The industry standards for estimating transportation impacts are the data and methods presented in the Institute of Transportation Engineers' (ITE) *Trip Generation Handbook* (2014); but as yet, there are no standard methods or available data to differentiate the transportation impacts of affordable housing developments (as compared to market-rate housing) across urban, suburban, or rural contexts in the U.S. This research aims to fill this gap by explicitly linking affordable housing development policies to the kinds of information, albeit limited, used in assessing transportation impacts during development review.

3 Data and methods

The 2010-2012 California Household Travel Survey (HTS) is used for this analysis. The survey sampled 42,431 households across all fifty-eight counties in California and participants agreed to complete a one-day travel diary, as well as provide socio-demographic and -economic information. Summaries for household-level trip making were computed from the trip segment data file by University of California, Irvine (Rindt, 2015) and provided by Caltrans as part of the HTS.

Based on our interests in linking our analysis to transportation-impact analyses, the travel outcome variables selected for the analysis are home-based vehicle trips and home-based person trips, all aggregated at the household level. These are commensurate with information used in state-of-the-practice trip generation analysis. Although travel behavior research has identified a large number of correlates with these travel outcomes, we limited the number and type of independent variables to mirror those factors that are available during development review stage of a project (pre-occupancy) and commonly used in transportation analyses. The independent variables include household size, dwelling type (single-family/multifamily housing), day of the week (weekday/weekend), household income (relative to affordable housing limits) and urban context at the place of residence. We controlled for weekday versus weekend travel using a single dummy variable because of expected differences in travel patterns between those two periods. Additionally, we controlled for potential differences in the large metropolitan areas of Los Angeles and San Francisco due to variations in the regional economies, urban spatial structures, and transportation options in those places.

4 Income qualifying limits for affordable housing programs

Income data are categorical in the HTS. Thus, the midpoint of each income category associated with a household was used to represent its income. California's Official State Income Limits for 2016 were used to relate each household's income to the qualifying limits for housing policy programs in each household's location and to control for regional economic variations (Bates, 2016). These annual qualifying income limits are used to determine eligibility for subsidized housing programs in California and are calculated by the Department of Housing and Community Development based on the US Department of Housing and Urban Development's (HUD) specification for below-market rates. *Median income* for each county is determined by HUD and based upon U.S. Census Bureau's American Community Survey (ACS) data, and a four-person household represents the basis for establishing limits.

Each household was then assigned to one of these income designations: extremely low-income, very low-income, low-income, median-income, moderate-income, or above moderate-income. These designations are determined relative to the median family income for a geographic area, known as area median income (AMI) in California. *Extremely low-income* households are households whose incomes do not exceed 30% of the area median income; *very low-income* households are households whose incomes are greater than 30% of AMI and do not exceed 50% of the AMI; and low-income households are those whose incomes are greater than 51% do not exceed 80%. *Moderate-income* levels are greater than 80% and no more than 120% of the county's AMI.

5 Place types

In this study, we developed a set of place typologies to capture the area-wide differences in the built environment based upon a set of indicators known to be associated with travel behavior outcomes, e.g., the "D's" (Ewing & Cevero, 2010) and accessibility (Handy, 1993). In order to better guide urban planning policy, Caltrans developed a suite of qualitative descriptions of place types in their 2010 Smart Mobility report to illuminate the difference in urban contexts (Caltrans, 2010). We utilized the Smart Mobility place type descriptions to inform the development of statewide, quantitatively driven place types used in our analysis. We used built environment data made available by the Environmental Protection Agency's Smart Location Database (EPA's SLDB) at the Census block group geography (U.S. EPA, 2014).

To classify each location into clustered place types, a discriminant analysis was used in order to place each zone into a unique category. To simplify the method of post-hoc location classification, we categorized the built environment in each of the 23,190 Census block groups in California based on a set of six characteristics: the population, employment, and intersection density in addition to percent of single-family housing units and proportion of jobs within a half mile of a fixed-service transit stop or 45 minutes via auto travel. Table 1 provides the descriptive statistics for each these measures per place type.

Each block group was then classified as one of five place types based on the variation in these built environment indicators. The procedure for place type assignment began by selecting all block groups with 80% of its area in an urban area (as defined by the US Census); those block groups deemed outside of urban areas were classified as non-urban. Each of six built environment variables were then manually divided into four intervals—first using standard breaks methods (e.g., Jenks breaks, clustering analysis), followed by manual modification of segments based upon examination of its distribution spatially. This inspection was iterative and involved an examination of variation across neighborhoods using online resources (e.g., Google StreetView); regional definitions of place types, e.g., (Caltrans, 2010); and local expertise (e.g., discussions within the research team, project panel, and sponsoring agency). Each block group was then assigned a score between one and four for each of the built environment measures depending on the interval where the calculated value of the measure was situated (e.g., a block group with no jobs would be given a value of one because it was situated in the category reflecting the lowest level of employment density). Then, the average of the scores across all six built environment characteristics was calculated for each block group and was used to assign the block groups into one of the four urban place types based on this mean interval score. Table 1 provides an overview of the break values used in creating these place types while Figure 1 displays their spatial representation throughout California.

These place types were then compared with the California results of a cluster analysis at the tract level conducted by Salon (2015). Generally, the place types were similar to those constructed by Salon, indicating relatively similar results between the two methods: clustering analysis and mutually exclusive breaks.

Each household in the study was assigned a place type based upon the classification of the Census block group of their residential location. Place types are useful for understanding the immediate context in which travel takes place. However, these places do not exist in a vacuum and the larger metropolitan structure in which they reside is an important consideration when evaluating travel. For example, an area categorized as an "urban district" in San Francisco will have similar features as an area in the same category located in Los Angeles; but the larger urban structure of each metropolitan area will also exert influence on travel choices. To this end, we introduce controls at the county level to test for the additional effects of the built environment at a larger scale.

6 Travel outcomes

To evaluate the relationship between household-level travel outcomes (home-based vehicle trips and total home-based person trips), we regressed each of these outcomes on income, place types, dwelling type, household size, weekday/weekend travel day, and county (see Table 2 for descriptions of all these variables). Because the transportation impacts of new development are assessed by the number of dwelling units, each outcome was predicted at a household-level aggregation.

All models were estimated with a negative binomial regression to accommodate the count-based nature of these data. We controlled for the impacts of individual counties on these trips but only Los Angeles and San Francisco counties were significant. For each model, interactions between place types, income categories, dwelling types, and counties were tested, but only those interactions in the home-based vehicle trip model provided statistical significance for interpretation, and therefore, only these interactions were included. The square of household size was included to examine the diminishing effect contributed by each additional person in the household. The statistically significant income category of Refused or Unknown was included in the models to control for any bias in this group. While developing the models, the Alkaline Information Criterion (AIC) was used to determine if variables contributed to explaining deviance existing in the models—models with decreasing AIC were deemed "improved."

Table 1: Descriptive statistics and interval score breaks for built environment indicators per place type

Place Type:	**Urban Core**		**Urban District**		**Urban Neighborhood**		**Suburban Neighborhood**		**Non- Urban**	
Indicator	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Population per Acre	67	48	42	25	27	14	11	8	<0	<0
Employment per Acre	58	96	17	41	7	13	2	4	<0	<0
Percent of Single-Family Housing	0.06	0.07	0.19	0.20	0.39	0.25	0.76	0.25	0.81	0.18
Intersections per Square Mile	213	148	165	111	126	79	85	47	5	8
Percent of Jobs in 0.5-mile of Transit Stop	0.93	0.21	0.45	0.45	0.19	0.34	0.03	0.13	0.00	0.01
Number of Jobs in 45 Mins. of Auto Travel	509,569	186,240	513,498	176,351	466,294	163,922	211,857	179,250	26,942	45,325
					Interval Score Breaks					
Population per Acre	80		40		20		< 20		N/A	
Employment per Acre	100		25		10		< 10		N/A	
Percent of Single-Family Housing	0.15		0.50		0.75		> 0.75		N/A	
Intersections per Square Mile	250		175		100		< 100		N/A	
Percent of Jobs in 0.5-mile of Transit Stop	0.95		0.50		0.10		< 0.10		N/A	
Number of Jobs in 45 Mins. of Auto Travel	400,000		300,000		200,000		< 200,000		N/A	
Mean Interval Score Break	3		2.5		2		1		N/A	
Number of Block Groups	317		714		3,074		17,151		1,934	

Notes: Sample size (n) is 23,190 US Census block groups.

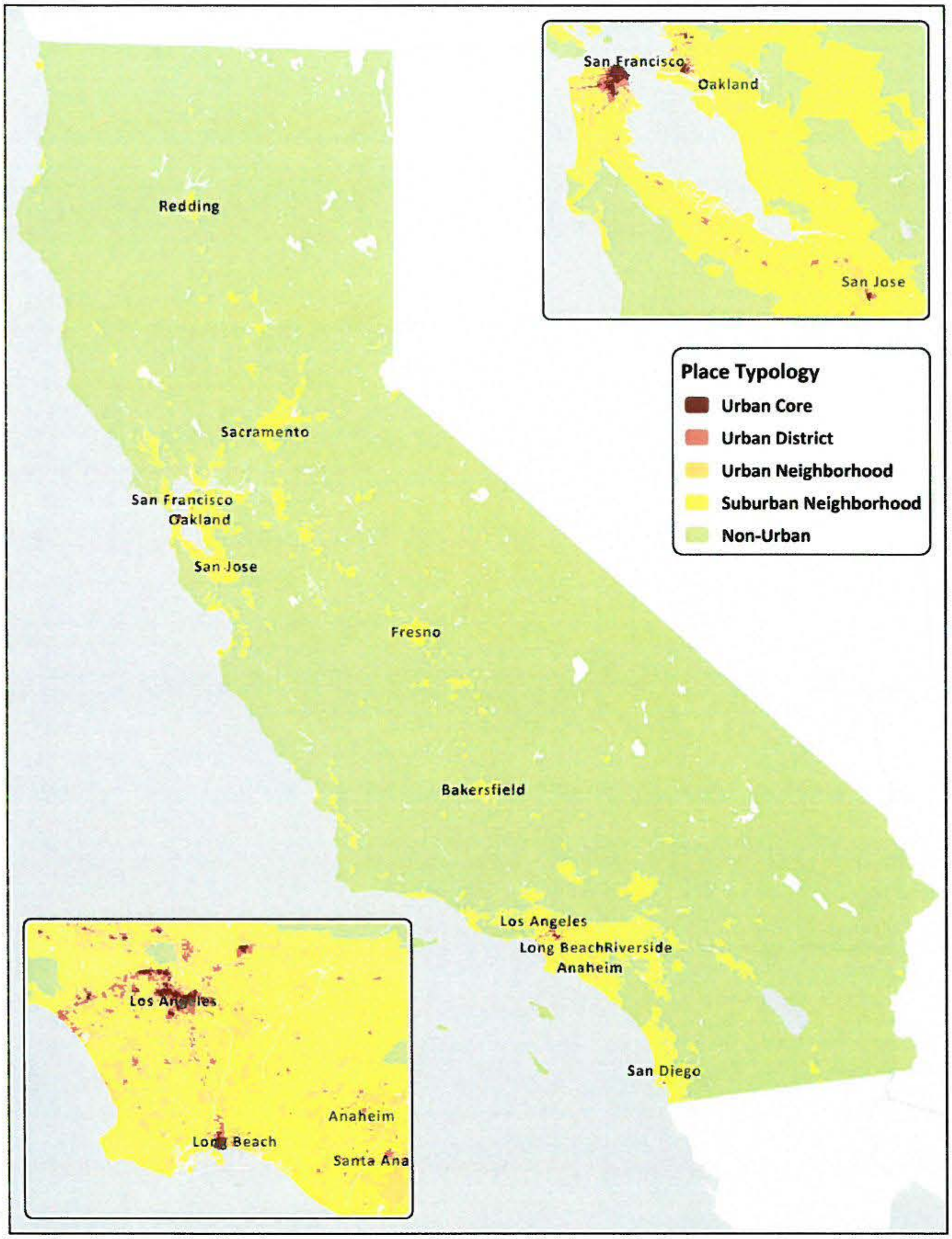

Figure 1: Place typologies applied to California

Table 2: Description of the travel data used in model estimation

Dependent Variables	Descriptions	Mean	Standard Deviation
Home-Based Person Trips	Count of daily home-based trips by household (any mode)	5.21	4.73
Home-Based Vehicle Trips	Count of daily home-based vehicle trips by households	2.99	2.66
Independent Variables	**Descriptions**	**Proportion[1]**	
County			
Los Angeles	Respondent lives in Los Angeles County	20%	
San Francisco	Respondent lives in San Francisco County	3%	
Multifamily Housing Unit	Respondent lives in a multifamily housing unit	15%	
Household Size	Size of respondent's household	2.57	
Household Size Squared	Size of respondent's household, squared	8.50	
Weekend Travel (Fri-Sun)	Travel day was Friday, Saturday, or Sunday	43%	
Household Income			
Above Moderate-Income	> 120% of the area median income	40%	
Moderate-Income	81-120% of the area median income	14%	
Low-Income	51-80% of the area median income	15%	
Very Low-Income	31-50% of the area median income	10%	
Extremely Low-Income	≤ 30% of the area median income	12%	
Refused or Unknown		9%	
Place Type	See descriptions in the text		
Urban Core		2%	
Urban District		2%	
Urban Neighborhood		9%	
Suburban Neighborhood		73%	
Non-Urban		15%	
Automobile Mode Share by Place Type		**Proportion**	**Trips (n)**
Urban Core		41%	3,551
Urban District		62%	6,378
Urban Neighborhood		74%	25,299
Suburban Neighborhood		88%	227,271
Non-Urban		92%	39,074

Notes: [1]Total households: 42,426

Table 3: Negative binomial regression model estimates for total home-based person trips (any mode) and total home-based vehicle trips

Travel Outcome:	Home-Based Vehicle Trips				Home-Based Person Trips (Any Mode			
	Model 1				Model 2			
Variable	B	SE	p	Exp(B)	B	SE	p	Exp(B)
Intercept	**-0.35**	0.07	0.00	0.71	**0.37**	0.04	0.00	1.44
County								
San Francisco	**-0.25**	0.04	0.00	0.77	0.04	0.03	0.19	1.04
Los Angeles	**0.43**	0.10	0.00	1.53	-0.01	0.01	0.21	0.99
Multifamily Housing Unit	**-0.17**	0.01	0.00	0.84	0.00	0.01	0.94	1.00
Household Size	**0.53**	0.01	0.00	1.70	**0.70**	0.01	0.00	2.02
Household Size Squared	**-0.05**	0.00	0.00	0.96	**-0.05**	0.00	0.00	0.95
Weekend Travel (Fri-Sun)	**-0.18**	0.01	0.00	0.83	**-0.09**	0.01	0.00	0.91
Household Income								
Above Moderate-Income	(base)				(base)			
Moderate-Income	**-0.09**	0.01	0.00	0.92	**-0.07**	0.01	0.00	0.93
Low-Income	**-0.16**	0.01	0.00	0.85	**-0.12**	0.01	0.00	0.89
Very Low-Income	**-0.34**	0.02	0.00	0.71	**-0.21**	0.01	0.00	0.81
Extremely Low-Income	**-0.60**	0.02	0.00	0.55	**-0.23**	0.01	0.00	0.79
Refused or Unknown	**-0.19**	0.02	0.00	0.82	**-0.14**	0.01	0.00	0.87
Place Type								
Urban Core	(base)				(base)			
Urban District	**0.47**	0.08	0.00	1.60	-0.01	0.04	0.73	0.99
Urban Neighborhood	**0.64**	0.07	0.00	1.90	-0.03	0.04	0.36	0.97
Suburban Neighborhood	**0.69**	0.07	0.00	2.00	**-0.08**	0.04	0.03	0.92
Non-Urban	**0.52**	0.07	0.00	1.69	**-0.28**	0.04	0.00	0.75
Interaction Variable								
Los Angeles County *								
Urban District	**-0.33**	0.11	0.00	0.72				
Urban Neighborhood	**-0.42**	0.10	0.00	0.66				
Suburban Neighborhood	**-0.41**	0.10	0.00	0.66				
Non-Urban	**-0.49**	0.12	0.00	0.61				
Model Summary								
Observations (n)				41,021				41,021
Deviance				50,351.47				49,600.21
Alkaline Information Criterion				173,521.38				206,792.82
Log Likelihood				-86,739.69				-103,379.41

7 Results

The model results are presented in Table 3. Models 1 and 2 are negative binomial models regressing home-based vehicle trips and home-based person trips respectively upon the independent variables. To interpret the effect size of the model coefficients, we examine the exponent of the coefficients, which, for both model types allows us to examine the relationship of each variable with the respective travel outcome. For example, when values of exp(B) are higher than one, this indicates a positive relationship between the travel outcome measures and the corresponding independent variable and vice versa.

The results show high levels of significance for nearly all of the independent variables with a few notable exceptions. The square of household size as well as the main effect are significant, in both the estimated coefficients as well as the contribution to explaining variance and deviance in the models.

While the main effects of household size indicate a positive relationship in the models, the square of household size is negative, indicating a diminishing relationship between each additional member of the household and each outcome—potentially representing the transportation efficiencies existing in multi-member households.

As households locate farther from the urban core (treated here as a base case), they make increasing vehicle trips. As their income decreases relative to the county median, households tend to make fewer trips and are less likely to drive. Compared to their single-family housing counterparts, households that live in multifamily units make approximately 16% fewer home-based vehicle trips.

We observe a significant mediating relationship of a Los Angeles County indicator on place type for home-based vehicle trips (Model 1), suggesting a significant relationship between place types and each outcome for Los Angeles (LA) County, compared with all other counties. These results indicate households in the urban core and urban district in Los Angeles make approximately 54% and 10% more home-based vehicle trips than those in the same place types in other areas of the state (except San Francisco). For urban and suburban neighborhood place types, households in LA make approximately 1-2% more home-based vehicle trips compared with other areas of the state. In non-urban areas, LA households generate approximately 6% fewer trips compared to non-urban areas in the rest of the state. Households in San Francisco generally make 23% fewer home-based vehicle trips for all place types compared to households in all other counties. Although we tested the contribution of mediating effects of San Francisco County with place types, there was not enough evidence to suggest a significant relationship.

To better illustrate the magnitude of these effects of the independent variables, the predicted travel outcome of home-based vehicle trips is shown in Table 4. The effects are shown relative to a four-person household with an income above the moderate level, living in a single-family housing unit in a suburban place (the base case). These results are also plotted against the trip data provided in the ITE *Trip Generation Manual* (Institute of Transportation Engineers, 2012) for Land Use Code (LUC) 220 Residential Apartment in Figure 2. This graphic illustration shows the degree of overestimation of vehicle trips when urban context and resident incomes are not included.

There have been recent advances in the way that we assess the transportation impacts of new development. Many cities are moving away from reliance solely on vehicle trip data provided by ITE's *Trip Generation Manual* and collecting new multimodal data for a variety of land uses. In the latest edition of the *Trip Generation Manual* (9th edition), recommended practice is to start with assessment of the person trips generated by a development and then estimate how those trips are distributed across various modes. For this reason, we estimate models of home-based person trips in Table 3, Model 2.

The most notable result for the person trip estimation is that they appear to be less sensitive to place type than vehicle trips. Here, the parameter estimates for urban district and urban neighborhood are not significantly different from urban core (the base case). Suburban and rural places have significantly different and decreasing impacts on person trips. This is somewhat consistent with the notion put forth by ITE and others that residential person trips should be less variable by urban place type (Currans, 2017; Institute of Transportation Engineers, 2014), unlike the distribution of trips across various modes (including vehicle trips). This consistency across urban areas may be due to people substituting vehicle trips for walk, bike, and transit trips in more urban areas. Home-based person trip frequencies are also sensitive to income, with trip rates decreasing as income decreases. This suggests that although person trip rates may be a better starting point for evaluating site-level trip generation, the methods for evaluating transportation impacts should still consider socioeconomics of trip makers in the analysis.

Table 4: Predicted home-based vehicle trips (Model 1) relative to base case scenario

Income Category	Non-Urban	Suburban Neighborhood	Urban Neighborhood	Urban District	Urban Core
Single-Family Dwellings					
Extremely Low-Income	46%	55%	52%	44%	27%
Very Low-Income	60%	71%	67%	56%	35%
Low-Income	72%	85%	81%	68%	42%
Median/Moderate-Income	77%	92%	87%	73%	46%
Above Moderate-Income	84%	**100%**	95%	80%	50%
Multifamily Dwellings					
Extremely Low-Income	39%	46%	44%	37%	23%
Very Low-Income	50%	60%	57%	47%	30%
Low-Income	60%	71%	68%	57%	36%
Median/Moderate-Income	65%	77%	73%	61%	38%
Above Moderate-Income	71%	84%	80%	67%	42%

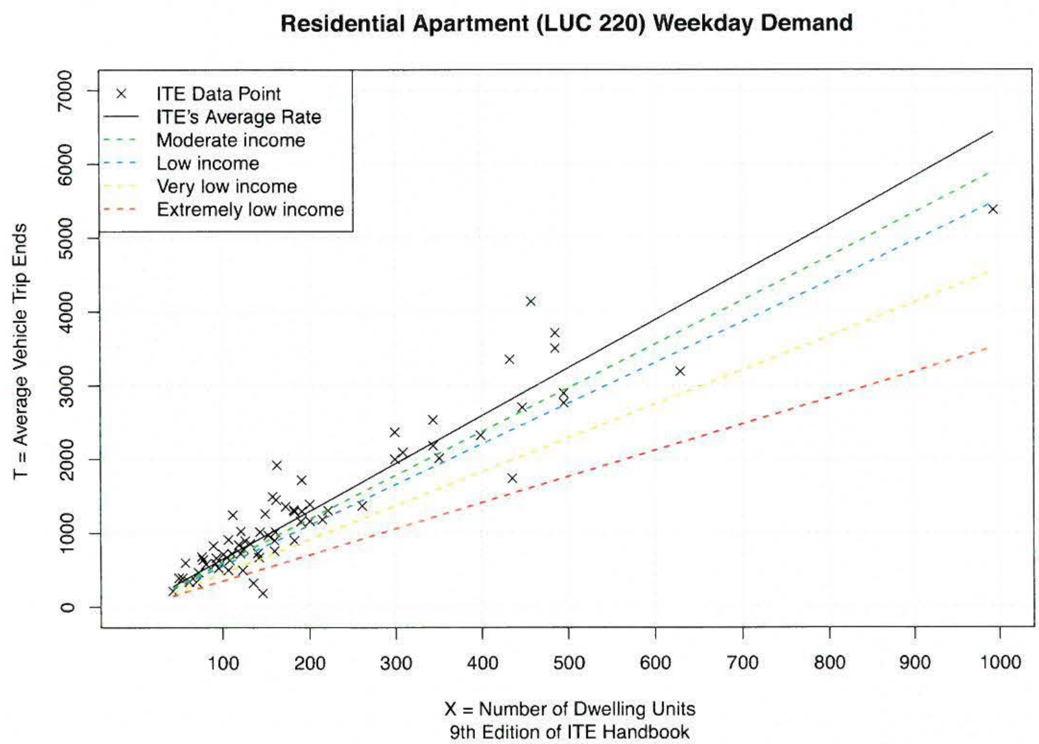

Figure 2: ITE residential apartment (LUC 220) weekday vehicle trips compared to home-based vehicle trip estimates from Model 1

8 Implications for affordable housing development

Many impact fee rates are developed using methodologies based upon vehicle trip estimates from ITE. If these rates are not sensitive to the issues we have been discussing—urban context and socioeconomics—they assume that all housing development will have same impact. Some fee structures fail to distinguish between multifamily and single-family development and assess the same fees on all residential development. To further demonstrate the implications of these shortcomings on development costs, we extend this analysis to consider the impact fees in two case study areas—Sacramento and Pasadena, California. We obtained the most recent impact fees for these locations (City of Sacramento, 2017; City of Pasadena, 2015) and adjusted them relative to the differences in travel outcomes by income and place type using the comparisons from Table 4. Table 5 shows the amount that each unit would be over-assessed based upon the relative differences in travel impact for the location and income of residents.

We did not control for any programs, discounts, or overlay zones that these jurisdictions may have in place to reduce fees for affordable housing or developments that are efficiently located with respect to transportation options. This exercise is strictly meant as an example to illustrate the potential additional costs that may be incurred by developers when impact analysis fails to control for differences in travel by income and location.

When one considers that most affordable housing development is multifamily and thus has many units per development, these errors can accumulate and have a marked impact on cost. For example, a developer of a 50-unit affordable apartment building targeted for residents in the low-income category in an Urban District neighborhood in Pasadena would be overcharged $59,238 in transportation impact fees. That same development in Sacramento would be overcharged $13,353. This number is lower because Sacramento has different rates for single-family and multifamily housing; thus, accounting explicitly for some of the travel differences between residents of different dwelling types which is corroborated by our analysis. These are not insignificant amounts in a project pro forma particularly given that fees are assessed for other utilities and services beyond transportation.

9 Discussion and conclusion

With an interest in contributing to affordable housing development policies, this analysis examined and quantified the relative influences of urban place type, residential dwelling type, and income on the travel outcomes that are most relevant in evaluating the transportation impacts of new developments. These results show significant differences in these travel outcomes between income groups and a strong association with place type, as well as contribute to understanding the interaction effects between the two. This strongly suggests that applying traditional methods and data to evaluate the transportation impacts of affordable housing developments will overestimate vehicle use and likely result in excessive fees and unwarranted mitigations.

The significant mediating relationship of LA County on place type also indicates that there is something about the relationship between residents and the built environment that results in significantly different home-based vehicle trips, even with a similar built environment. This may indicate that metropolitan structure or regional accessibility should be considered in addition to the local contextual variables. Another possible interpretation may have to do with the variation existing in categorical definitions of place—a common simplification of continuous, highly correlated variables to derive something more easily applied and assessed in practice. Either way, these results suggest that aggregating nationally collected data without providing more detailed contextual information—e.g., city or county, continuous built environment measures—may result in severe over- or under-estimation of behavior due to regional differences in how residents interact with similar built environments.

This analysis is not without limitations. First, our analysis was not conducted with explicit data from residents of affordable housing. Rather, we used income designations to identify households that would qualify to live in affordable housing in their area and discriminated by dwelling type. As a result, our conclusions may overstate the trip making differences because residents of affordable housing may have lower housing costs than similarly situated households living in market-rate housing and thus may have more resources to devote to activities and travel.

Second, our models are not intended to be sensitive to the full complement of household resources, environmental conditions and policies known to impact travel behavior. Despite having access to much of this information for the households in our data, we specifically limited our choices of independent variables to those that would be available to an analyst at the time a new development is proposed and under review. In those cases, the development is not yet built and thus the specific characteristics of the household are unknown, other than the targeted income qualifying limits for the housing. Third, we do not consider the role of self-selection bias in these results. However, low-income households have more constrained choices in where to live and perhaps self-section bias considerations can be relaxed. Fourth, while we considered on-site parking requirements in our discussion we were not able to include parking information as a variable in our model. Any data collected for an alternative rate study will be submitted to the City as a part of the official record and may be used in future rate calculations. The relationship between on-site parking requirements, vehicle ownership and trip generation warrants additional study. Finally, the development of place types was based upon the context of California and thus, may not fully represent the environments in other locations. Regardless, the findings here offer important direction for housing and transportation policy in the United States more broadly.

The contribution of the models estimated in this paper is that they are a) sensitive to regionally adjusted household incomes and the characteristics of the proposed sites, and b) based upon the observed travel behavior of residents, rather than merely vehicle counts. Therefore, using these results to estimate the travel outcomes for new housing developments may provide more robust estimates than the existing tools available today. These results also punctuate the need to understand how commonly used trip generation data vary from one region to the next. Without detailed information about how ITE's rates developed from sources across the nation were derived (e.g., urban and social context), application of these methods in urban areas may place additional burden on low-income housing developers and the corresponding residents.

Table 5: Amount of overassessment of impact fees relative to travel impacts

City of Sacramento				
Income Category	**Suburban Neighborhood Over-assessment per unit**	**Urban Neighborhood Over-assessment per unit**	**Urban District Over-assessment per unit**	**Urban Core Over-assessment per unit**
Single-Family Dwellings - Transportation impact fee of $1,182.00 per unit				
Extremely Low-Income	$533	$566	$665	$858
Very Low-Income	$344	$387	$515	$764
Low-Income	$178	$230	$382	$681
Median/Moderate-Income	$99	$154	$319	$641
Above Moderate-Income	$0	$60	$240	$592
Multifamily Dwellings - Transportation impact fee of $827.00 per unit				
Extremely Low-Income	$446	$465	$523	$636
Very Low-Income	$334	$360	$434	$581
Low-Income	$237	$267	$357	$532
Median/Moderate-Income	$190	$222	$319	$509
Above Moderate-Income	$132	$167	$273	$480
City of Pasadena				
Income Category	**Suburban Neighborhood Over-assessment per unit**	**Urban Neighborhood Over-assessment per unit**	**Urban District Over-assessment per unit**	**Urban Core Over-assessment per unit**
Single-Family Dwellings - Impact fee of $2,747.20 per residential unit				
Extremely Low-Income	$1,240	$1,317	$1,546	$1,994
Very Low-Income	$801	$900	$1,196	$1,775
Low-Income	$415	$534	$888	$1,582
Median/Moderate-Income	$229	$358	$741	$1,489
Above Moderate-Income	$0	$140	$558	$1,375
Multifamily Dwellings - Impact fee of $2,747.20 per residential unit				
Extremely Low-Income	$1,480	$1,545	$1,737	$2,114
Very Low-Income	$1,111	$1,195	$1,443	$1,930
Low-Income	$787	$887	$1,185	$1,768
Median/Moderate-Income	$631	$739	$1,061	$1,690
Above Moderate-Income	$438	$556	$907	$1,594

10 Acknowledgements

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Cutting the Cost of Parking Requirements

DONALD SHOUP

A city can be friendly to people or it can be friendly to cars, but it can't be both.

Enrique Peñalosa

At the dawn of the automobile age, suppose Henry Ford and John D. Rockefeller had hired you to devise policies to increase the demand for cars and gasoline. What planning regulations would make a car the obvious choice for most travel? First, segregate land uses (housing here, jobs there, shopping somewhere else) to increase travel demand. Second, limit density at every site to spread the city, further increasing travel demand. Third, require ample off-street parking everywhere, making cars the default way to travel.

American cities have unwisely embraced each of these car-friendly policies, luring people into cars for 87 percent of their daily trips. Zoning ordinances that segregate land uses, limit density, and require lots of parking create drivable cities but prevent walkable neighborhoods. Urban historians often say that cars have changed cities, but planning policies have also changed cities to favor cars over other forms of transportation.

Minimum parking requirements create especially severe problems. In *The High Cost of Free Parking,* I argued that parking requirements subsidize cars, increase traffic congestion and carbon emissions, pollute the air and water, encourage sprawl, raise housing costs, degrade urban design, reduce walkability, damage the economy, and exclude poor people. To my knowledge, no city planner has argued that parking requirements do *not* have these harmful effects. Instead, a flood of recent research has shown they *do* have these effects. We are poisoning our cities with too much parking.

Minimum parking requirements are almost an established religion in the planning profession. One shouldn't criticize anyone else's religion but, when it comes to parking requirements, I'm a protestant and I think the profession needs a reformation.

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Planners are placed in a difficult position when asked to set parking requirements in zoning ordinances because they don't know the demand for parking at every art gallery, bowling alley, dance hall, fitness club, hardware store, movie theater, night club, pet store, tavern, zoo, and hundreds of other land uses. Planners also do not know how much parking spaces cost or how the parking requirements affect everything else in the city. Nevertheless, planners must set the parking requirements for every land use and have adopted a veneer of professional language to justify the practice. Planning for parking is an ad-hoc talent learned on the job and is more a political activity than a professional skill. Despite a lack of both theory and data, planners have managed to set parking requirements for hundreds of land uses in thousands of cities—the ten thousand commandments for off-street parking.

Without knowing how much the required parking spaces cost to build, planners cannot know how much parking requirements increase the cost of housing. Small, spartan apartments cost much less to build than large, luxury apartments, but their parking spaces cost the same. Many cities require the same number of spaces for all apartments regardless of their size; the cost of the required parking thus greatly increases the price of low-income housing.

Parking requirements reduce the cost of owning a car but raise the cost of everything else. Recently, I estimated that the parking spaces required for shopping centers in Los Angeles increase the cost of building a shopping center by 67 percent if the parking is in an aboveground structure and by 93 percent if the parking is underground.

Developers would provide some parking even if cities did not require it, but parking requirements would be superfluous if they did not increase the parking supply. This increased cost is then passed on to all shoppers. For example, parking requirements raise the price of food at a grocery store for everyone, regardless of how they travel. People who are too poor to own a car pay more for their groceries to ensure that richer people can park free when they drive to the store.

Minimum parking requirements resemble what engineers call a *kludge:* an awkward but temporarily effective solution to a problem, with lots of moving parts that are clumsy, inefficient, redundant, hard to understand, and expensive to maintain. Instead of reasoning about parking requirements, planners must rationalize them. Parking requirements result from complex political and economic forces, but city planners enable these requirements and sometimes even oppose efforts to reform them. Ultimately, the public bears the high cost of this pseudoscience. ➢

A single parking space can cost far more to build than the net worth of many American households.

The Median is the Message

Cities require parking for every building without considering how the required spaces place a heavy burden on poor people. A single parking space, however, can cost far more to build than the net worth of many American households.

In recent research, I estimated that the average construction cost (excluding land cost) for parking structures in 12 American cities in 2012 was $24,000 per space for aboveground parking, and $34,000 per space for underground parking (Table 1).

By comparison, in 2011 the median net worth (the value of assets minus debts) was only $7,700 for Hispanic households and $6,300 for Black households in the United States (Figure 1). One space in a parking structure therefore costs at least three times the net worth of more than half of all Hispanic and Black households in the country. Nevertheless, cities require several parking spaces per household by requiring them at home, work, stores, restaurants, churches, schools, and everywhere else.

Many families have a negative net worth because their debts exceed their assets: 18 percent of all households, 29 percent of Hispanic households, and 34 percent of Black households had zero or negative net worth in 2011 (Figure 2). The only way these indebted people can use the required parking spaces is to buy a car, which they often must finance at a high, subprime interest rate. In a misguided attempt to provide free parking for everyone, cities have created a serious economic injustice by forcing developers to build parking spaces that many people can ill afford.

Urban planners cannot do much to counter the inequality of wealth in the US, but they can help to reform parking requirements that place heavy burdens on minorities and the poor. Simple parking reforms may be city planners' cheapest, fastest, and easiest way to achieve a more just society. ➢

TABLE 1

The Construction Cost of a Parking Space

	CONSTRUCTION COST PER SQUARE FOOT		CONSTRUCTION COST PER PARKING SPACE	
CITY	UNDERGROUND $/SQ FT (1)	ABOVEGROUND $/SQ FT (2)	UNDERGROUND $/SPACE (3) = (1) x 330	ABOVEGROUND $/SPACE (4) = (2) x 330
Boston	$95	$75	$31,000	$25,000
Chicago	$110	$88	$36,000	$29,000
Denver	$78	$55	$26,000	$18,000
Honolulu	$145	$75	$48,000	$25,000
Las Vegas	$105	$68	$35,000	$22,000
Los Angeles	$108	$83	$35,000	$27,000
New York	$105	$85	$35,000	$28,000
Phoenix	$80	$53	$26,000	$17,000
Portland	$105	$78	$35,000	$26,000
San Francisco	$115	$88	$38,000	$29,000
Seattle	$105	$75	$35,000	$25,000
Washington, DC	$88	$68	$29,000	$22,000
Average	**$103**	**$74**	**$34,000**	**$24,000**

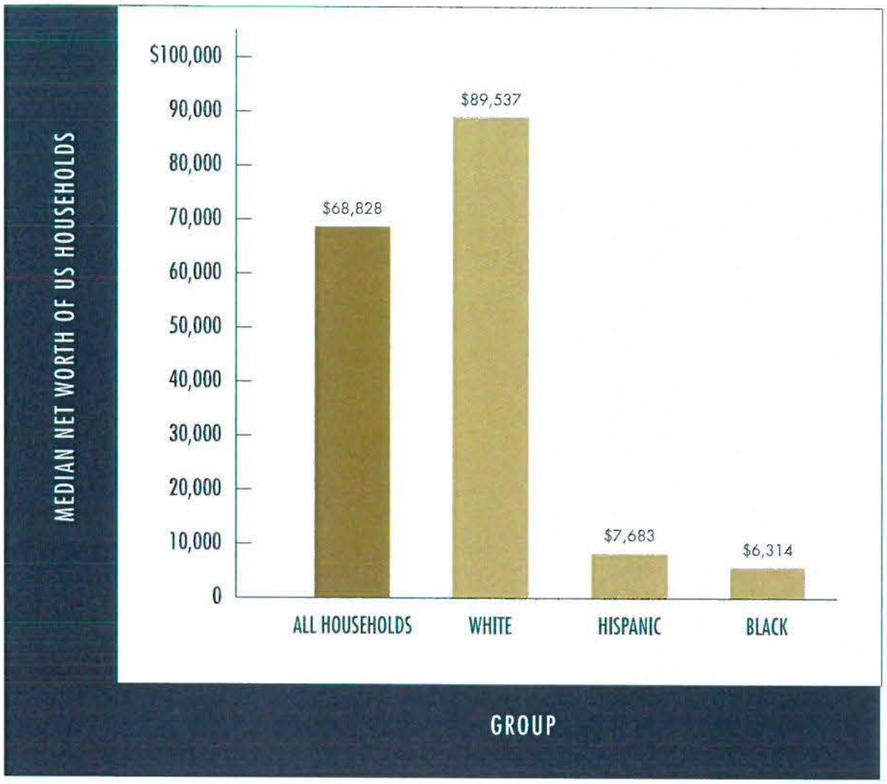

FIGURE 1

Median Net Worth of US Households, 2011

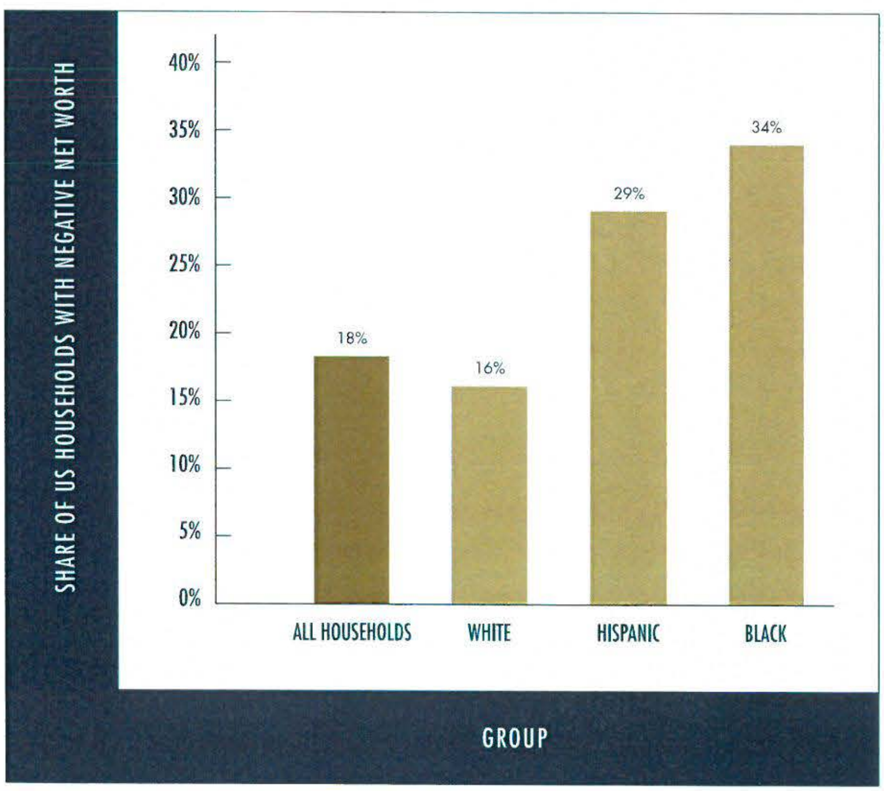

FIGURE 2

Share of US Households with Zero or Negative Net Worth, 2011

Putting a Cap on Parking Requirements

Off-street parking requirements increase the cost and reduce the supply of affordable housing. Most cities do not intend to exclude low-income residents when they require off-street parking, but even good intentions can produce bad results. Thoughtless planning for parking can be as harmful as a perverse and deliberate scheme.

Perhaps because of growing doubts about parking requirements, a few cities have begun to reduce or remove them, at least in their downtowns. Planners and elected officials are beginning to recognize that parking requirements increase the cost of housing, prevent infill development on small lots where it is difficult to build all the required parking, and prohibit new uses for older buildings that lack the required parking spaces.

According to recent newspaper articles, some of the reasons cities have reduced or removed their parking requirements include "to promote the creation of downtown apartments" (Greenfield, Massachusetts), "to see more affordable housing" (Miami), "to meet the needs of smaller businesses" (Muskegon, Michigan), "to give business owners more flexibility while creating a vibrant downtown" (Sandpoint, Idaho), and "to prevent ugly, auto-oriented townhouses" (Seattle).

Given this policy momentum, I thought the time to reform parking requirements in California had arrived when the legislature considered Assembly Bill 904 (the Sustainable Minimum Parking Requirements Act of 2012). AB 904 would have set an upper limit on how much parking cities can require in transit-rich districts: no more than one space per dwelling unit or two spaces per 1,000 square feet of commercial space. The bill defined these districts as areas within a quarter mile of transit lines that run every 15 minutes or better. If passed it would have been a huge boon for both housing and transit.

There are good reasons to adopt this policy. Federal and state governments give cities billions of dollars every year to build and operate mass transit systems, yet most cities require ample parking everywhere on the assumption that nearly everyone will drive for almost every trip. Minimum parking requirements counteract all these transit investments.

For example, Los Angeles is building its Subway to the Sea under Wilshire Boulevard, which already boasts the city's most frequent bus service. Nevertheless, along parts of Wilshire the city requires at least 2.5 parking spaces for each dwelling unit, regardless of the number of rooms. Similarly, 20 public transit lines serve the UCLA campus near Wilshire Boulevard in Westwood, with 119 buses per hour arriving during the morning peak. Nevertheless, across the street from campus, Los Angeles requires 3.5 parking spaces for every apartment that contains more than four rooms. We have expensive housing for people but we want free parking for cars.

Also on Wilshire Boulevard, Beverly Hills requires 22 parking spaces per 1,000 square feet for restaurants, which means the parking lot is seven times larger than the restaurant it serves. Public transit in this over-parked environment resembles a rowboat in the desert.

Cities seem willing to pay any price and bear any burden to assure the survival of free parking. But do people really want free parking more than affordable housing, clean air, walkable neighborhoods, good urban design, and many other public goals? A city where everyone happily pays for everyone else's free parking is a fool's paradise.

A city where everyone happily pays for everyone else's free parking is a fool's paradise.

Why Cap Parking Requirements?

Minimum parking requirements create an asphalt wasteland that blights the environment. A powerful force field of free parking encourages everyone to drive everywhere. A cap on parking requirements in transit-rich neighborhoods can reduce this parking blight by making parking-light development feasible.

How will reducing off-street parking requirements affect development? Zhan Guo and Shuai Ren at New York University studied the results when London shifted from minimum parking requirements with no maximum, to maximum parking limits with no minimum. Comparing developments completed before and after the reform in 2004, they found that the parking supplied after the reform was only 52 percent of the previous minimum required and only 68 percent of the new maximum allowed. This result implies that the previous minimum was almost *double* the number of parking spaces that developers would have voluntarily provided. Guo and Ren concluded that removing the parking minimum caused 98 percent of the reduction in parking spaces, while imposing the maximum caused only 2 percent of the resulting reduction. Removing the minimum had a far greater effect than imposing a maximum.

Cities usually require or restrict parking without considering the middle ground of neither a minimum nor a maximum. This behavior recalls a Soviet maxim: "What is not required must be prohibited." AB 904, however, was something new. It would not have restricted parking but instead would have imposed a cap on minimum parking requirements, a far milder reform. A cap on how much parking cities can require will not limit the parking supply because developers can always provide more parking than the zoning requires if they think market demand justifies the cost.

There are precedents for placing limits on parking requirements. Oregon's Transportation Systems Plan requires local governments to amend their land-use and subdivision regulations to achieve a 10 percent reduction in the number of parking spaces per capita. The United Kingdom's transport policy guidelines for local planning specify that "plans should state maximum levels of parking for broad classes of development ... There should be no minimum standards for development, other than parking for disabled people." ➢

Failure and Then Success in the Legislature

To my dismay, the California Chapter of the American Planning Association (APA) lobbied against AB 904, arguing that it "would restrict local agencies' ability to require parking in excess of statewide ratios for transit intensive areas unless the local agency makes certain findings and adopts an ordinance to opt out of the requirement."

Like the automobile itself, parking is a good servant but a bad master.

City planners must, of course, take direction from elected officials, but the APA represents the planning profession, not cities. AB 904 gave the planning profession an opportunity to support a reform that would coordinate parking requirements with public transportation, but instead the California APA insisted that cities should retain full control over parking requirements, despite their poor stewardship.

AB 904 failed to pass in 2012 but was resurrected in a weaker form as AB 744 and was successful in 2015. AB 744 addresses the parking requirements for low-income housing within half a mile of a major transit stop. If a development is entirely composed of low-income rental housing units, California now caps the parking requirement at 0.5 spaces *per dwelling unit.* It also caps the parking requirement for a development that includes at least 20 percent low-income or 10 percent very low-income housing at 0.5 spaces *per bedroom.* Developers can of course provide more parking if they want to, but cities cannot require more parking unless they conduct a study that demonstrates a need.

Affordable housing advocates initially opposed AB 744 because it would have capped the parking requirements for *all* housing in transit-rich areas. Another California law (SB 1818) already reduces the parking requirements for developments that include some affordable units.

Reducing the parking requirements for all housing would therefore dilute the existing incentive to include affordable units in market-rate developments. Confining AB 744's parking reduction to affordable housing was therefore necessary to gain political support from the affordable housing advocates, even though a cap on parking requirements for *all* housing would increase the supply and reduce the price of housing without any subsidy.

Statewide caps on parking requirements may be difficult to impose in the face of the demand for local control in all land use decisions. Nevertheless, the California experience shows that a statewide cap can be feasible if it is linked to affordable housing. This link attracted political support from affordable housing advocates who know that parking requirements are a severe burden on housing development, and that reducing the parking requirements for affordable housing will increase its supply.

Without the support from affordable housing advocates, California's cap on parking requirements near transit would probably not have been enacted. Until more people recognize that parking requirements cause widespread damage, one way to increase political support for a cap on parking requirements is to use it as an incentive for building affordable housing. This approach, however, may then lead affordable housing advocates to oppose any general reduction in parking requirements even if it will make all housing more affordable.

An Arranged Marriage

Many believe that Americans freely chose their love affair with the car, but it was an arranged marriage. By recommending parking requirements in zoning ordinances, the planning profession was both a matchmaker and a leading member of the wedding party. But no one provided a good prenuptial agreement. Planners should now become marriage counselors or divorce lawyers where the relationship between people and cars no longer works well.

