

**STAFF REPORT FOR THE PLANNING COMMISSION MEETING OF  
DECEMBER 20, 2022**

**FILE NO:** LU-2022-0326

**AGENDA ITEM: 14.B**

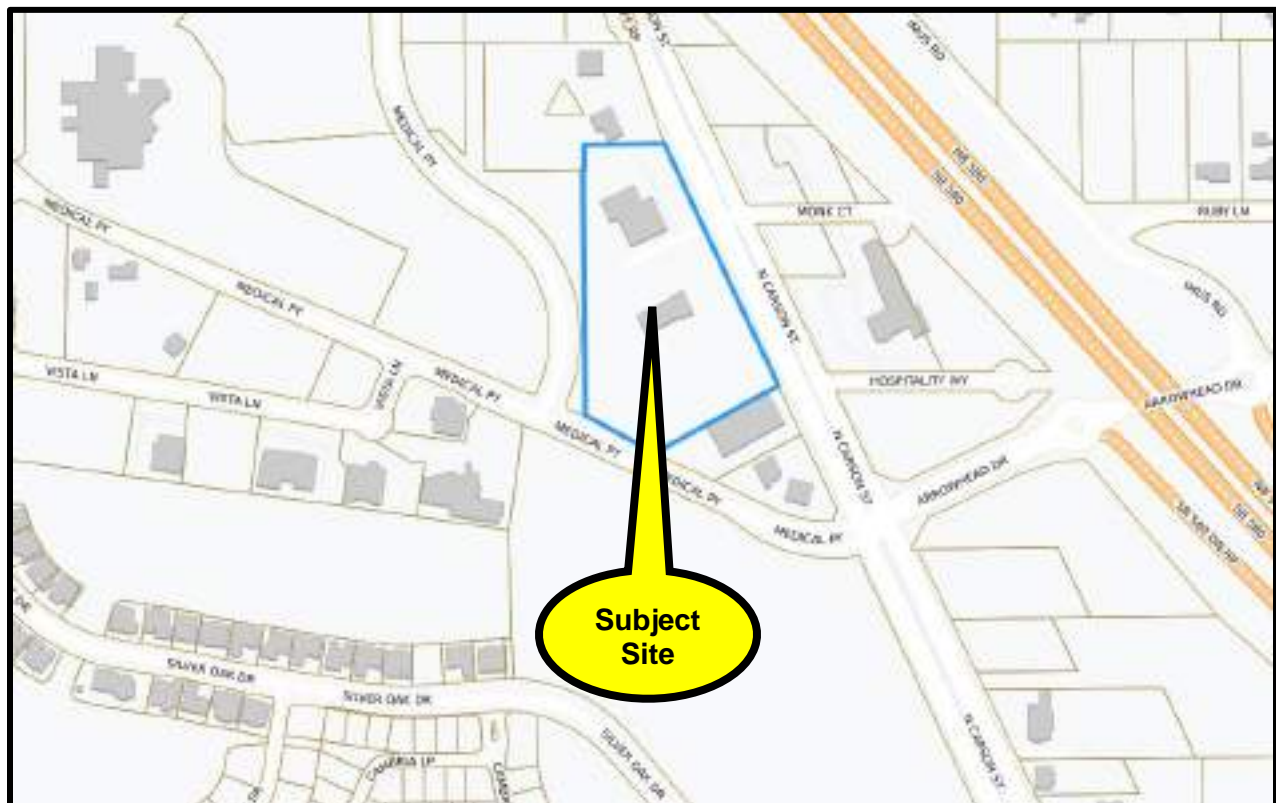
**STAFF CONTACT:** Heather Manzo, Associate Planner

**AGENDA TITLE:** For Possible Action: Discussion and possible action regarding an application from Peter Wilday (“Applicant”) for a special use permit (“SUP”) to allow for the construction of a congregate care facility and multi-family residential units on a property zoned Retail Commercial (“RC”) located at 4500 North Carson Street, Assessor Parcel Number (“APN”) 007-531-26. (Heather Manzo, [hmanzo@carson.org](mailto:hmanzo@carson.org))