Like the automobile itself, parking is a good servant but a bad master. Parking should be friendly—easy to find, easy to use, and easy to pay for—but cities should not require or subsidize parking. Cities will look and work much better when markets rather than planners and politicians govern decisions about the number of parking spaces. Putting a cap on parking requirements is a good place to start. ◆

Further Reading

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Owner / Developer:

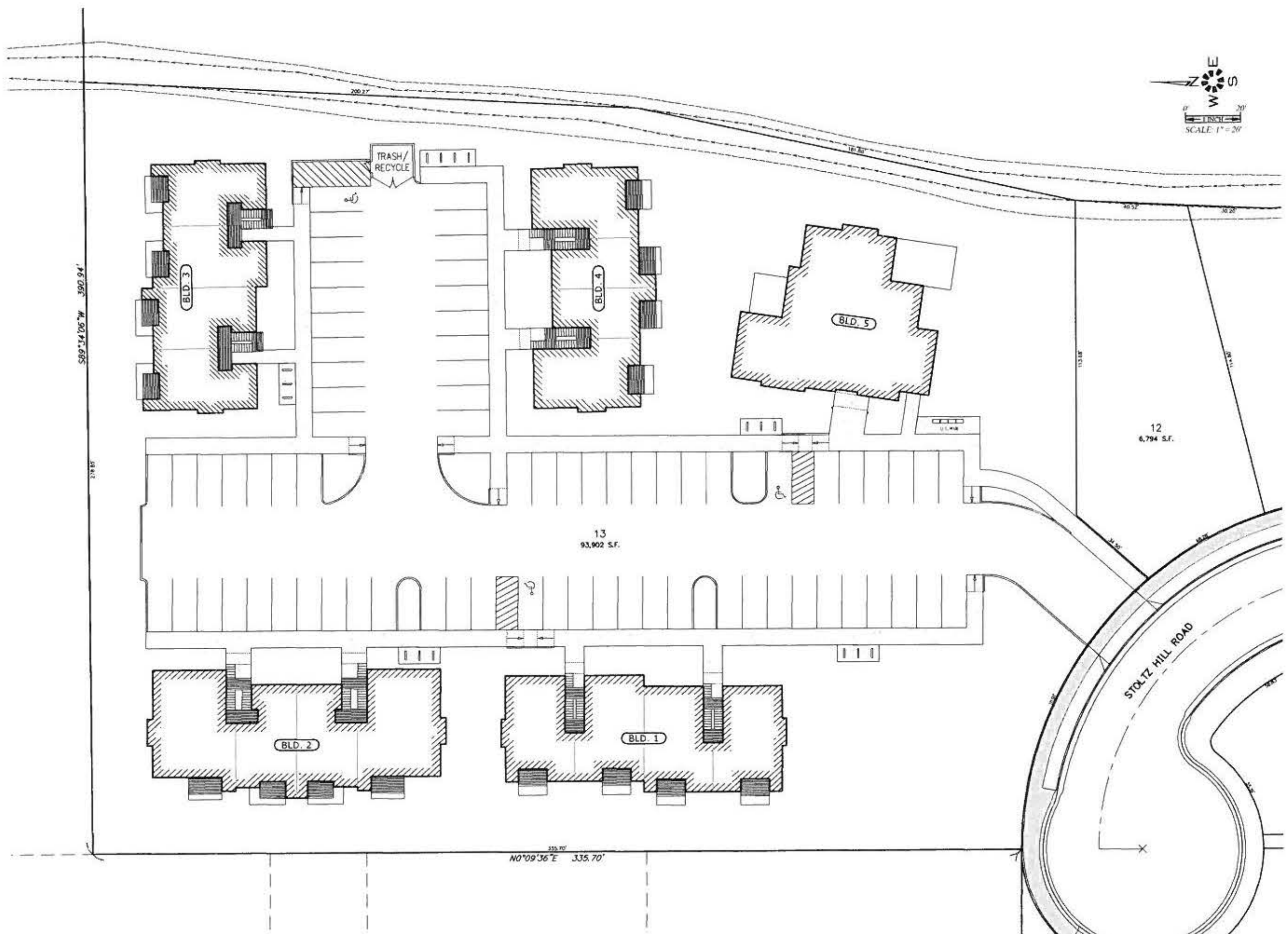
APPLEGATE LANDING, LLC

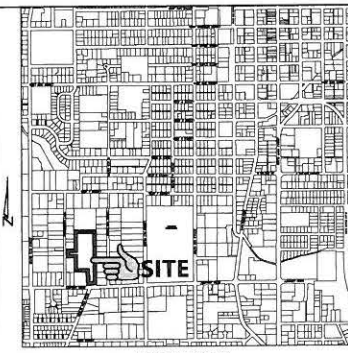
39596 GRIGGS DR.
LEBANON, OREGON 97355

APPLEGATE LANDING APARTMENTS

SEC. 15, T. 12 S., R. 2 W., W.M.
CITY OF LEBANON
LINN COUNTY, OREGON

B.M. 348.45
LINN COUNTY GPS #93364 (NGVD 29)
AT THE INTERSECTION OF
AIRPORT ROAD & 12TH STREET





VICINITY MAP

ABBREVIATIONS

A.C.	ASPHALTIC CONCRETE	L.P.	LIGHT POLE
ACMP	ALUMINIZED CMP	M	METER, MAIN
ASSY.	ASSEMBLY	M.H.	MANHOLE
B.O.	BLOW OFF	MTL.	METAL
B.F.V.	BUTTERFLY VALVE	O.H.	OVERHEAD
C & G	CURB & GUTTER	PC	POINT OF CURVE
CATV	CABLE TELEVISION	PCC	POINT OF CONTINUING CURVE
C.B.	CATCH BASIN	PED.	PEDESTAL
C.B.C.O.	CATCH BASIN CLEANOUT	PRC	POINT OF REVERSE CURVE
C.B.I.	CATCH BASIN INLET	PROP.	PROPOSED
C.L.	CENTERLINE	PT	POINT OF TANGENCY
CMP	CORRUGATED METAL PIPE	PUB.	PUBLIC
C.O.	CLEANOUT	PUE	PUBLIC UTILITY EASMT.
CONC.	CONCRETE	PVC	POLYVINYL CHLORIDE
CONST.	CONSTRUCT	PVT.	PRIVATE
D.I.	DUCTILE IRON	P.P.	POWER POLE
DIA.	DIAMETER	P.L.	PROPERTY LINE
DWG.	DRAWING	R	RADIUS
EASMT.	EASEMENT	R-	RIM
E.G.	EXIST. GRADE / GROUND	RD	ROOF DRAIN
EOP, E.P.	EDGE OF PAVEMENT	R.O.W.	RIGHT-OF-WAY
ELEC.	ELECTRIC	SAN.S. or S.S.	SANITARY SEWER
ELEV. or EL.	ELEVATION	S	SLOPE
EX. or EXIST.	EXISTING	STA.	STATION
FT.	FEET	STD.	STANDARD
F.F.	FINISH FLOOR	STL.	STEEL
F.G.	FINISH GRADE	STM.DRN. or S.D.	STORM DRAIN
F.H.	FIRE HYDRANT	SVC.	SERVICE
F.M.	FORCE MAIN	SW	SIDEWALK
GUT. or GTR.	GUTTER	T.C.	TOP OF CURB
G.V.	GATE VALVE	TEL.	TELEPHONE
IMP.	IMPROVEMENT	TYP.	TYPICAL
INST	INSERT	U.G.	UNDERGROUND
INV. or I=	INVERT	VLT.	VAULT
L	LENGTH, LINE	W.M.	WATER MAIN

SYMBOLS

EXIST. PROP.

- BLOW OFF ASSY.
- CATCH BASIN
- CATCH BASIN CLEANOUT
- CATCH BASIN INLET
- CATV PED. / BOX
- CLEANOUT
- ELEC. PED. / BOX
- FIRE HYDRANT
- GAS LOCATION MARKER
- GAS VALVE
- MAIL BOX
- MANHOLE SAN. SEWER
- MANHOLE STORM DRAIN
- 2' DIA. C.O. / M.H.
- MANHOLE TELEPHONE
- MANHOLE WATER
- REDUCER / INCREASER
- TEL. PED. / BOX
- TRAFFIC PED. / BOX
- UTILITY / POWER POLE
- WATER METER
- WATER VALVE
- CABLE TELEVISION
- CENTERLINE
- DITCH C.L.
- ELECTRICAL LINE
- GAS MAIN
- TELEPHONE LINE
- SANITARY SEWER EXIST.
- SANITARY SEWER PROP.
- STORM DRAIN EXIST.
- STORM DRAIN PROP.
- WATER MAIN EXIST.
- WATER MAIN PROP.

SHEET INDEX

MULTI/TECH
ENGINEERING SERVICES, INC.

COVER SHEET

APPLEGATE LANDING APARTMENTS

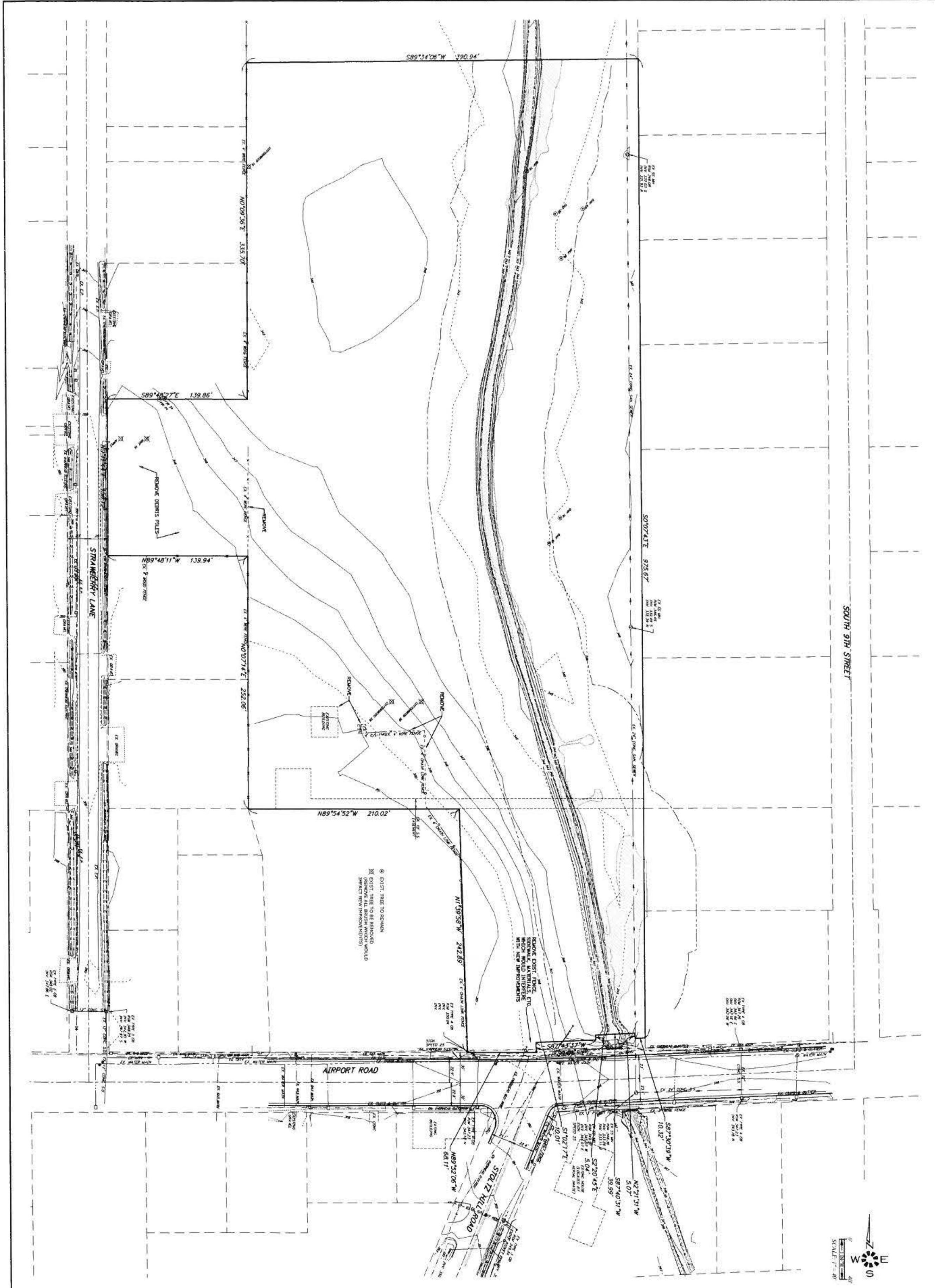
DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.

Design: M.D.G.
Drawn: D.G.G.
Checked: J.J.G.
Date: JAN. 2020
Scale: AS SHOWN

REGISTERED PROFESSIONAL ENGINEER
OREGON
JULY 14, 1978
MARK D. GRENZ
EXPIRES 06-30-2021

JOB # 6650

SDR1



SDR2

JOB # 6659

EXPIRES: 06-30-2021

Design: M.D.G.
Drawn: D.G.G.
Checked: J.L.G.
Date: JAN. 2020
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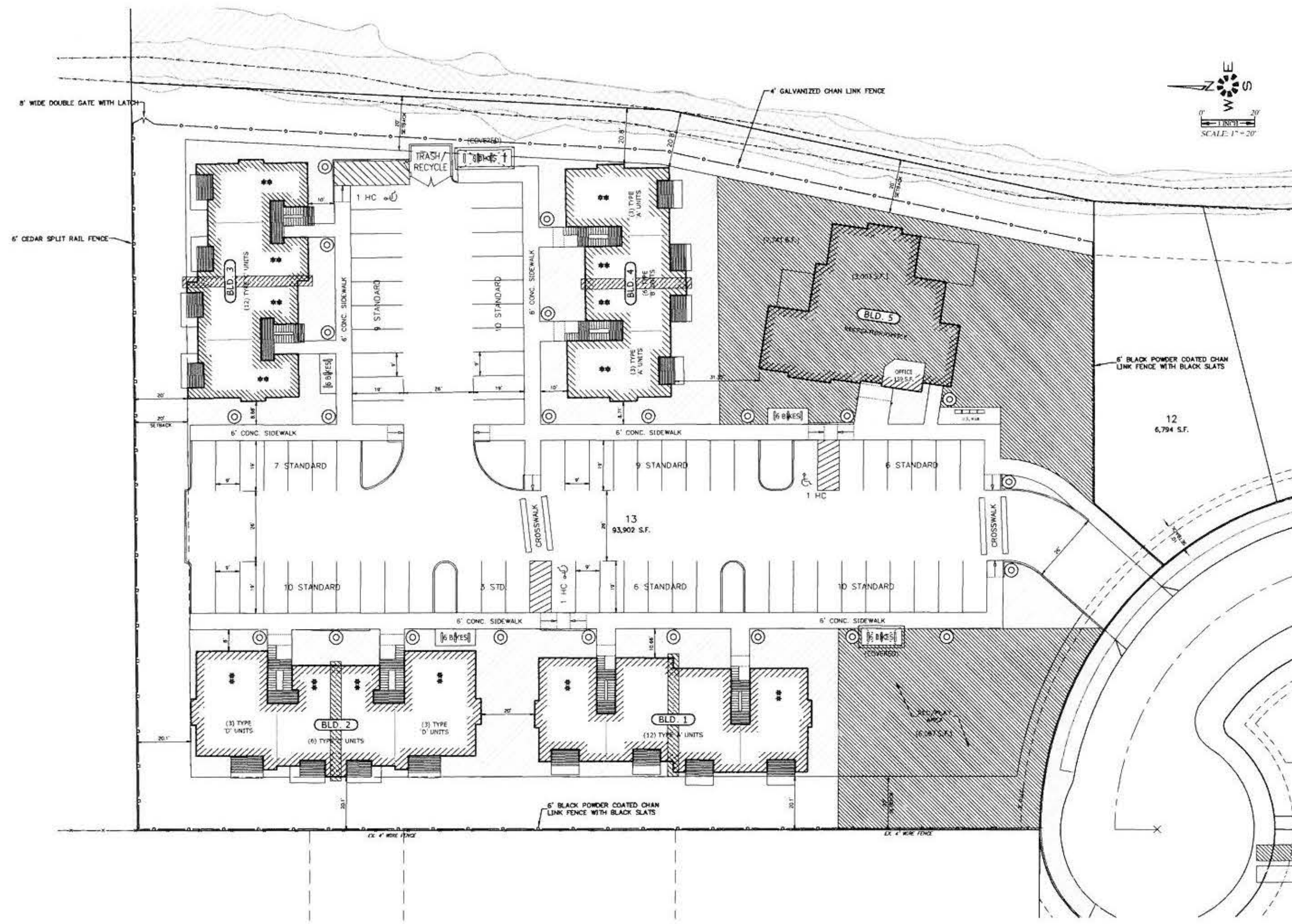
NO CHANGES, MODIFICATIONS OR REPRODUCTIONS TO BE MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM THE DESIGN ENGINEER.

DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.

APPLEGATE LANDING APARTMENTS

EXISTING CONDITIONS PLAN

MULTI/TECH ENGINEERING SERVICES, INC.
1155 13th ST. S.E. SALEM, OR. 97302
PH. (503) 363-9227 FAX (503) 364-1260



SITE AREAS

SITE — 93,364 S.F.

BUILDING COVERAGE — 16,240 S.F. (17.4%)
PARKING & DRIVEWAY — 25,447 S.F. (27.9%)
TOTAL HARD SURFACE — 52,181 S.F. (55.9%)

COMMON OPEN SPACE — 16,689 S.F. (17.9%)
OPEN SPACE — 25,652 S.F. (22.6%)

88 TOTAL APARTMENT UNITS
22 TYPE 'A' 2-Bd, 1-Ba (844 S.F.) UNITS
19 TYPE 'B' STUDIO (549 S.F.) UNITS
18 TYPE 'C' 1-Bd, 1-Ba (728 S.F.) UNITS
23 TYPE 'D' 3-Bd, 2-Ba (1127 S.F.) UNITS

74 TOTAL PARKING STALLS
71 STANDARD STALLS
3 HANDICAP STALLS
32 BICYCLE SPACES
14 BICYCLE SPACES (COVERED)
18 BICYCLE SPACES (OPEN)

1 RECREATION BLD. / MANAGER'S OFFICE
1 TRASH COMPACTOR / RECYCLE
1 PLAY AREA
1 U.S. MAIL BOX AREA

✱ THE INDICATED LOWER FLOOR UNITS IN BUILDINGS ✱ 5 & 9 ARE TO BE TYPE A UNITS IN ACCORDANCE WITH THE 2014 OSSC SEC. 1107.6.2.1.1 (NOTED ON FLOOR PLANS). ALL OTHER LOWER FLOOR UNITS TO BE TYPE B UNITS IN ACCORDANCE WITH THE 2014 OSSC SEC. 1107.6.2.1.2

- POST LIGHT MAXIMUM 5' TALL
- LOCATION OF ELECTRICAL SEPARATION WALL
- MAXIMUM 1:12 SLOPE ON SIDEWALK END RAMPS
- 6 BICYCLE SPACES
- 8 BICYCLE SPACES
- COVERED BICYCLE SPACES

ADA HANDICAP ACCESSIBLILITY NOTES:

1. ALL ON-SITE WALKWAYS, PEDESTRIAN CONNECTIONS TO THE PUBLIC SIDEWALK AND ROUTES TO BUILDING ENTRANCES ARE ACCESSIBLE WITH RUNNING SLOPES LESS THAN 5% AND CROSS SLOPE LESS THAN 2% MAX. LANDINGS AT BOTTOM OF STAIRS AND EXT. FACE OF ENTRANCE DOORS SHALL HAVE A SLOPE IN THE DIRECTION OF TRAVEL NOT TO EXCEED 2%
2. HANDICAP PARKING STALLS AND ACCESS AISLES ARE TO HAVE SLOPES IN ANY DIRECTION OF LESS THAN 2% MAX. GRAPHIC MARKINGS & SIGNAGE FOR HANDICAP AND VAN ACCESSIBLE STALLS WILL BE PER OSSC 2010 CHPTR. 11 AND ORS. REQUIREMENTS.
3. HANDICAP ACCESSIBLE CURB RAMPS SHALL HAVE A RUNNING SLOPE NOT TO EXCEED 1:12 MAX. AND A CROSS SLOPE NOT TO EXCEED 1%
4. THE COMMUNITY BUILDING & ON-SITE LAUNDRY FACILITIES WILL BE FULLY HANDICAP ACCESSIBLE IN ACCORDANCE WITH ANSI A117.1 AND CHAPTER 11 OF THE 2010 OSSC.
5. 2% OF THE LIVING UNITS OR (3) UNITS WILL BE TYPE 'A' HANDICAP ACCESSIBLE. THESE INCLUDE A 1, 2 AND 3 BEDROOM UNIT AS INDICATED ON THIS SITE PLAN. THE BALANCE OF THE GROUND FLOOR LIVING UNITS WILL BE TYPE 'B' ADAPTABLE UNITS IN ACCORDANCE WITH ANSI A117.1.

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SITE PLAN

APPLEGATE LANDING APARTMENTS

NO CHANGES, MODIFICATIONS OR REPRODUCTIONS TO BE MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM THE DESIGN ENGINEER.

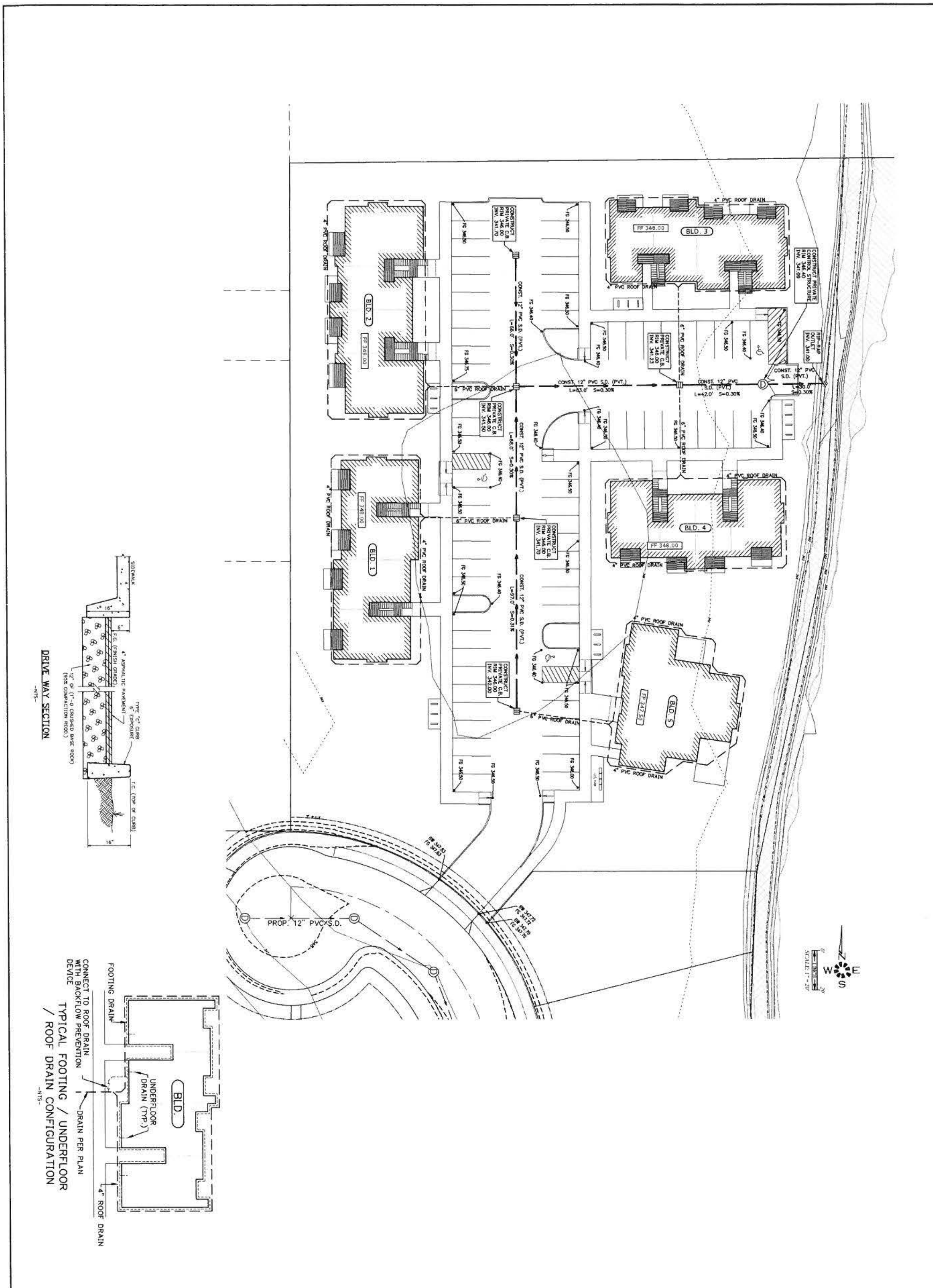
DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.

Design: M.D.G.
Drawn: D.G.G.
Checked: J.J.G.
Date: JAN. 2020
Scale: AS SHOWN

REGISTERED PROFESSIONAL ENGINEER
OREGON
MARK D. GRENZ
EXPIRES: 06-30-2021

JOB # 6650

SDR3



SDR4	JOB # 6653 EXPIRES: 06-30-2021	Design: M.D.G. Drawn: O.G.G. Checked: J.J.G. Date: JAN. 2020 Scale: AS SHOWN	NO CHANGES, MODIFICATIONS OR REPRODUCTIONS TO BE MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM THE DESIGN ENGINEER. DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.	**APPLEGATE LANDING APARTMENTS**	**SITE GRADING & DRAINAGE PLAN**

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ENGINEERING SERVICES, INC.
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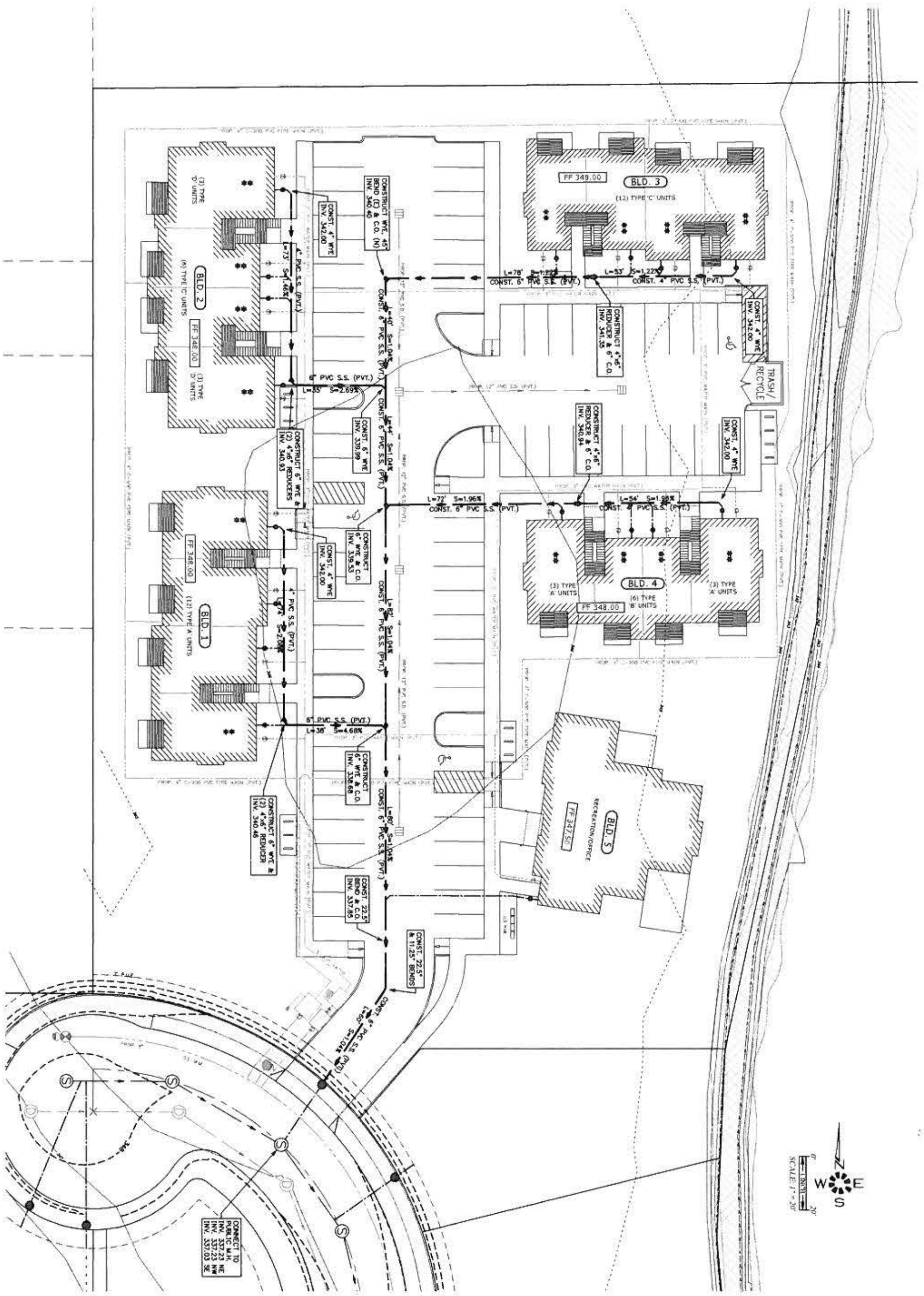
PH. (503) 363-9227 FAX (503) 364-1260



SDR5

EXPIRES 06-30-2021
JOB # 6650

Design: M.D.G.
Drawn: D.G.G.
Checked: J.J.G.
Date: JAN. 2020
Scale: AS SHOWN

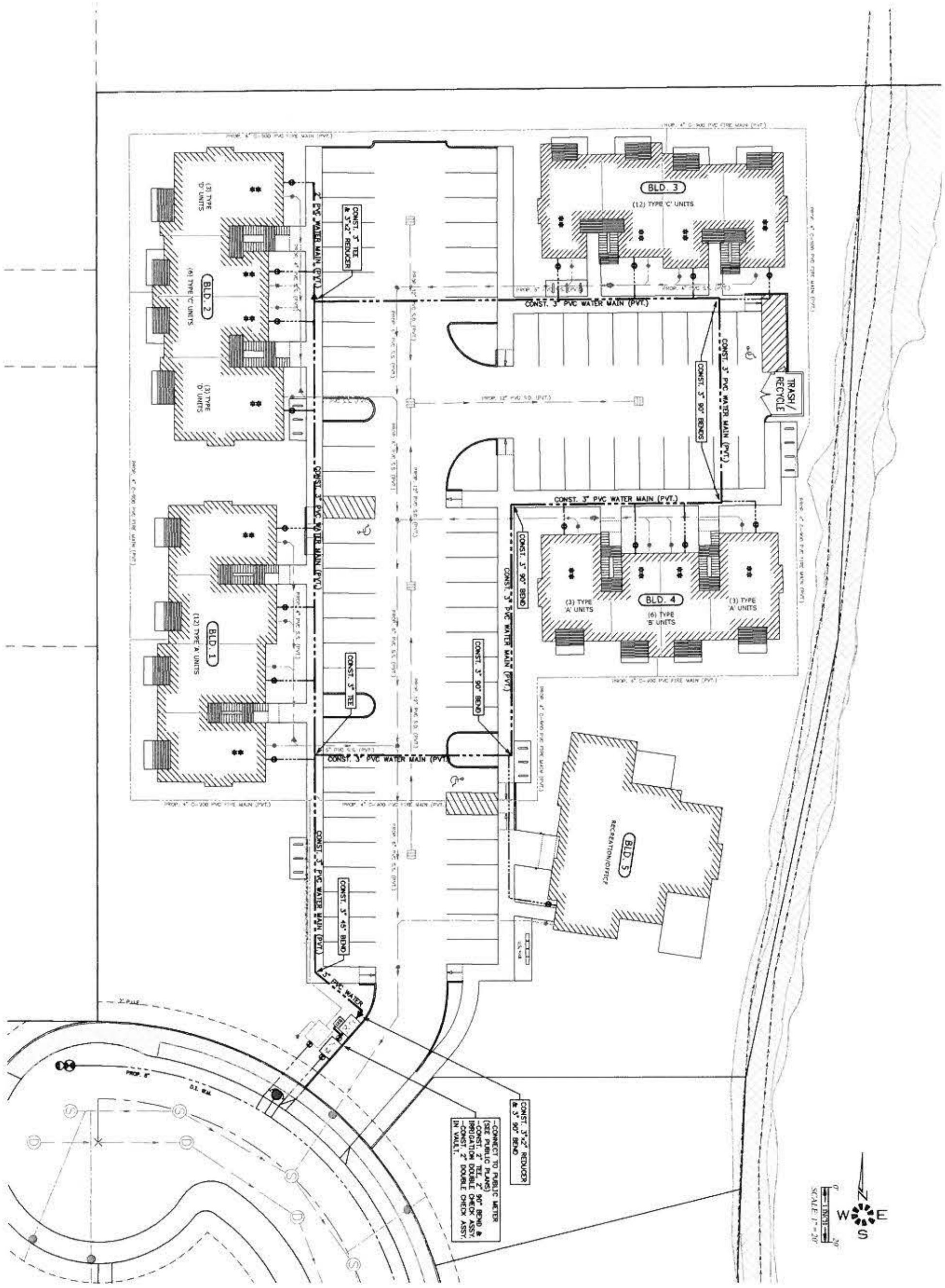
NO CHANGES, MODIFICATIONS OR REPRODUCTIONS TO BE MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM THE DESIGN ENGINEER.

DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.

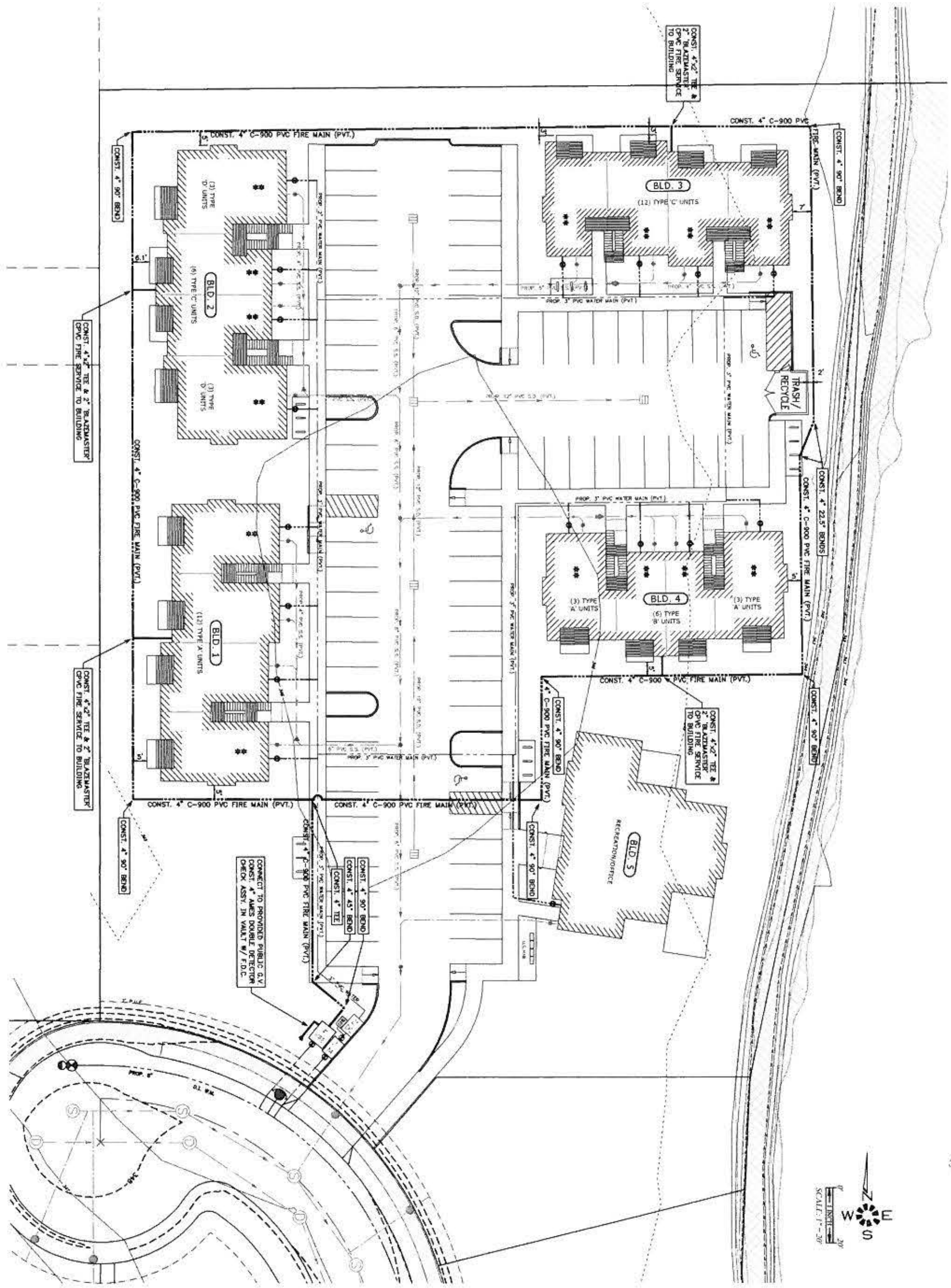
APPLEGATE LANDING APARTMENTS

PRIVATE SANITARY SEWER PLAN

MULTI/TECH
ENGINEERING SERVICES, INC.
1155 13th ST. S.E. SALEM, OR. 97302
PH. (503) 363-9227 FAX (503) 364-1260
www.mtengineering.net office@mtengineering.net

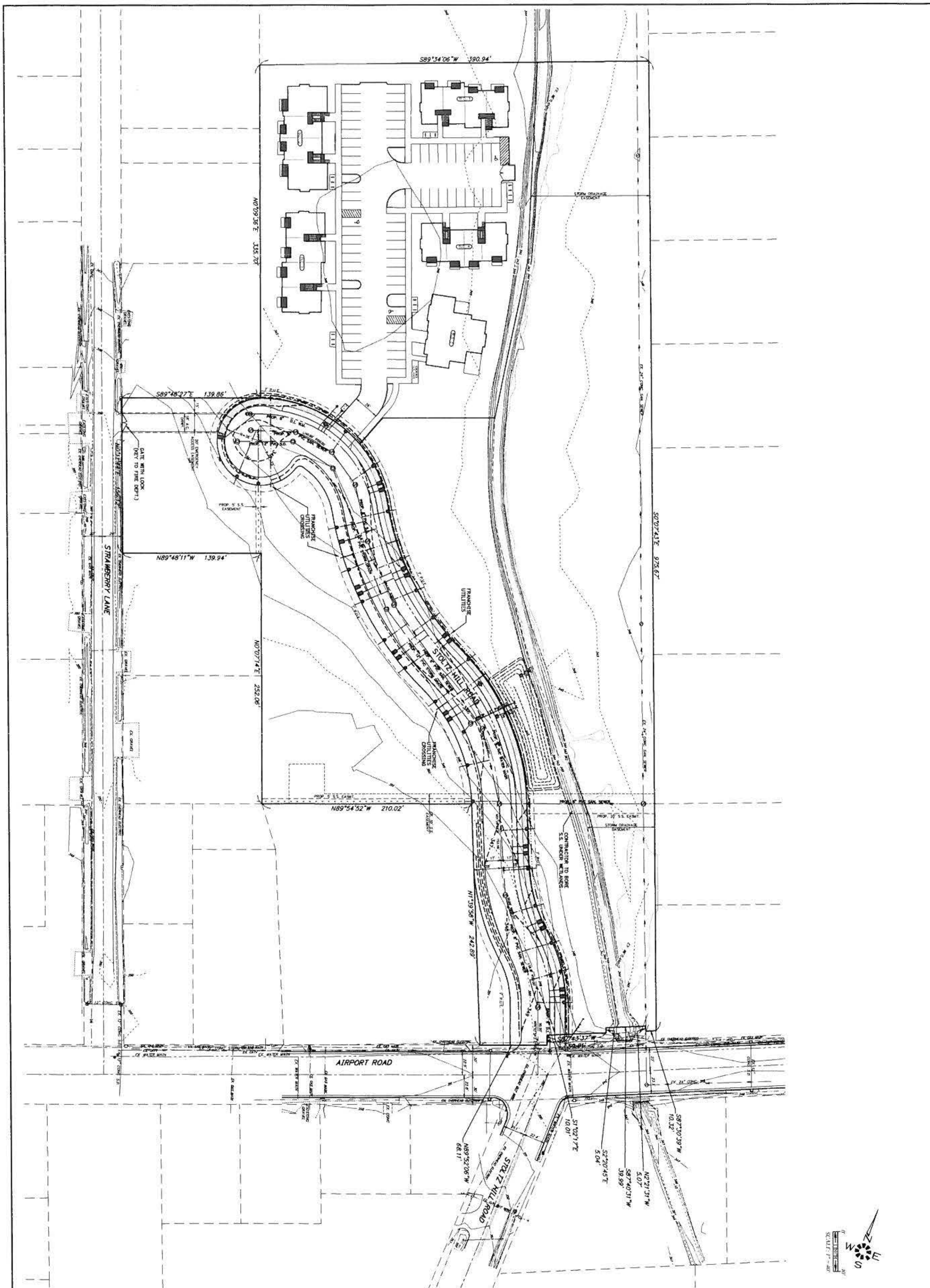


SDR6	JOB # 6650 EXPIRES: 06-30-2021	Design: M.D.G. Drawn: D.G.G. Checked: J.J.G. Date: JAN. 2020 Scale: AS SHOWN	NO CHANGES, MODIFICATIONS OR REPRODUCTIONS TO BE MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM THE DESIGN ENGINEER. DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.	APPLEGATE LANDING APARTMENTS	PRIVATE DOMESTIC WATER PLAN	MULTI/TECH ENGINEERING SERVICES, INC. 1155 13th ST. S.E. SALEM, OR. 97302 PH. (503) 363-9227 FAX (503) 364-1260



SDR7	JOB # 6450 EXPIRES: 06-30-2021	Design: M.D.G. Drawn: D.G.G. Checked: J.J.G. Date: JAN. 2020 Scale: AS SHOWN	NO CHANGES, MODIFICATIONS OR REPRODUCTIONS TO BE MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM THE DESIGN ENGINEER. DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.	**APPLEGATE LANDING APARTMENTS**	**PRIVATE FIRE SERVICE PLAN**

MULTI/TECH
ENGINEERING SERVICES, INC.
1155 13th ST. S.E. SALEM, OR. 97302
PH. (503) 363-9227 FAX (503) 364-1260
www.mtengineering.net office@mtengineering.net



JOB # 6650

Design: M.D.G.
Drawn: D.G.G.
ProjMgr: J.J.G.
Date: JAN. 2020
Scale: AS SHOWN
As-Built: ----

NO CHANGES, MODIFICATIONS OR REPRODUCTIONS TO BE MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM THE DESIGN ENGINEER.

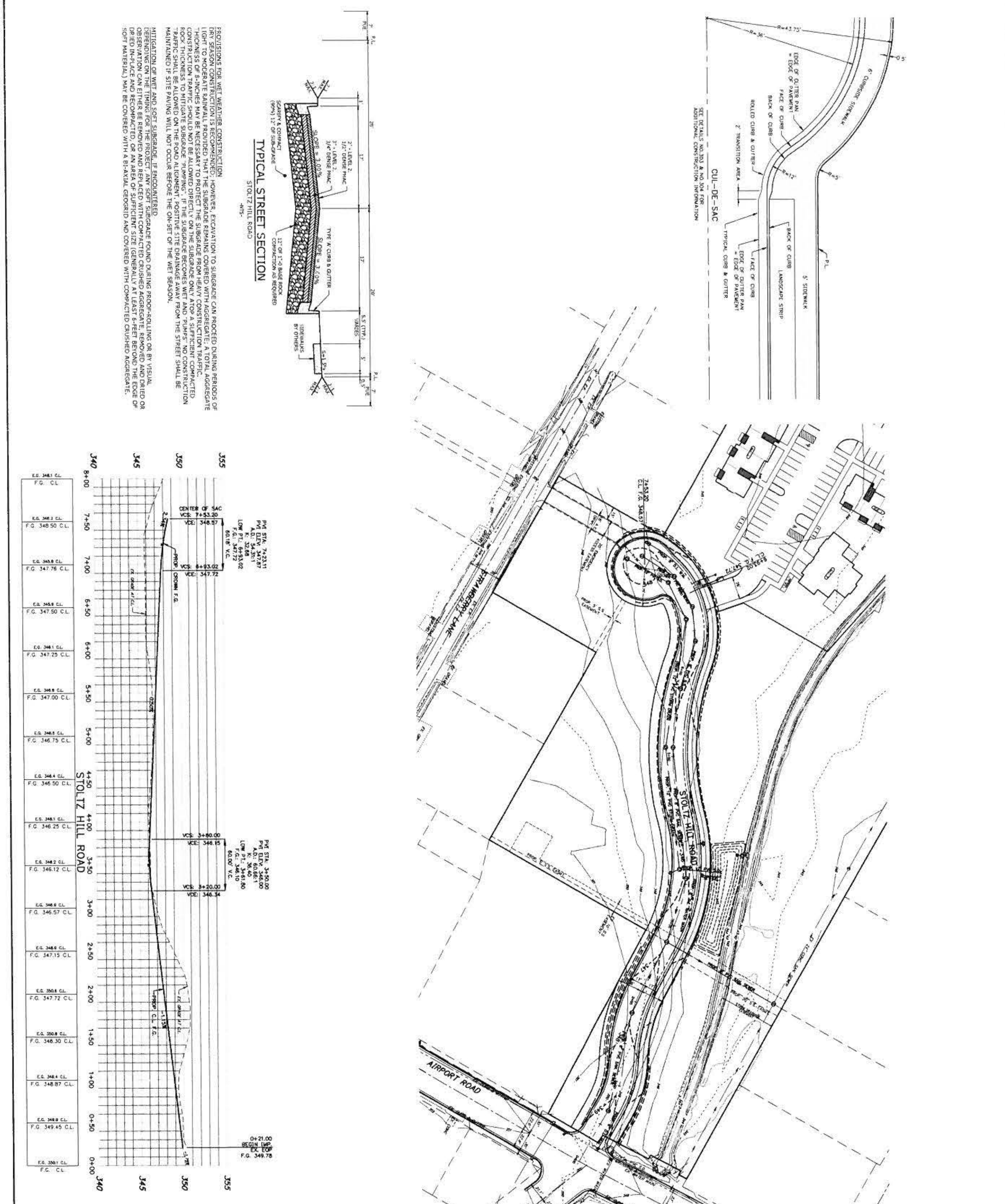
DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.

MULTI/TECH ENGINEERING EXEMPT FROM LIABILITY IF NOT STAMPED APPROVED

APPLEGATE LANDING APARTMENTS

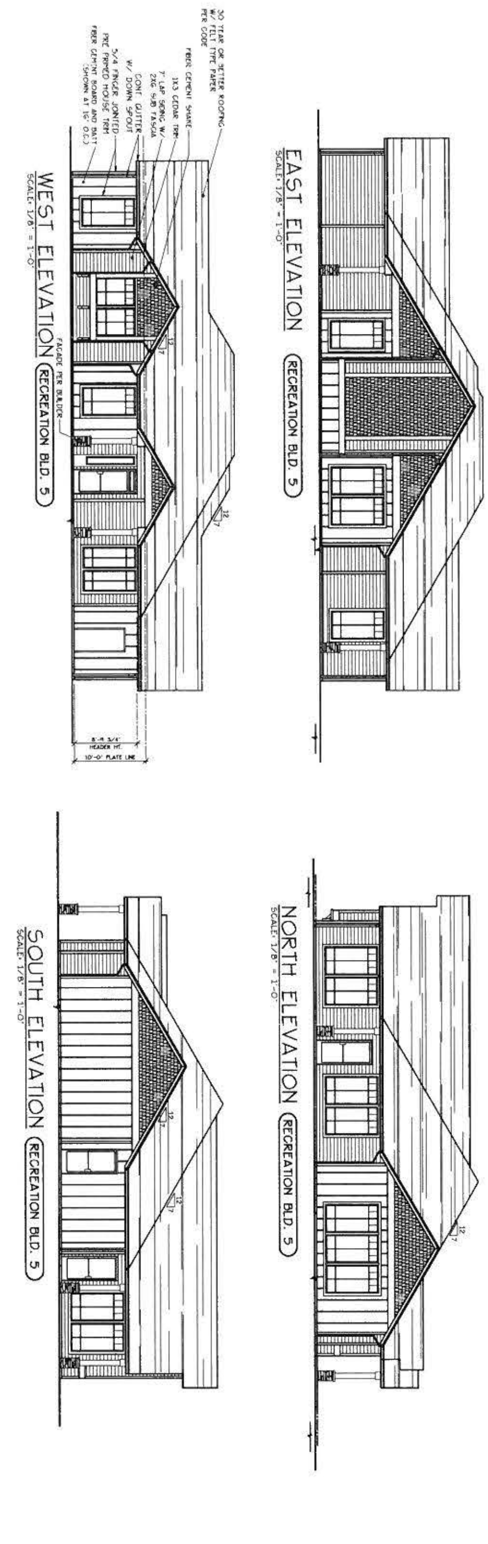
PROPOSED SITE LAYOUT

MULTI/TECH ENGINEERING SERVICES, INC.
1155 13th ST. S.E. SALEM, OR 97302
PH. (503) 363-9227 FAX (503) 364-1260
www.mtengineering.net office@mtengineering.net

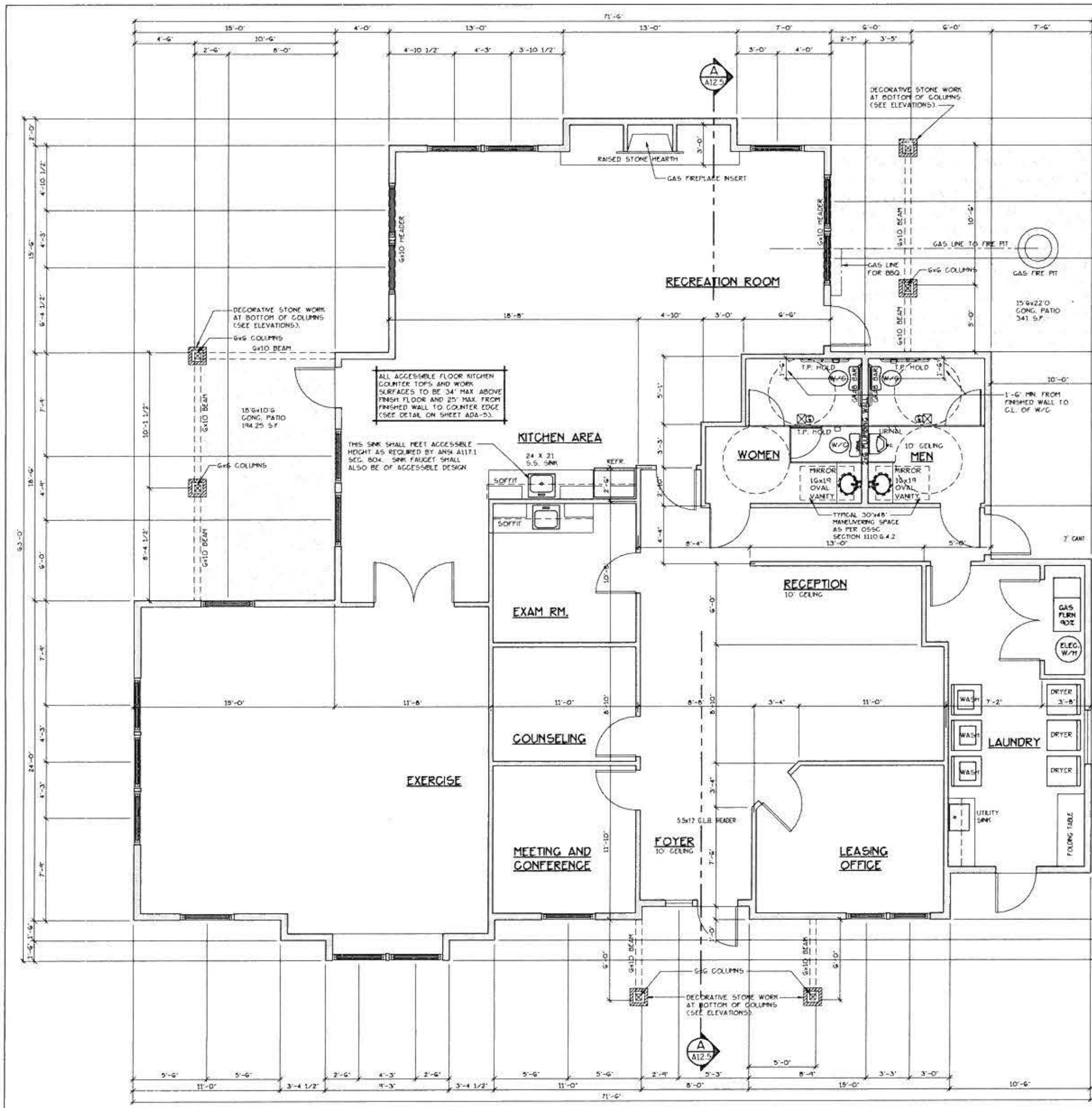


1 / 1	JOB # 6650	Design: M.D.G. Drawn: D.G.G. ProjMgr: J.J.G. Date: JAN. 2020 Scale: AS SHOWN As-Built: ----	NO CHANGES, MODIFICATIONS OR REPRODUCTIONS TO BE MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM THE DESIGN ENGINEER. DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.	MULTI/TECH ENGINEERING EXEMPT FROM LIABILITY IF NOT STAMPED APPROVED	**APPLEGATE LANDING APARTMENTS**	**PRELIMINARY STREET PLAN**

MULTI/TECH ENGINEERING SERVICES, INC.
1155 13th ST. S.E. SALEM, OR. 97302
PH. (503) 363-9227 FAX (503) 364-1260



A5.60	JOB # 6650	BLDS-REC/PLOT:1 A5.60ELEV - ELC Design: P.I.M. Drawn: G.I.O. Checked: M.D.G. Date: Oct-19 Scale: AS SHOWN	NO CHANGES, MODIFICATIONS OR REPRODUCTIONS TO BE MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM THE DESIGN ENGINEER. DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.	**AIRPORT ROAD APARTMENT COMPLEX**	**BUILDING ELEVATIONS & ELECTRICAL PLAN**	MULTI/TECH CONSULTANTS ENGINEERING SERVICES, INC.



FLOOR PLAN
SCALE: 1/4" = 1'-0"
(HANDICAP ADAPTABLE/ACCESSIBLE) RECREATION BLD. 5
REC. BLD. = 3,176 S.F.

CONSTRUCTION TYPE V B.

SEE 'GENERAL STRUCTURAL NOTES' ON SHEET A12.2 BEFORE BEGINNING ANY CONSTRUCTION.

GENERAL NOTES:

1. ALL EXTERIOR WALLS TO BE 2 X 6 STUDS. ALL OTHER WALLS TO BE 2 X 4 STUDS UNLESS OTHERWISE NOTED.
2. FIRE BLOCK CONCEALED SPACES (VERTICAL + HORIZONTAL) AS PER OSSC 718.2.2 AND OSSC 718.2.3
3. PRIOR TO INSTALLATION OF FIBERGLASS TUB/SHOWER + SHOWER UNITS, SHEET ROCK SHALL BE APPLIED TO STUD WALLS AS INDICATED ON PLANS.
4. ALL BATH FANS TO HAVE MIN. 80 CFM. RANGE HOOD EXHAUST FANS TO HAVE MIN. 150 CFM.
5. ELECTRIC OUTLETS IN 1 HR. WALL MAY NOT BE BACK TO BACK AND MUST BE SEPARATED BY HORIZONTAL DISTANCE OF 2'-0".
6. ALL EXTERIOR FLOOD LIGHTING SHALL BE CONNECTED TO HOUSE PANELS LOCATED IN ON-SITE UTILITY ROOMS + STORAGE BLD'S.
7. AS PER OEESC HIGH-EFFICIENCY LIGHTING SYSTEMS – A MINIMUM OF 50 PERCENT OF THE LAMPS IN PERMANENTLY INSTALLED LIGHTING FIXTURES SHALL BE COMPACT OR LINEAR FLOURESCENT, OR A LIGHTING SOURCE THAT HAS A MINIMUM EFFICACY OF 40 LUMENS PER INPUT WATT.
8. ALL 'TYPE A' ACCESSIBLE UNITS REQUIRE THE PATIO TO BE AT SAME LEVEL AS DWELLING UNIT.

HANDICAP UNIT NOTES:

THE UNITS HAVE BEEN DESIGNED TO COMPLY WITH OSSC 2014 REVISED TO BE EFFECTIVE APRIL 1, 2014. CHAPTER 11 OF THE OSSC 2014 AS REVISED INCORPORATES AS PART OF IT, AMERICAN NATIONAL STANDARD ICC/ANSI A117.1-1003. WITHIN ICC/ANSI A117.1 CHAPTER 10 SETS OUT SPECIFIC CODE REQUIREMENTS FOR DWELLING AND SLEEPING UNITS. CHAPTER 10 SETS OUT THE CODE REQUIREMENTS THAT ALL GROUND FLOOR UNITS MUST MEET.

THE INTENT IS THAT "ALL" GROUND FLOOR UNITS ARE TO BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH THE PROVISIONS OF THIS CODE.

WITHIN THE PROJECT THERE ARE TYPE 'A' UNITS WHICH MUST MEET SPECIFIC REQUIREMENTS SET OUT IN ICC/ANSI A117.1, CHAPTER 10, SECTION 1003.

WITHIN THE PROJECT THERE ARE ALSO TYPE 'B' UNITS WHICH MUST MEET SPECIFIC REQUIREMENTS SET OUT IN ICC/ANSI A117.1, CHAPTER 10 SECTION 1004. ALL ACCESSIBLE FLOOR UNITS WITHIN THIS PROJECT ARE TO BE TYPE 'B' UNITS UNLESS SPECIFICALLY DESIGNATED TYPE 'A' UNITS. WITHIN THESE TYPE 'B' UNITS THE MAIN BATHROOM (OR ONLY BATHROOM) SHALL BE DESIGNATED AS AN OPTION 'B' ADAPTABLE BATHROOM WHICH MUST MEET THE REQUIREMENTS OF ICC/ANSI A117.1 SECTION 1004.11.3.2.

ATTACHED TO THE DRAWING SETS ARE OUR SHEETS ADA-1 THRU 5 THAT SET OUT SPECIFIC INFORMATION FROM OSSC 2014, CHAPTER 10 AS WELL AS THE REFERENCED DOCUMENTS. THE DRAWINGS SET OUT SPECIFIC MINIMUM ELEMENTS AND DIMENSIONS THAT MUST BE MET TO ASSURE COMPLIANCE WITH THIS CODE.

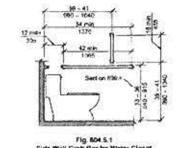


Fig. 604.5.1
Side Wall Grab Bar for Water Closet

604.5.1 Fixed Side Wall Grab Bars. Fixed side-wall grab bars shall be 42 inches (1065 mm) minimum in length, located 12 inches (305 mm) maximum from the rear wall and extending 54 inches (1370 mm) minimum from the rear wall. In addition, a vertical grab bar 18 inches (455 mm) minimum in length shall be mounted with the bottom of the bar located between 39 inches (990 mm) and 41 inches (1040 mm) above the floor, and with the center line of the bar located between 39 inches (990 mm) and 41 inches (1040 mm) from the rear wall.

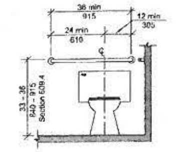


Fig. 604.5.2
Rear Wall Grab Bar for Water Closet

604.5.2 Rear Wall Grab Bars. The rear wall grab bar shall be 36 inches (915 mm) minimum in length, and extend from the centerline of the water closet 12 inches (305 mm) minimum on the side closest to the wall, and 24 inches (610 mm) minimum on the transfer side.

604.7 Dispensers. Toilet paper dispensers shall comply with Section 309.4 and shall be 7 inches (180 mm) minimum and 9 inches (230 mm) maximum in front of the water closet measured to the centerline of the dispenser. The outlet of the dispenser shall be 15 inches (380 mm) minimum and 48 inches (1220 mm) maximum above the floor, and shall not be located behind the grab bars. Dispensers shall not be of a type that control delivery, or do not allow continuous paper flow.

MULTI/TECH CONSULTANTS
ENGINEERING SERVICES, INC.

FLOOR PLAN

AIRPORT ROAD APARTMENT COMPLEX

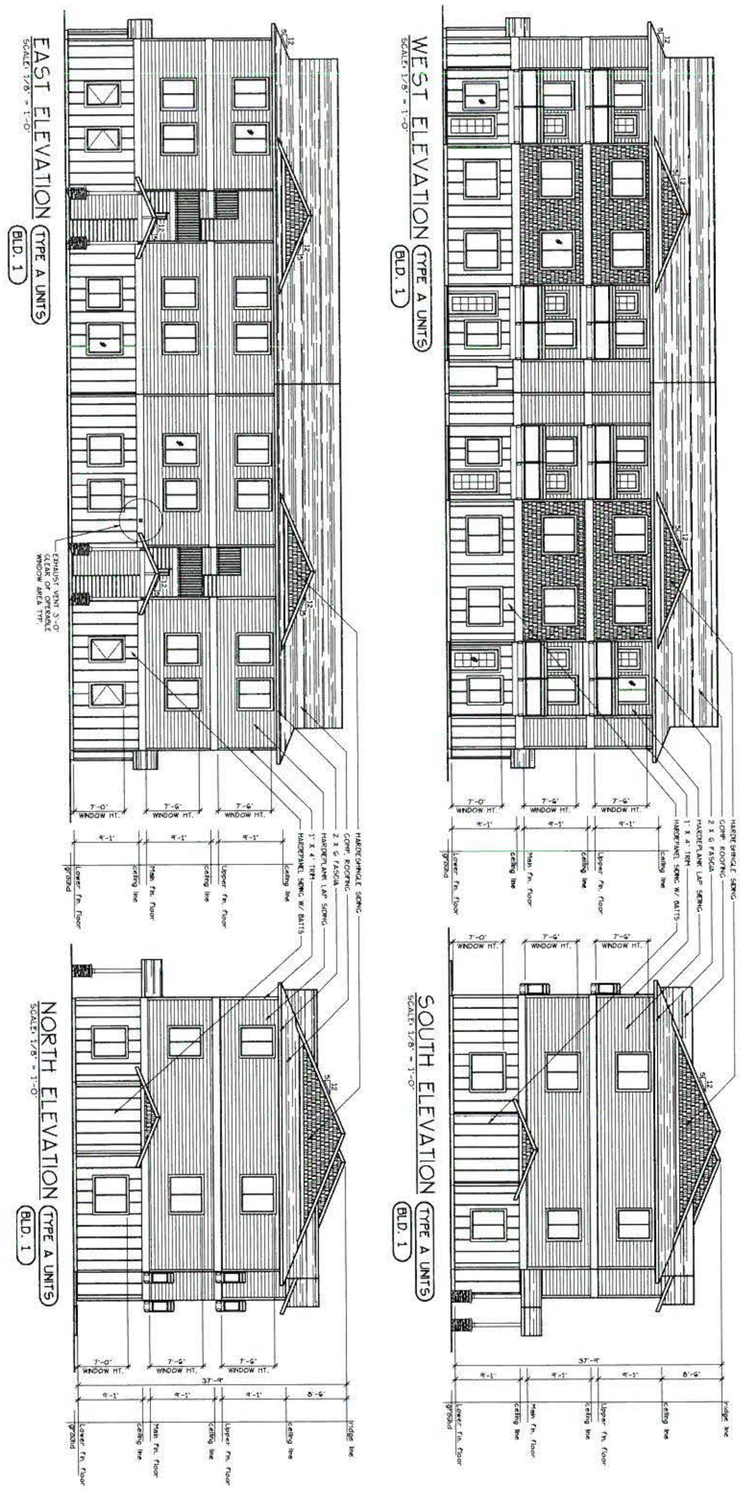
NO CHANGES, MODIFICATIONS OR REPRODUCTIONS TO BE MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM THE DESIGN ENGINEER.

DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.

Design: P.L.M.
Drawn: G.I.D.
Checked: M.D.G.
Date: Oct-19
Scale: AS SHOWN

JOB # 6650

A5.30



JOB # 6650

Design: P.L.M.
Drawn: G.I.O.
Checked: M.D.G.
Date: Oct-19
Scale: AS SHOWN

NO CHANGES, MODIFICATIONS OR REPRODUCTIONS TO BE MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM THE DESIGN ENGINEER.

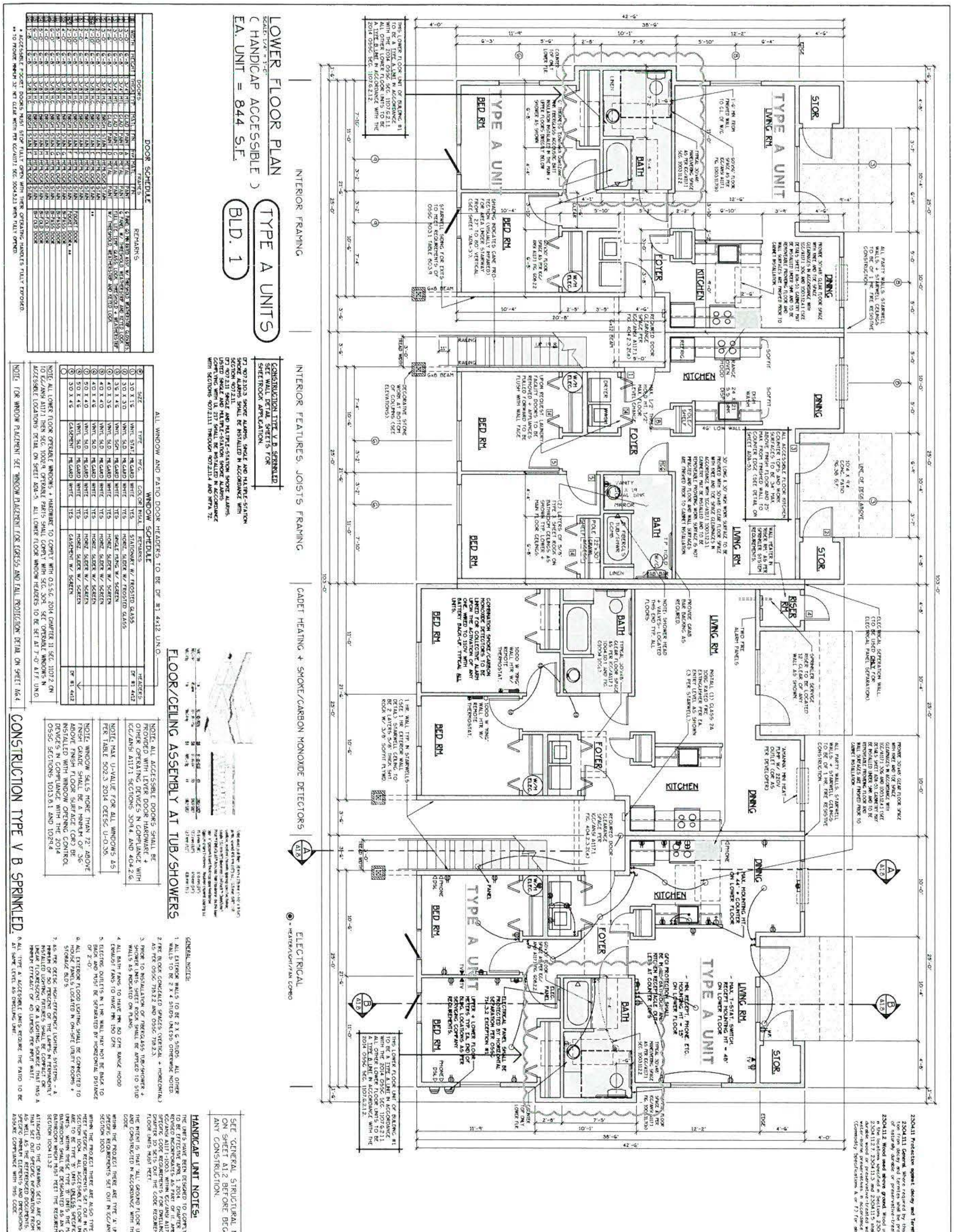
DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.

AIRPORT ROAD APARTMENT COMPLEX

BUILDING ELEVATIONS

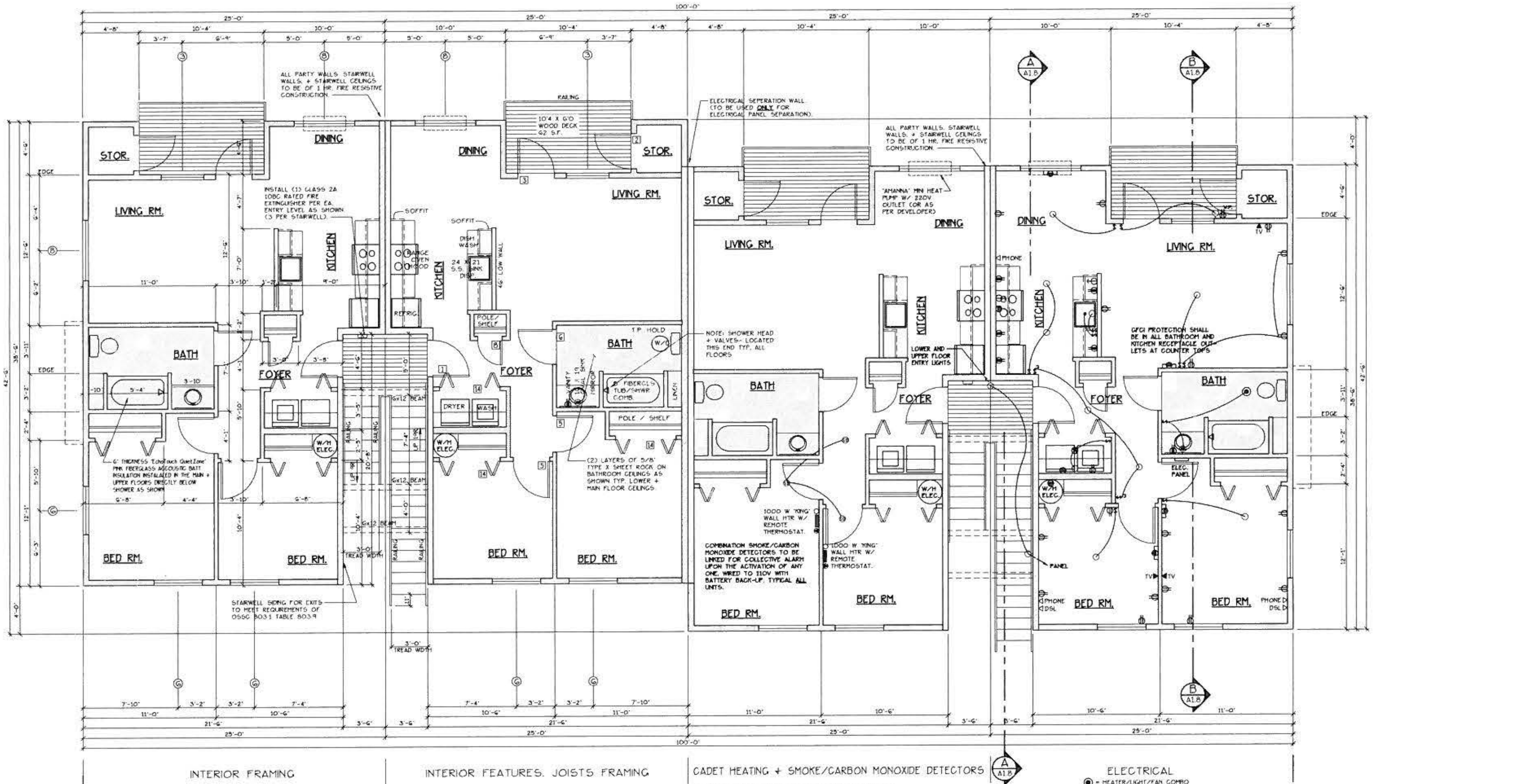
MULTI/TECH CONSULTANTS
ENGINEERING SERVICES, INC.
1155 13th ST. S.E. SALEM, OR. 97302
PHONE: (503) 363-9227 FAX: (503) 364-1260
www.multitech.ws office@multitech.ws

A1.90



A1.31	BLD1A-A-12/PLOT:1 A1.31LFLR Design: P.L.M. Drawn: C.I.D. Checked: M.D.G. Date: Oct-19 Scale: AS SHOWN JOB # 6650	NO CHANGES, MODIFICATIONS OR REPRODUCTIONS TO BE MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM THE DESIGN ENGINEER. DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.	AIRPORT ROAD APARTMENT COMPLEX	LOWER FLOOR PLAN

MULTI/TECH CONSULTANTS
ENGINEERING SERVICES, INC.
1155 13th ST. S.E. SALEM, OR. 97302
PHONE: (503) 363-9227 FAX: (503) 364-1260



[F] 907.2.10.3 SMOKE ALARMS, SINGLE AND MULTIPLE-STATION SMOKE ALARMS SHALL BE INSTALLED IN ACCORDANCE WITH SECTION 907.2.11.
[F] 907.2.11 SINGLE AND MULTIPLE-STATION SMOKE ALARMS. LISTED SINGLE AND MULTIPLE-STATION SMOKE ALARMS COMPLYING WITH UL 217 SHALL BE INSTALLED IN ACCORDANCE WITH SECTIONS 907.2.11.1 THROUGH 907.2.11.4 AND NFPA 72.

MAIN FLOOR PLAN

SCALE: 1/4" = 1'-0"

EA. UNIT = 844 S.F.

TYPE A UNITS

BLD. 1

CONSTRUCTION TYPE V B SPRINKLED
SEE WALL DETAIL SHEETS FOR SHEETROCK APPLICATION.

DOOR SCHEDULE

#	DOORS WIDTH	HEIGHT	THICK	TYP.	MATL.	FIN.	TYP	FRAMES MATL.	FIN.	REMARKS
1	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	A	METAL	PAINT	6 PANEL 60 MIN RATED ASS", W/ THRESHOLD, WEATHERSTRIP, CLOSURES.
2	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	B	METAL	PAINT	6 PANEL W/ THRESHOLD, WEATHERSTRIP AND KEYED LOCK
3	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	C	METAL	PAINT	FULL LITE, TEMP. GLASS, LOCK, THRESHOLD + WEATHERSTRIP
4	2'-6"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	D	METAL	PAINT	W/ THRESHOLD, WEATHERSTRIP AND KEYED LOCK
5	3'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
6	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
6A	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	**
7	2'-4"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
8	2'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
9	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	F	HEMLOCK	STAIN	POCKET DOOR
9A	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	F	HEMLOCK	STAIN	POCKET DOOR*, **
10	4'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
11	5'-8"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
12	6'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
13	4'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
14	5'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
15	6'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
16	1'-8"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	

* ACCESSIBLE POCKET DOORS MUST STOP FULLY OPEN WITH THEIR OPERATING HANDLES FULLY EXPOSED.
** TO PROVIDE MINIMUM 32" NET CLEAR WIDTH PER ICC/A117.1 SEC. 1004.5.2.1 WHEN FULLY OPENED.

ALL WINDOW AND PATIO DOOR HEADERS TO BE DF #1 4x12 U.N.O.

WINDOW SCHEDULE

#	SIZE	TYPE	MFG.	COLOR	INSUL.	REMARKS	HEADERS
1	3'0 X 1'6	VINYL STAT.	MILGARD	WHITE	YES	STATIONARY W/ FROSTED GLASS	DF #1 4x12
2	3'0 X 3'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ FROSTED GLASS	
3	3'6 X 4'6	VINYL SGH.	MILGARD	WHITE	YES	SINGLE HUNG W/ SCREEN	
4	4'0 X 3'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
5	4'0 X 4'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
6	4'0 X 4'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
7	5'0 X 4'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
8	5'0 X 4'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
9	3'0 X 4'6	CASEMENT	MILGARD	WHITE	YES	CASEMENT W/ SCREEN	DF #1 4x12

NOTE: ALL LOWER FLOOR OPERABLE WINDOWS + HARDWARE TO COMPLY WITH O.S.S.C. 2014 CHAPTER 11 SEC. 1107.2 ON TO ICC/ANSI A117.1 THEN SEC. 1002.9. OPERABLE PARTS SHALL COMPLY WITH SEC. 309. SEE "OPERABLE WINDOWS IN ACCESSIBLE LOCATIONS" DETAIL ON SHEET ADA-5. ALL LOWER FLOOR WINDOW HEADERS TO BE SET AT 7'-0" A.F.F. U.N.O.

NOTE: FOR WINDOW PLACEMENT SEE "WINDOW PLACEMENT FOR EGRESS AND FALL PROTECTION" DETAIL ON SHEET AG.4.

NOTE: ALL ACCESSIBLE DOORS SHALL BE PROVIDED WITH LEVER DOOR HARDWARE + OTHER OPERATING DEVICES IN COMPLIANCE WITH ICC/ANSI A117.1 SECTIONS 309.4. AND 404.2.6.

NOTE: MAX. U-VALUE FOR ALL WINDOWS AS PER TABLE 502.3 2014 OEESC U-0.35.

NOTE: WINDOW SILLS MORE THAN 72" ABOVE FINISH GRADE SHALL BE A MINIMUM OF 36" ABOVE FINISH FLOOR SURFACE (OR) BE INSTALLED WITH WINDOW OPENING CONTROL DEVICES IN COMPLIANCE WITH THE 2014 OSSC SECTIONS 1013.8.1 AND 1029.4.

CONSTRUCTION TYPE V B SPRINKLED.

NOTE: MAIN + UPPER FLOOR DOORS ARE SIZED THE SAME AS LOWER FLOOR DOORS. DOOR SIZE OPTIONS FOR MAIN + UPPER FLOORS ARE AS FOLLOWS:
BED RM. = 2'-6" DOOR
BATH RM. = 2'-4" DOOR.

SEE "GENERAL STRUCTURAL NOTES" ON SHEET A1.2 BEFORE BEGINNING ANY CONSTRUCTION.

GENERAL NOTES:

1. ALL EXTERIOR WALLS TO BE 2 X 6 STUDS. ALL OTHER WALLS TO BE 2 X 4 STUDS UNLESS OTHERWISE NOTED.
2. FIRE BLOCK CONCEALED SPACES (VERTICAL + HORIZONTAL) AS PER OSSC 718.2.2 AND OSSC 718.2.3.
3. PRIOR TO INSTALLATION OF FIBERGLASS TUB/SHOWER + SHOWER UNITS, SHEET ROCK SHALL BE APPLIED TO STUD WALLS AS INDICATED ON PLANS.
4. ALL BATH FANS TO HAVE MIN. 80 CFM. RANGE HOOD EXHAUST FANS TO HAVE MIN. 150 CFM.
5. ELECTRIC OUTLETS IN 1 HR. WALL MAY NOT BE BACK TO BACK AND MUST BE SEPARATED BY HORIZONTAL DISTANCE OF 2'-0".
6. ALL EXTERIOR FLOOD LIGHTING SHALL BE CONNECTED TO HOUSE PANELS LOCATED IN ON-SITE UTILITY ROOMS + STORAGE BLD'S.
7. AS PER OEESC HIGH-EFFICIENCY LIGHTING SYSTEMS - A MINIMUM OF 50 PERCENT OF THE LAMPS IN PERMANENTLY INSTALLED LIGHTING FIXTURES SHALL BE COMPACT OR LINEAR FLOURESCENT, OR A LIGHTING SOURCE THAT HAS A MINIMUM EFFICACY OF 40 LUMENS PER INPUT WATT.
8. ALL "TYPE A" ACCESSIBLE UNITS REQUIRE THE PATIO TO BE AT SAME LEVEL AS DWELLING UNIT.

MULTI/TECH CONSULTANTS
ENGINEERING SERVICES, INC.

MAIN FLOOR PLAN

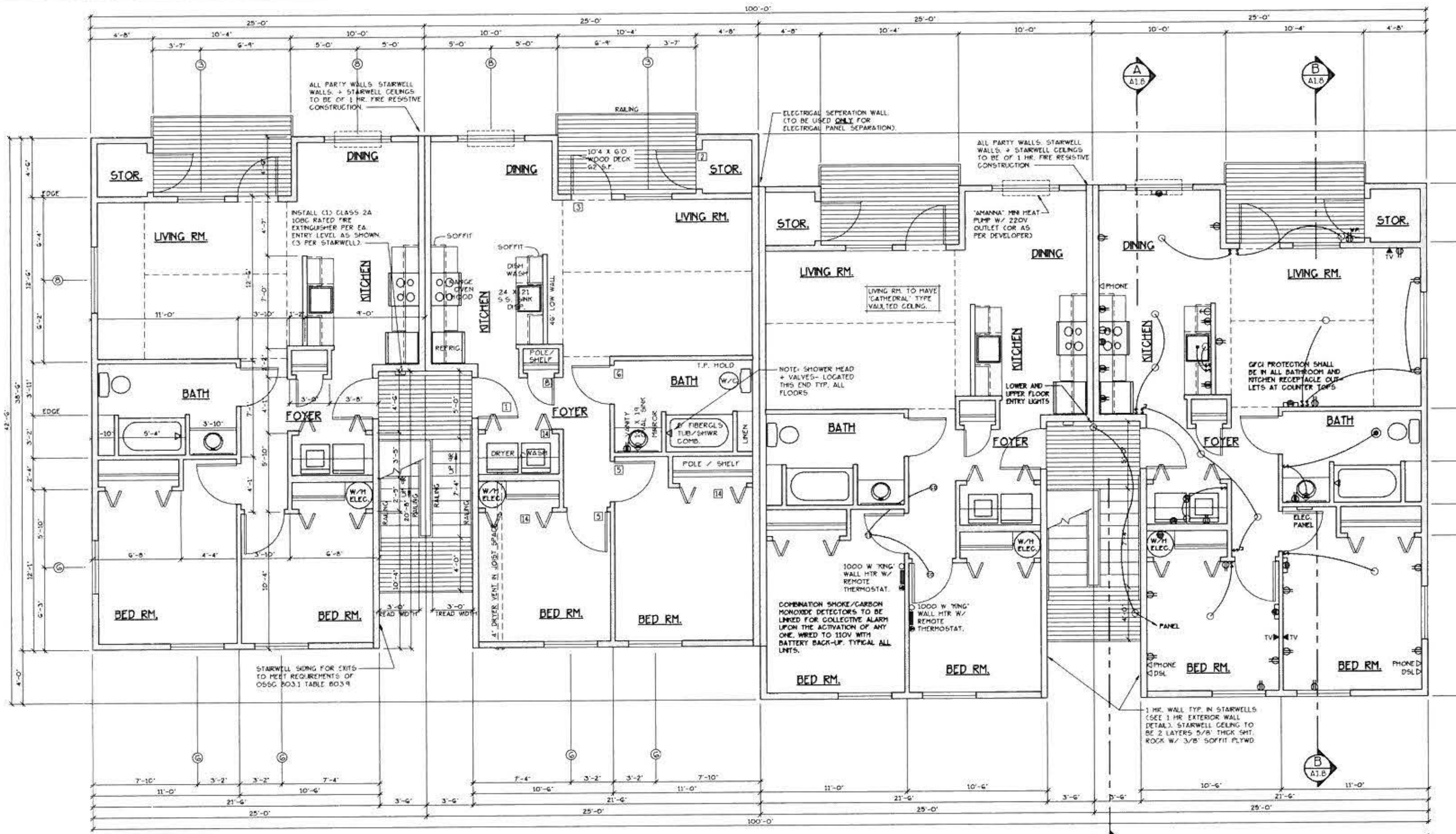
AIRPORT ROAD APARTMENT COMPLEX

DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.

Design: P.L.M.
Drawn: G.I.D.
Checked: M.D.G.
Date: Oct-19
Scale: AS SHOWN

JOB # 6650

A1.41



INTERIOR FRAMING | INTERIOR FEATURES | CADET HEATING + SMOKE/CARBON MONOXIDE DETECTORS | ELECTRICAL

⊙ = HEATER/LIGHT/FAN COMBO

[F] 907.2.10.3 SMOKE ALARMS, SINGLE AND MULTIPLE-STATION SMOKE ALARMS SHALL BE INSTALLED IN ACCORDANCE WITH SECTION 907.2.11.
[F] 907.2.11 SINGLE AND MULTIPLE-STATION SMOKE ALARMS. LISTED SINGLE AND MULTIPLE-STATION SMOKE ALARMS COMPLYING WITH UL 217 SHALL BE INSTALLED IN ACCORDANCE WITH SECTIONS 907.2.11.1 THROUGH 907.2.11.4 AND NFPA 72.

UPPER FLOOR PLAN

SCALE: 1/4" = 1'-0"

EA. UNIT = 844 S.F.

TYPE A UNITS

BLD. 1

CONSTRUCTION TYPE V B SPRINKLED
SEE WALL DETAIL SHEETS FOR SHEETROCK APPLICATION.

DOOR SCHEDULE

	DOORS							FRAMES		REMARKS
#	WIDTH	HEIGHT	THICK.	TYP.	MAT'L.	FIN.	TYP.	MAT'L.	FIN.	
1	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	A	METAL	PAINT	6 PANEL 60 MIN RATED ASSY. W/ THRESHOLD, WEATHERSTRIP, CLOSURES.
2	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	B	METAL	PAINT	6 PANEL W/ THRESHOLD, WEATHERSTRIP AND KEYED LOCK
3	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	C	METAL	PAINT	FULL LITE, TEMP. GLASS, LOCK, THRESHOLD + WEATHERSTRIP
4	2'-6"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	D	METAL	PAINT	W/ THRESHOLD, WEATHERSTRIP AND KEYED LOCK
5	3'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
6	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
6A	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	**
7	2'-4"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
8	2'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
9	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	F	HEMLOCK	STAIN	POCKET DOOR
9A	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	F	HEMLOCK	STAIN	POCKET DOOR*, **
10	4'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
11	5'-8"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
12	6'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
13	4'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
14	5'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
15	6'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
16	1'-8"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	

* ACCESSIBLE POCKET DOORS MUST STOP FULLY OPEN WITH THEIR OPERATING HANDLES FULLY EXPOSED.
** TO PROVIDE MINIMUM 32" NET CLEAR WIDTH PER ICC/A117.1 SEC. 1004.5.2.1 WHEN FULLY OPENED.

ALL WINDOW AND PATIO DOOR HEADERS TO BE DF #1 4x12 U.N.O.

WINDOW SCHEDULE

#	SIZE	TYPE	MFG.	COLOR	INSUL.	REMARKS	HEADERS
1	3'0 X 1'6	VINYL STAT.	MILGARD	WHITE	YES	STATIONARY W/ FROSTED GLASS	DF #1 4x12
2	3'0 X 3'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ FROSTED GLASS	
3	3'6 X 4'6	VINYL SGH.	MILGARD	WHITE	YES	SINGLE HUNG W/ SCREEN	
4	4'0 X 3'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
5	4'0 X 4'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
6	4'0 X 4'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
7	5'0 X 4'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
8	5'0 X 4'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
9	3'0 X 4'6	CASEMENT	MILGARD	WHITE	YES	CASEMENT W/ SCREEN	DF #1 4x12

NOTE: ALL LOWER FLOOR OPERABLE WINDOWS + HARDWARE TO COMPLY WITH O.S.S.C. 2014 CHAPTER 11 SEC. 1107.2 ON TO ICC/ANSI A117.1 THEN SEC. 1002.9. OPERABLE PARTS SHALL COMPLY WITH SEC. 309. SEE 'OPERABLE WINDOWS IN ACCESSIBLE LOCATIONS' DETAIL ON SHEET ADA-5. ALL LOWER FLOOR WINDOW HEADERS TO BE SET AT 7'-0" A.F.F. U.N.O.

NOTE: FOR WINDOW PLACEMENT SEE 'WINDOW PLACEMENT FOR EGRESS AND FALL PROTECTION' DETAIL ON SHEET A6.4.

NOTE: ALL ACCESSIBLE DOORS SHALL BE PROVIDED WITH LEVER DOOR HARDWARE + OTHER OPERATING DEVICES IN COMPLIANCE WITH ICC/ANSI A117.1 SECTIONS 309.4. AND 404.2.6.

NOTE: MAX. U-VALUE FOR ALL WINDOWS AS PER TABLE 502.3 2014 OEESC U-0.35.

NOTE: WINDOW SILLS MORE THAN 72" ABOVE FINISH GRADE SHALL BE A MINIMUM OF 36" ABOVE FINISH FLOOR SURFACE (OR) BE INSTALLED WITH WINDOW OPENING CONTROL DEVICES IN COMPLIANCE WITH THE 2014 OSSC SECTIONS 1013.8.1 AND 1029.4.

CONSTRUCTION TYPE V B SPRINKLED.

NOTE: MAIN + UPPER FLOOR DOORS ARE SIZED THE SAME AS LOWER FLOOR DOORS. DOOR SIZE OPTIONS FOR MAIN + UPPER FLOORS ARE AS FOLLOWS:
BED RM. = 2'-6" DOOR
BATH RM. = 2'-4" DOOR.

SEE 'GENERAL STRUCTURAL NOTES' ON SHEET A1.2 BEFORE BEGINNING ANY CONSTRUCTION.

GENERAL NOTES:

1. ALL EXTERIOR WALLS TO BE 2 X 6 STUDS. ALL OTHER WALLS TO BE 2 X 4 STUDS UNLESS OTHERWISE NOTED.
2. FIRE BLOCK CONCEALED SPACES (VERTICAL + HORIZONTAL) AS PER OSSC 718.2.2 AND OSSC 718.2.3.
3. PRIOR TO INSTALLATION OF FIBERGLASS TUB/SHOWER + SHOWER UNITS: SHEET ROCK SHALL BE APPLIED TO STUD WALLS AS INDICATED ON PLANS.
4. ALL BATH FANS TO HAVE MIN. 80 CFM. RANGE HOOD EXHAUST FANS TO HAVE MIN. 150 CFM.
5. ELECTRIC OUTLETS IN 1 HR. WALL MAY NOT BE BACK TO BACK AND MUST BE SEPARATED BY HORIZONTAL DISTANCE OF 2'-0".
6. ALL EXTERIOR FLOOD LIGHTING SHALL BE CONNECTED TO HOUSE PANELS LOCATED IN ON-SITE UTILITY ROOMS + STORAGE BLD'S.
7. AS PER OEESC HIGH-EFFICIENCY LIGHTING SYSTEMS - A MINIMUM OF 50 PERCENT OF THE LAMPS IN PERMANENTLY INSTALLED LIGHTING FIXTURES SHALL BE COMPACT OR LINEAR FLOURESCENT, OR A LIGHTING SOURCE THAT HAS A MINIMUM EFFICACY OF 40 LUMENS PER INPUT WATT.
8. ALL 'TYPE A' ACCESSIBLE UNITS REQUIRE THE PATIO TO BE AT SAME LEVEL AS DWELLING UNIT.

MULTI/TECH CONSULTANTS
ENGINEERING SERVICES, INC.
1155 13TH ST. S.E. SALEM, OR. 97302

UPPER FLOOR PLAN

AIRPORT ROAD APARTMENT COMPLEX

NO CHANGES, MODIFICATIONS OR REPRODUCTIONS TO BE MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM THE DESIGN ENGINEER.
DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.

Design: P.L.M.
Drawn: G.I.O.
Checked: M.D.G.
Date: Oct-19
Scale: AS SHOWN
JOB # 6650

A1.50

MULTI/TECH CONSULTANTS
ENGINEERING SERVICES, INC.

BUILDING ELEVATIONS

AIRPORT ROAD APARTMENT COMPLEX

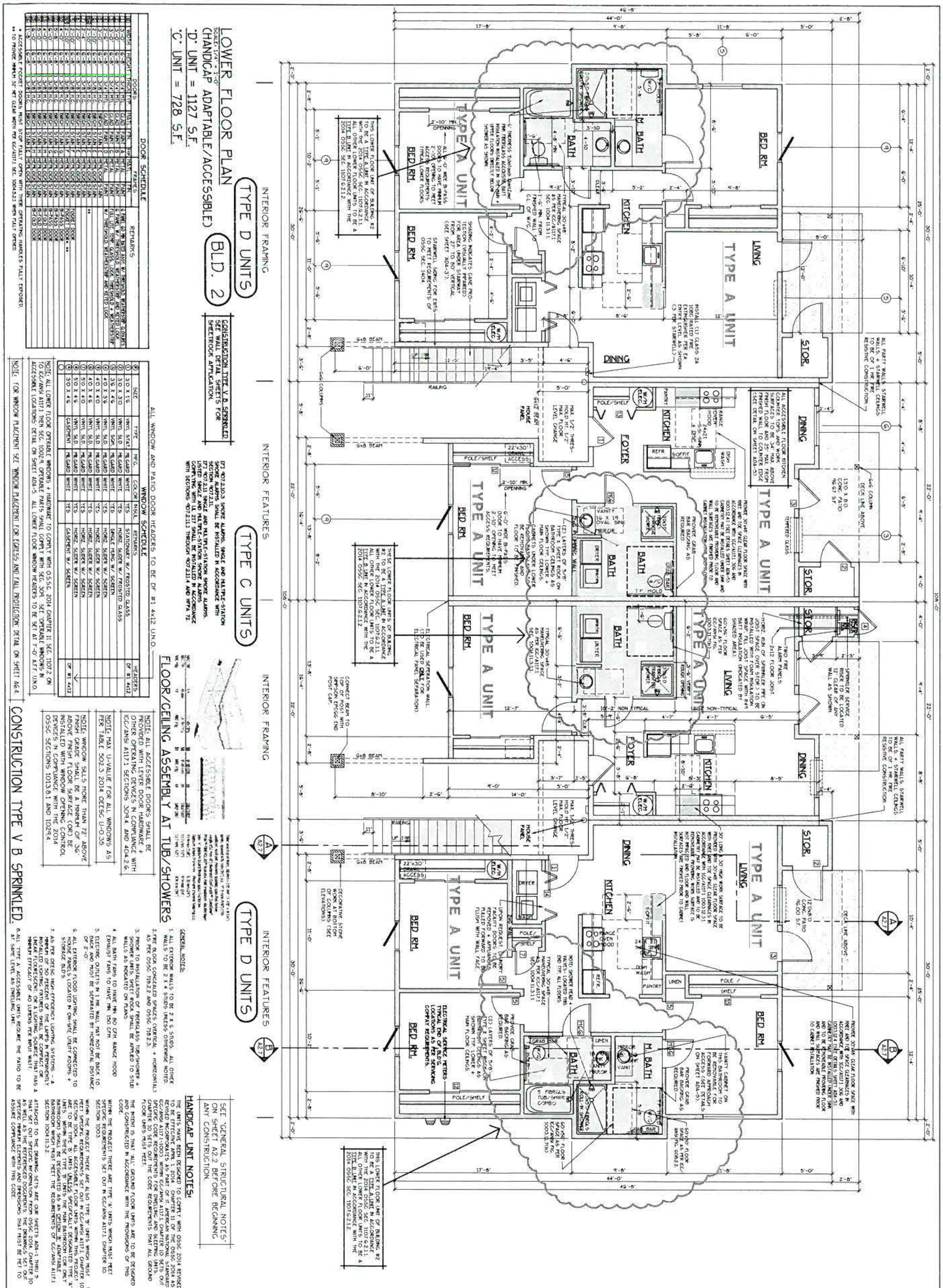
NO CHANGES, MODIFICATIONS OR REPRODUCTIONS TO BE MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM THE DESIGN ENGINEER.

DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.