**STAFF SUMMARY:** The Applicant has requested a SUP to construct three 3-story congregate care facility buildings containing a total of 356 beds, administrative and amenity buildings and onsite amenities to include outdoor resident recreation areas, dog parks, flower and vegetable gardens and other site improvements. The Applicant is also requesting an SUP for a residential use in a non-residential zoning district to include 12 caregiver apartment units. The Planning Commission is authorized to approve the SUP.

**PROPOSED MOTION:** “I move to approve the special use permit LU-2022-0326 based on the ability to make the required findings, and subject to the conditions of approval contained in the staff report.”

**VICINITY MAP:**



## **RECOMMENDED CONDITIONS OF APPROVAL**

1. All development shall be substantially in accordance with Special Use Permit plans and application materials on file with the Planning Division of the Carson City Community Development Department ("Planning Division").
2. All on and off-site improvements shall conform to City standards and requirements.
3. The applicant shall meet all the conditions of approval and commence the use for which this permit is granted, within 12 months of the date of issuance of the special use permit. A single, one-year extension of time may be granted if requested in writing to the Planning Division 30 days prior to the one-year expiration date. Should this permit not be initiated within one-year and no extension granted, the permit shall become null and void.
4. The applicant must sign and return the Notice of Decision within ten (10) days of receipt of notification. If the Notice of Decision is not signed and returned within ten (10) days, then the item may be rescheduled for the next Planning Commission meeting for further consideration.
5. Prior to the approval of a permit to construct the apartments, the applicant shall have plans approved to construct the congregate care facility.
6. Prior to the issuance of a certificate of occupancy for the apartment units, a certificate of occupancy for the congregate care facility shall be issued.
7. Prior to the issuance of the first site improvement permit, the applicant shall demonstrate that the Growth Management application has been approved by the Growth Management Commission and that project complies with the conditions of approval associated with GM-2022-0504.
8. Prior to the issuance of the first site improvement permit, plans shall be approved which demonstrates that the project shall connect to the 12-inch water main in Medical Parkway that is within the 5030 pressure zone.
9. Prior to the issuance of the first site improvement permit, plans shall be approved which demonstrates that the existing midblock crosswalk adjacent to the site on Medical Parkway will be removed.
10. Prior to the issuance of a site improvement permit, the applicant shall enter into a pro-rata share agreement pay its pro rata share of the cost to replace 1,216 feet of downstream sewer main in College Parkway. The contribution based on the estimated cost to upgrade these improvements and the 15,700 gallons per day requested is \$43,580.
11. Prior to issuance of the first site improvement permit, the applicant shall submit a

geotechnical report. The report shall address any necessary special construction requirements based on the proximity of the subject site to nearby faults. The site improvement plans and all building permits shall incorporate the recommendations of the report into the design.

12. Prior to issuance of the site improvement permit, the applicant shall provide an open space plan that demonstrates that there is sufficient open space provided to meet the multifamily open space requirements.
13. Prior to issuance of the site improvement permit, the applicant shall provide a landscape and irrigation plan consistent with Carson City Development Standards, Division 3—Landscaping.
14. Prior to issuance of a site improvement permit, the applicant shall provide a photometric plan for the exterior lighting, demonstrating compliance with Division 1.3 of the Carson City Development Standards.
15. Each year until three years after full buildout of the project, the applicant shall submit to the Growth Management Commission documentation of actual water use in the form of average gallons per day and peak flow for any consecutive 15 minutes. Documented accidental leaks, which have been properly repaired, will not count toward this peak flow. If it is found that the applicant is not in compliance with the Growth Management approval or if the applicant anticipates a need for additional water use beyond the amount approved herein, the applicant shall do one of the following: (a) implement onsite modifications to create compliance; (b) apply for a new growth management approval from the Growth Management Commission; or (c) license water rights to Carson City in an amount equal to any amount of water used or anticipated to be used in excess of this entitlement. In reviewing any new growth management application, the Commission may require additional conditions of approval. For any of the above options, if the flow drawn from the City system is increased to above the estimated demand at the time of building permit, the applicant must pay additional connection fees. If physical improvements are deemed necessary, the City will be allowed to install equipment, or require the applicant to install equipment, which will limit the flow to the approved flow.