Design: P.L.M.
Drawn: G.I.O.
Checked: M.D.G.
Date: Oct-19
Scale: AS SHOWN

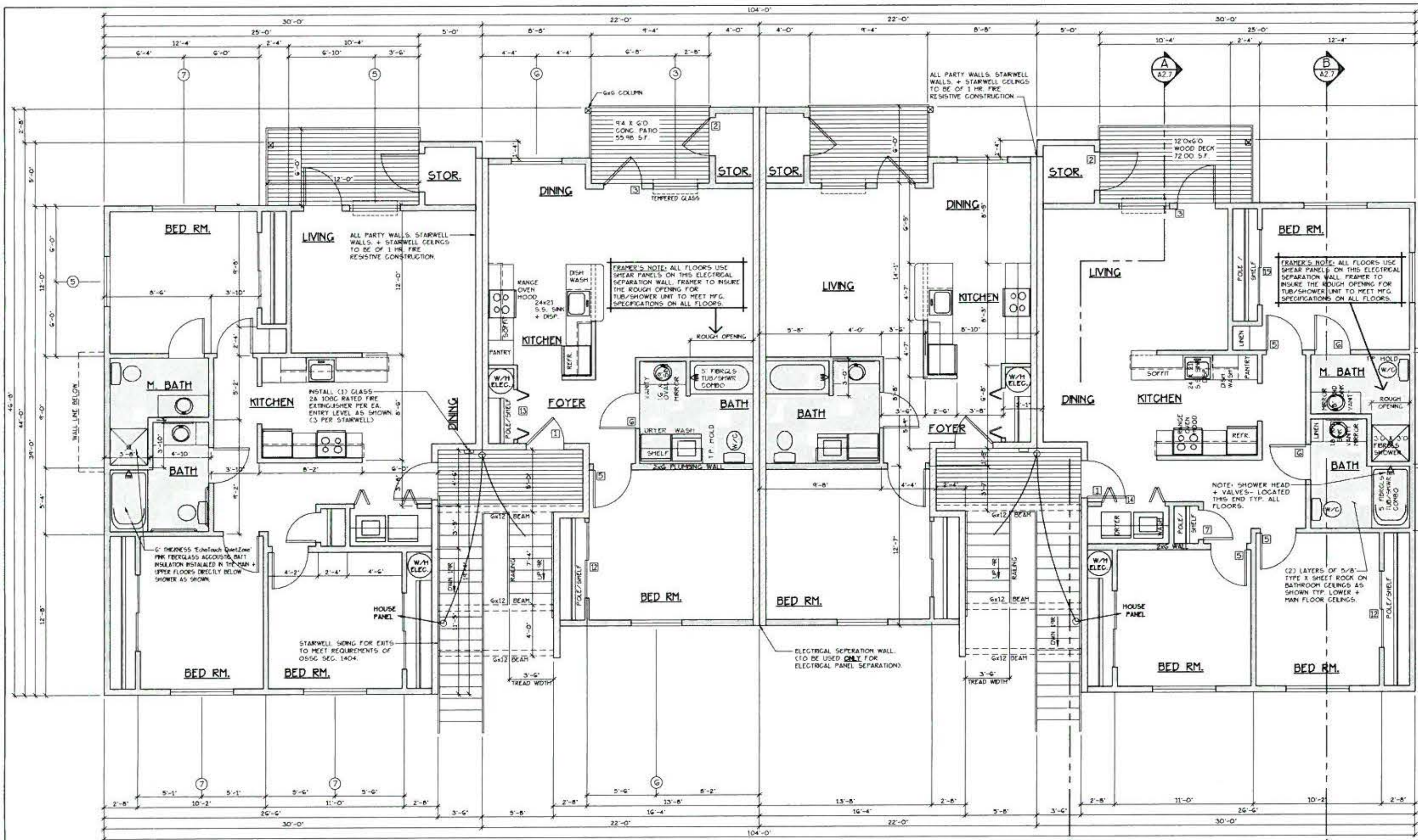
JOB # 6650

A2.90



A2.31	Design: P.L.M. Drawn: G.I.D. Checked: M.D.G. Date: Oct-19 Scale: AS SHOWN	NO CHANGES, MODIFICATIONS OR REPRODUCTIONS TO BE MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM THE DESIGN ENGINEER. DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.	AIRPORT ROAD APARTMENT COMPLEX	LOWER FLOOR PLAN	MULTI/TECH CONSULTANTS ENGINEERING SERVICES, INC.

JOB # 6650



INTERIOR FRAMING | INTERIOR FEATURES | INTERIOR FRAMING | INTERIOR FEATURES

TYPE D UNITS

TYPE C UNITS

TYPE D UNITS

MAIN FLOOR PLAN

SCALE: 1/4" = 1'-0"

BLD. 2

"D" UNIT = 1127 S.F.

"C" UNIT = 728 S.F.

CONSTRUCTION TYPE V B SPRINKLED
SEE WALL DETAIL SHEETS FOR SHEETROCK APPLICATION.

[F] 907.2.10.3 SMOKE ALARMS. SINGLE AND MULTIPLE-STATION SMOKE ALARMS SHALL BE INSTALLED IN ACCORDANCE WITH SECTION 907.2.11.
[F] 907.2.11 SINGLE AND MULTIPLE-STATION SMOKE ALARMS. LISTED SINGLE AND MULTIPLE-STATION SMOKE ALARMS COMPLYING WITH UL 217 SHALL BE INSTALLED IN ACCORDANCE WITH SECTIONS 907.2.11.1 THROUGH 907.2.11.4 AND NFPA 72.

DOOR SCHEDULE

	DOORS						FRAMES		REMARKS
#	WIDTH	HEIGHT	THICK	TYP.	MAT'L.	FIN.	TYP.	MAT'L.	FIN.	
1	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	A	METAL	PAINT	6 PANEL 60 MIN RATED ASSY. W/ THRESHOLD, WEATHERSTRIP, CLOSURES
2	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	B	METAL	PAINT	6 PANEL W/ THRESHOLD, WEATHERSTRIP AND KEYED LOCK
3	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	C	METAL	PAINT	FULL LITE, TEMP. GLASS, LOCK, THRESHOLD + WEATHERSTRIP
4	2'-6"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	D	METAL	PAINT	W/ THRESHOLD, WEATHERSTRIP AND KEYED LOCK
5	3'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
6	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
6A	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	**
7	2'-4"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
8	2'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
9	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	F	HEMLOCK	STAIN	POCKET DOOR
9A	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	F	HEMLOCK	STAIN	POCKET DOOR*, **
10	4'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
11	5'-8"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
12	6'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
13	4'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
14	5'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
15	6'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
16	1'-8"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	

* ACCESSIBLE POCKET DOORS MUST STOP FULLY OPEN WITH THEIR OPERATING HANDLES FULLY EXPOSED.
** TO PROVIDE MINIMUM 32" NET CLEAR WIDTH PER ICC/A117.1 SEC. 1004.5.2.1 WHEN FULLY OPENED.

ALL WINDOW AND PATIO DOOR HEADERS TO BE DF #1 4x12 U.N.O.

WINDOW SCHEDULE

#	SIZE	TYPE	MFG.	COLOR	INSUL.	REMARKS	HEADERS
1	3'0 X 1'6	VINYL STAT.	MILGARD	WHITE	YES	STATIONARY W/ FROSTED GLASS	DF #1 4x12
2	3'0 X 3'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ FROSTED GLASS	
3	3'6 X 4'6	VINYL SGH.	MILGARD	WHITE	YES	SINGLE HUNG W/ SCREEN	
4	4'0 X 3'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
5	4'0 X 4'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
6	4'0 X 4'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
7	5'0 X 4'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
8	5'0 X 4'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
9	3'0 X 4'6	CASEMENT	MILGARD	WHITE	YES	CASEMENT W/ SCREEN	DF #1 4x12

NOTE: ALL LOWER FLOOR OPERABLE WINDOWS + HARDWARE TO COMPLY WITH O.S.S.C. 2014 CHAPTER 11 SEC. 1107.2 ON TO ICC/ANSI A117.1 THEN SEC. 1002.9. OPERABLE PARTS SHALL COMPLY WITH SEC. 309. SEE 'OPERABLE WINDOWS IN ACCESSIBLE LOCATIONS' DETAIL ON SHEET ADA-5. ALL LOWER FLOOR WINDOW HEADERS TO BE SET AT 7'-0" A.F.F. U.N.O.

NOTE: FOR WINDOW PLACEMENT SEE 'WINDOW PLACEMENT FOR EGRESS AND FALL PROTECTION' DETAIL ON SHEET A6.4.

NOTE: ALL ACCESSIBLE DOORS SHALL BE PROVIDED WITH LEVER DOOR HARDWARE + OTHER OPERATING DEVICES IN COMPLIANCE WITH ICC/ANSI A117.1 SECTIONS 309.4, AND 404.2.6.

NOTE: MAX. U-VALUE FOR ALL WINDOWS AS PER TABLE 502.3 2014 OEESC U-0.35.

NOTE: WINDOW SILLS MORE THAN 72" ABOVE FINISH GRADE SHALL BE A MINIMUM OF 36" ABOVE FINISH FLOOR SURFACE (OR) BE INSTALLED WITH WINDOW OPENING CONTROL DEVICES IN COMPLIANCE WITH THE 2014 OSSC SECTIONS 1013.8.1 AND 1029.4.

CONSTRUCTION TYPE V B SPRINKLED.

NOTE: MAIN + UPPER FLOOR DOORS ARE SIZED THE SAME AS LOWER FLOOR DOORS. DOOR SIZE OPTIONS FOR MAIN + UPPER FLOORS ARE AS FOLLOWS:
BED RM. = 2'-6" DOOR
BATH RM. = 2'-4" DOOR.

SEE 'GENERAL STRUCTURAL NOTES' ON SHEET A2.2 BEFORE BEGINNING ANY CONSTRUCTION.

GENERAL NOTES:

1. ALL EXTERIOR WALLS TO BE 2 X 6 STUDS. ALL OTHER WALLS TO BE 2 X 4 STUDS UNLESS OTHERWISE NOTED.
2. FIRE BLOCK CONCEALED SPACES (VERTICAL + HORIZONTAL) AS PER OSSC 718.2.2 AND OSSC 718.2.3.
3. PRIOR TO INSTALLATION OF FIBERGLASS TUB/SHOWER + SHOWER UNITS, SHEET ROCK SHALL BE APPLIED TO STUD WALLS AS INDICATED ON PLANS.
4. ALL BATH FANS TO HAVE MIN. 80 CFM. RANGE HOOD EXHAUST FANS TO HAVE MIN. 150 CFM.
5. ELECTRIC OUTLETS IN 1 HR. WALL MAY NOT BE BACK TO BACK AND MUST BE SEPARATED BY HORIZONTAL DISTANCE OF 2'-0".
6. ALL EXTERIOR FLOOD LIGHTING SHALL BE CONNECTED TO HOUSE PANELS LOCATED IN ON-SITE UTILITY ROOMS + STORAGE BLD'S.
7. AS PER OEESC HIGH-EFFICIENCY LIGHTING SYSTEMS - A MINIMUM OF 50 PERCENT OF THE LAMPS IN PERMANENTLY INSTALLED LIGHTING FIXTURES SHALL BE COMPACT OR LINEAR FLOURESCENT, OR A LIGHTING SOURCE THAT HAS A MINIMUM EFFICACY OF 40 LUMENS PER INPUT WATT.
8. ALL 'TYPE A' ACCESSIBLE UNITS REQUIRE THE PATIO TO BE AT SAME LEVEL AS DWELLING UNIT.

MULTI/TECH CONSULTANTS
ENGINEERING SERVICES, INC.

MAIN & UPPER FLOOR PLAN

AIRPORT ROAD APARTMENT COMPLEX

NO CHANGES, MODIFICATIONS OR REPRODUCTIONS TO BE MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM THE DESIGN ENGINEER.

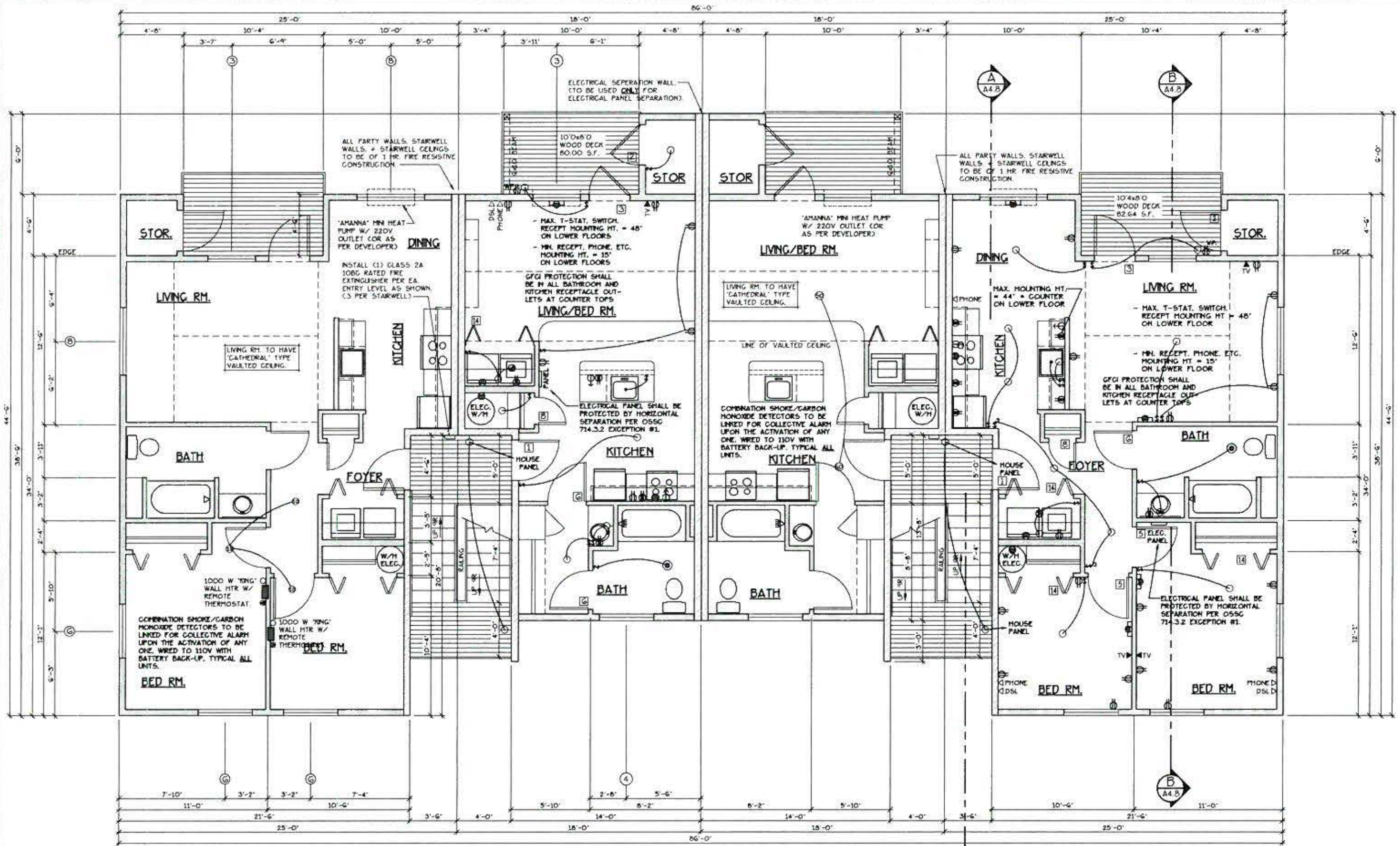
DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.

Design: P.L.M.
Drawn: G.I.D.
Checked: M.D.G.
Date: Oct-19
Scale: AS SHOWN

JOB # 6650

REGISTERED PROFESSIONAL ENGINEER OREGON JULY 14, 1978 MARK D. GRENZ
Renew date: June 30, 2021

A2.41



CADET HEATING + SMOKE/ CARBON MONOXIDE DETECTORS

ELECTRICAL
◉ = HEATER/LIGHT/FAN COMBO

CADET HEATING + SMOKE/ CARBON MONOXIDE DETECTORS

ELECTRICAL
◉ = HEATER/LIGHT/FAN COMBO

TYPE A UNITS

TYPE B UNITS

TYPE A UNITS

UPPER FLOOR PLAN
SCALE: 1/4" = 1'-0"

'A' UNIT = 844 S.F.

'B' UNIT = 540 S.F.

BLD. 4

CONSTRUCTION TYPE V B SPRINKLED
SEE WALL DETAIL SHEETS FOR SHEETROCK APPLICATION.

[F] 907.2.10.3 SMOKE ALARMS, SINGLE AND MULTIPLE-STATION SMOKE ALARMS SHALL BE INSTALLED IN ACCORDANCE WITH SECTION 907.2.11.
[F] 907.2.11 SINGLE AND MULTIPLE-STATION SMOKE ALARMS. LISTED SINGLE AND MULTIPLE-STATION SMOKE ALARMS COMPLYING WITH UL 217 SHALL BE INSTALLED IN ACCORDANCE WITH SECTIONS 907.2.11.1 THROUGH 907.2.11.4 AND NFPA 72.

DOOR SCHEDULE

#	DOORS WIDTH	HEIGHT	THICK	TYP.	MATL.	FIN.	FRAMES TYP.	MATL.	FIN.	REMARKS
1	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	A	METAL	PAINT	6 PANEL 60 MIN RATED ASSY. W/ THRESHOLD, WEATHERSTRIP, CLOSURES.
2	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	B	METAL	PAINT	6 PANEL W/ THRESHOLD, WEATHERSTRIP AND KEYED LOCK
3	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	C	METAL	PAINT	FULL LITE, TEMP. GLASS, LOCK, THRESHOLD + WEATHERSTRIP
4	2'-6"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	D	METAL	PAINT	W/ THRESHOLD, WEATHERSTRIP AND KEYED LOCK
5	3'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
6	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
6A	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	**
7	2'-4"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
8	2'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
9	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	F	HEMLOCK	STAIN	POCKET DOOR
9A	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	F	HEMLOCK	STAIN	POCKET DOOR*, **
10	4'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
11	5'-8"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
12	6'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
13	4'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
14	5'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
15	6'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
16	1'-8"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	

* ACCESSIBLE POCKET DOORS MUST STOP FULLY OPEN WITH THEIR OPERATING HANDLES FULLY EXPOSED.
** TO PROVIDE MINIMUM 32" NET CLEAR WIDTH PER ICC/A117.1 SEC. 1004.5.2.1 WHEN FULLY OPENED.

ALL WINDOW AND PATIO DOOR HEADERS TO BE DF #1 4x12 U.N.O.

WINDOW SCHEDULE

#	SIZE	TYPE	MFG.	COLOR	INSUL.	REMARKS	HEADERS
1	3'0 X 1'6	VINYL STAT.	MILGARD	WHITE	YES	STATIONARY W/ FROSTED GLASS	DF #1 4x12
2	3'0 X 3'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ FROSTED GLASS	
3	3'6 X 4'6	VINYL SGH.	MILGARD	WHITE	YES	SINGLE HUNG W/ SCREEN	
4	4'0 X 3'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
5	4'0 X 4'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
6	4'0 X 4'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
7	5'0 X 4'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
8	5'0 X 4'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
9	3'0 X 4'6	CASEMENT	MILGARD	WHITE	YES	CASEMENT W/ SCREEN	DF #1 4x12

NOTE: ALL LOWER FLOOR OPERABLE WINDOWS + HARDWARE TO COMPLY WITH O.S.S.C. 2014 CHAPTER 11 SEC. 1107.2 ON TO ICC/ANSI A117.1 THEN SEC. 1002.9. OPERABLE PARTS SHALL COMPLY WITH SEC. 309. SEE 'OPERABLE WINDOWS IN ACCESSIBLE LOCATIONS' DETAIL ON SHEET ADA-5. ALL LOWER FLOOR WINDOW HEADERS TO BE SET AT 7'-0" A.F.F. U.N.O.

NOTE: FOR WINDOW PLACEMENT SEE 'WINDOW PLACEMENT FOR EGRESS AND FALL PROTECTION' DETAIL ON SHEET A6.4.

NOTE: ALL ACCESSIBLE DOORS SHALL BE PROVIDED WITH LEVER DOOR HARDWARE + OTHER OPERATING DEVICES IN COMPLIANCE WITH ICC/ANSI A117.1 SECTIONS 309.4. AND 404.2.6.

NOTE: MAX. U-VALUE FOR ALL WINDOWS AS PER TABLE 502.3 2014 OEESC U-0.35.

NOTE: WINDOW SILLS MORE THAN 72" ABOVE FINISH GRADE SHALL BE A MINIMUM OF 36" ABOVE FINISH FLOOR SURFACE (OR) BE INSTALLED WITH WINDOW OPENING CONTROL DEVICES IN COMPLIANCE WITH THE 2014 OSSC SECTIONS 1013.8.1 AND 1029.4.

CONSTRUCTION TYPE V B SPRINKLED.

NOTE: MAIN + UPPER FLOOR DOORS ARE SIZED THE SAME AS LOWER FLOOR DOORS. DOOR SIZE OPTIONS FOR MAIN + UPPER FLOORS ARE AS FOLLOWS:
BED RM. = 2'-6" DOOR
BATH RM. = 2'-4" DOOR.

SEE 'GENERAL STRUCTURAL NOTES' ON SHEET A4.2 BEFORE BEGINNING ANY CONSTRUCTION.

GENERAL NOTES:

1. ALL EXTERIOR WALLS TO BE 2 X 6 STUDS. ALL OTHER WALLS TO BE 2 X 4 STUDS UNLESS OTHERWISE NOTED.
2. FIRE BLOCK CONCEALED SPACES (VERTICAL + HORIZONTAL) AS PER OSSC 718.2.2 AND OSSC 718.2.3.
3. PRIOR TO INSTALLATION OF FIBERGLASS TUB/SHOWER + SHOWER UNITS. SHEET ROCK SHALL BE APPLIED TO STUD WALLS AS INDICATED ON PLANS.
4. ALL BATH FANS TO HAVE MIN. 80 CFM. RANGE HOOD EXHAUST FANS TO HAVE MIN. 150 CFM.
5. ELECTRIC OUTLETS IN 1 HR. WALL MAY NOT BE BACK TO BACK AND MUST BE SEPARATED BY HORIZONTAL DISTANCE OF 2'-0".
6. ALL EXTERIOR FLOOD LIGHTING SHALL BE CONNECTED TO HOUSE PANELS LOCATED IN ON-SITE UTILITY ROOMS + STORAGE BLD'S.
7. AS PER OEESC HIGH-EFFICIENCY LIGHTING SYSTEMS - A MINIMUM OF 50 PERCENT OF THE LAMPS IN PERMANENTLY INSTALLED LIGHTING FIXTURES SHALL BE COMPACT OR LINEAR FLOURESCENT. OR A LIGHTING SOURCE THAT HAS A MINIMUM EFFICACY OF 40 LUMENS PER INPUT WATT.
8. ALL 'TYPE A' ACCESSIBLE UNITS REQUIRE THE PATIO TO BE AT SAME LEVEL AS DWELLING UNIT.

MULTI/TECH CONSULTANTS
ENGINEERING SERVICES, INC.

MAIN FLOOR PLAN

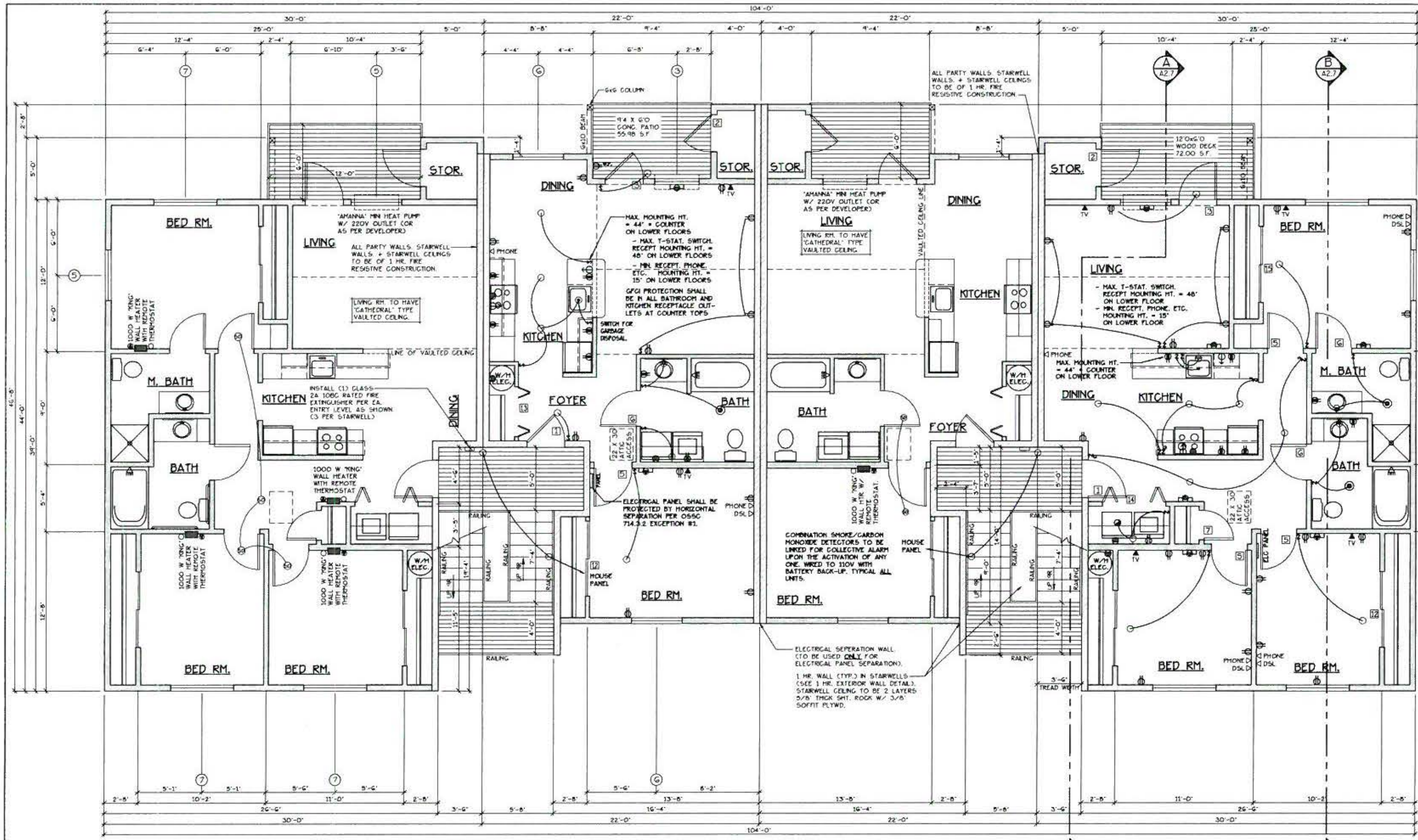
AIRPORT ROAD APARTMENT COMPLEX

NO CHANGES, MODIFICATIONS OR REPRODUCTIONS TO BE MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM THE DESIGN ENGINEER.
DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.

Design: P.L.M.
Drawn: G.I.O.
Checked: M.D.G.
Date: Oct-19
Scale: AS SHOWN

JOB # 8650

A4.50



CADET HEATING + SMOKE/CARBON MONOXIDE DETECTORS

TYPE D UNITS

ELECTRICAL

◉ = HEATER/LIGHT/FAN

TYPE C UNITS

CADET HEATING + SMOKE/CARBON MONOXIDE DETECTORS

ELECTRICAL ◉ = HEATER/LIGHT/FAN

TYPE D UNITS

UPPER FLOOR PLAN

SCALE: 1/4" = 1'-0"

BLD. 2

"D" UNIT = 1127 S.F.

"C" UNIT = 728 S.F.

CONSTRUCTION TYPE V B SPRINKLED
SEE WALL DETAIL SHEETS FOR SHEETROCK APPLICATION.

[F] 907.2.10.3 SMOKE ALARMS. SINGLE AND MULTIPLE-STATION SMOKE ALARMS SHALL BE INSTALLED IN ACCORDANCE WITH SECTION 907.2.11.
[F] 907.2.11 SINGLE AND MULTIPLE-STATION SMOKE ALARMS. LISTED SINGLE AND MULTIPLE-STATION SMOKE ALARMS COMPLYING WITH UL 217 SHALL BE INSTALLED IN ACCORDANCE WITH SECTIONS 907.2.11.1 THROUGH 907.2.11.4 AND NFPA 72.

DOOR SCHEDULE

	DOORS							FRAMES		REMARKS
#	WIDTH	HEIGHT	THICK	TYP.	MATL.	FIN.	TYP.	MATL.	FIN.	
1	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	A	METAL	PAINT	6 PANEL 60 MIN RATED ASSY. W/ THRESHOLD, WEATHERSTRIP, CLOSURES.
2	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	B	METAL	PAINT	6 PANEL W/ THRESHOLD, WEATHERSTRIP AND KEYED LOCK
3	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	C	METAL	PAINT	FULL LITE, TEMP. GLASS, LOCK, THRESHOLD + WEATHERSTRIP
4	2'-6"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	D	METAL	PAINT	W/ THRESHOLD, WEATHERSTRIP AND KEYED LOCK
5	3'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
6	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
6A	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	**
7	2'-4"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
8	2'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
9	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	F	HEMLOCK	STAIN	POCKET DOOR
9A	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	F	HEMLOCK	STAIN	POCKET DOOR*, **
10	4'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
11	5'-8"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
12	6'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
13	4'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
14	5'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
15	6'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
16	1'-8"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	

* ACCESSIBLE POCKET DOORS MUST STOP FULLY OPEN WITH THEIR OPERATING HANDLES FULLY EXPOSED.
** TO PROVIDE MINIMUM 32" NET CLEAR WIDTH PER ICC/A117.1 SEC. 1004.5.2.1 WHEN FULLY OPENED.

ALL WINDOW AND PATIO DOOR HEADERS TO BE DF #1 4x12 U.N.O.

WINDOW SCHEDULE

#	SIZE	TYPE	MFG.	COLOR	INSUL.	REMARKS	HEADERS
1	3'0 X 1'6	VINYL STAT.	MILGARD	WHITE	YES	STATIONARY W/ FROSTED GLASS	DF #1 4x12
2	3'0 X 3'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ FROSTED GLASS	
3	3'6 X 4'6	VINYL SGH.	MILGARD	WHITE	YES	SINGLE HUNG W/ SCREEN	
4	4'0 X 3'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
5	4'0 X 4'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
6	4'0 X 4'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
7	5'0 X 4'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
8	5'0 X 4'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
9	3'0 X 4'6	CASEMENT	MILGARD	WHITE	YES	CASEMENT W/ SCREEN	DF #1 4x12

NOTE: ALL LOWER FLOOR OPERABLE WINDOWS + HARDWARE TO COMPLY WITH O.S.S.C. 2014 CHAPTER 11 SEC. 1107.2 ON TO ICC/ANSI A117.1 THEN SEC. 1002.9. OPERABLE PARTS SHALL COMPLY WITH SEC. 309. SEE 'OPERABLE WINDOWS IN ACCESSIBLE LOCATIONS' DETAIL ON SHEET ADA-5. ALL LOWER FLOOR WINDOW HEADERS TO BE SET AT 7'-0" A.F.F. U.N.O.

NOTE: FOR WINDOW PLACEMENT SEE 'WINDOW PLACEMENT FOR EGRESS AND FALL PROTECTION' DETAIL ON SHEET A6.4.

CONSTRUCTION TYPE V B SPRINKLED.

NOTE: ALL ACCESSIBLE DOORS SHALL BE PROVIDED WITH LEVER DOOR HARDWARE + OTHER OPERATING DEVICES IN COMPLIANCE WITH ICC/ANSI A117.1 SECTIONS 309.4. AND 404.2.6.

NOTE: MAX. U-VALUE FOR ALL WINDOWS AS PER TABLE 502.3 2014 OEESC U-0.35.

NOTE: WINDOW SILLS MORE THAN 72" ABOVE FINISH GRADE SHALL BE A MINIMUM OF 36" ABOVE FINISH FLOOR SURFACE (OR) BE INSTALLED WITH WINDOW OPENING CONTROL DEVICES IN COMPLIANCE WITH THE 2014 OSSC SECTIONS 1013.8.1 AND 1029.4.

NOTE: MAIN + UPPER FLOOR DOORS ARE SIZED THE SAME AS LOWER FLOOR DOORS. DOOR SIZE OPTIONS FOR MAIN + UPPER FLOORS ARE AS FOLLOWS:
BED RM. = 2'-6" DOOR
BATH RM. = 2'-4" DOOR.

SEE 'GENERAL STRUCTURAL NOTES' ON SHEET A2.2 BEFORE BEGINNING ANY CONSTRUCTION.

GENERAL NOTES:

1. ALL EXTERIOR WALLS TO BE 2 X 6 STUDS. ALL OTHER WALLS TO BE 2 X 4 STUDS UNLESS OTHERWISE NOTED.
2. FIRE BLOCK CONCEALED SPACES (VERTICAL + HORIZONTAL) AS PER OSSC 718.2.2 AND OSSC 718.2.3.
3. PRIOR TO INSTALLATION OF FIBERGLASS TUB/SHOWER + SHOWER UNITS, SHEET ROCK SHALL BE APPLIED TO STUD WALLS AS INDICATED ON PLANS.
4. ALL BATH FANS TO HAVE MIN. 80 CFM. RANGE HOOD EXHAUST FANS TO HAVE MIN. 150 CFM.
5. ELECTRIC OUTLETS IN 1 HR. WALL MAY NOT BE BACK TO BACK AND MUST BE SEPARATED BY HORIZONTAL DISTANCE OF 2'-0".
6. ALL EXTERIOR FLOOD LIGHTING SHALL BE CONNECTED TO HOUSE PANELS LOCATED IN ON-SITE UTILITY ROOMS + STORAGE BLD'S.
7. AS PER OEESC HIGH-EFFICIENCY LIGHTING SYSTEMS - A MINIMUM OF 50 PERCENT OF THE LAMPS IN PERMANENTLY INSTALLED LIGHTING FIXTURES SHALL BE COMPACT OR LINEAR FLOURESCENT, OR A LIGHTING SOURCE THAT HAS A MINIMUM EFFICACY OF 40 LUMENS PER INPUT WATT.
8. ALL 'TYPE A' ACCESSIBLE UNITS REQUIRE THE PATIO TO BE AT SAME LEVEL AS DWELLING UNIT.

MULTI/TECH
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MAIN & UPPER FLOOR PLAN

AIRPORT ROAD APARTMENT COMPLEX

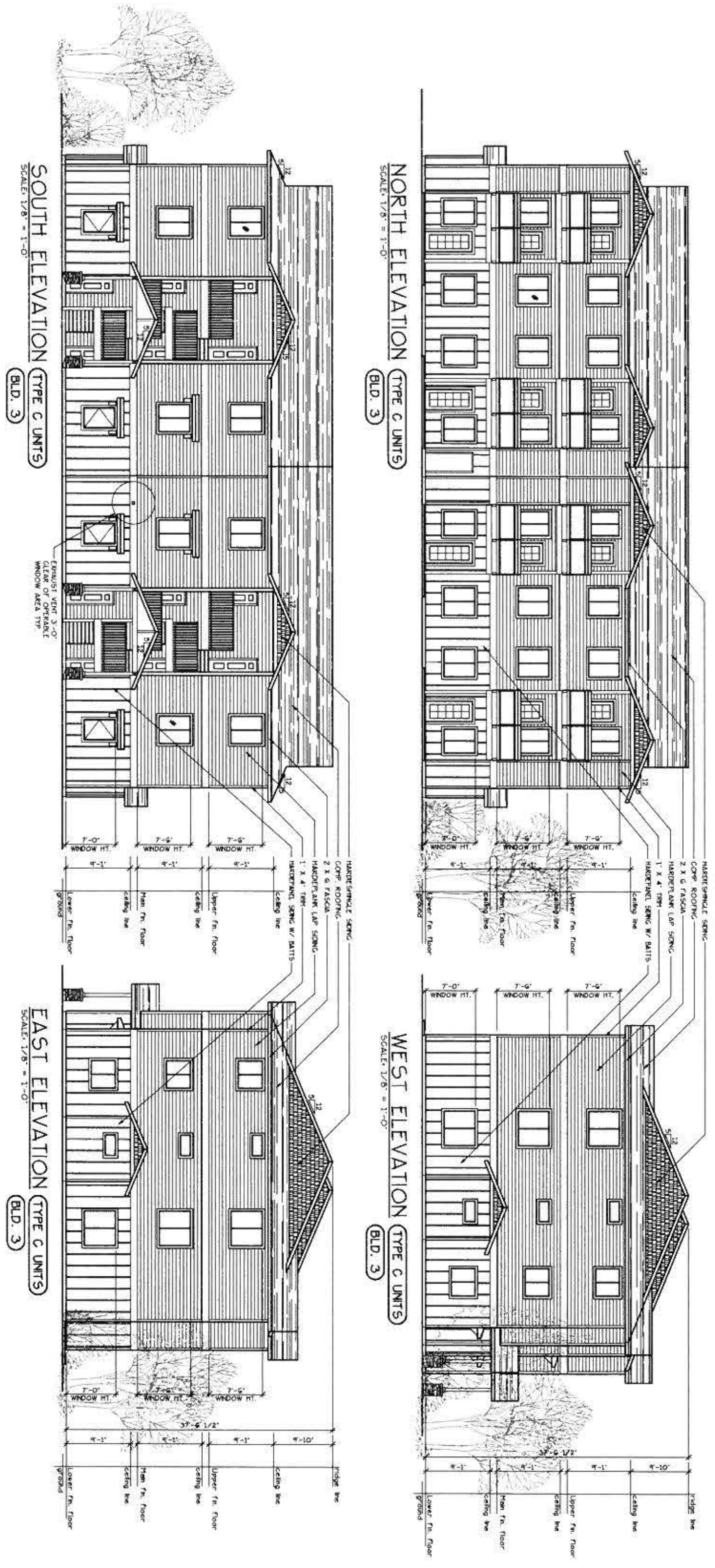
DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.

Design: P.L.M.
Drawn: G.I.D.
Checked: M.D.G.
Date: Oct-19
Scale: AS SHOWN

JOB # 6650

REGISTERED PROFESSIONAL ENGINEER
OREGON
JULY 14, 1978
MARK D. GRENZ
Renew date: June 30, 2021

A2.50



Design:	P.L.M.
Drawn:	G.I.D.
Checked:	M.D.G.
Date:	Oct-19
Scale:	AS SHOWN

JOB # 6650

BLD3C-A-12/PLOT.1
A3.90ELEV

REGISTERED PROFESSIONAL ENGINEER
OREGON
JULY 14, 1978
MARK D. GRENZ

NO CHANGES, MODIFICATIONS OR REPRODUCTIONS TO BE MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM THE DESIGN ENGINEER.

DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.

AIRPORT ROAD APARTMENT COMPLEX

BUILDING ELEVATIONS

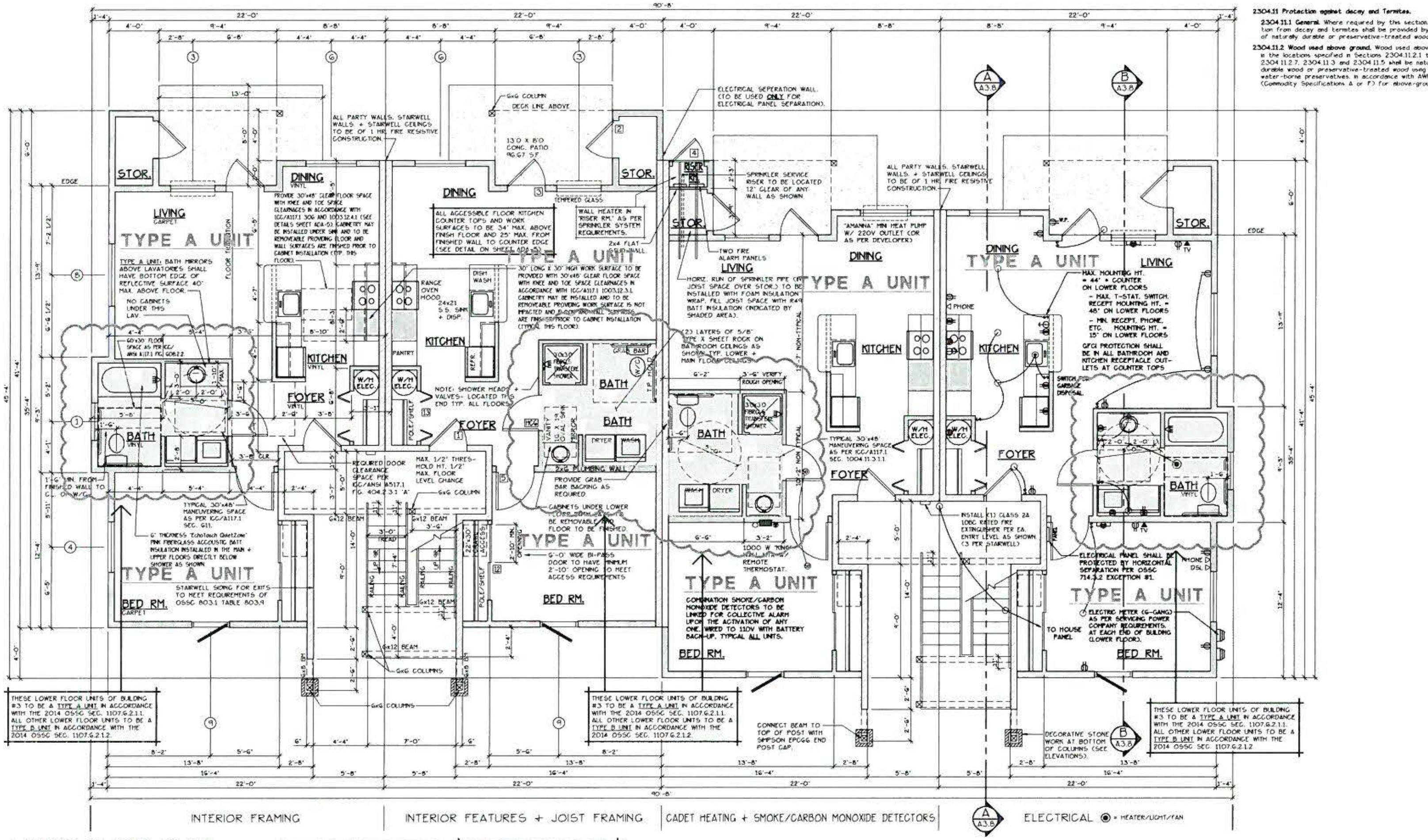
MULTI/TECH CONSULTANTS
ENGINEERING SERVICES, INC.

A3.90

2304.11 Protection against decay and Termites.

2304.11.1 General. Where required by this section protection from decay and termites shall be provided by the use of naturally durable or preservative-treated wood.

2304.11.2 Wood used above ground. Wood used above ground in the locations specified in Sections 2304.11.2.1 through 2304.11.2.7, 2304.11.3 and 2304.11.5 shall be naturally durable wood or preservative-treated wood using water-borne preservatives, in accordance with AWPA U1 (Commodity Specifications A or F) for above-ground use.



LOWER FLOOR PLAN

SCALE: 1/4" = 1'-0"

(HANDICAP ADAPTABLE/ACCESSIBLE)

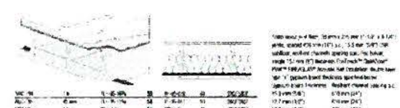
"C" UNIT = 728 S.F.

TYPE C UNITS

BLD. 3

CONSTRUCTION TYPE V B SPRINKLED
SEE WALL DETAIL SHEETS FOR SHEETROCK APPLICATION.

[F] 907.2.10.3 SMOKE ALARMS. SINGLE AND MULTIPLE-STATION SMOKE ALARMS SHALL BE INSTALLED IN ACCORDANCE WITH SECTION 907.2.11.
[F] 907.2.11 SINGLE AND MULTIPLE-STATION SMOKE ALARMS. LISTED SINGLE AND MULTIPLE-STATION SMOKE ALARMS COMPLYING WITH UL 217 SHALL BE INSTALLED IN ACCORDANCE WITH SECTIONS 907.2.11.1 THROUGH 907.2.11.4 AND NFPA 72.



FLOOR/CEILING ASSEMBLY AT TUB/SHOWERS

DOOR SCHEDULE

	DOORS							FRAMES		REMARKS
#	WIDTH	HEIGHT	THICK	TYP.	MATL.	FIN.	TYP	MATL.	FIN.	
[illegible]	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	A	METAL	PAINT	6 PANEL 20 MIN RATED ASSY. W/ THRESHOLD, WEATHERSTRIP, CLOSURES.
[illegible]	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	B	METAL	PAINT	6 PANEL W/ THRESHOLD, WEATHERSTRIP AND KEYED LOCK
[illegible]	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	C	METAL	PAINT	FULL LITE, TEMP. GLASS, LOCK, THRESHOLD + WEATHERSTRIP
[illegible]	2'-6"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	D	METAL	PAINT	W/ THRESHOLD, WEATHERSTRIP AND KEYED LOCK
[illegible]	3'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
[illegible]	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
[illegible]	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	**
[illegible]	2'-4"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
[illegible]	2'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
[illegible]	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	F	HEMLOCK	STAIN	POCKET DOOR
[illegible]	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	F	HEMLOCK	STAIN	POCKET DOOR* **
[illegible]	4'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
[illegible]	5'-8"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
[illegible]	6'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
[illegible]	4'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
[illegible]	5'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
[illegible]	6'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
[illegible]	1'-8"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	

* ACCESSIBLE POCKET DOORS MUST STOP FULLY OPEN WITH THEIR OPERATING HANDLES FULLY EXPOSED.
** TO PROVIDE MINIMUM 32" NET CLEAR WIDTH PER ICC/A117.1 SEC. 1004.5.2.1 WHEN FULLY OPENED.

ALL WINDOW AND PATIO DOOR HEADERS TO BE DF #1 4x12 U.N.O.

WINDOW SCHEDULE

#	SIZE	TYPE	MFG.	COLOR	INSUL.	REMARKS	HEADERS
1	3'0 X 1'6	VINYL STAT.	MILGARD	WHITE	YES	STATIONARY W/ FROSTED GLASS	DF #1 4x12
2	3'0 X 3'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ FROSTED GLASS	
3	3'6 X 4'6	VINYL SGH.	MILGARD	WHITE	YES	SINGLE HUNG W/ SCREEN	
4	4'0 X 3'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
5	4'0 X 4'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
6	4'0 X 4'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
7	5'0 X 4'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
8	5'0 X 4'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
9	3'0 X 4'6	CASEMENT	MILGARD	WHITE	YES	CASEMENT W/ SCREEN	DF #1 4x12

NOTE: ALL LOWER FLOOR OPERABLE WINDOWS + HARDWARE TO COMPLY WITH O.S.S.C. 2014 CHAPTER 11 SEC. 1107.2 ON TO ICC/ANSI A117.1 THEN SEC. 1002.9. OPERABLE PARTS SHALL COMPLY WITH SEC. 309. SEE "OPERABLE WINDOWS IN ACCESSIBLE LOCATIONS" DETAIL ON SHEET ADA-5. ALL LOWER FLOOR WINDOW HEADERS TO BE SET AT 7'-0" A.F.F. U.N.O.

NOTE: FOR WINDOW PLACEMENT SEE "WINDOW PLACEMENT FOR EGRESS AND FALL PROTECTION" DETAIL ON SHEET A6.4.

NOTE: ALL ACCESSIBLE DOORS SHALL BE PROVIDED WITH LEVER DOOR HARDWARE + OTHER OPERATING DEVICES IN COMPLIANCE WITH ICC/ANSI A117.1 SECTIONS 309.4. AND 404.2.6.

NOTE: MAX. U-VALUE FOR ALL WINDOWS AS PER TABLE 502.3 2014 OEESC U-0.35.

NOTE: WINDOW SILLS MORE THAN 72" ABOVE FINISH GRADE SHALL BE A MINIMUM OF 36" ABOVE FINISH FLOOR SURFACE (OR) BE INSTALLED WITH WINDOW OPENING CONTROL DEVICES IN COMPLIANCE WITH THE 2014 OSSC SECTIONS 1013.8.1 AND 1029.4.

CONSTRUCTION TYPE V B SPRINKLED.

GENERAL NOTES:

1. ALL EXTERIOR WALLS TO BE 2 X 6 STUDS. ALL OTHER WALLS TO BE 2 X 4 STUDS UNLESS OTHERWISE NOTED.
2. FIRE BLOCK CONCEALED SPACES (VERTICAL + HORIZONTAL) AS PER OSSC 718.2.2 AND OSSC 718.2.3.
3. PRIOR TO INSTALLATION OF FIBERGLASS TUB/SHOWER + SHOWER UNITS, SHEET ROCK SHALL BE APPLIED TO STUD WALLS AS INDICATED ON PLANS.
4. ALL BATH FANS TO HAVE MIN. 80 CFM. RANGE HOOD EXHAUST FANS TO HAVE MIN. 150 CFM.
5. ELECTRIC OUTLETS IN 1 HR. WALL MAY NOT BE BACK TO BACK AND MUST BE SEPARATED BY HORIZONTAL DISTANCE OF 2'-0".
6. ALL EXTERIOR FLOOD LIGHTING SHALL BE CONNECTED TO HOUSE PANELS LOCATED IN ON-SITE UTILITY ROOMS + STORAGE BLD'S.
7. AS PER OEESC HIGH-EFFICIENCY LIGHTING SYSTEMS - A MINIMUM OF 50 PERCENT OF THE LAMPS IN PERMANENTLY INSTALLED LIGHTING FIXTURES SHALL BE COMPACT OR LINEAR FLOURESCENT, OR A LIGHTING SOURCE THAT HAS A MINIMUM EFFICACY OF 40 LUMENS PER INPUT WATT.
8. ALL "TYPE A" ACCESSIBLE UNITS REQUIRE THE PATIO TO BE AT SAME LEVEL AS DWELLING UNIT.

SEE "GENERAL STRUCTURAL NOTES" ON SHEET A3.3 BEFORE BEGINNING ANY CONSTRUCTION.

HANDICAP UNIT NOTES:

THE UNITS HAVE BEEN DESIGNED TO COMPLY WITH OSSC 2014 REVISED TO BE EFFECTIVE APRIL 1, 2014. CHAPTER 11 OF THE OSSC 2014 AS REVISED INCORPORATES AS PART OF IT, AMERICAN NATIONAL STANDARD ICC/ANSI A117.1-1003. WITHIN ICC/ANSI A117.1, CHAPTER 10 SETS OUT SPECIFIC CODE REQUIREMENTS FOR DWELLING AND SLEEPING UNITS. CHAPTER 10 SETS OUT THE CODE REQUIREMENTS THAT ALL GROUND FLOOR UNITS MUST MEET.

THE INTENT IS THAT "ALL" GROUND FLOOR UNITS ARE TO BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH THE PROVISIONS OF THIS CODE.

WITHIN THE PROJECT THERE ARE TYPE "A" UNITS WHICH MUST MEET SPECIFIC REQUIREMENTS SET OUT IN ICC/ANSI A117.1, CHAPTER 10, SECTION 1003.

WITHIN THE PROJECT THERE ARE ALSO TYPE "B" UNITS WHICH MUST MEET SPECIFIC REQUIREMENTS SET OUT IN ICC/ANSI A117.1, CHAPTER 10, SECTION 1004. ALL ACCESSIBLE FLOOR UNITS WITHIN THIS PROJECT ARE TO BE TYPE "B" UNITS UNLESS SPECIFICALLY DESIGNATED TYPE "A" UNITS. WITHIN THESE TYPE "B" UNITS THE MAIN BATHROOM (OR ONLY BATHROOM) SHALL BE DESIGNATED AS AN OPTION "B" ADAPTABLE BATHROOM WHICH MUST MEET THE REQUIREMENTS OF ICC/ANSI A117.1 SECTION 1004.11.3.2.

ATTACHED TO THE DRAWING SETS ARE OUR SHEETS ADA-1 THRU 5 THAT SET OUT SPECIFIC INFORMATION FROM OSSC 2014, CHAPTER 10 AS WELL AS THE REFERENCED DOCUMENTS. THE DRAWINGS SET OUT SPECIFIC MINIMUM ELEMENTS AND DIMENSIONS THAT MUST BE MET TO ASSURE COMPLIANCE WITH THIS CODE.

MULTI/TECH CONSULTANTS
ENGINEERING SERVICES, INC.

LOWER FLOOR PLAN

AIRPORT ROAD APARTMENT COMPLEX

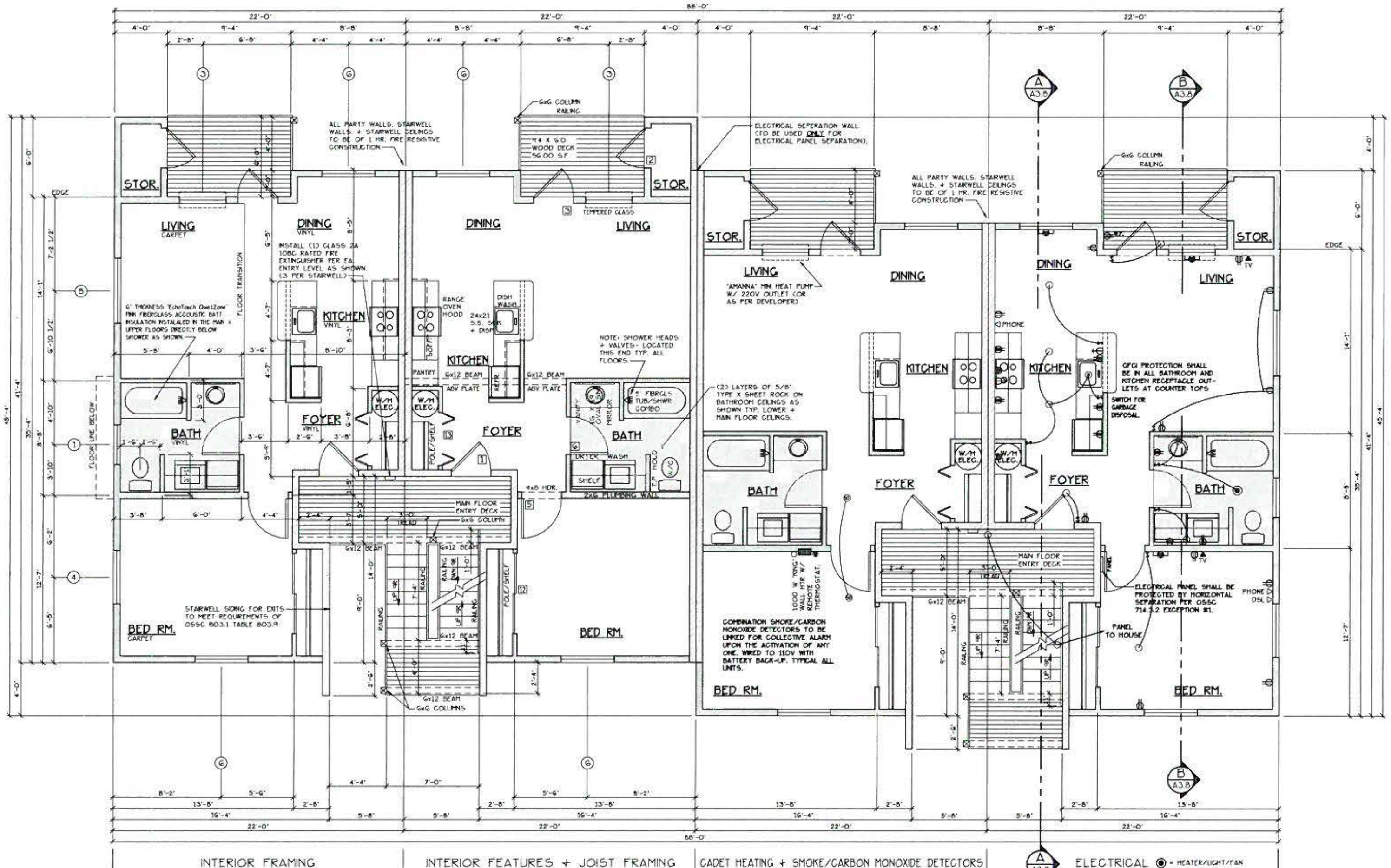
DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.

Design: P.L.M.
Drawn: G.I.D.
Checked: M.D.G.
Date: Oct-19
Scale: AS SHOWN

JOB # 6650

REGISTERED PROFESSIONAL ENGINEER
OREGON
JULY 1, 1978
MARK D. GRENZ
Renew date: June 30, 2021

A3.31



MAIN FLOOR PLAN
SCALE: 1/4" = 1'-0"
"C" UNIT = 728 S.F.

TYPE C UNITS

BLD. 3

CONSTRUCTION TYPE V B SPRINKLED
SEE WALL DETAIL SHEETS FOR SHEETROCK APPLICATION.

[F] 907.2.10.3 SMOKE ALARMS. SINGLE AND MULTIPLE-STATION SMOKE ALARMS SHALL BE INSTALLED IN ACCORDANCE WITH SECTION 907.2.11.
[F] 907.2.11 SINGLE AND MULTIPLE-STATION SMOKE ALARMS. LISTED SINGLE AND MULTIPLE-STATION SMOKE ALARMS COMPLYING WITH UL 217 SHALL BE INSTALLED IN ACCORDANCE WITH SECTIONS 907.2.11.1 THROUGH 907.2.11.4 AND NFPA 72.

DOOR SCHEDULE

ID	DOORS WIDTH	HEIGHT	THICK	TYP.	MATL.	FIN.	TYP.	FRAMES MATL.	FIN.	REMARKS
1	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	A	METAL	PAINT	6 PANEL 60 MIN RATED ASSY. W/ THRESHOLD, WEATHERSTRIP, CLOSURES.
2	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	B	METAL	PAINT	6 PANEL W/ THRESHOLD, WEATHERSTRIP AND KEYED LOCK
3	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	C	METAL	PAINT	FULL LITE. TEMP. GLASS, LOCK, THRESHOLD + WEATHERSTRIP
4	2'-6"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	D	METAL	PAINT	W/ THRESHOLD, WEATHERSTRIP AND KEYED LOCK
5	3'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
6	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
6A	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	**
7	2'-4"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
8	2'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
9	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	F	HEMLOCK	STAIN	POCKET DOOR
9A	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	F	HEMLOCK	STAIN	POCKET DOOR*, **
10	4'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
11	5'-8"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
12	6'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
13	4'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
14	5'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
15	6'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
16	1'-8"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	

* ACCESSIBLE POCKET DOORS MUST STOP FULLY OPEN WITH THEIR OPERATING HANDLES FULLY EXPOSED.
** TO PROVIDE MINIMUM 32" NET CLEAR WIDTH PER ICC/A117.1 SEC. 1004.5.2.1 WHEN FULLY OPENED.

ALL WINDOW AND PATIO DOOR HEADERS TO BE DF #1 4x12 U.N.O.

WINDOW SCHEDULE

#	SIZE	TYPE	MFG.	COLOR	INSUL.	REMARKS	HEADERS
1	3'0 X 1'6	VINYL STAT.	MILGARD	WHITE	YES	STATIONARY W/ FROSTED GLASS	DF #1 4x12
2	3'0 X 3'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ FROSTED GLASS	
3	3'6 X 4'6	VINYL SGH.	MILGARD	WHITE	YES	SINGLE HUNG W/ SCREEN	
4	4'0 X 3'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
5	4'0 X 4'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
6	4'0 X 4'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
7	5'0 X 4'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
8	5'0 X 4'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
9	3'0 X 4'6	CASEMENT	MILGARD	WHITE	YES	CASEMENT W/ SCREEN	DF #1 4x12

NOTE: ALL LOWER FLOOR OPERABLE WINDOWS + HARDWARE TO COMPLY WITH O.S.S.C. 2014 CHAPTER 11 SEC. 1107.2 ON TO ICC/ANSI A117.1 THEN SEC. 1002.9. OPERABLE PARTS SHALL COMPLY WITH SEC. 309. SEE 'OPERABLE WINDOWS IN ACCESSIBLE LOCATIONS' DETAIL ON SHEET ADA-5. ALL LOWER FLOOR WINDOW HEADERS TO BE SET AT 7'-0" A.F.F. U.N.O.

NOTE: FOR WINDOW PLACEMENT SEE 'WINDOW PLACEMENT FOR EGRESS AND FALL PROTECTION' DETAIL ON SHEET A6.4.

NOTE: ALL ACCESSIBLE DOORS SHALL BE PROVIDED WITH LEVER DOOR HARDWARE + OTHER OPERATING DEVICES IN COMPLIANCE WITH ICC/ANSI A117.1 SECTIONS 309.4. AND 404.2.6.

NOTE: MAX. U-VALUE FOR ALL WINDOWS AS PER TABLE 502.3 2014 OEESC U-0.35.

NOTE: WINDOW SILLS MORE THAN 72" ABOVE FINISH GRADE SHALL BE A MINIMUM OF 36" ABOVE FINISH FLOOR SURFACE (OR) BE INSTALLED WITH WINDOW OPENING CONTROL DEVICES IN COMPLIANCE WITH THE 2014 OSSC SECTIONS 1013.8.1 AND 1029.4.

CONSTRUCTION TYPE V B SPRINKLED.

NOTE: MAIN + UPPER FLOOR DOORS ARE SIZED THE SAME AS LOWER FLOOR DOORS. DOOR SIZE OPTIONS FOR MAIN + UPPER FLOORS ARE AS FOLLOWS:
BED RM. = 2'-6" DOOR
BATH RM. = 2'-4" DOOR

SEE 'GENERAL STRUCTURAL NOTES' ON SHEET A3.3 BEFORE BEGINNING ANY CONSTRUCTION.

GENERAL NOTES:

1. ALL EXTERIOR WALLS TO BE 2 X 6 STUDS. ALL OTHER WALLS TO BE 2 X 4 STUDS UNLESS OTHERWISE NOTED.
2. FIRE BLOCK CONCEALED SPACES (VERTICAL + HORIZONTAL) AS PER OSSC 718.2.2 AND OSSC 718.2.3.
3. PRIOR TO INSTALLATION OF FIBERGLASS TUB/SHOWER + SHOWER UNITS, SHEET ROCK SHALL BE APPLIED TO STUD WALLS AS INDICATED ON PLANS.
4. ALL BATH FANS TO HAVE MIN. 80 CFM. RANGE HOOD EXHAUST FANS TO HAVE MIN. 150 CFM.
5. ELECTRIC OUTLETS IN 1 HR. WALL MAY NOT BE BACK TO BACK AND MUST BE SEPARATED BY HORIZONTAL DISTANCE OF 2'-0".
6. ALL EXTERIOR FLOOD LIGHTING SHALL BE CONNECTED TO HOUSE PANELS LOCATED IN ON-SITE UTILITY ROOMS + STORAGE BLD'S.
7. AS PER OEESC HIGH-EFFICIENCY LIGHTING SYSTEMS - A MINIMUM OF 50 PERCENT OF THE LAMPS IN PERMANENTLY INSTALLED LIGHTING FIXTURES SHALL BE COMPACT OR LINEAR FLOURESCENT, OR A LIGHTING SOURCE THAT HAS A MINIMUM EFFICACY OF 40 LUMENS PER INPUT WATT.
8. ALL 'TYPE A' ACCESSIBLE UNITS REQUIRE THE PATIO TO BE AT SAME LEVEL AS DWELLING UNIT.

MULTI/TECH CONSULTANTS
ENGINEERING SERVICES, INC.
1155 13th ST. S.E. SALEM, OR. 97302
PHONE: (503) 363-9227 • FAX: (503) 364-1260

MAIN FLOOR PLAN

AIRPORT ROAD APARTMENT COMPLEX

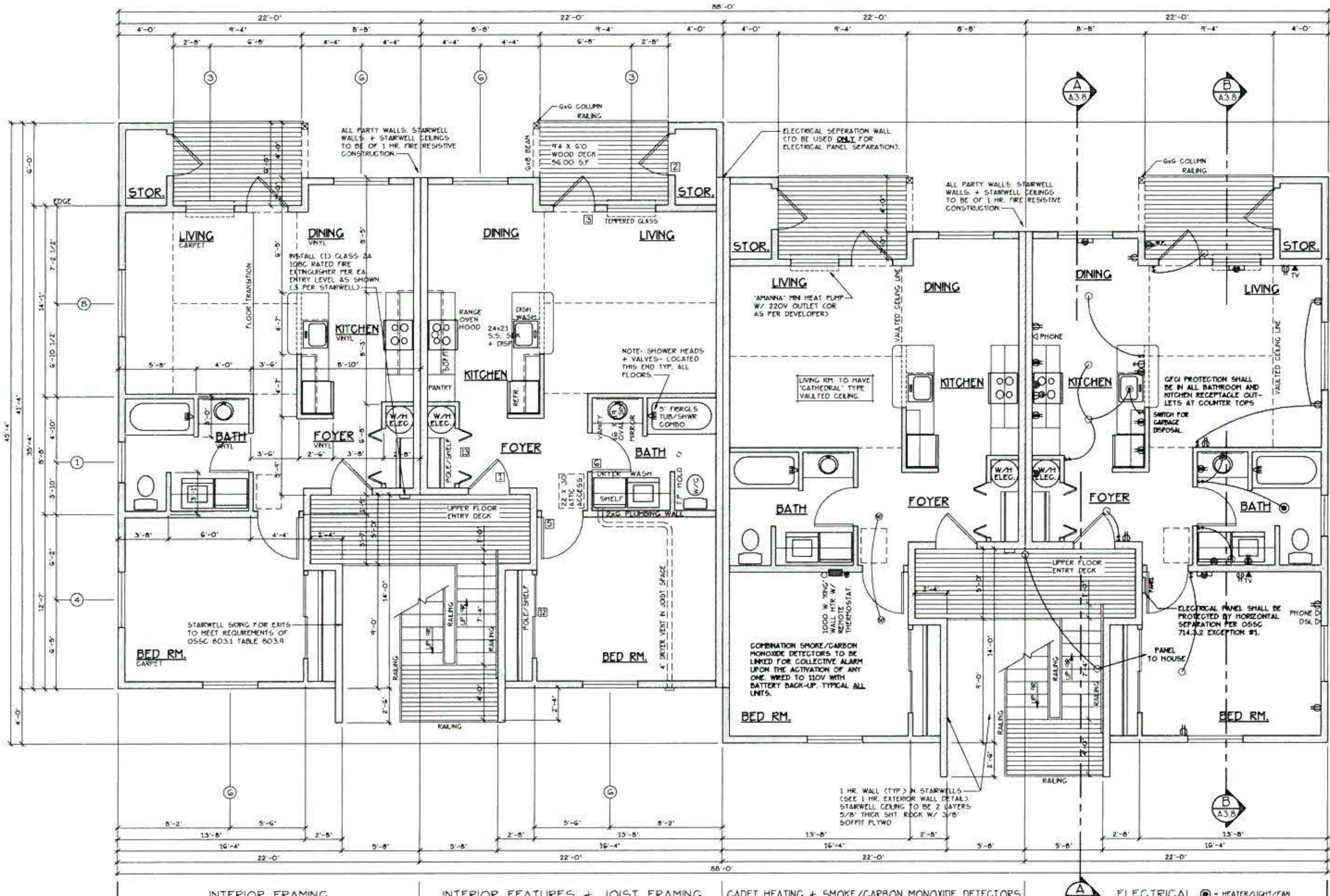
DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.

Design: P.L.M.
Drawn: G.I.D.
Checked: M.D.G.
Date: Oct-19
Scale: AS SHOWN

JOB # 6650

REGISTERED PROFESSIONAL ENGINEER OREGON MARK D. GRENZ
Renew date: June 30, 2021

A3.41



UPPER FLOOR PLAN

SCALE: 1/4" = 1'-0"

"C" UNIT = 728 S.F.

TYPE C UNITS

BLD. 3

CONSTRUCTION TYPE V B SPRINKLED. SEE WALL DETAIL SHEETS FOR SHEETROCK APPLICATION.

[F] 907.2.10.3 SMOKE ALARMS. SINGLE AND MULTIPLE-STATION SMOKE ALARMS SHALL BE INSTALLED IN ACCORDANCE WITH SECTION 907.2.11.
[F] 907.2.11 SINGLE AND MULTIPLE-STATION SMOKE ALARMS LISTED SINGLE AND MULTIPLE-STATION SMOKE ALARMS COMPLYING WITH UL 217 SHALL BE INSTALLED IN ACCORDANCE WITH SECTIONS 907.2.11.1 THROUGH 907.2.11.4 AND NFPA 72.

DOOR SCHEDULE

#	DOORS: WIDTH	HEIGHT	THICK	TYP.	MAT'L.	FIN.	FRAMES: TYP.	MAT'L.	FIN.	REMARKS
[illegible]	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	A	METAL	PAINT	6 PANEL 60 MIN RATED ASSY. W/ THRESHOLD, WEATHERSTRIP, CLOSURES,
[illegible]	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	B	METAL	PAINT	6 PANEL W/ THRESHOLD, WEATHERSTRIP AND KEYED LOCK
[illegible]	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	C	METAL	PAINT	FULL LITE, TEMP. GLASS LOCK, THRESHOLD + WEATHERSTRIP
[illegible]	2'-6"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	D	METAL	PAINT	W/ THRESHOLD, WEATHERSTRIP AND KEYED LOCK
[illegible]	3'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
[illegible]	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
[illegible]	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	**
[illegible]	2'-4"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
[illegible]	2'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
[illegible]	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	F	HEMLOCK	STAIN	POCKET DOOR
[illegible]	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	F	HEMLOCK	STAIN	POCKET DOOR* **
[illegible]	4'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
[illegible]	5'-8"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
[illegible]	6'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
[illegible]	4'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
[illegible]	5'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
[illegible]	6'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
[illegible]	1'-8"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	

* ACCESSIBLE POCKET DOORS MUST STOP FULLY OPEN WITH THEIR OPERATING HANDLES FULLY EXPOSED.
** TO PROVIDE MINIMUM 32" NET CLEAR WIDTH PER ICC/A117.1 SEC. 1004.5.2.1 WHEN FULLY OPENED.

ALL WINDOW AND PATIO DOOR HEADERS TO BE DF #1 4x12 U.N.O.

WINDOW SCHEDULE

#	SIZE	TYPE	MFG.	COLOR	INSUL.	REMARKS	HEADERS
1	3'0 X 1'6	VINYL STAT.	MILGARD	WHITE	YES	STATIONARY W/ FROSTED GLASS	DF #1 4x12
2	3'0 X 3'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ FROSTED GLASS	↓
3	3'6 X 4'6	VINYL SGH.	MILGARD	WHITE	YES	SINGLE HUNG W/ SCREEN	↓
4	4'0 X 3'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	↓
5	4'0 X 4'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	↓
6	4'0 X 4'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	↓
7	5'0 X 4'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	↓
8	5'0 X 4'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	↓
9	3'0 X 4'6	CASEMENT	MILGARD	WHITE	YES	CASEMENT W/ SCREEN	DF #1 4x12

NOTE: ALL LOWER FLOOR OPERABLE WINDOWS + HARDWARE TO COMPLY WITH O.S.S.C. 2014 CHAPTER 11 SEC. 1107.2 ON TO ICC/ANSI A117.1 THEN SEC. 1002.9. OPERABLE PARTS SHALL COMPLY WITH SEC. 309. SEE 'OPERABLE WINDOWS IN ACCESSIBLE LOCATIONS' DETAIL ON SHEET ADA-5. ALL LOWER FLOOR WINDOW HEADERS TO BE SET AT 7'-0" A.F.F. U.N.O.

NOTE: FOR WINDOW PLACEMENT SEE 'WINDOW PLACEMENT FOR EGRESS AND FALL PROTECTION' DETAIL ON SHEET A6.4.

NOTE: ALL ACCESSIBLE DOORS SHALL BE PROVIDED WITH LEVER DOOR HARDWARE + OTHER OPERATING DEVICES IN COMPLIANCE WITH ICC/ANSI A117.1 SECTIONS 309.4. AND 404.2.6.

NOTE: MAX. U-VALUE FOR ALL WINDOWS AS PER TABLE 502.3 2014 OEESC U-0.35.

NOTE: WINDOW SILLS MORE THAN 72" ABOVE FINISH GRADE SHALL BE A MINIMUM OF 36" ABOVE FINISH FLOOR SURFACE (OR) BE INSTALLED WITH WINDOW OPENING CONTROL DEVICES IN COMPLIANCE WITH THE 2014 OSSC SECTIONS 1013.8.1 AND 1029.4.

CONSTRUCTION TYPE V B SPRINKLED.

NOTE: MAIN + UPPER FLOOR DOORS ARE SIZED THE SAME AS LOWER FLOOR DOORS. DOOR SIZE OPTIONS FOR MAIN + UPPER FLOORS ARE AS FOLLOWS:
BED RM. = 2'-6" DOOR
BATH RM. = 2'-4" DOOR

SEE 'GENERAL STRUCTURAL NOTES' ON SHEET A3.3 BEFORE BEGINNING ANY CONSTRUCTION.

GENERAL NOTES:

1. ALL EXTERIOR WALLS TO BE 2 X 6 STUDS. ALL OTHER WALLS TO BE 2 X 4 STUDS UNLESS OTHERWISE NOTED.
2. FIRE BLOCK CONCEALED SPACES (VERTICAL + HORIZONTAL) AS PER OSSC 718.2.2 AND OSSC 718.2.3.
3. PRIOR TO INSTALLATION OF FIBERGLASS TUB/SHOWER + SHOWER UNITS, SHEET ROCK SHALL BE APPLIED TO STUD WALLS AS INDICATED ON PLANS.
4. ALL BATH FANS TO HAVE MIN. 80 CFM. RANGE HOOD EXHAUST FANS TO HAVE MIN. 150 CFM.
5. ELECTRIC OUTLETS IN 1 HR. WALL MAY NOT BE BACK TO BACK AND MUST BE SEPARATED BY HORIZONTAL DISTANCE OF 2'-0".
6. ALL EXTERIOR FLOOD LIGHTING SHALL BE CONNECTED TO HOUSE PANELS LOCATED IN ON-SITE UTILITY ROOMS + STORAGE BLD'S.
7. AS PER OEESC HIGH-EFFICIENCY LIGHTING SYSTEMS - A MINIMUM OF 50 PERCENT OF THE LAMPS IN PERMANENTLY INSTALLED LIGHTING FIXTURES SHALL BE COMPACT OR LINEAR FLOURESCENT, OR A LIGHTING SOURCE THAT HAS A MINIMUM EFFICACY OF 40 LUMENS PER INPUT WATT.
8. ALL 'TYPE A' ACCESSIBLE UNITS REQUIRE THE PATIO TO BE AT SAME LEVEL AS DWELLING UNIT.

MULTI/TECH CONSULTANTS
ENGINEERING SERVICES, INC.

UPPER FLOOR PLAN

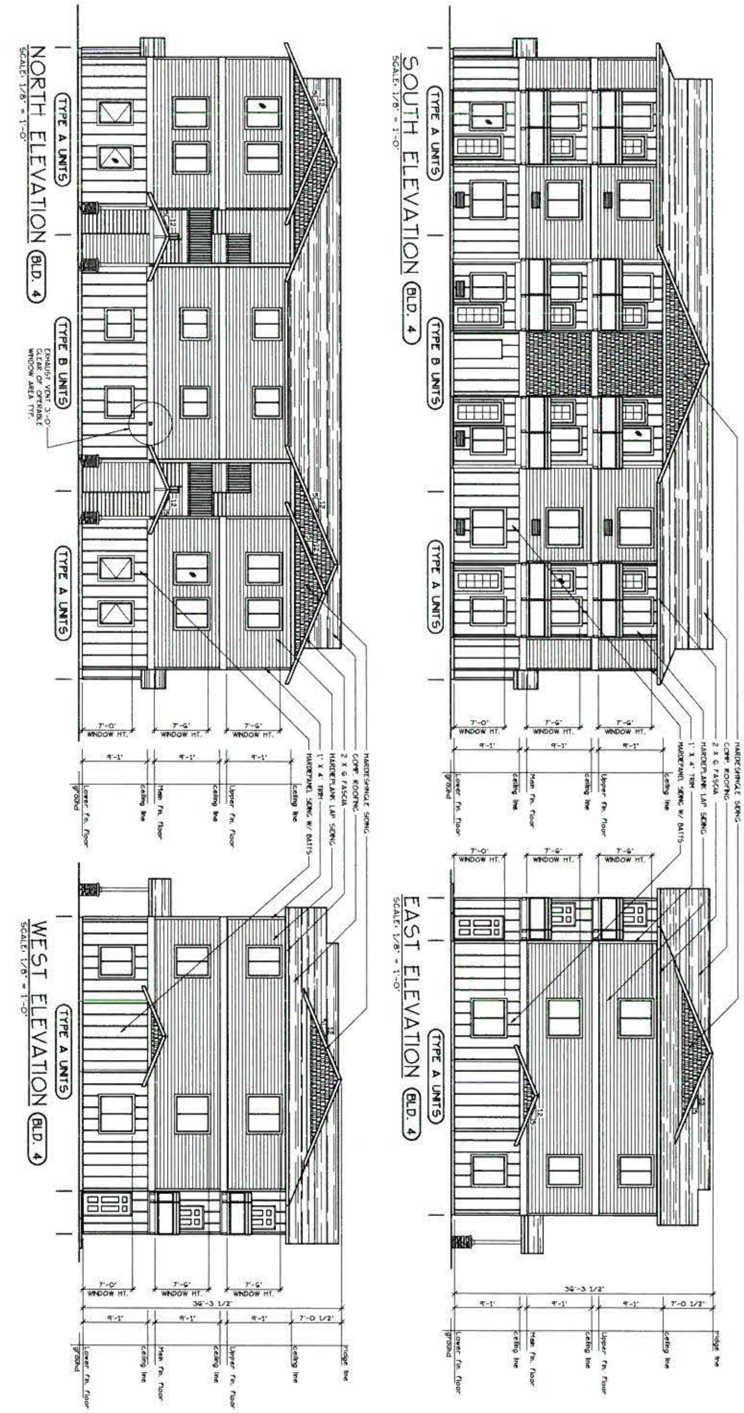
AIRPORT ROAD APARTMENT COMPLEX

NO CHANGES, MODIFICATIONS OR REPRODUCTIONS TO BE MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM THE DESIGN ENGINEER.

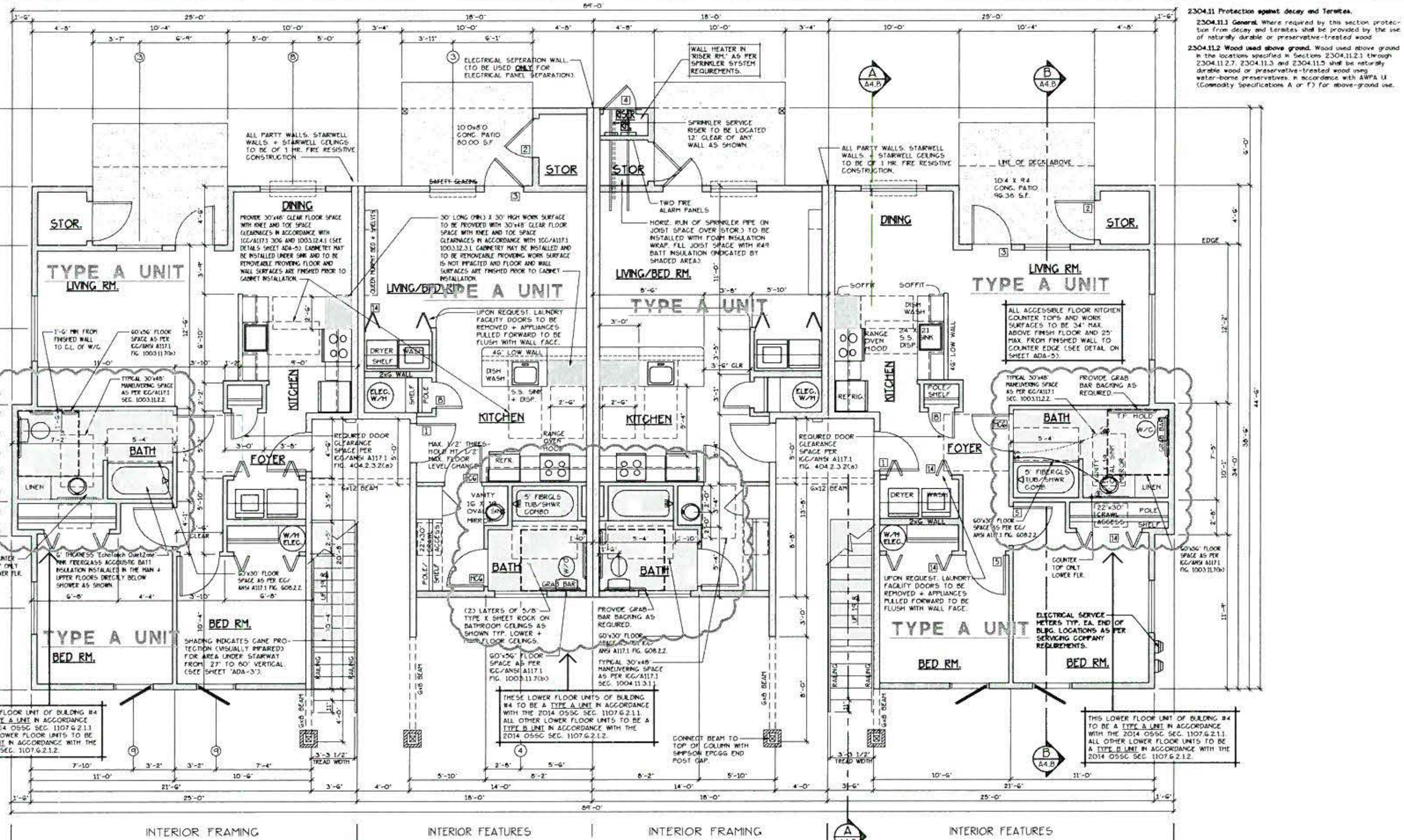
DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.

Design: P.L.M.
Drawn: G.I.D.
Checked: M.D.G.
Date: Oct-19
Scale: AS SHOWN
JOB # 6650

A3.50



A4.90	JOB # 6650 Design: P.L.M. Drawn: G.I.D. Checked: M.D.G. Date: Oct-19 Scale: AS SHOWN	NO CHANGES, MODIFICATIONS OR REPRODUCTIONS TO BE MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM THE DESIGN ENGINEER. DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.	AIRPORT ROAD APARTMENT COMPLEX	BUILDING ELEVATIONS	MULTI/TECH CONSULTANTS ENGINEERING SERVICES, INC.



2304.11 Protection against decay and Termites.

2304.11.1 General. Where required by this section protection from decay and termites shall be provided by the use of naturally durable or preservative-treated wood.

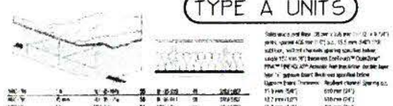
2304.11.2 Wood used above ground. Wood used above ground in the locations specified in Sections 2304.11.2.1 through 2304.11.2.7, 2304.11.3 and 2304.11.5 shall be naturally durable wood or preservative-treated wood using water-borne preservatives, in accordance with AWPA U1 (Commodity Specifications A or F) for above-ground use.

TYPE A UNITS

TYPE B UNITS

[F] 907.2.10.3 SMOKE ALARMS. SINGLE AND MULTIPLE-STATION SMOKE ALARMS SHALL BE INSTALLED IN ACCORDANCE WITH SECTION 907.2.11.
[F] 907.2.11 SINGLE AND MULTIPLE-STATION SMOKE ALARMS. LISTED SINGLE AND MULTIPLE-STATION SMOKE ALARMS COMPLYING WITH UL 217 SHALL BE INSTALLED IN ACCORDANCE WITH SECTIONS 907.2.11.1 THROUGH 907.2.11.4 AND NFPA 72.

TYPE A UNITS



FLOOR/CEILING ASSEMBLY AT TUB/SHOWERS

LOWER FLOOR PLAN

SCALE: 1/4" = 1'-0"

(HANDICAP ACCESSIBLE)

"A" UNIT = 844 S.F.

"B" UNIT = 540 S.F.

BLD. 4

CONSTRUCTION TYPE V B SPRINKLED
SEE WALL DETAIL SHEETS FOR SHEETROCK APPLICATION.

DOOR SCHEDULE

#	DOORS WIDTH	HEIGHT	THICK	TYP.	MAT'L	FIN.	FRAMES TYP.	MAT'L	FIN.	REMARKS
1	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	A	METAL	PAINT	6 PANEL 60 MIN RATED ASST. W/ THRESHOLD, WEATHERSTRIP, CLOSURES
2	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	B	METAL	PAINT	6 PANEL W/ THRESHOLD, WEATHERSTRIP AND KEYED LOCK
3	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	C	METAL	PAINT	FULL LITE, TEMP. GLASS, LOCK, THRESHOLD + WEATHERSTRIP
4	2'-6"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	D	METAL	PAINT	W/ THRESHOLD, WEATHERSTRIP AND KEYED LOCK
5	3'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
6	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
6G	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	**
7	2'-4"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
8	2'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
9	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	F	HEMLOCK	STAIN	POCKET DOOR
9G	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	F	HEMLOCK	STAIN	POCKET DOOR*, **
10	4'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
11	5'-8"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
12	6'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
13	4'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
14	5'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
15	6'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
16	1'-8"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	

* ACCESSIBLE POCKET DOORS MUST STOP FULLY OPEN WITH THEIR OPERATING HANDLES FULLY EXPOSED.
** TO PROVIDE MINIMUM 32" NET CLEAR WIDTH PER ICC/A117.1 SEC. 1004.5.2.1 WHEN FULLY OPENED.

ALL WINDOW AND PATIO DOOR HEADERS TO BE DF #1 4x12 U.N.O.

WINDOW SCHEDULE

#	SIZE	TYPE	MFG.	COLOR	INSUL.	REMARKS	HEADERS
1	3'0 X 1'6	VINYL STAT.	MILGARD	WHITE	YES	STATIONARY W/ FROSTED GLASS	DF #1 4x12
2	3'0 X 3'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ FROSTED GLASS	
3	3'6 X 4'6	VINYL SGH.	MILGARD	WHITE	YES	SINGLE HUNG W/ SCREEN	
4	4'0 X 3'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
5	4'0 X 4'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
6	4'0 X 4'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
7	5'0 X 4'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
8	5'0 X 4'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
9	3'0 X 4'6	CASEMENT	MILGARD	WHITE	YES	CASEMENT W/ SCREEN	DF #1 4x12

NOTE: ALL LOWER FLOOR OPERABLE WINDOWS + HARDWARE TO COMPLY WITH O.S.S.C. 2014 CHAPTER 11 SEC. 1107.2 ON TO ICC/ANSI A117.1 THEN SEC. 1002.9. OPERABLE PARTS SHALL COMPLY WITH SEC. 309. SEE 'OPERABLE WINDOWS IN ACCESSIBLE LOCATIONS' DETAIL ON SHEET ADA-5. ALL LOWER FLOOR WINDOW HEADERS TO BE SET AT 7'-0" A.F.F. U.N.O.

NOTE: FOR WINDOW PLACEMENT SEE 'WINDOW PLACEMENT FOR EGRESS AND FALL PROTECTION' DETAIL ON SHEET A6.4.

NOTE: ALL ACCESSIBLE DOORS SHALL BE PROVIDED WITH LEVER DOOR HARDWARE + OTHER OPERATING DEVICES IN COMPLIANCE WITH ICC/ANSI A117.1 SECTIONS 309.4, AND 404.2.6.

NOTE: MAX. U-VALUE FOR ALL WINDOWS AS PER TABLE 502.3 2014 OEESC U-0.35.

NOTE: WINDOW SILLS MORE THAN 72" ABOVE FINISH GRADE SHALL BE A MINIMUM OF 36" ABOVE FINISH FLOOR SURFACE (OR) BE INSTALLED WITH WINDOW OPENING CONTROL DEVICES IN COMPLIANCE WITH THE 2014 OSSC SECTIONS 1013.8.1 AND 1029.4.

CONSTRUCTION TYPE V B SPRINKLED.

GENERAL NOTES:

1. ALL EXTERIOR WALLS TO BE 2 X 6 STUDS. ALL OTHER WALLS TO BE 2 X 4 STUDS UNLESS OTHERWISE NOTED.
2. FIRE BLOCK CONCEALED SPACES (VERTICAL + HORIZONTAL) AS PER OSSC 718.2.2 AND OSSC 718.2.3.
3. PRIOR TO INSTALLATION OF FIBERGLASS TUB/SHOWER + SHOWER UNITS, SHEET ROCK SHALL BE APPLIED TO STUD WALLS AS INDICATED ON PLANS.
4. ALL BATH FANS TO HAVE MIN. 80 CFM. RANGE HOOD EXHAUST FANS TO HAVE MIN. 150 CFM.
5. ELECTRIC OUTLETS IN 1 HR. WALL MAY NOT BE BACK TO BACK AND MUST BE SEPARATED BY HORIZONTAL DISTANCE OF 2'-0".
6. ALL EXTERIOR FLOOD LIGHTING SHALL BE CONNECTED TO HOUSE PANELS LOCATED IN ON-SITE UTILITY ROOMS + STORAGE BLD'S.
7. AS PER OEESC HIGH-EFFICIENCY LIGHTING SYSTEMS - A MINIMUM OF 50 PERCENT OF THE LAMPS IN PERMANENTLY INSTALLED LIGHTING FIXTURES SHALL BE COMPACT OR LINEAR FLOURESCENT, OR A LIGHTING SOURCE THAT HAS A MINIMUM EFFICACY OF 40 LUMENS PER INPUT WATT.
8. ALL 'TYPE A' ACCESSIBLE UNITS REQUIRE THE PATIO TO BE AT SAME LEVEL AS DWELLING UNIT.

SEE 'GENERAL STRUCTURAL NOTES' ON SHEET A4.2 BEFORE BEGINNING ANY CONSTRUCTION.

HANDICAP UNIT NOTES:

THE UNITS HAVE BEEN DESIGNED TO COMPLY WITH OSSC 2014 REVISED TO BE EFFECTIVE APRIL 1, 2014. CHAPTER 11 OF THE OSSC 2014 AS REVISED INCORPORATES AS PART OF IT AMERICAN NATIONAL STANDARD ICC/ANSI A117.1-1003. WITHIN ICC/ANSI A117.1, CHAPTER 10 SETS OUT SPECIFIC CODE REQUIREMENTS FOR DWELLING AND SLEEPING UNITS. CHAPTER 10 SETS OUT THE CODE REQUIREMENTS THAT ALL GROUND FLOOR UNITS MUST MEET.

THE INTENT IS THAT 'ALL' GROUND FLOOR UNITS ARE TO BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH THE PROVISIONS OF THIS CODE.

WITHIN THE PROJECT THERE ARE TYPE 'A' UNITS WHICH MUST MEET SPECIFIC REQUIREMENTS SET OUT IN ICC/ANSI A117.1, CHAPTER 10, SECTION 1003.

WITHIN THE PROJECT THERE ARE ALSO TYPE 'B' UNITS WHICH MUST MEET SPECIFIC REQUIREMENTS SET OUT IN ICC/ANSI A117.1, CHAPTER 10, SECTION 1004. ALL ACCESSIBLE FLOOR UNITS WITHIN THIS PROJECT ARE TO BE TYPE 'B' UNITS UNLESS SPECIFICALLY DESIGNATED TYPE 'A' UNITS. WITHIN THESE TYPE 'B' UNITS THE MAIN BATHROOM (OR ONLY BATHROOM) SHALL BE DESIGNATED AS AN OPTION 'B' ADAPTABLE BATHROOM WHICH MUST MEET THE REQUIREMENTS OF ICC/ANSI A117.1 SECTION 1004.11.3.2.

ATTACHED TO THE DRAWING SETS ARE OUR SHEETS ADA-1 THRU 5 THAT SET OUT SPECIFIC INFORMATION FROM OSSC 2014, CHAPTER 10 AS WELL AS THE REFERENCED DOCUMENTS. THE DRAWINGS SET OUT SPECIFIC MINIMUM ELEMENTS AND DIMENSIONS THAT MUST BE MET TO ASSURE COMPLIANCE WITH THIS CODE.

MULTI/TECH CONSULTANTS
ENGINEERING SERVICES, INC.

LOWER FLOOR PLAN

AIRPORT ROAD APARTMENT COMPLEX

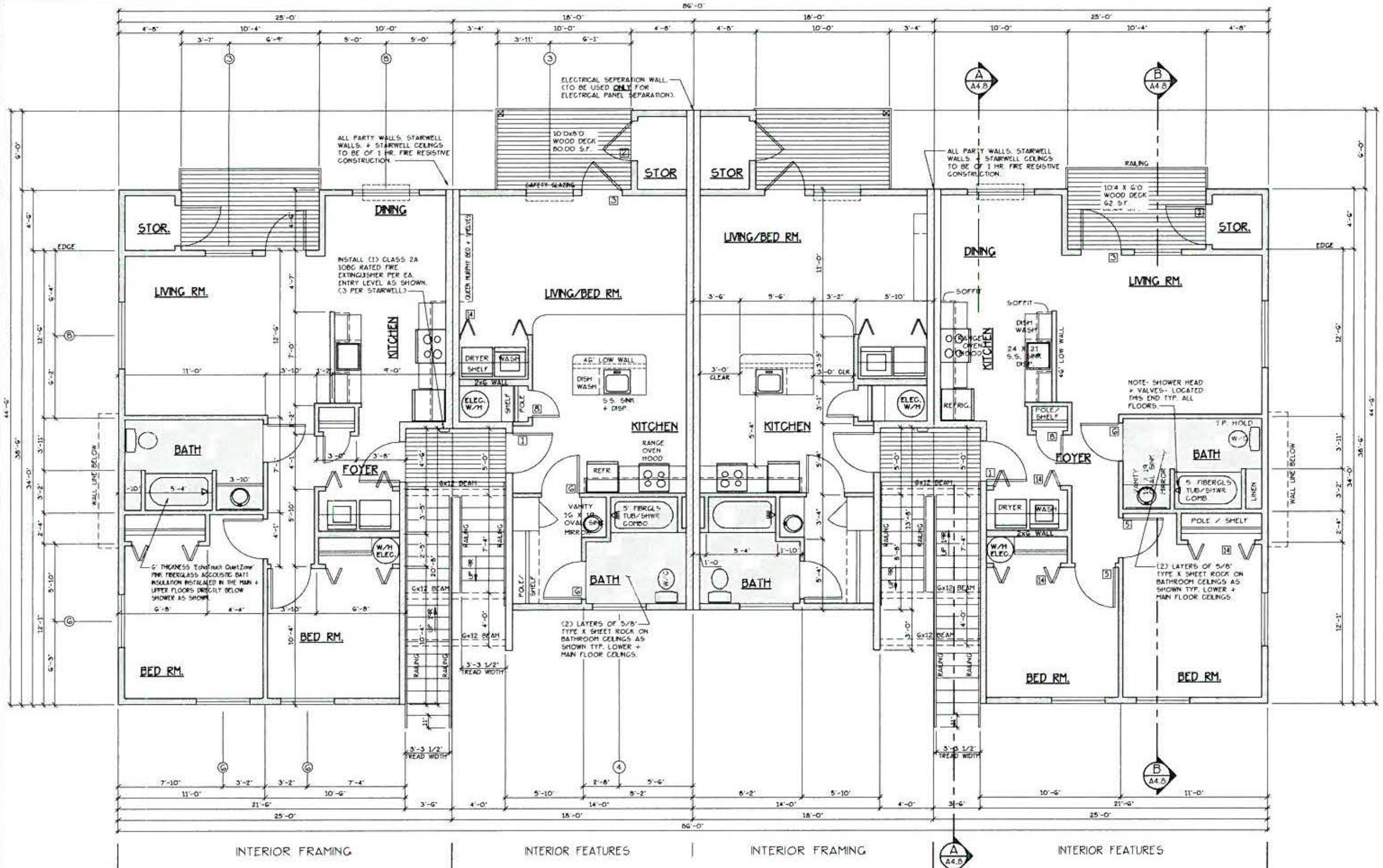
DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.

Design: P.L.M.
Drawn: G.I.D.
Checked: M.D.G.
Date: Oct-19
Scale: AS SHOWN

JOB # 6650

REGISTERED PROFESSIONAL ENGINEER
OREGON
MARK D.
Renew date June 30, 2021

A4.31



TYPE A UNITS

TYPE B UNITS

TYPE A UNITS

MAIN FLOOR PLAN

SCALE: 1/4" = 1'-0"

"A" UNIT = 844 S.F.