**LEGAL REQUIREMENTS:** Carson City Municipal Code (“CCMC”): 18.02.080 (Special Use Permits), 18.04.130 Retail Commercial (“RC”), Carson City Design Standards (“CCDS”), and Division 1.18 (Residential Development Standards in Non-Residential Districts)

**MASTER PLAN DESIGNATION:** Mixed-Use Commercial

**PRESENT ZONING:** Retail Commercial (“RC”)

**KEY ISSUES:** Will the proposed development be compatible with the surrounding

neighborhood and be in keeping with the standards of the Carson City Municipal Code?

**SURROUNDING ZONING AND LAND USE INFORMATION:**

- EAST: RC / motel & restaurant
- WEST: RC / vacant
- NORTH: RC / Recreational vehicle ("RV") sales and service
- SOUTH: RC & RC-P / retail & vacant

**ENVIRONMENTAL INFORMATION:**

- FLOOD ZONE: X and X Shaded
- EARTHQUAKE FAULT: within 200 feet
- FAULT ZONE: Zone 2 Moderate
- SLOPE/DRAINAGE: The site is relatively flat, most of which is developed

**SITE DEVELOPMENT INFORMATION:**

- SITE SIZE: ±6.1 acres
- EXISTING DEVELOPMENT: RV sales
- PROPOSED DEVELOPMENT: Congregate Care facility
- PROPOSED PARKING: 131 required, 147 provided parking spaces

**DISCUSSION:**

The subject site is developed and is currently operating as a RV sales use. The Applicant is proposing the construction of a congregate care facility consisting of three 3-story resident buildings containing a total of 356 beds, 12 apartment units for caregivers to reside onsite, and approximately 30,100 square feet of non-residential buildings to support the congregate care use. The congregate care facility has been designed to comply with CCMC and reports necessary to evaluate the request have been submitted and accepted by staff. Per CCMC 18.04.130, a congregate care facility and multi-family dwellings are conditional uses in the RC zoning district. Therefore, the use may only be established upon approval of a SUP by the Planning Commission.

The caregiver apartment units are proposed in association with the congregate care facility. Because the multifamily residences rely upon the site improvements and are an accessory use to the congregate care facility, conditions are recommended to require the congregate care facility to establish concurrent to or before the multifamily units are complete. A residential use within a non-residential zoning district must demonstrate compliance with CCDS 1.18. Since there are no residentially zoned properties adjacent to the site, the multifamily buildings are subject to, and as presented comply with, the setbacks and height limitations of the RC zoning district. The proposed project complies with the parking standards outlined in CCMC and sufficient amenities are provided throughout the site to satisfy common open space requirements for the 12 caregiver residences. The Planning Commission is authorized to approve a SUP.

This request was continued from the November 15, 2022 Planning Commission meeting as a Growth Management application was required. This request is subject to the approval of GM-2022-0504.



**PUBLIC COMMENTS:** Public notices were mailed on November 3, 2022 to 32 property owners within 800 feet of the subject property. As of the writing of this report, staff had not received any public comments related to the request. Any comments that are received after this report is completed will be submitted to the Planning Commission prior to or at the meeting on December 20, 2022, depending on the date of submission of the comments to the Planning Division.

**OTHER CITY DEPARTMENTS OR OUTSIDE AGENCY COMMENTS:** The following comments were received by various City departments. Recommendations have been incorporated into the recommended conditions of approval, where applicable.