"B" UNIT = 540 S.F.

BLD. 4

CONSTRUCTION TYPE V B SPRINKLED
SEE WALL DETAIL SHEETS FOR SHEETROCK APPLICATION.

[F] 907.2.10.3 SMOKE ALARMS. SINGLE AND MULTIPLE-STATION SMOKE ALARMS SHALL BE INSTALLED IN ACCORDANCE WITH SECTION 907.2.11.
[F] 907.2.11 SINGLE AND MULTIPLE-STATION SMOKE ALARMS. LISTED SINGLE AND MULTIPLE-STATION SMOKE ALARMS COMPLYING WITH UL 217 SHALL BE INSTALLED IN ACCORDANCE WITH SECTIONS 907.2.11.1 THROUGH 907.2.11.4 AND NFPA 72.

DOOR SCHEDULE

	DOORS						FRAMES			REMARKS
#	WIDTH	HEIGHT	THICK	TYP.	MATL.	FIN.	TYP.	MATL.	FIN.	
1	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	A	METAL	PAINT	6 PANEL 60 MIN RATED ASST. W/ THRESHOLD, WEATHERSTRIP, CLOSURES
2	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	B	METAL	PAINT	6 PANEL W/ THRESHOLD, WEATHERSTRIP AND KEYED LOCK
3	3'-0"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	C	METAL	PAINT	FULL LITE, TEMP. GLASS, LOCK, THRESHOLD + WEATHERSTRIP
4	2'-6"	6'-8"	1 3/4"	MTL.	CLAD	PAINT	D	METAL	PAINT	W/ THRESHOLD, WEATHERSTRIP AND KEYED LOCK
5	3'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
6	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
6A	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	**
7	2'-4"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
8	2'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	
9	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	F	HEMLOCK	STAIN	POCKET DOOR
9A	2'-10"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	F	HEMLOCK	STAIN	POCKET DOOR*, **
10	4'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
11	5'-8"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
12	6'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	G	HEMLOCK	STAIN	BI-PASS DOOR
13	4'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
14	5'-0"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	H	HEMLOCK	STAIN	BI-FOLD DOOR
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16	1'-8"	6'-8"	1 3/8"	H.C.	BIRCH	STAIN	E	HEMLOCK	STAIN	

* ACCESSIBLE POCKET DOORS MUST STOP FULLY OPEN WITH THEIR OPERATING HANDLES FULLY EXPOSED.
** TO PROVIDE MINIMUM 32" NET CLEAR WIDTH PER ICC/A117.1 SEC. 1004.5.2.1 WHEN FULLY OPENED.

ALL WINDOW AND PATIO DOOR HEADERS TO BE DF #1 4x12 U.N.O.

WINDOW SCHEDULE

#	SIZE	TYPE	MFG.	COLOR	INSUL.	REMARKS	HEADERS
1	3'0 X 1'6	VINYL STAT.	MILGARD	WHITE	YES	STATIONARY W/ FROSTED GLASS	DF #1 4x12
2	3'0 X 3'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ FROSTED GLASS	
3	3'6 X 4'6	VINYL SGH.	MILGARD	WHITE	YES	SINGLE HUNG W/ SCREEN	
4	4'0 X 3'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
5	4'0 X 4'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
6	4'0 X 4'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
7	5'0 X 4'0	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
8	5'0 X 4'6	VINYL SLD.	MILGARD	WHITE	YES	HORIZ. SLIDER W/ SCREEN	
9	3'0 X 4'6	CASEMENT	MILGARD	WHITE	YES	CASEMENT W/ SCREEN	DF #1 4x12

NOTE: ALL LOWER FLOOR OPERABLE WINDOWS + HARDWARE TO COMPLY WITH O.S.S.C. 2014 CHAPTER 11 SEC. 1107.2 ON TO ICC/ANSI A117.1 THEN SEC. 1002.9. OPERABLE PARTS SHALL COMPLY WITH SEC. 309. SEE 'OPERABLE WINDOWS IN ACCESSIBLE LOCATIONS' DETAIL ON SHEET ADA-5. ALL LOWER FLOOR WINDOW HEADERS TO BE SET AT 7'-0" A.F.F. U.N.O.

NOTE: FOR WINDOW PLACEMENT SEE 'WINDOW PLACEMENT FOR EGRESS AND FALL PROTECTION' DETAIL ON SHEET A6.4

NOTE: ALL ACCESSIBLE DOORS SHALL BE PROVIDED WITH LEVER DOOR HARDWARE + OTHER OPERATING DEVICES IN COMPLIANCE WITH ICC/ANSI A117.1 SECTIONS 309.4. AND 404.2.6.

NOTE: MAX. U-VALUE FOR ALL WINDOWS AS PER TABLE 502.3 2014 OEESC U-0.35.

NOTE: WINDOW SILLS MORE THAN 72" ABOVE FINISH GRADE SHALL BE A MINIMUM OF 36" ABOVE FINISH FLOOR SURFACE (OR) BE INSTALLED WITH WINDOW OPENING CONTROL DEVICES IN COMPLIANCE WITH THE 2014 OSSC SECTIONS 1013.8.1 AND 1029.4.

CONSTRUCTION TYPE V B SPRINKLED.

NOTE: MAIN + UPPER FLOOR DOORS ARE SIZED THE SAME AS LOWER FLOOR DOORS. DOOR SIZE OPTIONS FOR MAIN + UPPER FLOORS ARE AS FOLLOWS:
BED RM. = 2'-6" DOOR
BATH RM. = 2'-4" DOOR

SEE 'GENERAL STRUCTURAL NOTES' ON SHEET A4.2 BEFORE BEGINNING ANY CONSTRUCTION.

GENERAL NOTES:

1. ALL EXTERIOR WALLS TO BE 2 X 6 STUDS. ALL OTHER WALLS TO BE 2 X 4 STUDS UNLESS OTHERWISE NOTED.
2. FIRE BLOCK CONCEALED SPACES (VERTICAL + HORIZONTAL) AS PER OSSC 718.2.2 AND OSSC 718.2.3.
3. PRIOR TO INSTALLATION OF FIBERGLASS TUB/SHOWER + SHOWER UNITS, SHEET ROCK SHALL BE APPLIED TO STUD WALLS AS INDICATED ON PLANS.
4. ALL BATH FANS TO HAVE MIN. 80 CFM. RANGE HOOD EXHAUST FANS TO HAVE MIN. 150 CFM.
5. ELECTRIC OUTLETS IN 1 HR. WALL MAY NOT BE BACK TO BACK AND MUST BE SEPARATED BY HORIZONTAL DISTANCE OF 2'-0".
6. ALL EXTERIOR FLOOD LIGHTING SHALL BE CONNECTED TO HOUSE PANELS LOCATED IN ON-SITE UTILITY ROOMS + STORAGE BLD'S.
7. AS PER OEESC HIGH-EFFICIENCY LIGHTING SYSTEMS - A MINIMUM OF 50 PERCENT OF THE LAMPS IN PERMANENTLY INSTALLED LIGHTING FIXTURES SHALL BE COMPACT OR LINEAR FLOURESCENT, OR A LIGHTING SOURCE THAT HAS A MINIMUM EFFICACY OF 40 LUMENS PER INPUT WATT.
8. ALL 'TYPE A' ACCESSIBLE UNITS REQUIRE THE PATIO TO BE AT SAME LEVEL AS DWELLING UNIT.

MULTI/TECH CONSULTANTS
ENGINEERING SERVICES, INC.

MAIN FLOOR PLAN

AIRPORT ROAD APARTMENT COMPLEX

DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.

Design: P.L.M.
Drawn: G.I.D.
Checked: M.D.C.
Date: Oct-19
Scale: AS SHOWN

JOB # 6650

REGISTERED PROFESSIONAL ENGINEER OREGON JULY 14, 1978 MARK D. GRENZ
Renew date June 30, 2021

A4.41

MEMORANDUM

DKS

REGISTERED PROFESSIONAL ENGINEER
85448
OREGON
MAY 23, 2013
LACY SUE VOSTI BROWN
EXPIRES: 12/31/21

DATE: February 27, 2020

TO: James Lutz | Applegate Landing, LLC

FROM: Lacy Brown, Ph.D., P.E. | DKS Associates
Clive Lara, E.I. | DKS Associates

SUBJECT: Lebanon Veterans Housing – Transportation Impact Study

---

This memorandum documents the traffic assessment related to the impacts of the proposed Veterans Housing Project in Lebanon, Oregon. Table 1 provides more details regarding the study area and characteristics of the proposed project.

Table 1: Study Area and Proposed Project Characteristics

Study Area	
Study Intersections	Airport Road/Strawberry Lane, Airport Road/Stoltz Hill Road, Airport Road/7th Street
Analysis Periods	Weekday AM peak hour (peak hour between 7:00-9:00 AM) Weekday PM peak hour (peak hour between 4:00-6:00 PM)
Proposed Development	
Land Use	56 apartment units, 22 duplex townhouse units
Project Trips	571 daily trips 36 (8 in, 28 out) AM peak hour trips 43 (27 in, 16 out) PM peak hour trips
Vehicle Access Points	One full access at Airport Road/Stoltz Hill Road intersection and one (temporary) full access driveway on Strawberry Lane
Other Transportation Facilities	
Pedestrian Facilities	Existing sidewalk on south side of Airport Road in the study area Partial existing sidewalk on Stoltz Hill Road, and 7th Street No existing sidewalk on Strawberry Lane
Bicycle Facilities	Existing bicycle lanes on both sides of Airport Road
Transit Facilities	No existing transit facilities within the study area

The following sections summarize the existing conditions of the study area as well as the development's impact to the surrounding transportation network.

DKS

EXISTING CONDITIONS

This section details the existing study area conditions including the proposed site development, existing bicycle and pedestrian facilities, roadway network, future planned projects, and existing traffic volumes and operations. Supporting details are provided in the appendix.

STUDY AREA

The proposed development includes 56 apartment units and 22 duplex townhouse units, shown in Figure 1. The development will be accessed via a full-movement driveway that forms the fourth leg of the Airport Road/Stoltz Hill Road intersection. In the interim, the development will also include a temporary full-access driveway on Strawberry Lane. The driveway on Strawberry Lane will remain open to the public until a traffic signal is installed at the Airport Road/Stoltz Hill Road intersection, at which point the Strawberry Lane access will become a gated, emergency access only.

Figure 1: Study Area

ROADWAY NETWORK

The roadways within the study area are under the jurisdiction of the City of Lebanon and Linn County. The transportation characteristics of the roadways within the study area are shown in Table 2. The table includes the functional classification, the number of travel lanes, posted speed, and the facilities for bicyclists and pedestrians.

Table 2: Existing Study Area Roadway Characteristics

Roadway	Functional Classification	Jurisdiction	Lanes	Posted Speed	Sidewalk	Bike Lanes
Airport Road	Arterial	Linn County	3	25	Partial	Yes
Strawberry Lane	Local	Linn County	2	N/A	No	No
Stoltz Hill Road	Arterial	Linn County	2	35	Partial	No
7th Street	Collector	City of Lebanon	2	25	Partial	Yes

The functional classification specifies the purpose of the facility and is a determining factor of applicable cross-section, access spacing, and intersection performance standards.

EXISTING TRAFFIC VOLUMES

An analysis of the 2019 existing intersection operations was performed for the three study intersections. Intersections are the focus of the analysis because they are the controlling bottlenecks of traffic flow and the ability of a roadway system to carry traffic efficiently is nearly always diminished in their vicinity.

Intersection operations were analyzed for the AM and PM peak hours. Turning movement counts were collected on Thursday, October 24, 2019 from 7:00 – 9:00 AM and 4:00 – 6:00 PM at each of the following study intersections.

- Airport Road/Strawberry Lane
- Airport Road/Stoltz Hill Road
- Airport Road/7th Street

Figure 2 shows the peak hour turn movement volumes, intersection traffic control, and lane configurations at the study intersections.

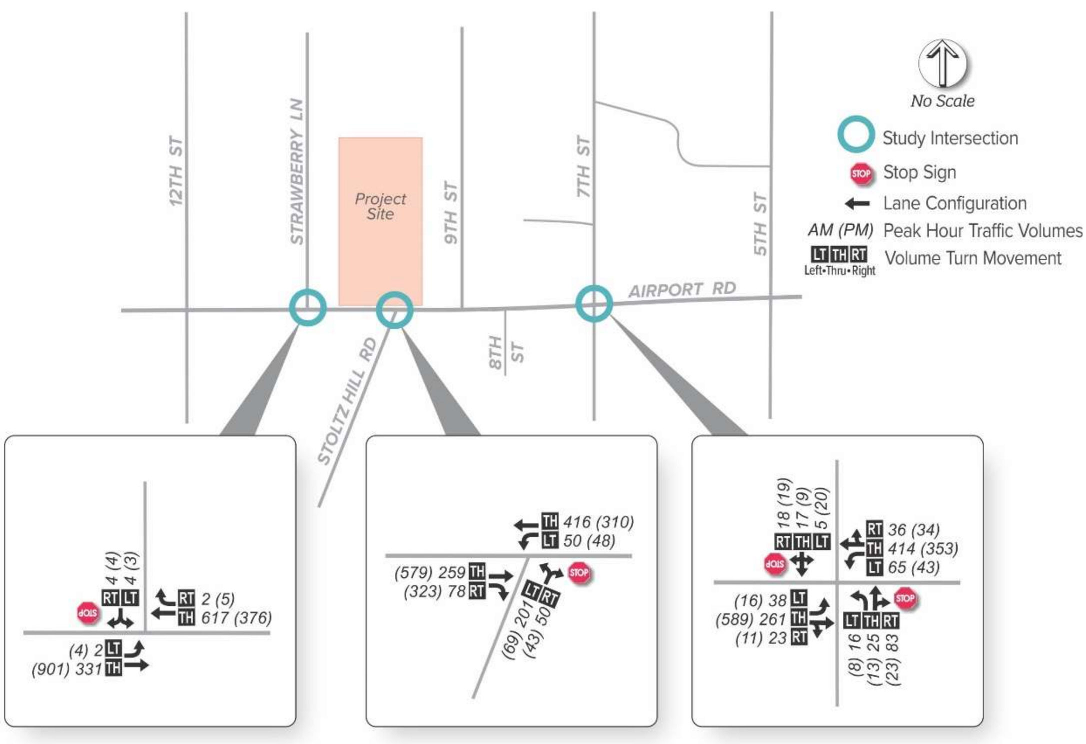

Figure 2: Existing Traffic Volumes

CRASH HISTORY

The most recent five years (2013-2017) of available crash data for the study area was obtained from the ODOT crash database and was used to evaluate the safety performance of the study intersections and roadway segment. A total of 10 collisions occurred during the study period, 9 of which were intersection crashes. No collisions resulted in a fatality or severe injury.

Four collisions occurred at the Airport Road/7th Street intersection (2 rear-end, 2 angle crashes). One of the rear end crashes involved a pedestrian crossing the road. A driver traveling eastbound came to a stop and was rear-ended by another driver heading eastbound. The pedestrian was not injured. Five collisions occurred at the Airport Road/Stoltz Hill Road intersection: 3 turning crashes, 1 rear-end, and 1 fixed object. One segment crash occurred on Airport Road between 7th Street and 8th Street. The turning movement crash occurred when a vehicle attempting to make a left turn out of a driveway onto Airport Road failed to yield to oncoming traffic.

Safety Priority Index System (SPIS)

The Safety Priority Index System (SPIS) is a ranking system developed by ODOT to identify potential safety problems on state highways. SPIS scores are developed based upon crash frequency, crash severity, and traffic volume for a 0.10 mile or variable length segment along the state highway over a rolling three-year window (i.e., every year it is updated with the most recent three years). There were no SPIS sites identified within the study area.

Collision Rate

The total number of crashes observed at an intersection is typically related to the volume of traffic traveling through said intersection. Because of this relationship, a commonly used measure to evaluate the safety performance of an intersection is the intersection crash rate, which is the number of crashes per year per million entering vehicles (MEV). ODOT has developed a list of critical crash rates which represent the expected crash rate for different types of intersections across the state. If the calculated crash rate is higher than the corresponding ODOT critical crash rate, this would indicate a potential safety concern and would warrant additional safety investigations. As shown in Table 3 below, the calculated crash rates are below the ODOT critical crash rates for all study area facilities. Because the frequency and severity of crashes in the study area are relatively low and below critical values, no additional safety evaluations are warranted.

Table 3: Study Intersection and Segment Crashes (2013-2017)

Location	Crash Frequency (Severity)				AADT	ODOT Critical Crash Rate[b]	Observed Crash Rate[c]
	Severe Injury	*Non-Severe Injury*	*PDO[a]*	***Total***			
Intersection							
Airport Road/Strawberry Lane	0	0	0	0	12,930	0.475	0.00
Airport Road/Stoltz Hill Road	0	1	3	4	13,720	0.475	0.16
Airport Road/7th Street	0	2	3	5	11,380	1.080	0.24
Segment							
Airport Road: Strawberry Lane to 7th Street	0	0	1	1	9,900	1.78	0.22

[a] PDO = Property damage only
[b] Critical crash rate according to 90th Percentile rate from ODOT APM Exhibit 4-1 for all three intersections and from ODOT's 2017 Crash Report Table 2: 5 Year Comparison of State Highway Crash Rates for the two Airport Road street segments
[c] Crash rate = average annual crashes per million entering vehicles (MEV); MEV estimates based on PM peak-hour traffic count

Bold/Highlighted: Intersection or segment is over the critical crash rate.

INTERSECTION PERFORMANCE MEASURES

Level of service (LOS) ratings and volume-to-capacity (v/c) ratios are two commonly used performance measures that provide a good representation of intersection operations. In addition, they are often incorporated into agency mobility standards.

Level of service (LOS): A "report card" rating (A through F) based on the average delay experienced by vehicles at the intersection. LOS A, B, and C indicate conditions where traffic moves without significant delays over periods of peak hour travel demand. LOS D and E are progressively worse operating conditions. LOS F represents conditions where average vehicle delay has become excessive and demand has exceeded capacity. This condition is typically evident in long queues and delays.

Volume-to-capacity (v/c) ratio: A decimal representation (typically between 0.00 and 1.00) of the proportion of capacity that is being used at a turn movement, approach leg, or intersection. It is determined by dividing the peak hour traffic volume by the hourly capacity of a given intersection or movement. A lower ratio indicates smooth operations and minimal delays. As the ratio approaches 0.95, congestion increases, and performance is reduced. If the ratio is greater than 1.00, the turn movement, approach leg, or intersection is oversaturated and usually results in excessive queues and long delays.

The City of Lebanon has adopted volume-to-capacity ratio standards for two-way stop-controlled intersections during peak hour traffic conditions. For two-way stop-controlled intersections, the maximum acceptable volume-to-capacity ratio is 0.90 for each approach.[1]

EXISTING TRAFFIC OPERATIONS

Existing study intersection operations were evaluated based on the Highway Capacity Manual 6th Edition methodology for unsignalized intersections.[2] Table 4 below lists the existing volume to capacity (v/c) ratio, delay, and LOS for the study intersections. As shown, all intersections currently meet operating standards and mobility targets.

Table 4: 2019 Existing Peak Hour Study Intersection Operations

Intersection	Traffic Control	Operating Standard	AM Peak			PM Peak		
			v/c	*Delay*	*LOS*	*v/c*	*Delay*	*LOS*
Airport Road/ Strawberry Lane	Two-way stop	v/c ≤ 0.90 for each approach	0.02 SB	13.7	B	0.02 SB	13.1	B
Airport Road/ Stoltz Hill Road	Two-way stop	v/c ≤ 0.90 for each approach	0.60 NB	22.8	C	0.34 NB	19.8	C
Airport Road/ 7th Street	Two-way stop	v/c ≤ 0.90 for each approach	0.37 NBTR	19.7	C	0.14 NBTR	19.5	C

Two-Way Stop Controlled intersections:
v/c = Highest Volume-to-Capacity Ratio of All Approaches
Delay = Delay (sec) of Highest Volume-to-Capacity Approach
LOS = Level of Service of Highest Volume-to-Capacity Approach

It should be noted that the City's Transportation System Plan reports a v/c ratio of 0.39 and LOS E for the worst approach of the Airport Road/7th Street intersection under 2016 conditions, whereas this memo reports a v/c ratio of 0.14 and LOS D for the worst approach under existing 2019 conditions. The discrepancy is largely due to two factors.

1. The TSP utilized the Highway Capacity Manual 2010 methodology, while this TIA applied Highway Capacity Manual 6th Edition methodology for intersection capacity analysis. The 6th Edition methodology is the current standard of practice and was not available at the time the TSP was developed.
2. The TSP analysis did not account for the two-way center turn lane on Airport Road that allows for two-stage left-turns when there are no conflicting vehicles present. The analysis for this TIA did include the center turn lane, which significantly reduces the v/c ratio and delay for the side-street approaches.[3]

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[1] Page 64, Lebanon Transportation System Plan, Volume 1, Adopted December 12, 2018.
[2] *Highway Capacity Manual, Sixth Edition*, Transportation Research Board, Washington D.C., 2016.
[3] During field observations, drivers commonly used the center turn lane to make two-stage crossings at unsignalized intersections along Airport Road. Future striping of dedicated left-turn lanes at these intersections may affect driver behavior and result in a lower occurrence of two-stage left-turns.

PROJECT IMPACTS

This section presents the anticipated impacts of the proposed development on the surrounding transportation system, including the number of trips generated by the proposed development, the distribution of trips within the study area, the future intersection volumes and operating conditions, and a review of the preliminary site plan. Supporting information can be found in the appendix.

The proposed development involves the construction of a 48-unit apartment complex, an 8-unit apartment complex, and 22 duplex townhouses located on the north side of the Airport Road/Stoltz Hill Road intersection in Lebanon, Oregon. The development will be accessed via a full-movement driveway that forms the fourth leg of the Airport Road/Stoltz Hill Road intersection. In the interim, the development will also include a temporary full-access driveway on Strawberry Lane. The driveway on Strawberry Lane will remain open to the public until a traffic signal is installed at the Airport Road/Stoltz Hill Road intersection, at which point the Strawberry Lane access will become a gated, emergency access only. For analysis purposes, this TIA evaluates a worst-case scenario in which all vehicle trips access Airport Road via the driveway at Stoltz Hill Road prior to signalization of the intersection.

TRIP GENERATION

Trip generation is the method used to estimate the number of vehicles a development adds to site driveways and the adjacent roadway network during a specified period (i.e., such as the PM peak hour). Trip generation estimates are performed using trip rates surveyed at similar land uses, as provided by the Institute of Transportation Engineers (ITE).[4]

The proposed development is estimated to generate 571 daily trips including 36 (8 in, 28 out) AM peak hour trips and 43 (27 in, 16 out) PM peak hour trips. Table 5 lists the AM and PM peak hour vehicle trip generation estimates, which were used for intersection operations.

Table 5: Trip Generation Summary

Land Use (ITE Code)	Trip Generation Rate[a]		Units	AM Peak Hour			PM Peak Hour			Daily Trips
	AM Peak	*PM Peak*		*In*	*Out*	*Total*	*In*	*Out*	*Total*	
Multifamily Housing (Low Rise) (220)	0.46	0.56	48	5	17	22	17	10	27	351
			8	1	3	4	2	2	4	59
			22	2	8	10	8	4	12	161
		Total	**78**	**8**	**28**	**36**	**27**	**16**	**43**	**571**

[a] Trip generation rates are back calculated from ITE rate equation.

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[4] *Trip Generation Manual, 10th Edition*, Institute of Transportation Engineers, 2017.

TRIP DISTRIBUTION

Trip distribution provides an estimation of where project-related trips would be coming from and going to. It is given as percentages at key gateways to the study area and is used to route project trips through the study intersections. The trip distribution, estimated using the existing traffic counts, is shown in Figure 3.

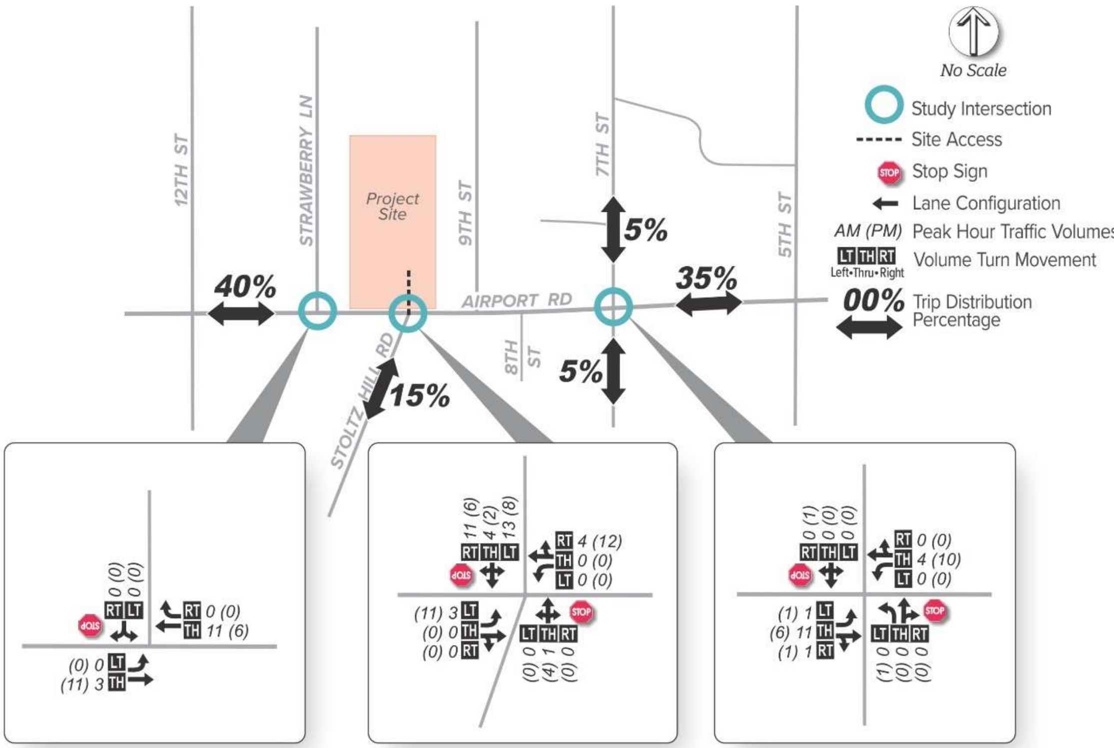

Figure 3: Project Trips and Trip Distribution

As shown in the figure above, all the project trips were assumed to enter and exit the site at the Stoltz Hill Road driveway and none were assumed to use the access on Strawberry Lane. This assumption results in an analysis of the worst-case scenario as all trips would be concentrated at one intersection.

FUTURE TRAFFIC VOLUMES

Future 2020 traffic volume forecasts are used to estimate the expected impact the proposed development will have on intersection operations. An annual growth rate of 2.3% was used to estimate the annual background traffic growth in the study area.[5] Future traffic volumes were estimated for Background (existing volume + background growth) and Background + Project scenarios (Figure 4 and Figure 5, respectively).

[5] Growth rate determined from long-term traffic volume forecasts included in the City's Transportation System Plan.

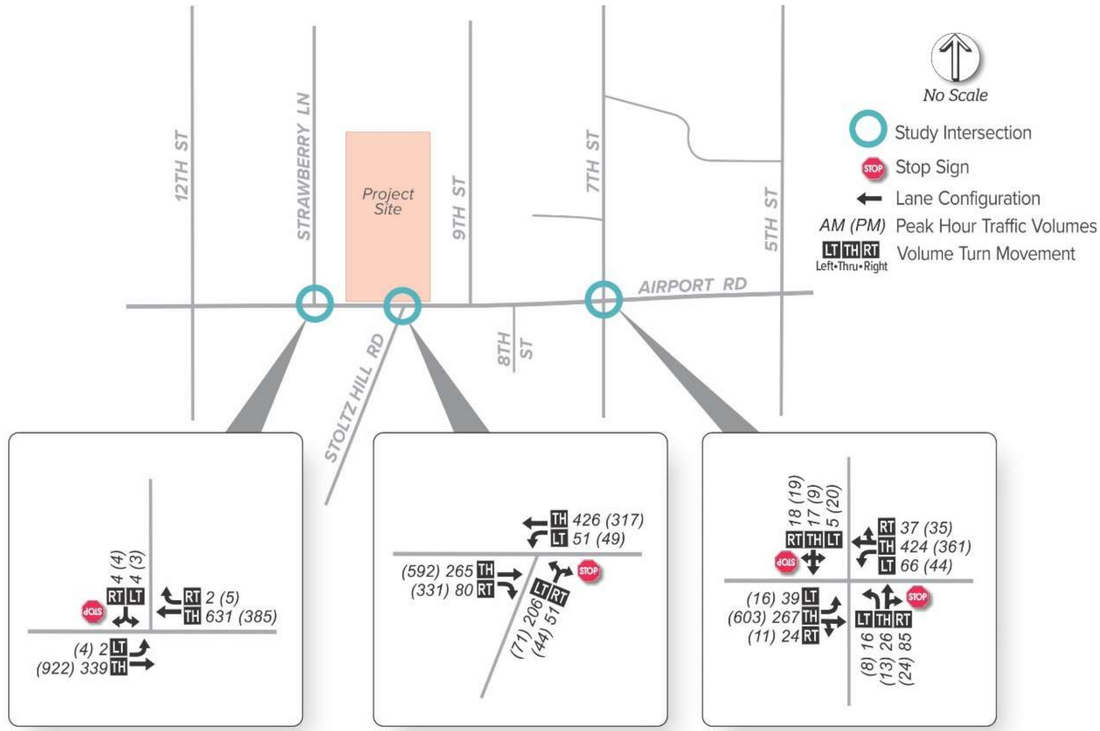

Figure 4: Future 2020 Background Traffic Volumes

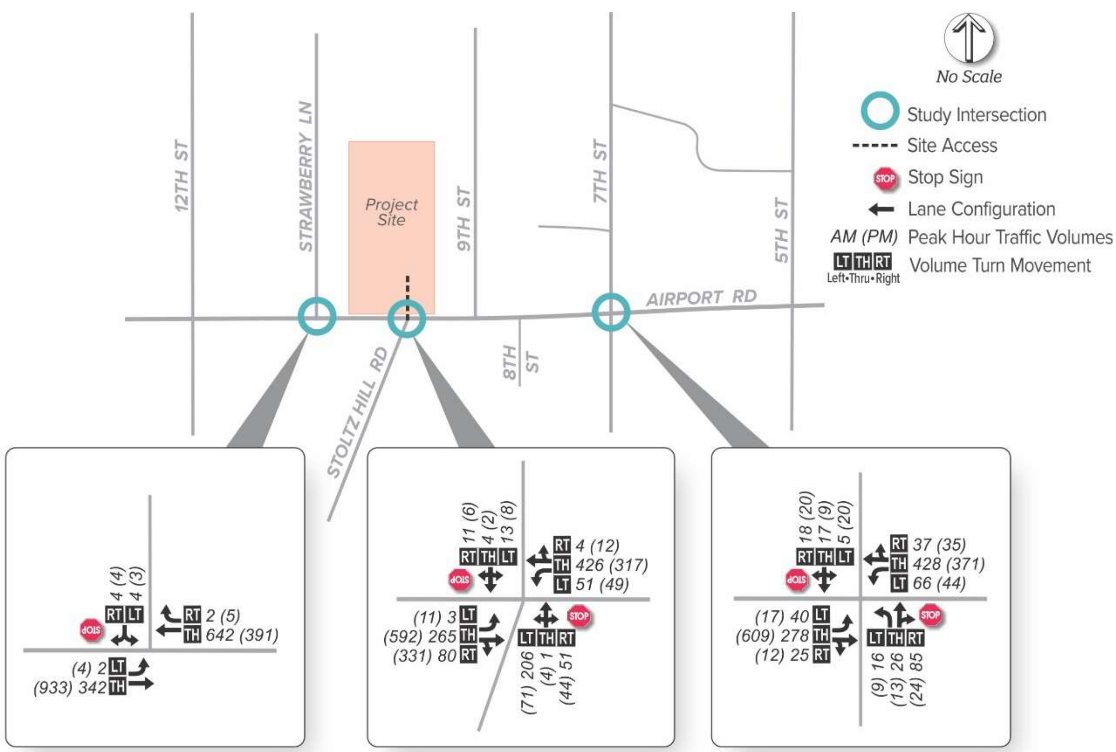

Figure 5: Future 2020 Background + Project Traffic Volumes

FUTURE TRAFFIC OPERATIONS

Intersection operations analysis was performed for the future build scenario. The traffic conditions at the study intersections were determined based on the *Highway Capacity Manual*, *6th Edition* methodology for unsignalized intersections. The estimated level of service (LOS) and volume to capacity ratio (v/c) of each study intersection for the two scenarios are shown in Table 6 below. As shown in Table 6, all study intersections meet the operating standard under both future scenarios.

Table 6: Future 2020 Background and Build Intersection Operations

Intersection	Traffic Control	Operating Standard	AM Peak			PM Peak		
			v/c	*Delay*	*LOS*	*v/c*	*Delay*	*LOS*
Future 2020 Background								
Airport Road/ Strawberry Lane	Two-way stop	v/c ≤ 0.90 for each approach	0.02 SB	13.9	B	0.02 SB	13.2	B
Airport Road/ Stoltz Hill Road	Two-way stop	v/c ≤ 0.90 for each approach	0.62 NB	24.1	C	0.36 NB	20.5	C
Airport Road/ 7th Street	Two-way stop	v/c ≤ 0.90 for each approach	0.39 NBTR	20.8	C	0.14 NBTR	19.9	C
Future 2020 Build (Background + Project Trips)								
Airport Road/ Strawberry Lane	Two-way stop	v/c ≤ 0.90 for each approach	0.02 SB	14.0	B	0.02 SB	13.3	B
Airport Road/ Stoltz Hill Road	Two-way stop	v/c ≤ 0.90 for each approach	0.83 NB	48.1	E	0.48 NB	29.6	D
Airport Road/ 7th Street	Two-way stop	v/c ≤ 0.90 for each approach	0.40 NBTR	21.5	C	0.15 NBTR	20.3	C

Two-Way Stop Controlled intersections:
v/c = Highest Volume-to-Capacity Ratio of All Approaches
Delay = Delay (sec) of Highest Volume-to-Capacity Approach
LOS = Level of Service of Highest Volume-to-Capacity Approach

It should be noted that the analysis assumes opportunities for northbound left-turning drivers to make two-stage left-turns from Stoltz Hill Rd onto Airport Road in the 2020 Build scenario. Because the conflicting eastbound left turn volume is estimated to be very low (3 and 11 vehicles during the AM and PM peak hours, respectively), there will be ample opportunity for a drivers to make a two-stage northbound left turn without encountering conflicts in the turn lane. During field observations, drivers commonly used the center turn lane along this section of Airport Road to make two-stage left-turns at unsignalized intersections where dedicated left-turn pockets are not striped. For these reasons, it was determined that a two-stage left-turn was a reasonable assumption for this analysis.

DKS

SITE PLAN REVIEW

This section provides an overview of the proposed site plan and evaluations of access spacing, site circulation, and parking. A preliminary site plan for the development can be found in the appendix.

Site Access

The development will be accessed via a full-movement driveway that forms the fourth leg of the Airport Road/Stoltz Hill Road intersection. In the interim, the development will also include a temporary full-access driveway on Strawberry Lane. The driveway on Strawberry Lane will remain open to the public until a traffic signal is installed at the Airport Road/Stoltz Hill Road intersection, at which point the Strawberry Lane access will become a gated, emergency access only. Adding a fourth leg to the intersection of Airport Road/Stoltz Hill Road, which is currently a skewed intersection, will introduce the potential for additional vehicle conflicts at this intersection. However, these conflicts will be mitigated once the planned traffic signal is installed.

Access Spacing

- The City's access spacing guidelines state outline the following requirements:[6]
    - Minimum driveway spacing on minor arterial (Airport Road) is 265 feet.

- The proposed access at the Airport Road/Stoltz Hill Road intersection will form the fourth leg of an existing intersection and does not change access spacing along Airport Road. The proposed site access to Airport Road should be aligned at an approximately 90-degree angle with Airport Road for safe and efficient vehicle travel paths. It should also be designed to accommodate future signalization of the Airport Road/Stoltz Hill Road intersection.

Driveway Sight Distance

Based on preliminary observations, there are no existing sight distance limitations at the proposed driveways. However, prior to occupancy, sight distance at any existing any proposed access points will need to be verified, documented, and stamped by a registered professional Civil or Traffic Engineer licensed in the State of Oregon.

Site Circulation

The site plan shows an internal street, which loops through the site and connects to both access driveways. The internal street shows 34-foot width and is sufficient for two-way vehicular circulation.

Parking

It is our understanding that the developer has an agreement with the City of Lebanon requiring 1.5 parking spaces/dwelling unit.[7] The City Development Code also states that 0.5 bicycle parking spaces per unit are required for apartment buildings. The site plan does not show bicycle parking spaces

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[6] Table 9, Lebanon Transportation System Plan, Volume 1, Adopted December 12, 2018. Distances are measured from center to center of adjacent approaches.

[7] Per City code (Table 16.14.070-1, City of Lebanon Development Code, City of Lebanon, adopted on December 10, 2008), the required number of vehicle parking spaces for multiple family dwellings is 2.25 spaces/dwelling unit which includes 1 visitor space for every 4 units.

however it is our understanding that all apartment units will have an indoor storage closet with a bike hook. The developer also has stated plans to include six bicycle parking spaces at the community center as well as two spaces at each apartment building. Per the City Development Code, the required number of vehicle parking spaces for two family dwellings (duplexes) is 2 spaces per dwelling unit. The developer has confirmed that each unit will have a vehicle garage and driveway space.

As indicated in Table 7, the proposed parking supply is sufficient to meet the City requirements for vehicle and bicycle parking.

Table 7. Summary of Parking Provisions and Requirements

Site Plan Section	Required Vehicle Parking	Provided Vehicle Parking	Required Bicycle Parking	Provided Bicycle Parking
48-Unit Apartment Complex	72	73	24	62
8-Unit Apartment Complex	12	13	4	10
22-Unit Duplex Townhomes	44	44	n/a	0
Total	**128**	**130**	**28**	**72**

Bicycle and Pedestrian Facilities

The site plan shows new sidewalk facilities along the building frontages and along the new private internal street. The proposed site plan is sufficient to meet pedestrian needs on-site.

Existing bicycle lanes are present on Airport Road. Sufficient bicycle access to and from the project site via the adjacent street network is shown on the site plan. Per the City's cross section standards, no additional bicycle facilities are required beyond what currently exists.[8]

[8] Table 8, Lebanon Transportation System Plan, Volume 1, Adopted December 12, 2018.

PROJECT SUMMARY

The proposed Veteran's Housing development in Lebanon, Oregon will include up to 56 apartment units and 22 duplex townhomes. The proposed development is not expected to degrade operations of the surrounding transportation network beyond local acceptable levels and the provided site plan sufficiently addresses requirements related to access spacing, site circulation, and parking. No recommended improvements or mitigations have been identified for this development.

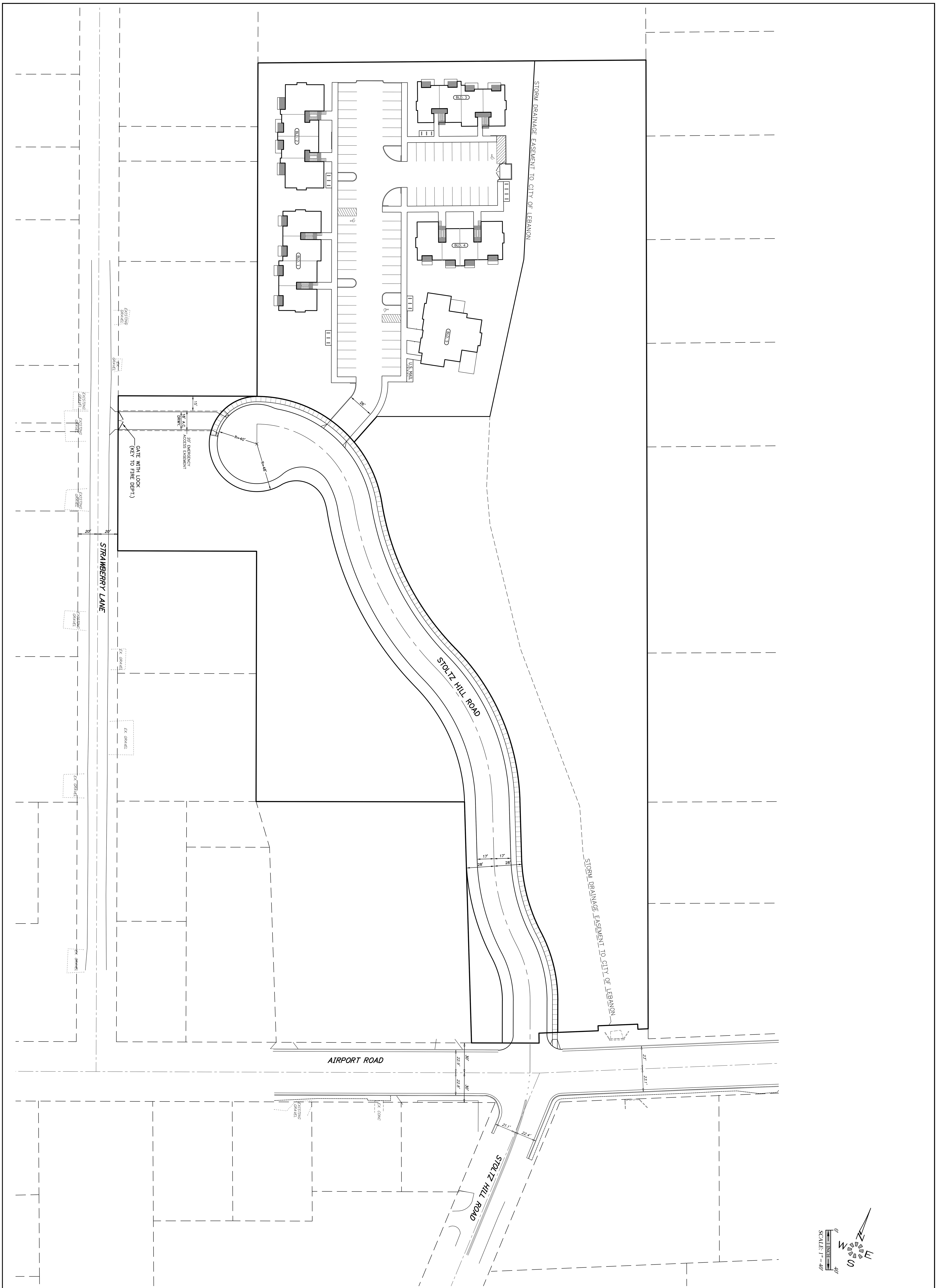
Trip Generation and Intersection Operations

- The proposed development is estimated to generate 571 daily trips including 36 (8 in, 28 out) AM peak hour trips and 43 (27 in, 16 out) PM peak hour trips.
- All study intersections meet the City of Lebanon operating standards with the addition of site generated trips.

Site Plan Evaluation

- The proposed site access to Airport Road should be aligned at a 90-degree angle with Airport Road for safe and efficient vehicle travel paths. It should also be designed to accommodate future signalization of the Airport Road/Stoltz Hill Road intersection.
- Based on our understanding of the developer's agreement with the City of Lebanon, the proposed vehicle and bicycle parking supply is sufficient to meet City requirements and estimated parking demand.

Appendix A – Site Plan



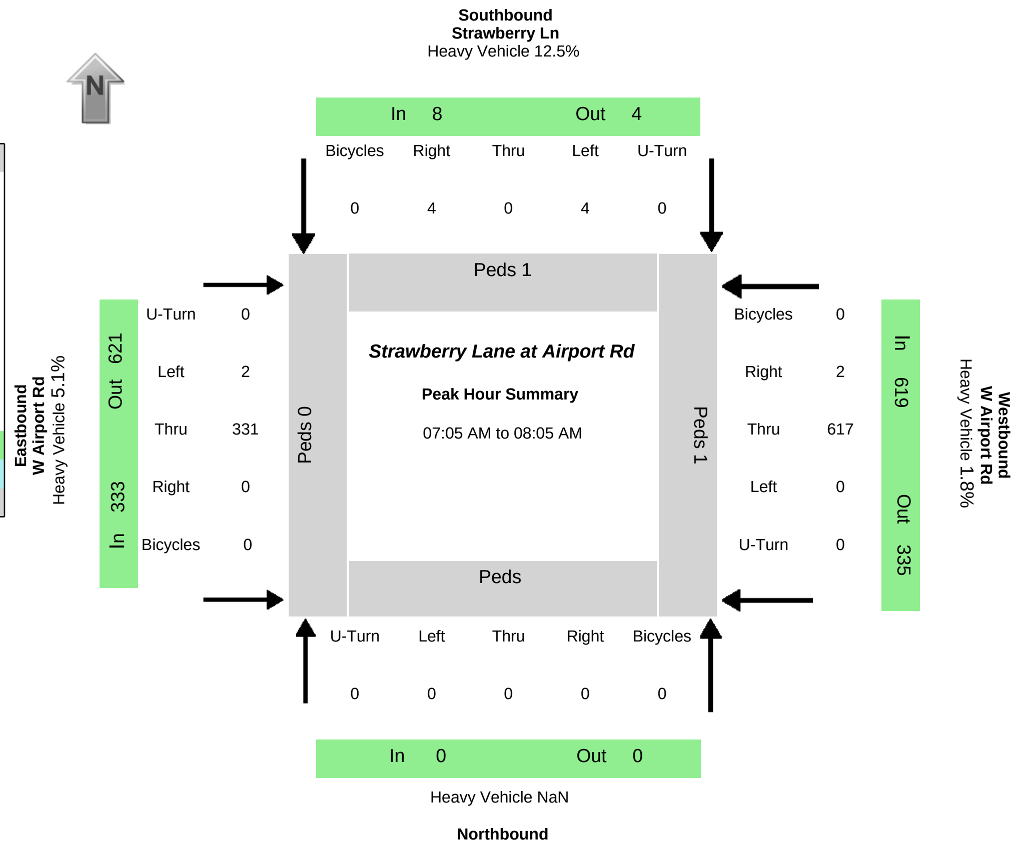
1 of 1	JOB # 6650	6650p REALIGN Design: M.D.G. Drawn: D.G.G. ProjMgr: J.J.G. Date: JAN. 2020 Scale: AS SHOWN As-Built: ----	NO CHANGES, MODIFICATIONS OR REPRODUCTIONS TO BE MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM THE DESIGN ENGINEER. DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.	MULTI/TECH ENGINEERING EXEMPT FROM LIABILITY IF NOT STAMPED APPROVED NOT FOR CONSTRUCTION UNLESS STAMPED APPROVED HERE	**APPLEGATE LANDING APARTMENTS**	**PROPOSED SITE LAYOUT**

MULTI/TECH
ENGINEERING SERVICES, INC.
1155 13th ST. S.E. SALEM, OR. 97302
PH. (503) 363 - 9227 FAX (503) 364-1260
www.mtengineering.net office@mtengineering.net

Appendix B – Existing Peak Hour Traffic Counts

KEY DATA NETWORK

Data Provided by K-D-N.com 503-594-4224	
N/S street	*Strawberry Ln*
E/W street	*W Airport Rd*
City, State	Lebanon OR
Site Notes	
Location	44.526624 - -122.921484
Start Date	Wednesday, October 23, 2019
Start Time	07:00:00 AM
Weather	
Study ID #	
Peak Hour Start	07:05:00 AM
Peak 15 Min Start	07:15:00 AM
PHF (15-Min Int)	0.90



Peak-Hour Volumes (PHV)

Northbound				Southbound				Eastbound				Westbound				Entering				Leaving			
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	NB	SB	EB	WB	NB	SB	EB	WB
0	0	0	0	4	0	4	0	2	331	0	0	0	617	2	0	0	8	333	619	0	4	621	335

Percent Heavy Vehicles

0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	25.0%	0.0%	0.0%	5.1%	0.0%	0.0%	0.0%	1.6%	50.0%	0.0%	NaN	12.5%	5.1%	1.8%	NaN	25.0%	1.8%	5.1%

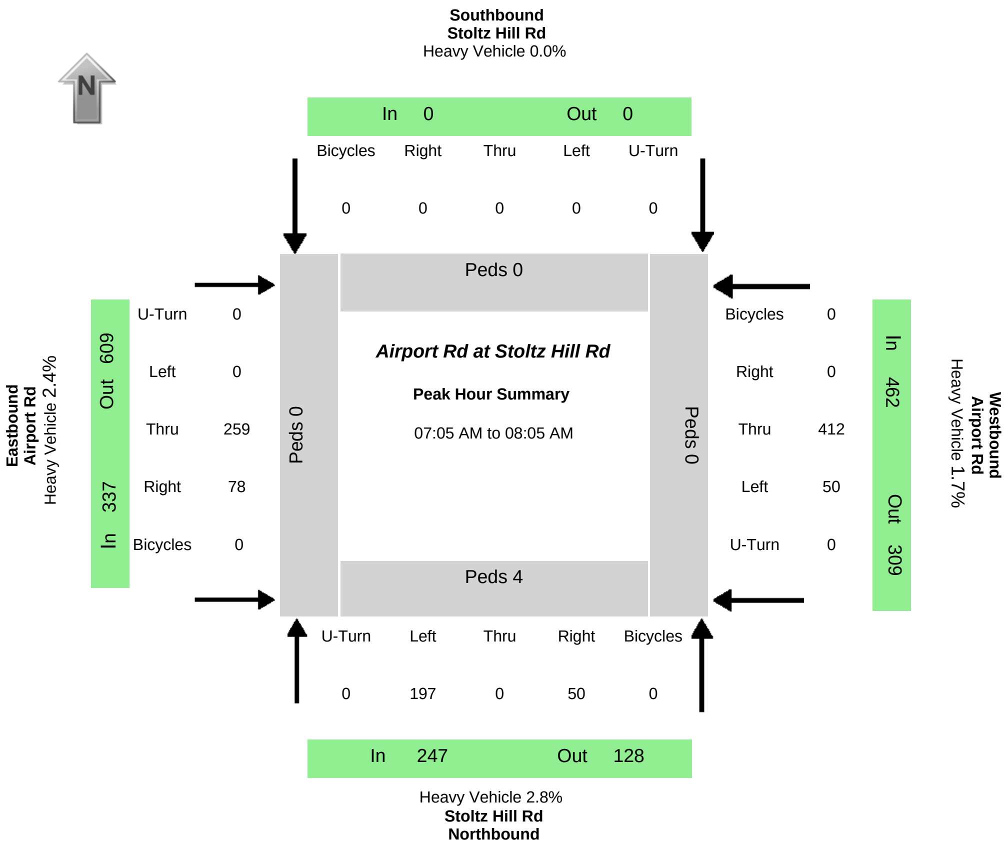
PHV- Bicycles																	PHV - Pedestrians				
Northbound				Southbound				Eastbound				Westbound					in Crosswalk				
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	**Sum**	NB	SB	EB	WB	**Sum**
				0		0	0	0	0		0		0	0	0	0		1	0	1	2

All Vehicle Volumes

	Northbound				Southbound Strawberry Ln				Eastbound W Airport Rd				Westbound W Airport Rd				15 Min	1 HR
Time	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Sum	Sum
07:00:00 AM					0		2	0	0	20		0		43	0	0		
07:05:00 AM					0		0	0	0	25		0		50	0	0		
07:10:00 AM					0		1	0	0	20		0		49	0	0	210	
07:15:00 AM					0		0	0	0	34		0		48	0	0	227	
07:20:00 AM					0		0	0	0	35		0		61	0	0	248	
07:25:00 AM					0		0	0	0	28		0		62	0	0	268	
07:30:00 AM					0		0	0	0	19		0		59	2	0	266	
07:35:00 AM					1		2	0	1	20		0		58	0	0	252	
07:40:00 AM					0		0	0	1	28		0		50	0	0	241	
07:45:00 AM					2		0	0	0	30		0		46	0	0	239	
07:50:00 AM					1		0	0	0	35		0		47	0	0	240	
07:55:00 AM					0		1	0	0	35		0		40	0	0	237	956
08:00:00 AM					0		0	0	0	22		0		47	0	0	228	960
08:05:00 AM					0		1	0	2	21		0		44	1	0	214	954
08:10:00 AM					0		0	0	0	20		0		48	0	0	206	952
08:15:00 AM					0		0	0	1	27		0		42	1	0	208	941
08:20:00 AM					0		0	0	0	20		0		52	1	0	212	918
08:25:00 AM					0		0	0	0	23		0		48	0	0	215	899
08:30:00 AM					0		0	0	0	20		0		47	0	0	211	886
08:35:00 AM					0		0	0	0	29		0		34	0	0	201	867
08:40:00 AM					0		0	0	0	16		0		25	0	0	171	829
08:45:00 AM					0		0	0	0	18		0		31	0	0	153	800
08:50:00 AM					1		0	0	0	24		0		30	0	0	145	772
08:55:00 AM					1		1	0	0	24		0		23	0	0	153	745

K-D-N KEY DATA NETWORK

Data Provided by K-D-N.com 503-594-4224	
N/S street	***Stoltz Hill Rd***
E/W street	***Airport Rd***
City, State	Lebanon OR
Site Notes	
Location	44.526573 - -122.91979
Start Date	Thursday, October 24, 2019
Start Time	07:00:00 AM
Weather	
Study ID #	
Peak Hour Start	07:05:00 AM
Peak 15 Min Start	07:20:00 AM
PHF (15-Min Int)	0.86



Peak-Hour Volumes (PHV)

Northbound				Southbound				Eastbound				Westbound				Entering				Leaving			
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	NB	SB	EB	WB	NB	SB	EB	WB
197	0	50	0	0	0	0	0	0	259	78	0	50	412	0	0	247	0	337	462	128	0	609	309

Percent Heavy Vehicles

1.5%	0.0%	8.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%	2.6%	0.0%	6.0%	1.2%	0.0%	0.0%	2.8%	0.0%	2.4%	1.7%	3.9%	0.0%	1.3%	3.2%

PHV- Bicycles / PHV - Pedestrians

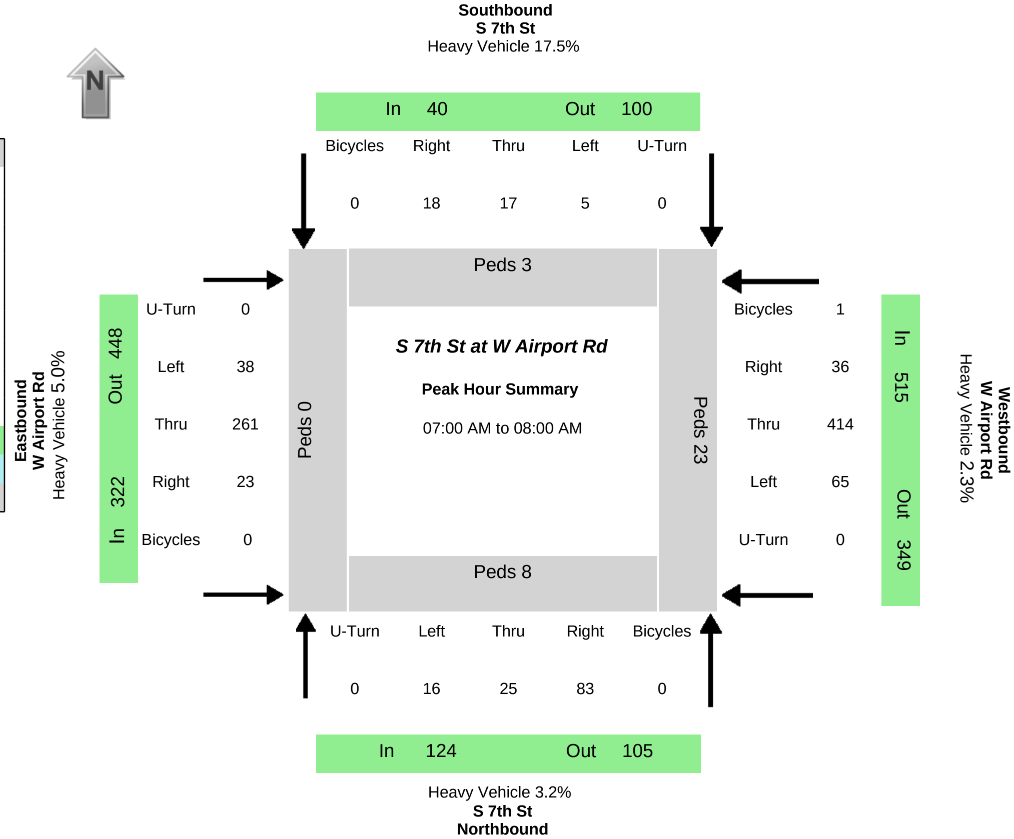
Northbound				Southbound				Eastbound				Westbound					in Crosswalk				
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	**Sum**	NB	SB	EB	WB	**Sum**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	4

All Vehicle Volumes

	Northbound Stoltz Hill Rd				**Southbound** Stoltz Hill Rd				**Eastbound** Airport Rd				**Westbound** Airport Rd				15 Min	1 HR
Time	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Sum	Sum
07:00:00 AM	14	0	2	0	0	0	0	0	0	17	1	0	2	25	0	0		
07:05:00 AM	17	0	1	0	0	0	0	0	0	21	4	0	2	35	0	0		
07:10:00 AM	19	0	5	0	0	0	0	0	0	17	4	0	5	26	0	0	217	
07:15:00 AM	19	0	3	0	0	0	0	0	0	30	4	0	2	28	0	0	242	
07:20:00 AM	19	0	12	0	0	0	0	0	0	29	6	0	6	42	0	0	276	
07:25:00 AM	22	0	5	0	0	0	0	0	0	19	10	0	3	37	0	0	296	
07:30:00 AM	10	0	8	0	0	0	0	0	0	14	5	0	7	49	0	0	303	
07:35:00 AM	18	0	6	0	0	0	0	0	0	17	3	0	8	44	0	0	285	
07:40:00 AM	15	0	4	0	0	0	0	0	0	17	11	0	9	32	0	0	277	
07:45:00 AM	14	0	1	0	0	0	0	0	0	26	7	0	4	32	0	0	268	
07:50:00 AM	20	0	1	0	0	0	0	0	0	27	10	0	2	27	0	0	259	
07:55:00 AM	13	0	1	0	0	0	0	0	0	27	8	0	1	24	0	0	245	1035
08:00:00 AM	11	0	3	0	0	0	0	0	0	15	6	0	1	36	0	0	233	1046
08:05:00 AM	9	0	3	0	0	0	0	0	0	13	9	0	2	34	0	0	216	1036
08:10:00 AM	19	0	1	0	0	0	0	0	0	17	3	0	2	26	0	0	210	1028
08:15:00 AM	12	0	5	0	0	0	0	0	0	24	3	0	0	31	0	0	213	1017
08:20:00 AM	15	0	0	0	0	0	0	0	0	19	3	0	1	38	0	0	219	979
08:25:00 AM	16	0	4	0	0	0	0	0	0	18	5	0	3	33	0	0	230	962
08:30:00 AM	7	0	3	0	0	0	0	0	0	18	3	0	2	37	0	0	225	939
08:35:00 AM	7	0	2	0	0	0	0	0	0	24	5	0	1	29	0	0	217	911
08:40:00 AM	9	0	0	0	0	0	0	0	0	11	5	0	3	15	0	0	181	866
08:45:00 AM	17	0	0	0	0	0	0	0	0	10	8	0	1	17	0	0	164	835
08:50:00 AM	7	0	2	0	0	0	0	0	0	19	5	0	3	22	0	0	154	806
08:55:00 AM	6	0	1	0	0	0	0	0	0	24	2	0	1	14	0	0	159	780

KEY DATA NETWORK

Data Provided by K-D-N.com 503-594-4224	
N/S street	*S 7th St*
E/W street	*W Airport Rd*
City, State	Lebanon OR
Site Notes	
Location	44.526723 - -122.916107
Start Date	Wednesday, October 23, 2019
Start Time	07:00:00 AM
Weather	
Study ID #	
Peak Hour Start	07:00:00 AM
Peak 15 Min Start	07:20:00 AM
PHF (15-Min Int)	0.77



Peak-Hour Volumes (PHV)

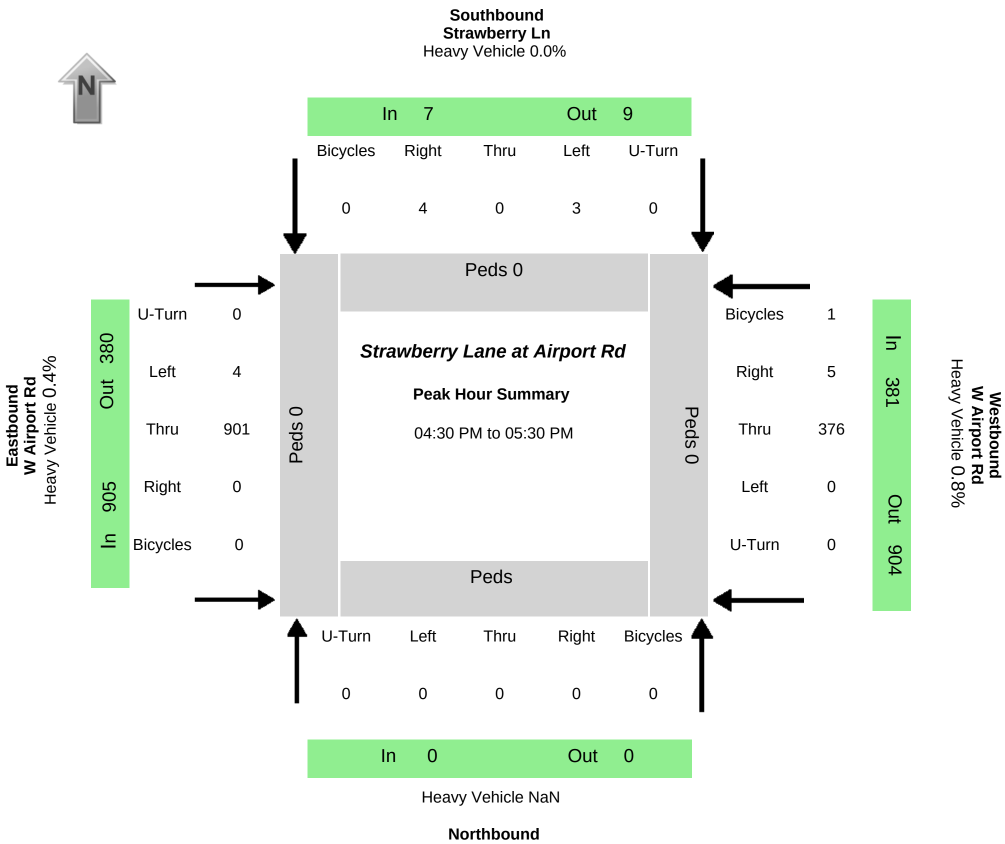
Northbound				**Southbound**				**Eastbound**				**Westbound**				**Entering**				**Leaving**			
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	NB	SB	EB	WB	NB	SB	EB	WB
16	25	83	0	5	17	18	0	38	261	23	0	65	414	36	0	124	40	322	515	105	99	448	349
Percent Heavy Vehicles																							
6.3%	4.0%	2.4%	0.0%	40.0%	17.6%	11.1%	0.0%	15.8%	3.1%	8.7%	0.0%	1.5%	1.9%	8.3%	0.0%	3.2%	17.5%	5.0%	2.3%	5.7%	10.1%	2.5%	3.4%

PHV- Bicycles																	PHV - Pedestrians				
Northbound				**Southbound**				**Eastbound**				**Westbound**					in Crosswalk				
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	**Sum**	NB	SB	EB	WB	**Sum**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	8	3	0	23	34

All Vehicle Volumes

	Northbound				**Southbound**				**Eastbound**				**Westbound**					
	S 7th St				S 7th St				W Airport Rd				W Airport Rd				15 Min	1 HR
Time	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Sum	Sum
07:00:00 AM	1	1	1	0	0	2	1	0	3	19	2	0	4	31	1	0		
07:05:00 AM	2	2	2	0	0	0	1	0	2	20	1	0	3	28	4	0		
07:10:00 AM	0	3	4	0	2	1	2	0	2	12	3	0	1	32	5	0	198	
07:15:00 AM	0	1	2	0	0	2	1	0	6	23	2	0	7	24	3	0	203	
07:20:00 AM	4	3	5	0	2	2	4	0	6	35	2	0	6	37	5	0	249	
07:25:00 AM	3	3	15	0	0	1	2	0	8	21	2	0	6	41	5	0	289	
07:30:00 AM	2	2	17	0	0	2	2	0	5	13	2	0	7	47	7	0	324	
07:35:00 AM	0	3	6	0	0	1	1	0	3	22	1	0	8	49	0	0	307	
07:40:00 AM	1	1	7	0	1	3	1	0	1	16	4	0	4	38	1	0	278	
07:45:00 AM	1	1	12	0	0	1	0	0	1	25	2	0	5	37	2	0	259	
07:50:00 AM	2	5	7	0	0	1	2	0	0	26	1	0	6	24	1	0	240	
07:55:00 AM	0	0	5	0	0	1	1	0	1	29	1	0	8	26	2	0	236	1001
08:00:00 AM	0	0	4	0	1	1	0	0	2	14	0	0	0	36	2	0	209	995
08:05:00 AM	1	0	2	0	1	1	1	0	0	17	1	0	0	37	0	0	195	991
08:10:00 AM	0	0	1	0	0	1	1	0	1	14	2	0	0	24	3	0	168	971
08:15:00 AM	0	2	0	0	1	0	3	0	0	25	1	0	0	35	1	0	176	968
08:20:00 AM	0	2	0	0	2	0	1	0	1	22	0	0	1	34	1	0	179	921
08:25:00 AM	0	0	1	0	0	2	1	0	0	22	0	0	0	37	1	0	196	878
08:30:00 AM	0	1	2	0	0	2	0	0	2	18	0	0	0	33	0	0	186	830
08:35:00 AM	0	0	1	0	0	2	0	0	0	28	0	0	2	30	1	0	186	800
08:40:00 AM	0	4	3	0	0	0	0	0	0	12	0	0	0	19	0	0	160	760
08:45:00 AM	0	1	0	0	0	0	0	0	0	9	1	0	0	19	2	0	134	705
08:50:00 AM	0	2	2	0	1	0	1	0	1	19	0	0	3	23	1	0	123	683
08:55:00 AM	0	1	1	0	1	0	0	0	0	24	0	0	1	17	0	0	130	654

Data Provided by K-D-N.com 503-594-4224	
N/S street	***Strawberry Ln***
E/W street	***W Airport Rd***
City, State	Lebanon OR
Site Notes	
Location	44.526624 - -122.921484
Start Date	Wednesday, October 23, 2019
Start Time	04:00:00 PM
Weather	
Study ID #	
Peak Hour Start	04:30:00 PM
Peak 15 Min Start	05:15:00 PM
PHF (15-Min Int)	0.92



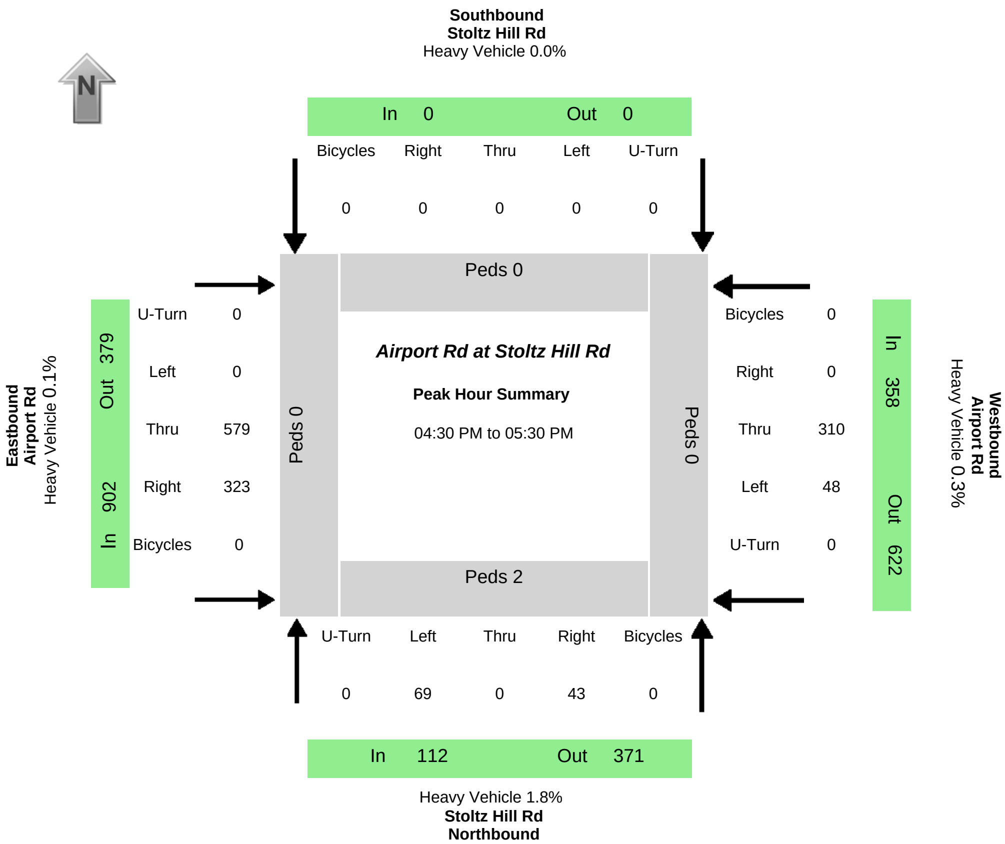
Peak-Hour Volumes (PHV)																							
Northbound				**Southbound**				**Eastbound**				**Westbound**				**Entering**				**Leaving**			
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	NB	SB	EB	WB	NB	SB	EB	WB
0	0	0	0	3	0	4	0	4	901	0	0	0	376	5	0	0	7	905	381	0	9	380	904
Percent Heavy Vehicles																							
0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	NaN	0.0%	0.4%	0.8%	NaN	0.0%	0.8%	0.4%

PHV- Bicycles																	PHV - Pedestrians				
Northbound				**Southbound**				**Eastbound**				**Westbound**					in Crosswalk				
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	**Sum**	NB	SB	EB	WB	**Sum**
				0		0	0	0	0		0		1	0	0	1		0	0	0	0

All Vehicle Volumes																		
	Northbound				**Southbound**				**Eastbound**				**Westbound**					
					Strawberry Ln				W Airport Rd				W Airport Rd				15 Min	1 HR
Time	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Sum	Sum
04:00:00 PM					0		0	0	1	70		0		26	0	0		
04:05:00 PM					0		1	0	0	78		0		26	0	0		
04:10:00 PM					0		1	0	0	69		0		30	0	0	302	
04:15:00 PM					0		0	0	0	63		0		32	1	0	301	
04:20:00 PM					0		0	0	0	72		0		27	1	0	296	
04:25:00 PM					0		0	0	0	82		0		26	0	0	304	
04:30:00 PM					0		0	0	0	82		0		27	1	0	318	
04:35:00 PM					0		0	0	0	72		0		33	0	0	323	
04:40:00 PM					0		0	0	1	71		0		32	1	0	320	
04:45:00 PM					0		0	0	0	62		0		36	1	0	309	
04:50:00 PM					0		0	0	1	72		0		22	0	0	299	
04:55:00 PM					0		1	0	1	61		0		31	0	0	288	1214
05:00:00 PM					0		0	0	0	80		0		39	1	0	309	1237
05:05:00 PM					0		1	0	0	73		0		34	0	0	322	1240
05:10:00 PM					2		1	0	0	68		0		35	0	0	334	1246
05:15:00 PM					0		0	0	1	82		0		34	0	0	331	1267
05:20:00 PM					0		1	0	0	82		0		23	0	0	329	1273
05:25:00 PM					1		0	0	0	96		0		30	1	0	351	1293
05:30:00 PM					0		0	0	0	51		0		31	1	0	317	1266
05:35:00 PM					0		0	0	0	68		0		27	0	0	306	1256
05:40:00 PM					0		0	0	0	66		0		38	0	0	282	1255
05:45:00 PM					0		0	0	0	65		0		37	0	0	301	1258
05:50:00 PM					0		0	0	0	65		0		30	0	0	301	1258
05:55:00 PM					0		0	0	3	64		0		39	1	0	304	1271

KEY DATA NETWORK

Data Provided by K-D-N.com 503-594-4224	
N/S street	*Stoltz Hill Rd*
E/W street	*Airport Rd*
City, State	Lebanon OR
Site Notes	
Location	44.526573 - -122.91979
Start Date	Wednesday, October 23, 2019
Start Time	04:00:00 PM
Weather	
Study ID #	
Peak Hour Start	04:30:00 PM
Peak 15 Min Start	05:15:00 PM
PHF (15-Min Int)	0.90



Peak-Hour Volumes (PHV)

Northbound				Southbound				Eastbound				Westbound				Entering				Leaving			
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	NB	SB	EB	WB	NB	SB	EB	WB
69	0	43	0	0	0	0	0	0	579	323	0	48	310	0	0	112	0	902	358	371	0	379	622

Percent Heavy Vehicles

1.4%	0.0%	2.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	2.1%	0.0%	0.0%	0.0%	1.8%	0.0%	0.1%	0.3%	0.3%	0.0%	0.3%	0.3%

PHV- Bicycles / PHV - Pedestrians

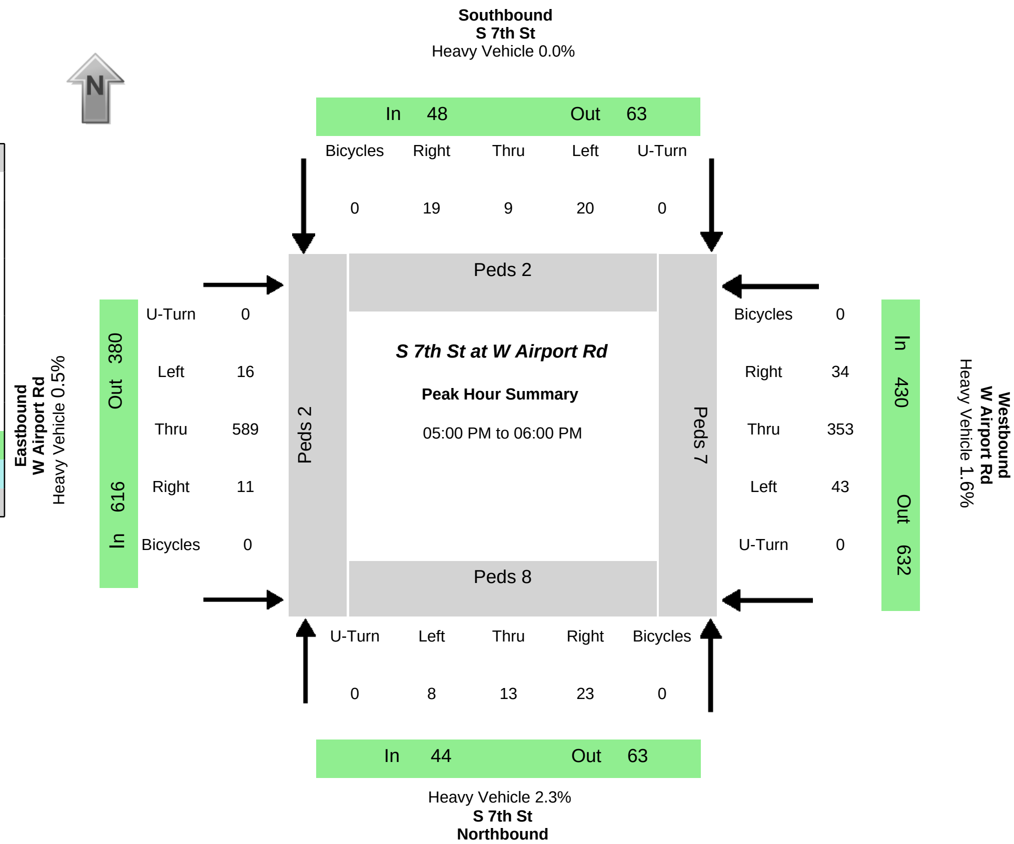
Northbound				Southbound				Eastbound				Westbound					in Crosswalk				
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Sum	NB	SB	EB	WB	Sum
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2

All Vehicle Volumes

	Northbound Stoltz Hill Rd				Southbound Stoltz Hill Rd				Eastbound Airport Rd				Westbound Airport Rd				15 Min	1 HR
Time	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Sum	Sum
04:00:00 PM	6	0	3	0	0	0	0	0	0	51	15	0	0	20	0	0		
04:05:00 PM	10	0	1	0	0	0	0	0	0	53	25	0	3	16	0	0		
04:10:00 PM	13	0	2	0	0	0	0	0	0	42	26	0	3	16	0	0	305	
04:15:00 PM	7	0	2	0	0	0	0	0	0	41	24	0	3	25	0	0	312	
04:20:00 PM	3	0	3	0	0	0	0	0	0	49	21	0	4	24	0	0	308	
04:25:00 PM	4	0	3	0	0	0	0	0	0	45	38	0	2	22	0	0	320	
04:30:00 PM	3	0	2	0	0	0	0	0	0	52	28	0	2	28	0	0	333	
04:35:00 PM	5	0	3	0	0	0	0	0	0	46	30	0	0	26	0	0	339	
04:40:00 PM	5	0	2	0	0	0	0	0	0	49	24	0	4	28	0	0	337	
04:45:00 PM	7	0	7	0	0	0	0	0	0	41	21	0	2	31	0	0	331	
04:50:00 PM	5	0	4	0	0	0	0	0	0	46	23	0	5	16	0	0	320	
04:55:00 PM	6	0	3	0	0	0	0	0	0	39	23	0	4	25	0	0	308	1270
05:00:00 PM	10	0	3	0	0	0	0	0	0	48	31	0	3	30	0	0	324	1300
05:05:00 PM	9	0	3	0	0	0	0	0	0	36	35	0	4	23	0	0	335	1302
05:10:00 PM	8	0	4	0	0	0	0	0	0	49	22	0	2	27	0	0	347	1312
05:15:00 PM	4	0	2	0	0	0	0	0	0	57	25	0	7	29	0	0	346	1334
05:20:00 PM	5	0	6	0	0	0	0	0	0	63	20	0	12	19	0	0	361	1355
05:25:00 PM	2	0	4	0	0	0	0	0	0	53	41	0	3	28	0	0	380	1372
05:30:00 PM	11	0	6	0	0	0	0	0	0	37	19	0	4	21	0	0	354	1355
05:35:00 PM	6	0	3	0	0	0	0	0	0	49	17	0	2	21	0	0	327	1343
05:40:00 PM	8	0	5	0	0	0	0	0	0	39	29	0	4	33	0	0	314	1349
05:45:00 PM	5	0	4	0	0	0	0	0	0	45	17	0	1	31	0	0	319	1343
05:50:00 PM	4	0	4	0	0	0	0	0	0	46	24	0	5	27	0	0	331	1354
05:55:00 PM	8	0	1	0	0	0	0	0	0	44	16	0	5	31	0	0	318	1359

KEY DATA NETWORK

Data Provided by K-D-N.com 503-594-4224	
N/S street	*S 7th St*
E/W street	*W Airport Rd*
City, State	Lebanon OR
Site Notes	
Location	44.526723 - -122.916107
Start Date	Wednesday, October 23, 2019
Start Time	04:00:00 PM
Weather	
Study ID #	
Peak Hour Start	05:00:00 PM
Peak 15 Min Start	05:15:00 PM
PHF (15-Min Int)	0.92



Peak-Hour Volumes (PHV)

Northbound				Southbound				Eastbound				Westbound				Entering				Leaving			
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	NB	SB	EB	WB	NB	SB	EB	WB
8	13	23	0	20	9	19	0	16	589	11	0	43	353	34	0	44	48	616	430	63	63	380	632
Percent Heavy Vehicles																							
0.0%	0.0%	4.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	2.0%	0.0%	0.0%	2.3%	0.0%	0.5%	1.6%	0.0%	0.0%	1.8%	0.6%

PHV- Bicycles																	PHV - Pedestrians				
Northbound				Southbound				Eastbound				Westbound					in Crosswalk				
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Sum	NB	SB	EB	WB	Sum
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	2	2	7	19

All Vehicle Volumes

	Northbound S 7th St				Southbound S 7th St				Eastbound W Airport Rd				Westbound W Airport Rd				15 Min	1 HR
Time	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Sum	Sum
04:00:00 PM	0	1	0	0	2	0	1	0	3	47	2	0	1	17	1	0		
04:05:00 PM	0	0	3	0	0	1	1	0	2	51	2	0	0	21	3	0		
04:10:00 PM	0	0	1	0	2	0	2	0	1	44	0	0	1	21	4	0	235	
04:15:00 PM	1	2	3	0	5	2	1	0	1	43	2	0	4	23	0	0	247	
04:20:00 PM	1	0	1	0	3	2	0	0	0	45	1	0	10	31	2	0	259	
04:25:00 PM	2	2	4	0	1	1	2	0	1	46	4	0	2	27	4	0	279	
04:30:00 PM	0	2	4	0	1	2	1	0	1	49	1	0	4	21	5	0	283	
04:35:00 PM	0	0	2	0	1	2	1	0	2	52	1	0	4	28	7	0	287	
04:40:00 PM	1	0	0	0	2	1	2	0	1	49	3	0	3	26	0	0	279	
04:45:00 PM	1	2	2	0	1	1	1	0	3	42	0	0	2	29	2	0	274	
04:50:00 PM	0	1	1	0	2	0	1	0	1	42	2	0	4	22	4	0	254	
04:55:00 PM	2	1	1	0	1	1	3	0	2	43	0	0	5	25	7	0	257	1050
05:00:00 PM	1	1	0	0	2	0	2	0	1	48	1	0	2	27	2	0	258	1062
05:05:00 PM	1	0	1	0	3	1	0	0	2	41	2	0	4	29	3	0	265	1065
05:10:00 PM	0	0	3	0	0	0	0	0	1	49	1	0	3	33	1	0	265	1080
05:15:00 PM	0	2	1	0	3	1	3	0	1	59	1	0	3	32	4	0	288	1103
05:20:00 PM	0	0	1	0	0	0	4	0	3	66	0	0	3	24	0	0	302	1108
05:25:00 PM	1	0	2	0	3	2	1	0	0	50	1	0	5	31	3	0	310	1111
05:30:00 PM	0	3	6	0	2	2	3	0	2	42	2	0	0	25	5	0	292	1112
05:35:00 PM	1	1	3	0	2	0	1	0	1	48	1	0	5	22	4	0	280	1101
05:40:00 PM	2	1	3	0	2	1	4	0	0	53	0	0	3	33	3	0	286	1118
05:45:00 PM	1	3	2	0	2	1	0	0	3	43	0	0	1	29	2	0	281	1119
05:50:00 PM	0	1	1	0	0	1	1	0	1	47	1	0	3	32	4	0	284	1131
05:55:00 PM	1	1	0	0	1	0	0	0	1	43	1	0	11	36	3	0	277	1138

Appendix C – HCM Intersection Analysis Reports

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	2	331	617	2	4	4
Future Vol, veh/h	2	331	617	2	4	4
Conflicting Peds, #/hr	0	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	2	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	5	2	50	0	25
Mvmt Flow	2	368	686	2	4	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	688	0	-	0	1059	688
Stage 1	-	-	-	-	687	-
Stage 2	-	-	-	-	372	-
Critical Hdwy	4.1	-	-	-	6.4	6.45
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.525
Pot Cap-1 Maneuver	916	-	-	-	251	409
Stage 1	-	-	-	-	503	-
Stage 2	-	-	-	-	702	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	916	-	-	-	250	409
Mov Cap-2 Maneuver	-	-	-	-	437	-
Stage 1	-	-	-	-	502	-
Stage 2	-	-	-	-	702	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	13.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	916	-	-	-	423
HCM Lane V/C Ratio	0.002	-	-	-	0.021
HCM Control Delay (s)	8.9	-	-	-	13.7
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	5.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	259	78	50	416	201	50
Future Vol, veh/h	259	78	50	416	201	50
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	2	3	6	1	2	8
Mvmt Flow	301	91	58	484	234	58

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	392	0	947	347
Stage 1	-	-	-	-	347	-
Stage 2	-	-	-	-	600	-
Critical Hdwy	-	-	4.16	-	6.42	6.28
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.254	-	3.518	3.372
Pot Cap-1 Maneuver	-	-	1145	-	290	683
Stage 1	-	-	-	-	716	-
Stage 2	-	-	-	-	548	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1145	-	275	683
Mov Cap-2 Maneuver	-	-	-	-	455	-
Stage 1	-	-	-	-	716	-
Stage 2	-	-	-	-	520	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	22.8
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	487	-	-	1145	-
HCM Lane V/C Ratio	0.599	-	-	0.051	-
HCM Control Delay (s)	22.8	-	-	8.3	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	3.9	-	-	0.2	-

Intersection	
Int Delay, s/veh	4.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	38	261	23	65	414	36	16	25	83	5	17	18
Future Vol, veh/h	38	261	23	65	414	36	16	25	83	5	17	18
Conflicting Peds, #/hr	8	0	3	3	0	8	23	0	0	0	0	23
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	100	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	77	77	77	77	77	77	77	77	77
Heavy Vehicles, %	16	3	9	2	2	8	6	4	2	40	18	11
Mvmt Flow	49	339	30	84	538	47	21	32	108	6	22	23

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	593	0	0	372	0	0	1230	1216	357	1260	1208	593
Stage 1	-	-	-	-	-	-	455	455	-	738	738	-
Stage 2	-	-	-	-	-	-	775	761	-	522	470	-
Critical Hdwy	4.26	-	-	4.12	-	-	7.16	6.54	6.22	7.5	6.68	6.31
Critical Hdwy Stg 1	-	-	-	-	-	-	6.16	5.54	-	6.5	5.68	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.16	5.54	-	6.5	5.68	-
Follow-up Hdwy	2.344	-	-	2.218	-	-	3.554	4.036	3.318	3.86	4.162	3.399
Pot Cap-1 Maneuver	918	-	-	1186	-	-	152	179	687	123	171	489
Stage 1	-	-	-	-	-	-	577	565	-	356	401	-
Stage 2	-	-	-	-	-	-	385	411	-	475	534	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	912	-	-	1183	-	-	121	156	685	79	149	476
Mov Cap-2 Maneuver	-	-	-	-	-	-	121	156	-	213	295	-
Stage 1	-	-	-	-	-	-	545	533	-	335	370	-
Stage 2	-	-	-	-	-	-	314	379	-	356	504	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.1	1	22.4	17.7
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	121	384	912	-	-	1183	-	-	336
HCM Lane V/C Ratio	0.172	0.365	0.054	-	-	0.071	-	-	0.155
HCM Control Delay (s)	40.8	19.7	9.2	-	-	8.3	-	-	17.7
HCM Lane LOS	E	C	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.6	1.6	0.2	-	-	0.2	-	-	0.5

Intersection						
Int Delay, s/veh	0.1					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	4	901	376	5	3	4
Future Vol, veh/h	4	901	376	5	3	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	2	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	1	0	0	0
Mvmt Flow	4	979	409	5	3	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	414	0	-	0	1399	412
Stage 1	-	-	-	-	412	-
Stage 2	-	-	-	-	987	-
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	1156	-	-	-	156	644
Stage 1	-	-	-	-	673	-
Stage 2	-	-	-	-	364	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1156	-	-	-	156	644
Mov Cap-2 Maneuver	-	-	-	-	325	-
Stage 1	-	-	-	-	671	-
Stage 2	-	-	-	-	364	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	13.1
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1156	-	-	-	453
HCM Lane V/C Ratio	0.004	-	-	-	0.017
HCM Control Delay (s)	8.1	-	-	-	13.1
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	579	323	48	310	69	43
Future Vol, veh/h	579	323	48	310	69	43
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	2	0	1	2
Mvmt Flow	643	359	53	344	77	48

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1002	0	1273	823
Stage 1	-	-	-	-	823	-
Stage 2	-	-	-	-	450	-
Critical Hdwy	-	-	4.12	-	6.41	6.22
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.218	-	3.509	3.318
Pot Cap-1 Maneuver	-	-	691	-	186	373
Stage 1	-	-	-	-	433	-
Stage 2	-	-	-	-	644	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	691	-	172	373
Mov Cap-2 Maneuver	-	-	-	-	364	-
Stage 1	-	-	-	-	433	-
Stage 2	-	-	-	-	594	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.4	19.8
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	367	-	-	691	-
HCM Lane V/C Ratio	0.339	-	-	0.077	-
HCM Control Delay (s)	19.8	-	-	10.6	-
HCM Lane LOS	C	-	-	B	-
HCM 95th %tile Q(veh)	1.5	-	-	0.2	-

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	16	589	11	43	353	34	8	13	23	20	9	19
Future Vol, veh/h	16	589	11	43	353	34	8	13	23	20	9	19
Conflicting Peds, #/hr	8	0	2	2	0	8	7	0	2	2	0	7
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	100	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	1	0	0	2	0	0	0	4	0	0	0
Mvmt Flow	17	640	12	47	384	37	9	14	25	22	10	21

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	429	0	0	654	0	0	1201	1205	650	1207	1193	418
Stage 1	-	-	-	-	-	-	682	682	-	505	505	-
Stage 2	-	-	-	-	-	-	519	523	-	702	688	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.24	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.336	3.5	4	3.3
Pot Cap-1 Maneuver	1141	-	-	943	-	-	163	185	466	162	188	639
Stage 1	-	-	-	-	-	-	443	453	-	553	544	-
Stage 2	-	-	-	-	-	-	544	534	-	432	450	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1133	-	-	941	-	-	146	171	464	135	174	631
Mov Cap-2 Maneuver	-	-	-	-	-	-	146	171	-	296	332	-
Stage 1	-	-	-	-	-	-	435	445	-	541	513	-
Stage 2	-	-	-	-	-	-	488	504	-	389	442	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.9	21.6	15.8
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	146	287	1133	-	-	941	-	-	385
HCM Lane V/C Ratio	0.06	0.136	0.015	-	-	0.05	-	-	0.136
HCM Control Delay (s)	31.2	19.5	8.2	-	-	9	-	-	15.8
HCM Lane LOS	D	C	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.2	0.5	0	-	-	0.2	-	-	0.5

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	2	339	631	2	4	4
Future Vol, veh/h	2	339	631	2	4	4
Conflicting Peds, #/hr	0	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	2	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	5	2	50	0	25
Mvmt Flow	2	377	701	2	4	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	703	0	-	0	1083	703
Stage 1	-	-	-	-	702	-
Stage 2	-	-	-	-	381	-
Critical Hdwy	4.1	-	-	-	6.4	6.45
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.525
Pot Cap-1 Maneuver	904	-	-	-	243	401
Stage 1	-	-	-	-	495	-
Stage 2	-	-	-	-	695	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	904	-	-	-	243	401
Mov Cap-2 Maneuver	-	-	-	-	429	-
Stage 1	-	-	-	-	494	-
Stage 2	-	-	-	-	695	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	13.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	904	-	-	-	415
HCM Lane V/C Ratio	0.002	-	-	-	0.021
HCM Control Delay (s)	9	-	-	-	13.9
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	6.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	265	80	51	426	206	51
Future Vol, veh/h	265	80	51	426	206	51
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	2	3	6	1	2	8
Mvmt Flow	308	93	59	495	240	59

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	401	0	968	355
Stage 1	-	-	-	-	355	-
Stage 2	-	-	-	-	613	-
Critical Hdwy	-	-	4.16	-	6.42	6.28
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.254	-	3.518	3.372
Pot Cap-1 Maneuver	-	-	1136	-	282	676
Stage 1	-	-	-	-	710	-
Stage 2	-	-	-	-	541	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1136	-	267	676
Mov Cap-2 Maneuver	-	-	-	-	448	-
Stage 1	-	-	-	-	710	-
Stage 2	-	-	-	-	513	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	24.1
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	480	-	-	1136	-
HCM Lane V/C Ratio	0.623	-	-	0.052	-
HCM Control Delay (s)	24.1	-	-	8.3	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	4.2	-	-	0.2	-

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	39	267	24	66	424	37	16	26	85	5	17	18
Future Vol, veh/h	39	267	24	66	424	37	16	26	85	5	17	18
Conflicting Peds, #/hr	8	0	3	3	0	8	23	0	0	0	0	23
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	100	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	77	77	77	77	77	77	77	77	77
Heavy Vehicles, %	16	3	9	2	2	8	6	4	2	40	18	11
Mvmt Flow	51	347	31	86	551	48	21	34	110	6	22	23

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	607	0	0	381	0	0	1261	1247	366	1292	1238	606
Stage 1	-	-	-	-	-	-	468	468	-	755	755	-
Stage 2	-	-	-	-	-	-	793	779	-	537	483	-
Critical Hdwy	4.26	-	-	4.12	-	-	7.16	6.54	6.22	7.5	6.68	6.31
Critical Hdwy Stg 1	-	-	-	-	-	-	6.16	5.54	-	6.5	5.68	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.16	5.54	-	6.5	5.68	-
Follow-up Hdwy	2.344	-	-	2.218	-	-	3.554	4.036	3.318	3.86	4.162	3.399
Pot Cap-1 Maneuver	907	-	-	1177	-	-	144	172	679	117	164	481
Stage 1	-	-	-	-	-	-	568	558	-	348	394	-
Stage 2	-	-	-	-	-	-	376	403	-	465	527	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	901	-	-	1174	-	-	114	149	677	73	142	469
Mov Cap-2 Maneuver	-	-	-	-	-	-	114	149	-	203	288	-
Stage 1	-	-	-	-	-	-	534	525	-	326	363	-
Stage 2	-	-	-	-	-	-	305	371	-	344	496	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.1	1	23.7	18
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	114	370	901	-	-	1174	-	-	328
HCM Lane V/C Ratio	0.182	0.39	0.056	-	-	0.073	-	-	0.158
HCM Control Delay (s)	43.5	20.8	9.2	-	-	8.3	-	-	18
HCM Lane LOS	E	C	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.6	1.8	0.2	-	-	0.2	-	-	0.6

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	4	922	385	5	3	4
Future Vol, veh/h	4	922	385	5	3	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	2	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	1	0	0	0
Mvmt Flow	4	1002	418	5	3	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	423	0	-	0	1431	421
Stage 1	-	-	-	-	421	-
Stage 2	-	-	-	-	1010	-
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	1147	-	-	-	150	637
Stage 1	-	-	-	-	667	-
Stage 2	-	-	-	-	355	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1147	-	-	-	150	637
Mov Cap-2 Maneuver	-	-	-	-	317	-
Stage 1	-	-	-	-	665	-
Stage 2	-	-	-	-	355	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	13.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1147	-	-	-	445
HCM Lane V/C Ratio	0.004	-	-	-	0.017
HCM Control Delay (s)	8.2	-	-	-	13.2
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection						
Int Delay, s/veh	2					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	592	331	49	317	71	44
Future Vol, veh/h	592	331	49	317	71	44
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	2	0	1	2
Mvmt Flow	658	368	54	352	79	49

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1026	0	1302	842
Stage 1	-	-	-	-	842	-
Stage 2	-	-	-	-	460	-
Critical Hdwy	-	-	4.12	-	6.41	6.22
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.218	-	3.509	3.318
Pot Cap-1 Maneuver	-	-	677	-	178	364
Stage 1	-	-	-	-	424	-
Stage 2	-	-	-	-	638	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	677	-	164	364
Mov Cap-2 Maneuver	-	-	-	-	356	-
Stage 1	-	-	-	-	424	-
Stage 2	-	-	-	-	587	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.4	20.5
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	359	-	-	677	-
HCM Lane V/C Ratio	0.356	-	-	0.08	-
HCM Control Delay (s)	20.5	-	-	10.8	-
HCM Lane LOS	C	-	-	B	-
HCM 95th %tile Q(veh)	1.6	-	-	0.3	-