**Fire Department:**

1. The project shall meet or exceed the 2018 International Fire Code requirements.
2. The project shall meet or exceed the 2018 International Fire Code Northern Nevada Amendments.
3. Any building over 5,000 square feet shall be provided with an approved automatic fire sprinkler system.
4. A key box (KNOX) shall be provided, multiple boxes maybe required.
5. On site fire hydrants shall meet or exceed the appendix C of the 2018 International fire Code.
6. On site fire flow shall meet the 2018 International fire code.
7. Access shall be provided within 150 feet of all portions of the building(s) and shall meet the 2018 IFC for access road construction.

**Development Engineering:**

The Development Engineering Division of the Carson City Public Works Department ("Development Engineering") has no preference or objection to the special use request provided that the following conditions are met:

- Prior to an improvement permit being issued, the project must enter into a pro rata share agreement and pay its pro rata share of the cost to replace 1,216 feet of downstream sewer main in College Parkway. The contribution based on the estimated cost to upgrade these improvements and the 15,700 gallons per day requested is \$43,580.
- The project must be approved by the Growth Management Commission for the SUP to be valid. Any Growth Management conditions of approval will also apply to the SUP.
- Prior to a permit being issued, improvement plans must be submitted which demonstrate compliance with the following:
  - Connection to the 12-inch water main in Medical Parkway that is within the 5030-pressure zone.
  - Removal of the mid-block crosswalk on medical way, as part of the site improvements submittal.

Development Engineering has reviewed the application within our areas of purview relative to adopted standards and practices and to the provisions of CCMC 18.02.080, Conditional

Uses. Development Engineering offers the following discussion:

Compliance with CCDS and Standard Details including but not limited to the following:

- An appropriate backflow preventor device must be installed on domestic water service line.
- On-site and off-site striping must be designed to meet the Manual on Uniform Traffic Control Devices ("MUTCD") standard, specifically at the driveway connections to Medical Parkway and Carson Street.
- A Geotechnical report must be submitted.

**CCMC 18.02.080(5)(a) - Master Plan**

The request is not in conflict with any Engineering related Master Plan policies.

**CCMC 18.02.080(5)(b) – Use, Peaceful Enjoyment, Economic Value, Compatibility**

Development Engineering has no comment on this finding.

**CCMC 18.02.080(5)(c) - Traffic/Pedestrians**

The proposed Medical Parkway driveway will have left and right turning movements onto Medical Parkway which appears to conflict with the midblock crosswalk located on Medical Parkway adjacent to the site. Development Engineering has noted that due to its proximity to other existing nearby crosswalks on Medical Parkway, the midblock crosswalk is not necessary and should be eliminated. A condition is recommended to require the applicant to remove the mid-block crossing to include the removal of striping and curb ramps. The project as proposed and with recommended conditions will not have a detrimental effect on vehicular or pedestrian traffic.

**CCMC 18.02.080(5)(d) - Public Services**

Sanitary Sewer: The Applicant has proposed to connect to a 10-inch main in Medical Parkway. The Medical Parkway main has been estimated to be 35% full. A sewer pipe is considered to be "full" when it reaches 50% of its maximum capacity as measured by the maximum depth of flow to pipe diameter ("d/D"). The Medical Parkway main flows into the College Parkway main. According to the City's sewer model there is approximately 1,216 feet of sewer main in College Parkway that is at capacity. This main is 12 inches in diameter with a depth at peak flow that varies from about 51% to 54% full d/D. The project in question will increase the depth by about 1%. The 12-inch College Parkway main can easily accommodate 60% full with no anticipated issues. Also, some of the depth in the sewer model is future projected flow based on projects that have not been constructed yet. The City estimates that the actual flows in the College Parkway main will reach these future estimated flows in approximately 5 years. The City plans to replace this main in 5 to 10 years, but the main is being closely monitored and the main may be replaced sooner if conditions change. The City is requesting a pro rata share contribution to upgrade the College Parkway main. The estimated pro rata share contribution based on the current sewer demand estimate is \$43,580.