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	16	603	11	44	361	35	8	13	24	20	9	19
Future Vol, veh/h	16	603	11	44	361	35	8	13	24	20	9	19
Conflicting Peds, #/hr	8	0	2	2	0	8	7	0	2	2	0	7
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	100	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	1	0	0	2	0	0	0	4	0	0	0
Mvmt Flow	17	655	12	48	392	38	9	14	26	22	10	21

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	438	0	0	669	0	0	1227	1231	665	1232	1218	426
Stage 1	-	-	-	-	-	-	697	697	-	515	515	-
Stage 2	-	-	-	-	-	-	530	534	-	717	703	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.24	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.336	3.5	4	3.3
Pot Cap-1 Maneuver	1133	-	-	931	-	-	157	179	457	155	182	633
Stage 1	-	-	-	-	-	-	435	446	-	546	538	-
Stage 2	-	-	-	-	-	-	536	528	-	424	443	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1125	-	-	929	-	-	140	166	455	129	168	625
Mov Cap-2 Maneuver	-	-	-	-	-	-	140	166	-	287	325	-
Stage 1	-	-	-	-	-	-	428	438	-	534	506	-
Stage 2	-	-	-	-	-	-	479	497	-	380	435	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.9	22.1	16.1
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	140	282	1125	-	-	929	-	-	376
HCM Lane V/C Ratio	0.062	0.143	0.015	-	-	0.051	-	-	0.139
HCM Control Delay (s)	32.4	19.9	8.2	-	-	9.1	-	-	16.1
HCM Lane LOS	D	C	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.2	0.5	0	-	-	0.2	-	-	0.5

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↱		Y	
Traffic Vol, veh/h	2	342	642	2	4	4
Future Vol, veh/h	2	342	642	2	4	4
Conflicting Peds, #/hr	0	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	2	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	5	2	50	0	25
Mvmt Flow	2	380	713	2	4	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	715	0	-	0	1098	715
Stage 1	-	-	-	-	714	-
Stage 2	-	-	-	-	384	-
Critical Hdwy	4.1	-	-	-	6.4	6.45
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.525
Pot Cap-1 Maneuver	895	-	-	-	238	394
Stage 1	-	-	-	-	489	-
Stage 2	-	-	-	-	693	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	895	-	-	-	238	394
Mov Cap-2 Maneuver	-	-	-	-	424	-
Stage 1	-	-	-	-	488	-
Stage 2	-	-	-	-	693	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	14
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	895	-	-	-	408
HCM Lane V/C Ratio	0.002	-	-	-	0.022
HCM Control Delay (s)	9	-	-	-	14
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	12.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	265	80	51	426	4	206	1	51	13	4	11
Future Vol, veh/h	3	265	80	51	426	4	206	1	51	13	4	11
Conflicting Peds, #/hr	4	0	0	0	0	4	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	1	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	0	2	3	6	1	0	2	0	8	0	0	0
Mvmt Flow	3	308	93	59	495	5	240	1	59	15	5	13

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	504	0	0	401	0	0	986	983	355	1011	1027	502
Stage 1	-	-	-	-	-	-	361	361	-	620	620	-
Stage 2	-	-	-	-	-	-	625	622	-	391	407	-
Critical Hdwy	4.1	-	-	4.16	-	-	7.12	6.5	6.28	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.254	-	-	3.518	4	3.372	3.5	4	3.3
Pot Cap-1 Maneuver	1071	-	-	1136	-	-	~ 227	251	676	220	236	573
Stage 1	-	-	-	-	-	-	657	629	-	479	483	-
Stage 2	-	-	-	-	-	-	473	482	-	637	601	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1067	-	-	1136	-	-	~ 209	236	676	191	222	571
Mov Cap-2 Maneuver	-	-	-	-	-	-	326	342	-	191	222	-
Stage 1	-	-	-	-	-	-	655	627	-	476	456	-
Stage 2	-	-	-	-	-	-	434	455	-	578	599	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.9	48.1	20.4
HCM LOS			E	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	363	1067	-	-	1136	-	-	266
HCM Lane V/C Ratio	0.826	0.003	-	-	0.052	-	-	0.122
HCM Control Delay (s)	48.1	8.4	-	-	8.3	-	-	20.4
HCM Lane LOS	E	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	7.4	0	-	-	0.2	-	-	0.4

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	40	278	25	66	428	37	16	26	85	5	17	18
Future Vol, veh/h	40	278	25	66	428	37	16	26	85	5	17	18
Conflicting Peds, #/hr	8	0	3	3	0	8	23	0	0	0	0	23
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	100	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	77	77	77	77	77	77	77	77	77
Heavy Vehicles, %	16	3	9	2	2	8	6	4	2	40	18	11
Mvmt Flow	52	361	32	86	556	48	21	34	110	6	22	23

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	612	0	0	396	0	0	1282	1268	380	1313	1260	611
Stage 1	-	-	-	-	-	-	484	484	-	760	760	-
Stage 2	-	-	-	-	-	-	798	784	-	553	500	-
Critical Hdwy	4.26	-	-	4.12	-	-	7.16	6.54	6.22	7.5	6.68	6.31
Critical Hdwy Stg 1	-	-	-	-	-	-	6.16	5.54	-	6.5	5.68	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.16	5.54	-	6.5	5.68	-
Follow-up Hdwy	2.344	-	-	2.218	-	-	3.554	4.036	3.318	3.86	4.162	3.399
Pot Cap-1 Maneuver	903	-	-	1163	-	-	139	167	667	113	159	478
Stage 1	-	-	-	-	-	-	557	549	-	346	392	-
Stage 2	-	-	-	-	-	-	374	401	-	456	517	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	897	-	-	1160	-	-	110	144	665	69	137	466
Mov Cap-2 Maneuver	-	-	-	-	-	-	110	144	-	198	283	-
Stage 1	-	-	-	-	-	-	524	516	-	324	361	-
Stage 2	-	-	-	-	-	-	303	369	-	335	486	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.1	1	24.5	18.3
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	110	360	897	-	-	1160	-	-	323
HCM Lane V/C Ratio	0.189	0.4	0.058	-	-	0.074	-	-	0.161
HCM Control Delay (s)	45.2	21.5	9.3	-	-	8.4	-	-	18.3
HCM Lane LOS	E	C	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.7	1.9	0.2	-	-	0.2	-	-	0.6

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	4	933	391	5	3	4
Future Vol, veh/h	4	933	391	5	3	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	2	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	1	0	0	0
Mvmt Flow	4	1014	425	5	3	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	430	0	-	0	1450	428
Stage 1	-	-	-	-	428	-
Stage 2	-	-	-	-	1022	-
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	1140	-	-	-	146	631
Stage 1	-	-	-	-	662	-
Stage 2	-	-	-	-	350	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1140	-	-	-	145	631
Mov Cap-2 Maneuver	-	-	-	-	312	-
Stage 1	-	-	-	-	659	-
Stage 2	-	-	-	-	350	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	13.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1140	-	-	-	439
HCM Lane V/C Ratio	0.004	-	-	-	0.017
HCM Control Delay (s)	8.2	-	-	-	13.3
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	3.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	11	592	331	49	317	12	71	4	44	8	2	6
Future Vol, veh/h	11	592	331	49	317	12	71	4	44	8	2	6
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	1	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	2	0	0	1	0	2	0	0	0
Mvmt Flow	12	658	368	54	352	13	79	4	49	9	2	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	367	0	0	1026	0	0	1337	1341	842	1362	1519	361
Stage 1	-	-	-	-	-	-	866	866	-	469	469	-
Stage 2	-	-	-	-	-	-	471	475	-	893	1050	-
Critical Hdwy	4.1	-	-	4.12	-	-	7.11	6.5	6.22	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.11	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.11	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.218	-	-	3.509	4	3.318	3.5	4	3.3
Pot Cap-1 Maneuver	1203	-	-	677	-	-	131	154	364	126	120	688
Stage 1	-	-	-	-	-	-	349	373	-	579	564	-
Stage 2	-	-	-	-	-	-	575	561	-	339	307	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1201	-	-	677	-	-	119	140	364	100	109	687
Mov Cap-2 Maneuver	-	-	-	-	-	-	240	256	-	100	109	-
Stage 1	-	-	-	-	-	-	346	369	-	572	518	-
Stage 2	-	-	-	-	-	-	522	515	-	287	304	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	1.4	29.6	32.4
HCM LOS			D	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	275	1201	-	-	677	-	-	149
HCM Lane V/C Ratio	0.481	0.01	-	-	0.08	-	-	0.119
HCM Control Delay (s)	29.6	8	-	-	10.8	-	-	32.4
HCM Lane LOS	D	A	-	-	B	-	-	D
HCM 95th %tile Q(veh)	2.4	0	-	-	0.3	-	-	0.4

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	17	609	12	44	371	35	9	13	24	20	9	20
Future Vol, veh/h	17	609	12	44	371	35	9	13	24	20	9	20
Conflicting Peds, #/hr	8	0	2	2	0	8	7	0	2	2	0	7
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	100	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	1	0	0	2	0	0	0	4	0	0	0
Mvmt Flow	18	662	13	48	403	38	10	14	26	22	10	22

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	449	0	0	677	0	0	1248	1252	673	1253	1239	437
Stage 1	-	-	-	-	-	-	707	707	-	526	526	-
Stage 2	-	-	-	-	-	-	541	545	-	727	713	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.24	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.336	3.5	4	3.3
Pot Cap-1 Maneuver	1122	-	-	924	-	-	152	174	452	150	177	624
Stage 1	-	-	-	-	-	-	429	441	-	539	532	-
Stage 2	-	-	-	-	-	-	529	522	-	419	438	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1115	-	-	922	-	-	135	161	450	124	164	616
Mov Cap-2 Maneuver	-	-	-	-	-	-	135	161	-	283	321	-
Stage 1	-	-	-	-	-	-	421	433	-	527	501	-
Stage 2	-	-	-	-	-	-	472	491	-	375	430	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.9	22.9	16.2
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	135	276	1115	-	-	922	-	-	374
HCM Lane V/C Ratio	0.072	0.146	0.017	-	-	0.052	-	-	0.142
HCM Control Delay (s)	33.7	20.3	8.3	-	-	9.1	-	-	16.2
HCM Lane LOS	D	C	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.2	0.5	0.1	-	-	0.2	-	-	0.5

AGENDA ITEM

5.b.

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MEMORANDUM

Community Development

To: Charmain Salvage and Planning Commissioners — Date: April 10, 2020

From: Kelly Hart, Community Development Director

Subject: Proposal to operate a fuel (propane) storage and distribution facility with access to the railroad for the property located at 101 Industrial Way.
Applications: CU-20-01

I. BACKGROUND

The subject property is generally located at the east end of Industrial Way, and the north end of Williams Street. The subject site is a lease area toward the north end of the Rick Franklin Railroad Yard. The Applicant, CoEnergy Propane, is proposing to utilize the lease area for a propane fuel storage and distribution facility. Under consideration is an application for a Conditional Use Permit for a fuel distribution and storage facility as required per Section 16.09.070 of the Lebanon Development Code.

II. CURRENT REPORT

Project Location and Zoning Designation – The subject lease area is approximately 1.69 acres located toward the north end of the Rick Franklin Railyard. Entrance to the lease area would be from the northern terminus of Williams street. The property is zoned Industrial (Z-IND). Surrounding the lease area to the north is a largely vacant area that is utilized for storage associated with the railyard located in the Z-IND zone; to the south is the railyard operations and offices located in the Z-IND zone; to the east is vacant property in the Z-IND zone, and to the west is a cemetery, and further west is the Samaritan Hospital campus, both uses located in the Public Use (Z-PU) zone.

Use Proposal – The Applicant is proposing to establish a propane storage and distribution facility. The use would include a 60,000 gallon above-ground storage tank for the on-site storage of liquid propane. The tank would generally be located in the northwest corner of the leasehold area, and adjacent to the rail line. The tank would be installed on a concrete foundation, with concrete bollards placed every four feet around the perimeter of the tank.

The tank would have a rail tower installed to allow for the propane tank to be refueled from the rail line. In addition, the site would be accessed from Williams Street for distribution trucks to be able to fill the smaller truck tanks from the on-site storage tank from a second valve source facing the interior of the property. The site is 1.69 acres and provides sufficient area for trucks to fully maneuver and turn around to allow for proper vehicle circulation on-site.

For the fueling procedure, it would be through a closed system, where a hose is connected to the storage tank and the truck or rail tank. Once connected, the valve would be opened to fill the tank. Upon completion of fueling, the valve would be closed, and the hose lines would be disconnected. As identified on the provided plans, there are safety protocols in place, including an emergency shutdown switch, fire extinguisher rated for propane fires, and crash protection bollards. In terms of staffing, the site would be considered "unmanned" as there are no staff on-site. The train operators and truck drivers that would be fueling the tank, or discharging to the truck all require training and certifications prior to operating the tank.

For additional safety considerations, federal regulations indicate that the tank must be at least 75 feet away from a building that is suitable for human occupation. As proposed, the storage tank would be located approximately 842 feet from the closest building on the Samaritan Hospital Campus to the west, and 850 to the office buildings for the railyard to the south. All required State permits would be necessary to be obtained prior to issuance of a certificate of occupancy. The State Fire Marshal would be the permitting agent for the storage of hazardous materials.

III. REVIEW CRITERIA AND RECOMMENDED FINDINGS

The Applicant is requesting consideration of a Conditional Use Permit (CU-20-01) for the operation of a fuel (propane) distribution and storage yard. Section 16.21.060 of the Lebanon Development Code establishes the Decision Criteria for consideration of Conditional Use Permits.

1. The application complies with all of the applicable provisions of the underlying Land Use Zones (LDC Chapters 16.09.110), including: building and yard setbacks, lot area and dimensions, density and floor area, lot coverage, building height, building orientation, architecture, and other special standards as may be required for certain land uses.

   RECOMMENDED FINDING: The lease area is located within the Industrial zone. There is no minimum lot area or lot coverage in the industrial zone. The use for the fuel storage yard and distribution does not include the construction or use of structures, therefore the application complies with the required building setbacks, height and orientation. A perimeter fence will be provided to provide security measures for the property, and the fence would be installed up to a maximum height of 10 feet in compliance with Section 16.09.110.B.4 of the Lebanon Development Code (LDC).

2. The site size, dimensions, location, topography and access are adequate for the needs of the proposed use, considering the proposed building mass, parking, traffic, noise, vibration, exhaust/emissions, light, glare, erosion, odor, dust, visibility, safety, and aesthetic considerations.

   RECOMMENDED FINDING: The subject lease area is located north of the terminus of Williams Street, and is part of the Rick Franklin railyard, a heavy industrial site. The lease area is approximately 1.69 acres in size. The use would be for the storage of a 60,000 gallon propane tank for the purposes of propane distribution through trucks, with the tank refueling from a rail car. The site is approximately 200 feet wide and 300 feet deep, which provides sufficient area for trucks to enter and maneuver through the site, then exit in a forward motion. The only noise generated from the site would be that generated from trucks entering and exiting the site. With the storage tank, the fueling and distribution process is through a closed system, so there would be no odor generated from the site. Safety measures have been included in the installation including an emergency shutdown switch, crash protection bollards, and fire extinguishers on-site. The tank would not be visible from the public right-of-way, and would be located at least 840 from the nearest structure, so there is no anticipated impacts on light, glare, visibility or aesthetic considerations. Based on the use and operations, the site would be of sufficient size to provide adequate access and safety considerations for the site and surrounding properties and uses.

3. The negative impacts of the proposed use on adjacent properties and on the public can be mitigated through application of other Code standards, or other reasonable conditions of approval.

   RECOMMENDED FINDING: The proposed use includes the storage of a 60,000 gallon propane fuel tank, and the fuel distribution through trucks. The tank is located at least 842 feet from the nearest structure and is largely isolated. Based on the location of the tank and operation of the site, it is separated from uses on adjacent properties, and not accessible to the public. Based on the site configuration and location, there are no anticipated negative impacts to mitigate further beyond obtaining necessary permits and inspections through the State Fire Marshal.

4. All required public facilities have adequate capacity to serve the proposal.

   RECOMMENDED FINDING: Sanitary sewer, water and storm drain are all available at the end of Williams Street. There are a number of fire hydrants located within the general vicinity to provide fire suppression services. Through the permitting process with the State Fire Marshal, it will be determined if additional fire hydrants would be required to be provided. If so, there is sufficient capacity in the available water lines to accommodate the addition. As there are no facilities being built, there is no proposed connection to the city's sewer line. Based on the site development proposal, all required public facilities would be able to be provided, and have adequate capacity.

5. Existing conditions of approval required as part of a prior land use decision shall be met.

   RECOMMENDED FINDING: There are no known conditional use permits for the subject lease area.

6. The applicant shall be required to upgrade any existing development that does not comply with the applicable land use district standards, in conformance with Chapter 16.30, Non-conforming Use and Development.

   RECOMMENDED FINDING: There are no non-conforming conditions in the lease-hold area as the area is largely vacant, and previously utilized for outdoor storage.

7. The application complies with all of the Community Development Standards in LDC Chapters 16.12-16.19

   RECOMMENDED FINDING: The site is located at the terminus of Williams Street, and there are no public improvements or facilities proposed or required to provide appropriate access and service to the site. The site is 1.69 acres and largely vacant. The majority of the site would be utilized for the maneuvering of the fuel distribution trucks, and as proposed, there would be no on-site employees. As there is no office or storage structure, and no employees on-site, and the property is not open to the public, there is no identified parking provided on-site. As there are no development improvements associated with the use, there are no landscape improvements that would be required for the site. Finally, all signage would be required to meet the code requirements and a permit shall be obtained for any signs as required in Chapter 16.18 of the LDC.

IV. PUBLIC NOTIFICATION AND COMMENTS

A public notification for this project was issued on April 10, 2020. Due to the COVID-19 pandemic, the City will be conducting the public hearing process virtually. To provide the public ample time to review and comment on the application, the Planning Commission agenda was also posted online on April 10, 2020. Public comment will be accepted for the application until May 5, 2020. The comments will be made public and provided to the Planning Commission, applicant, and public for review, prior to concluding the public hearing process on May 7, 2020. As the staff report was prepared and released at the same time as the public notice, there are no public comments to incorporate in the report.

V. CONCLUSION AND RECOMMENDED CONDITIONS FOR DEVELOPMENT

Staff finds the proposal complies with the decision criteria for Conditional Use Permit, and recommends approval of the application subject to the adoption of the following Conditions of Development:

The Planning Department conditions include, but may not be limited to:

1. Security fencing shall be provided along the perimeter of the leasehold area to a height of up to 10 feet.
2. Any future construction of employee shelter structures, or new construction shall meet the minimum development standards identified in the Lebanon Development Code and shall obtain all required City permits as applicable.
3. The maximum storage capacity of propane or other fuel source shall not exceed 70,000 gallons. An application for modification to the Conditional Use Permit would be required if it is requested to exceed the amount permitted.
4. The site shall be limited to access by authorized personnel only. The site shall not be accessible to the public.

The Lebanon Fire District conditions include, but may not be limited to:

1. All required permits through the State Fire Marshal shall be issued prior to issuance of certificate of occupancy.
2. A Knox Padlock shall be installed on all access gates to the property for appropriate fire access.
3. Appropriate access and turnaround per Fire Code shall be provided and continuously maintained to the satisfaction of the Lebanon Fire District.

The Engineering Department conditions include, but may not be limited to:

1. An Engineered Site Plan must be provided for review and approval prior to issuance of Building Permits.

V. RECOMMENDED ACTIONS

1. Evaluate the public testimony and the record established before the Planning Commission

2. Commission options:

    1. Approve the proposed Conditional Use Permit (CU-20-01) for the operation of a fuel distribution and storage yard, adopting the written findings for the decision criteria contained in the staff report with the conditions of development; or

    2. Approve the proposed Conditional Use Permit (CU-20-01) for the operation of a fuel distribution and storage yard, adopting modified findings for the decision criteria and conditions of development; or

    3. Deny the proposed Conditional Use Permit (CU-20-01) for the operation of a fuel distribution and storage yard, specifying reasons why the proposal fails to comply with the decision criteria; and

    4. Direct staff to prepare an Order of Recommendation for the Chair or Vice Chair's signature incorporating the adopted findings as approved by the Planning Commission.

VIRTUAL SPECIAL MEETING
NOTICE OF PUBLIC HEARING
LEBANON PLANNING COMMISSION

NOTICE IS HEREBY GIVEN that a public hearing will be held before the Lebanon Planning Commission on **Thursday, April 30, 2020 at 6:00 p.m. and Thursday, May 7, 2020 at 6:00pm** through a virtual (online) meeting to afford interested persons and the general public an opportunity to be heard and give testimony concerning the following matter:

Planning Case No.:	CU-20-01
Applicant:	Bryan Adams - CoEnergy
Location:	Industrial Way
Map & Tax Lot No.:	12S02W02 01412
Request:	Conditional Use
Decision Criteria:	Lebanon Development Code Chapters: 16.05 & 16.20

Request: The applicant is requesting approval of a Conditional Use Permit to operate a bulk propane storage and distribution facility.

Virtual Meeting: Due to the COVID-19 pandemic, the City will be hosting a virtual Planning Commission meeting and following the procedural guidance provided by the Oregon Department of Land Conservation and Development (DLCD) in compliance with Oregon Public Meeting Laws.

The public hearing will occur in two phases: on April 30, 2020 at 6:00pm, the Planning Commission will open the public hearing, receive Staff's report, and allow for the applicant to present. The Planning Commission will then postpone the public hearing to a date certain of Thursday, May 7, 2020 at 6:00pm. This will provide time to receive written and verbal comment from the public. The written and verbal comment will be received by City Staff until 5:00pm on Tuesday, May 5, 2020. The comments will then be read into the record and played for the Planning Commission at the May 7, 2020 meeting. The applicant will then be able to respond to the public comments. Once all comments are recorded as part of the meeting, and the applicant responds, the Planning Commission will close the public hearing, and deliberate on the application.

The public is invited to watch the meeting online through the City of Lebanon's YouTube page at https://www.youtube.com/watch?v=syhhvsLYBJ0 on April 30, 2020, and https://www.youtube.com/watch?v=-yEop1w5dgY on May 7, 2020. The City of Lebanon thanks you for your support in slowing the spread of COVID-19 by attending this public meeting digitally. For those that do not have access to a computer, there will be limited seating available at the Santiam Travel Station located at 750 S 3rd Street.

The Agenda and application materials will be available for review on the City's website at https://www.ci.lebanon.or.us/meetings by the end of the day on April 10, 2020.

Providing Comments: The City will be accepting public comment on this item in a number of ways to afford interested persons and the general public an opportunity to give testimony on the subject matter. Written and verbal testimony will be accepted upon issuance of this notice, **until 5:00pm on Tuesday, May 5, 2020**. Written testimony may be emailed to khart@ci.lebanon.or.us, or may be mailed to the City at 925 S. Main Street, Lebanon, OR 97355, or delivered to the City and dropped in the white mail box in front of City Hall. Please note for mailed testimony, the letter must be received by the City no later than 5:00pm on Tuesday, May 5, 2020. For verbal testimony, a recording may be provided to the City, or you may call (541) 258-4252 and leave a voice message. There will be no testimony accepted in person.

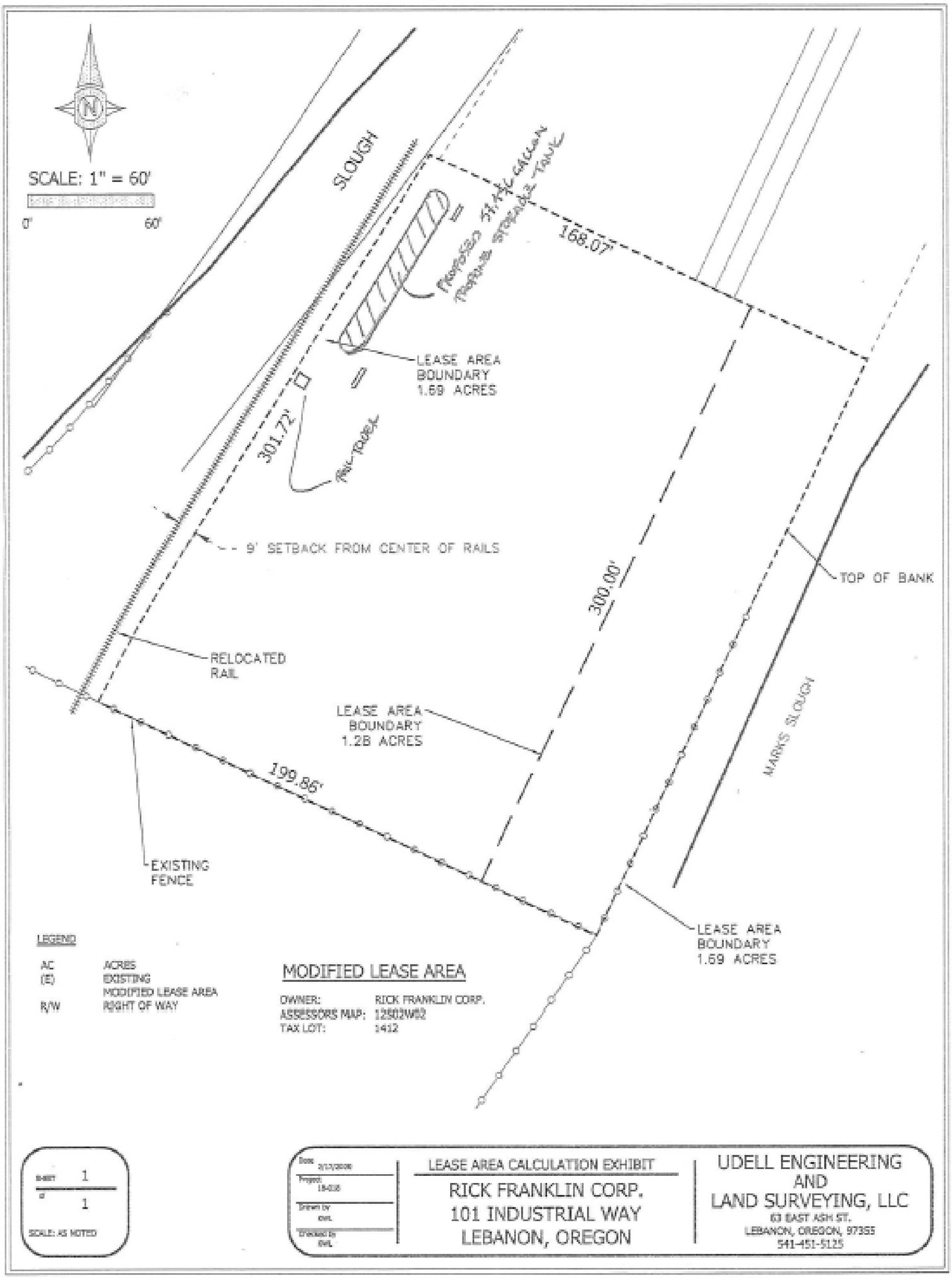
CITIZENS ARE INVITED TO PARTICIPATE in the public hearings and give written or oral testimony as described above that addresses applicable decision criteria during that part of the hearing process designated for testimony in favor of, or opposition to, the proposal. If additional documents or evidence are provided in support of the application subsequent to notice being sent, a party may, prior to the close of the hearing, request that the record remain open for at least seven days so such material may be reviewed.

Appeals: Failure to raise an issue in the hearings, in person or by letter, or failure to provide sufficient specificity to afford the decision makers an opportunity to respond to the issue precludes appeal to the Land Use Board of Appeals based on that issue. Decisions of the Planning Commission may be appealed to the Lebanon City Council within 15 days following the date the Commission's final written decision is mailed. Only the applicant, a party providing testimony, and/or a person who requests a copy of the decision has rights to appeal a land use decision. The appeal must be submitted on the appeals form as prescribed by City Council with appropriate fee paid and must set forth the criteria issues that were raised which the applicant or party deems itself aggrieved. Please contact our office should you have any questions about our appeals process.

Obtain Information: A copy of the application, all documents and evidence relied upon by the applicant, and applicable criteria are available online in the Planning Commission Agenda Packet at https://www.ci.lebanon.or.us/meetings. The materials are also available for inspection in person at no cost and will be provided at the cost of 25 cents per single-sided page. If you have questions, would like additional information, or would like to schedule a time to view the application materials in person, please contact City of Lebanon Community Development Department, 925 Main Street; phone 541-258-4252; email khart@ci.lebanon.or.us.

The meeting location is accessible to persons with disabilities. A request for an interpreter for the hearing impaired or for other accommodations for persons with disabilities should be made at least 48 hours before the meeting to 541-258-4906.

PROPOSED SITE PLAN



Lebanon

LAND USE APPLICATION

PROPERTY INFORMATION
Site Address(es): 101 Industrial Way Lebanon, OR 97355
Assessor's Map & Tax Lot No.(s): 12S-2W-02-1404
Comprehensive Plan Designation / Zoning Designation: Industrial
Current Property Use: Vacant
Project Description: Bulk plant propane storage to be used for unloading propane from railcars and loading propane
delivery trucks used to deliver propane to local residents, businesses, and farms.

APPLICANT / PRIMARY CONTACT INFORMATION	
Applicant: Bryan Adams	Phone: (541) 504-9444
Address: 2505 Pacific Blvd	Email: badams@coenergy.net
City/State/Zip: Albany, OR 97321	

I hereby certify that the statements, attachments, exhibits, plot plan and other information submitted as a part of this application are true; that the proposed land use activity does not violate State and/or Federal Law, or any covenants, conditions and restrictions associated with the subject property; and, any approval granted based on this information may be revoked if it is found that such statements are false.

APPLICANT SIGNATURE	Date: 3/17/20

PROPERTY OWNER INFORMATION (IF DIFFERENT THAN ABOVE)	
Owner: Rick Franklin	Phone:
Address: 101 Industrial Way	Email:
City/State/Zip: Lebanon, OR 97355	
OWNER SIGNATURE	Date: 3/18/20

ADDITIONAL CONTACT INFORMATION	
Engineer / Surveyor: LPG Specialties	Phone: (503) 908-0101
Address: PO Box 1684	Email: craig@lpgspecialties
City/State/Zip: Tualatin, OR 97062	

Architect:	Phone:
Address:	Email:
City/State/Zip:	

Other:	Phone:
Address:	Email:
City/State/Zip	

REQUIRED SUBMITTALS

- ☐ Application and Filing Fee
- ☐ Narrative Describing the Proposed Development and addressing the Decision Criteria
  - LDC Article Two Land Uses and Land Use Zones
  - LDC Article Three Development Standards
  - LDC Article Four Review & Decision Requirements
  - LDC Article Five Exceptions to Standards (eg Variance, Non-Conforming Uses)
- ☐ Site Plan(s) drawn to scale with dimensions, Include other drawings if applicable
- ☐ Copy of current Property Deed showing Ownership, Easements, Property Restrictions

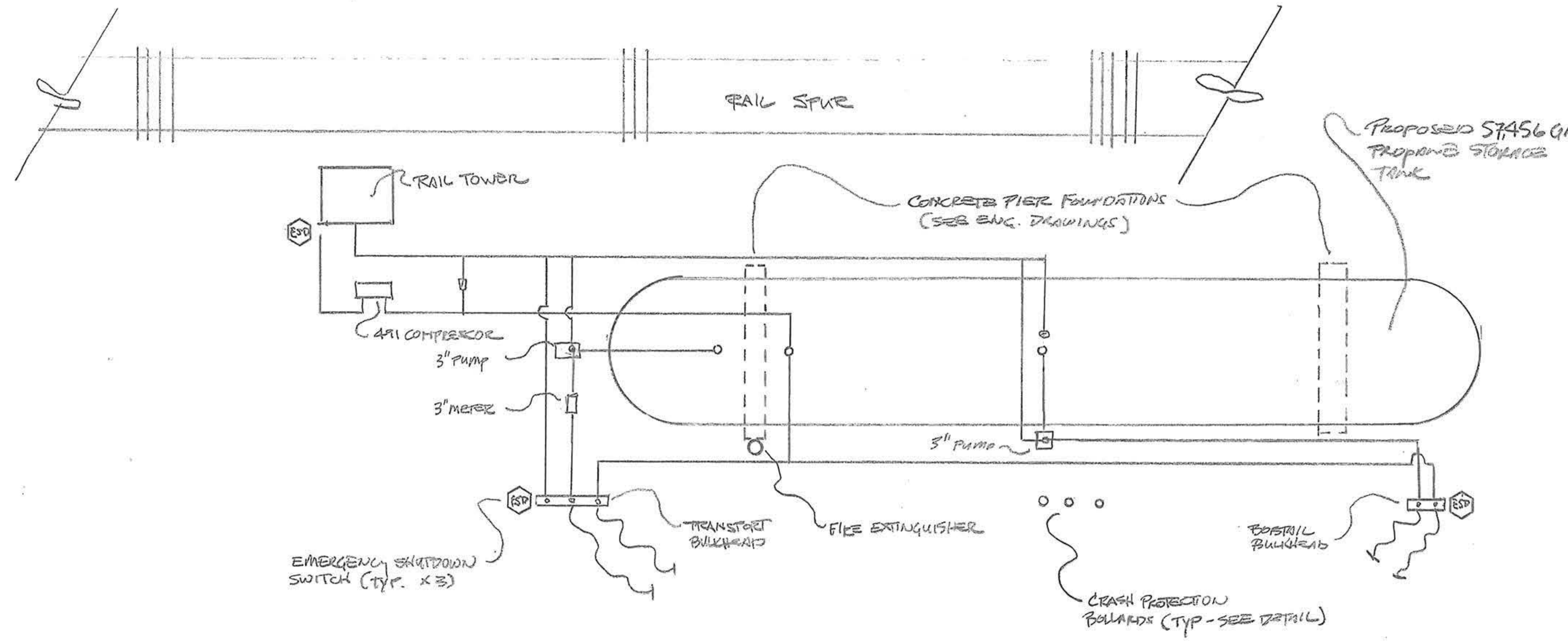
FOR OFFICE USE

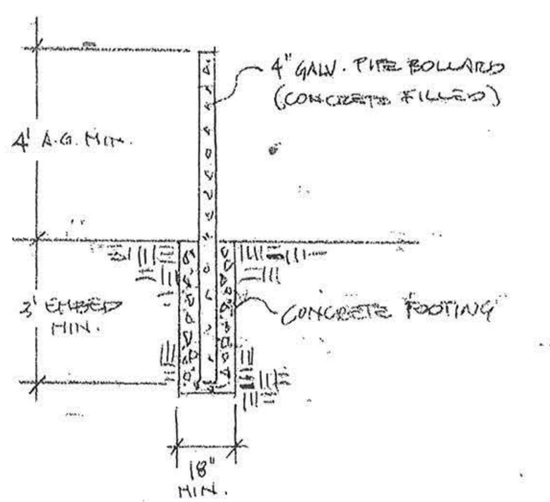
***If more than one review process is required, applicant pays highest priced fee, then subsequent applications charged at half-price.**

	Land Use Review Process	Fee		Land Use Review Process	Fee
	Administrative Review	$450		Planned Development – Preliminary	$2500
	Annexation	$1500		Planned Development – Ministerial	$200
	Code Interpretation	$100		Planned Development – Final (Administrative)	$450
	Comprehensive Plan Map Amendment	$2000		Planned Development – Final (Quasi-Judicial)	$750
	Comprehensive Plan Text Amendment	$2000		Subdivision Tentative	$2000 + $15/lot
	Conditional Use	$1500		Subdivision Final	$800 + $15/lot
	Historic Preservation Review or Register	Varies		Tree Felling Permit (Steep Slopes only)	$150 + $5/tree
	Land Partition	$450		Urban Growth Boundary Amendment	Actual Costs
	Ministerial Review	$150		Variance (Class 1 – Minor Adjustment)	$150
	Modification of Approved Plan	25% of Application		Variance (Class 2 – Adjustment)	$450
	Non-Conforming Use/Development	$450		Variance (Class 3)	$1000
	Property (Lot) Line Adjustment	$250		Zoning Map Amendment	$1000

APPLICATION RECEIPT & PAYMENT

Date Received:	Date Complete:	Receipt No.:
Received By:	Total Fee:	File No.:





Bollards shall be spaced 4'oc around the perimeter of the tank and above ground piping and equipment. Bollards shall be spaced minimum 5' from the shell of the tank.

CRASH PROTECTION BOLLARD DETAIL

COENERGY PROPANE

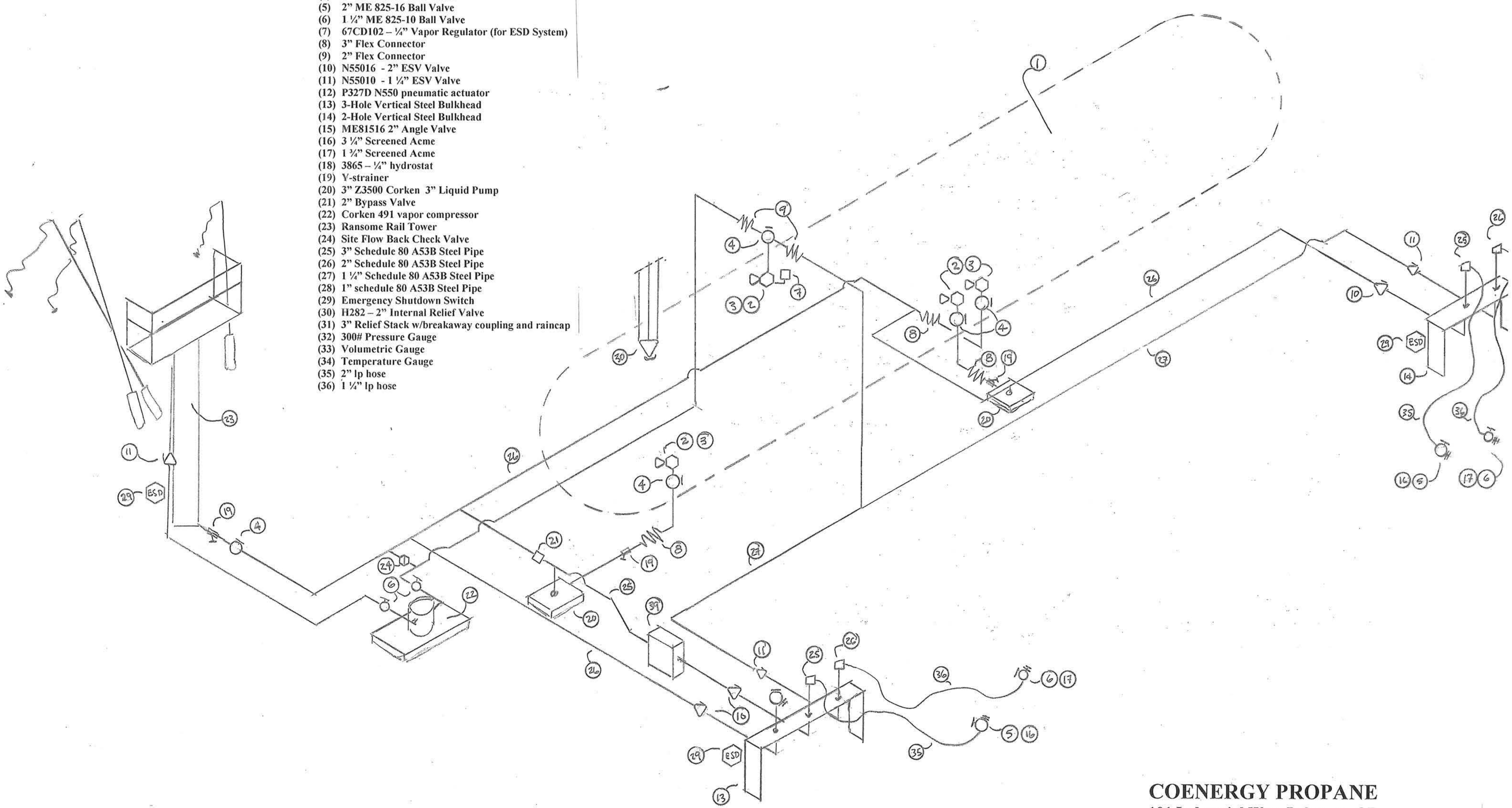
101 Industrial Way, Lebanon, OR

PROPANE INSTALLATION - SITE PLAN

Prepared By: LPG Specialties, LLC
Date: 2/21/20

LEGEND:

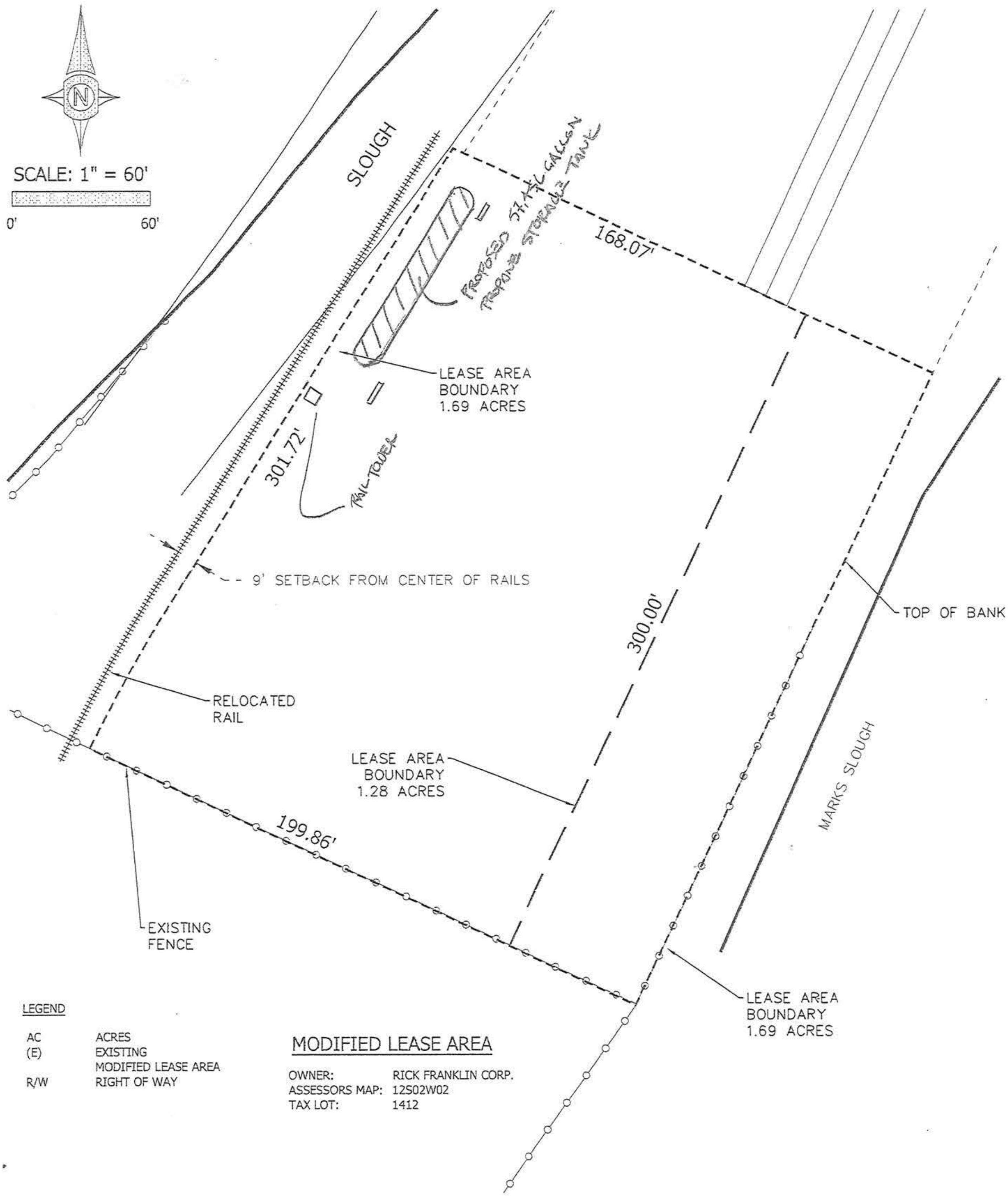
(1) 60k gallon Trinity propane tank (250psi MAWP)
(2) 3" Internal Valve
(3) Internal Valve pneumatic actuator
(4) 3" ME825-24 Ball Valve
(5) 2" ME 825-16 Ball Valve
(6) 1 ¼" ME 825-10 Ball Valve
(7) 67CD102 – ¼" Vapor Regulator (for ESD System)
(8) 3" Flex Connector
(9) 2" Flex Connector
(10) N55016 - 2" ESV Valve
(11) N55010 - 1 ¼" ESV Valve
(12) P327D N550 pneumatic actuator
(13) 3-Hole Vertical Steel Bulkhead
(14) 2-Hole Vertical Steel Bulkhead
(15) ME81516 2" Angle Valve
(16) 3 ¼" Screened Acme
(17) 1 ¾" Screened Acme
(18) 3865 – ¼" hydrostat
(19) Y-strainer
(20) 3" Z3500 Corken 3" Liquid Pump
(21) 2" Bypass Valve
(22) Corken 491 vapor compressor
(23) Ransome Rail Tower
(24) Site Flow Back Check Valve
(25) 3" Schedule 80 A53B Steel Pipe
(26) 2" Schedule 80 A53B Steel Pipe
(27) 1 ¼" Schedule 80 A53B Steel Pipe
(28) 1" schedule 80 A53B Steel Pipe
(29) Emergency Shutdown Switch
(30) H282 – 2" Internal Relief Valve
(31) 3" Relief Stack w/breakaway coupling and raincap
(32) 300# Pressure Gauge
(33) Volumetric Gauge
(34) Temperature Gauge
(35) 2" lp hose
(36) 1 ¼" lp hose



COENERGY PROPANE
101 Industrial Way, Lebanon, OR

PROPANE INSTALLATION - P&ID PLAN

Prepared By: LPG Specialties, LLC
Date: 2/21/20



LEGEND

AC	ACRES
(E)	EXISTING
	MODIFIED LEASE AREA
R/W	RIGHT OF WAY

MODIFIED LEASE AREA

OWNER: RICK FRANKLIN CORP.
ASSESSORS MAP: 12S02W02
TAX LOT: 1412

SHEET 1 of 1
SCALE: AS NOTED

Date 2/17/2020
Project 18-018
Drawn by KWL
Checked by KWL

LEASE AREA CALCULATION EXHIBIT
RICK FRANKLIN CORP.
101 INDUSTRIAL WAY
LEBANON, OREGON

UDELL ENGINEERING AND LAND SURVEYING, LLC
63 EAST ASH ST.
LEBANON, OREGON, 97355
541-451-5125

CoEnergy Propane

Lebanon LPG Storage Facility Discussion

March 3, 2020

About CoEnergy

- **Founded in 2001**
- **Owned by 38,000+ Oregon citizens**
  - Consumer Power
  - Central Electric Coop
  - Pioneer Connect
- **Current Storefronts:**
  - Albany
  - Redmond
- **Current Storage Facilities**
  - Redmond
  - Corvallis

Project Overview

- CoEnergy is looking to establish a Willamette Valley bulk storage facility with access to railroad
- CoEnergy has selected a site in Lebanon
- If approved, CoEnergy would install (1) 60,000 gallon storage tank.
- Facility would be used to serve local communities within a 60 mile radius from Lebanon

Ruler
Line
Path
Polygon
Circle
3D path
3D polygon
Measure the distance between two points on the ground
Map Length: 842.83 Feet
Ground Length: 842.83
Heading: 87.16 degrees
Mouse Navigation
Save
Clear
Marks Slough
Industrial Way
Williams
E Olive St
© 2020 Google
Google Earth


Marks Slough
Marks Slough
N
Industrial Way
Williams
© 2020 Google
Google Earth