Water: A backflow preventer and a master meter will be required on the domestic water line. The project spans two pressure zones. The development shall be connected to the 12-inch water main in Medical Parkway that is in the 5030-pressure zone.

**Growth Management:** The water analysis estimates that the project will use 15,700 gallons per day on average, however actual usage for other similar uses within the City is higher than was estimated for this project. The Applicant submitted a Growth Management application in association with this request and development will be subject to the approval of the Growth Management request.

**Drainage:** The applicant has submitted a conceptual drainage study with their SUP application. The study addresses the drainage along the eastern area of the project and North Carson Street by proposing to install an underground storm drain pipe along the frontage or keeping the open drainage system that currently exists, which would be designed to handle flows. The western portion of the project would drain into two connected drainage basins that then flow to existing drainage facilities within Medical Parkway that can handle the project flows.

**CCMC 18.02.080(5)(e) – Title 18 Standards**

Development Engineering has no comment on this finding.

**CCMC 18.02.080(5)(f) – Public health, Safety, Convenience, and Welfare**

The project will meet engineering standards for health and safety if conditions are met.

**Earthquake faults:** There is an earthquake fault line to the west of the property, approximately 450 feet, and one to the north of the property, approximately 70 feet. A geotechnical analysis will be required to address any identified special construction requirements based on the proximity of the subject site to nearby faults.

**Federal Emergency Management Agency (“FEMA”) flood zones:** The FEMA flood zones are Zone X, with some X Shaded, therefore there are no flood concerns or floodplain requirements.

**CCMC 18.02.080(5)(g) – Material Damage or Prejudice to Other Property**

Development Engineering has no comment on this finding.

**CCMC18.02.080(5)(h) – Adequate Information**

The plans and reports provided were adequate for this analysis. The project must meet all CCDS and Standard Details including but not limited to the following:

- An appropriate backflow preventor device must be installed on domestic water service line.
- On-site and off-site striping must be designed to meet MUTCD standard, specifically at the driveway connections to Medical Parkway and Carson Street.

**SPECIAL USE PERMIT FINDINGS:** Staff's recommendation is based upon the findings as required by CCMC 18.02.080 (Special Use Permits) enumerated below and substantiated in the public record for the project.

1. ***Will be consistent with the master plan elements.***

The requested development is considered an infill development and is located on North Carson Street, a five-lane roadway. The project site is near the Carson Tahoe Hospital campus with a mix of primarily commercial and support uses in the area.

Compact and Efficient Pattern of Growth (Guiding Principle 1). Carson City is committed to a compact pattern that makes efficient use of the limited land area and water resources it has available for urban growth, and that fosters the provision of infrastructure and services in a cost-effective manner. The subject property is served by water and sewer.

Guiding Principal 7 discusses compact, mixed-use activity centers, stating “Carson City will encourage the creation of compact, mixed-use activity centers in easily accessible and highly visible locations of the community. The activity centers will promote the efficient use of available commercial lands and concentrate retail services in pedestrian and transit-oriented development nodes that may be easily accessed from and serve surrounding neighborhoods. Activity centers will vary in size and composition depending upon their location, context, and level of priority.”

Guiding Principal 9 promotes neighborhood diversity with a mix of housing options which include options that meet varying functional and financial needs.

Goal 1.2 of the Master Plan discusses promoting infill and redevelopment in targeted areas. It encourages mixed-use development as a redevelopment strategy along the City’s major gateway corridors.

Staff finds that the proposed congregate care facility will compliment other uses within proximity to the site. The project will help to address housing needs and services within the community.

2. ***Will not be detrimental to the use, peaceful enjoyment, economic value, or development of surrounding properties or the general neighborhood; and will cause no objectionable noise, vibrations, fumes, odors, dust, glare or physical activity.***

The project proposes a congregate care facility in an area that is commercial in nature and nearby to the hospital. A condition of approval is recommended to require the Applicant to provide a photometric plan to demonstrate that lighting fixtures have been designed to be downlit and contained on the site. The use is not anticipated to be detrimental to the use, peaceful enjoyment, or economic value of surrounding properties and is compatible with the surrounding neighborhood. With the recommended conditions of approval, the project will not generate objectionable noises, fumes, odors, dust, glare or activities.

3. ***Will have little or no detrimental effect on vehicular or pedestrian traffic.***

The Applicant is required to obtain appropriate permits from NDOT for right of way improvements along North Carson Street in addition to permits through Carson City. Based on the traffic study findings, and with the removal of an existing midblock crosswalk

within Medical Parkway, the project will have little or no detrimental effect on vehicular or pedestrian traffic.

**4. *Will not overburden existing public services and facilities, including schools, police and fire protection, water, sanitary sewer, public roads, storm drainage, and other public improvements.***

The existing water and storm drain infrastructure will be sufficient to provide service to the project. The Applicant has proposed to connect to a 10-inch sewer main in Medical Parkway. The Medical Parkway main has been estimated to be 35% full. A sewer pipe is considered to be “full” when it reaches 50% of its maximum capacity as measured by the maximum depth of flow to pipe diameter (“d/D”). The Medical Parkway main flows into the College Parkway main. According to the City’s sewer model there is approximately 1,216 feet of sewer main in College Parkway that is at capacity. This main is 12 inches in diameter with a depth at peak flow that varies from about 51% to 54% full d/D. The project in question will increase the depth by about 1%. The 12-inch College Parkway main can easily accommodate 60% full with no anticipated issues. Also, some of the depth in the sewer model is future projected flow based on projects that have not been constructed yet. The City estimates that the actual flows in the College Parkway main will reach these future estimated flows in approximately 5 years. The City plans to replace this main in 5 to 10 years, but the main is being closely monitored and the main may be replaced sooner if conditions change. The City is requesting a pro rata share contribution to upgrade the College Parkway main. The estimated pro rata share contribution based on the current sewer demand estimate is \$43,580.

A Growth Management application has been submitted and a condition is recommended to require the application to be approved and that the final design comply with the conditions of approval associated with the Growth Management application GM-2022-0504

The site is within an infill area where police and fire protection is already in place to serve the project. With the recommended conditions of approval, the project will not overburden existing public services and facilities.

**5. *Meets the definition and specific standards set forth elsewhere in this title for such particular use and meets the purpose statement of that district.***

The congregate care facility has been designed to comply with CCMC. The proposed maximum height for the congregate towers is 44 feet, 11 inches. This height is below the maximum 45 feet tall, therefore no additional SUP is required. As provided by the Applicant in a supplemental document submitted on October 24, 2022, the applicant has designed their project to comply with the parking standards for a congregate care facility and also includes 36 parking spaces for the multifamily residential caregiver units. The use requires a total of 131 parking spaces and the project proposes to provide 147 parking stalls, including accessible parking throughout the project.

Multifamily residential development is a conditional use in accordance with CCMC

18.04.130 Retail Commercial conditional uses and requires a SUP. As proposed and with the recommended conditions of approval, the project will meet the definition and specific standards required to support this use in the RC zoning district.

Residential uses proposed in non-residential zoning districts are subject to specific criteria outlined in the CCDS, Section 1.18 – Residential Development Standards in Non-Residential Districts. The development standards and how the proposed project meets them are addressed below.

**1.18 Residential Development Standards in Non-Residential Districts.**

1. *Permitted uses. Residential uses are only allowed as permitted by Chapter 18.04, Use Districts, as a primary or conditional use in the applicable zoning districts.*

The proposed multifamily use is a conditional use allowed with the approval of a SUP in the RC zoning district.

2. *Maximum permitted density. There is no maximum residential density within non-residential zoning districts subject to meeting the height, setback, parking and open space requirements of Chapter 18.04.*

The applicant is proposing 12 multifamily units that will be utilized as caregiver residential units. The applicant has demonstrated compliance with the maximum height of the buildings, setbacks and parking. There is sufficient common open space located throughout the project to serve as amenities for the multifamily residences.

3. *Maximum building height shall be the maximum height established by the zoning district in which the project is located.*

The maximum building height in the RC zone is 45 feet, unless otherwise approved by SUP. The three-story apartment buildings are proposed to be 39 feet tall. All portions of the project comply with the maximum height limit of 45 feet tall. Proposed building materials will be consistent with the architectural character of the overall congregate care facility.

While the proposed architectural elevations appear to meet Carson City Design Standards, the applicant will be required to demonstrate compliance with Section 1.1 of the Development Standards: Architectural Design at the time of building permit.

4. *Setbacks. Minimum setbacks shall be those established by the zoning district in which the project is located, subject to the following:*

a. *In the RC zoning districts, a minimum setback is required adjacent to a residential zoning district. Additionally, where development has multiple stories, additional setbacks are required. A 6 foot wide landscape buffer is required along the other street frontages.*

The subject site is not adjacent to residentially zoned property, therefore no additional setbacks are required. A minimum 6 foot wide landscape buffer will be required along the Medical Parkway frontages.

*b. A minimum setback of 10 feet is required from the right-of-way of an arterial street as identified in the adopted Transportation Master Plan, excluding the Downtown Mixed-Use area.*

North Carson Street is classified as an arterial roadway owned by NDOT. As such, a minimum 10 foot wide landscaped area will be required along the North Carson Street frontage. All improvements within the North Carson Street ROW are subject to NDOT approval.

*5. Required parking. Two spaces per dwelling unit, plus guest parking when on-street parking is not available based on the Development Standards Division 2, Parking and Loading.*

Per Division 2, two parking spaces are required for each dwelling unit plus guest parking at a rate of 1 space for every 2 units. The applicant has summarized the proposed parking for the project which includes 36 parking stalls available to the multifamily residential portion of the project.

It should be noted that CCDS Division 2, Section 2.1.16 requires snow storage for development projects. Snow storage must not be located within required parking areas or where living landscaping is located.

*6. Open Space.*

*a. A minimum of 150 square feet per dwelling unit of common open space must be provided. For projects of 10 or more units, areas of common open space may only include contiguous landscaped areas within no dimension less than 15 feet, and a minimum of 100 square feet per unit of the common open space area must be designed for recreation, which may include but not be limited to picnic areas, sports courts, a softscape covered with turf, sand or similar materials acceptable for use by young children, including play equipment and trees, within no dimension less than 25 feet.*

*b. A minimum of 100 square feet of additional open space must be provided for each unit either as private open space or common open space.*

*c. Front and street side yard setback areas may not be included toward meeting the open space requirements.*

The project identifies many unique outdoor recreation amenities located throughout the site that will be accessible to the caregiver quarters residents. These improvements appear to more than sufficiently address the common open space requirements; however the final site improvement plans will need to include information demonstrating that the

open space requirements have been met for the multifamily residences. However, the applicant will need to provide a plan that summarizes the total amount of landscaping, common open space, and other site design characteristics at the time of building and site improvement permit.

*7. Landscaping. Landscaping shall comply with the Carson City Development Standards Division 3, Landscaping.*

The landscaping appears to be in compliance with Division 3. The applicant will need to demonstrate compliance with the landscape requirements at the time of building permit.

*8. SUP review standards. Where a residential use is a conditional use within a given zoning district, the Planning Commission shall make two of the following findings in the affirmative in the review of the SUP in addition to the required findings of Section 18.02.080 of the Carson City Municipal Code.*

*a. The development is not situated on a primary commercial arterial street frontage.*

While the overall 6.1 acre subject site is located with frontage on a commercial arterial street, the Applicant has proposed the multifamily residences to be located along the Medical Parkway frontage. The congregate care campus will be located between the arterial roadway to fully screen and separate the residential units from the arterial roadway. Therefore, staff finds that this finding can be met.

*b. The development is integrated into a mixed-use development that includes commercial development.*

The proposed project is a congregate care facility with 12 multifamily residences. Therefore, staff is able to make this finding as the project is a mixed-use development with commercial uses as the primary use for the project.

*c. The applicant has provided evidence that the site is not a viable location for commercial uses.*

The project location is appropriate for a commercial use and is proposed to be developed with a primary commercial use, so while this finding cannot be met, the intent of CCMC is adhered to by this request.

*d. The site is designated Mixed-Use Commercial, Mixed-Use Residential or Mixed-Use Employment on the Master Plan Land Use Map and the project meets all applicable mixed-use criteria and standards.*

The site has a Master Plan land use designation of Mixed Use Commercial and the proposal is a mixed-use development supported by the Master Plan criteria and policies. Therefore, this finding can be met.



**6. *Will not be detrimental to the public health, safety, convenience and welfare.***

The use is appropriate at the location. As conditioned, the proposed development will not be detrimental to public health, safety, convenience, and welfare.

**7. *Will not result in material damage or prejudice to other property in the vicinity.***

The proposed project will not result in material damage to other property in the vicinity. As proposed and with recommended conditions of approval, the project will enhance the surrounding properties while providing the community with a service that will support Carson City residents as their needs evolve.

Attachments:

Application LU-2022-0326

December 7, 2022

Carson City Public Works Department  
ATTN: Stephen Pott  y, P.E.  
[spottey@carson.org](mailto:spottey@carson.org)  
775-283-7079

Attention: Mr. Stephen Pott  y, P.E.

**Subject: ADDENDUM LETTER NO. 3 FOR WATER MAIN ANALYSIS FOR OASIS ASSISTED LIVING**  
4500 N Carson Street  
Carson City APN 007-531-26  
File No: 2284.001-B

Mr. Pott  y,

**This letter is intended to serve as a third addendum letter to the Water Main Analysis for Oasis Assisted Living dated and Stamped October 3, 2022. A first addendum letter was written and dated 10/14/2022, and a second addendum letter was written and dated 10/17/2022. This letter supersedes and replaces the previous addendum letter dated 10/17/2022. Key changes include:**

- **Calculations updated**

Based on review and feedback from Carson City, I was told that additional information is required to determine peak water usage for this project (Oasis Assisted Living, a 356 maximum bed assisted living facility to be located at 4500 N Carson Street).

I reached out to IMEG Corporation who performed the water fixture count for the project (Attachment 3 of the Water Main Analysis). I spoke with Richard of IMEG Corporation (775-374-5684). He identified that the 279.6 TOTAL GPM flow on the fixture unit count was all fixtures running simultaneously. My original water main analysis mistakenly identified this as the peak flow, however, the peak flow will realistically be much less than this.

In order to determine peak flow and average daily flow, we will use the water fixture count and adjust it based on realistic maximum use.

Based on discussions with the applicant, there will be one caregiver for every six residents. These residents will likely not be able to function, let alone perform bathing and bathroom functions without assistance. Many will be in their beds and will have catheters, and will not perform standard bathroom and daily hygiene functions without the assistance of their caregiver. Additionally, residents won't sit in the bath or shower for long periods of time. Standard cleaning schedules are very brief showers (1 to 2 minutes) twice a week. Most of the caregiver's time is spent assisting with changing, medication, helping movement, and taking medical readings. A very small portion of their time in the room is running water fixtures. Accordingly, not all nurses will be running water fixtures at the same time. If we assume that at peak demand, half of all nurses will be running water fixtures at a given time, we

come to a Peak Water Demand of 23.3 gpm. (279.6 gpm of all fixtures running at once / 6 nurses per patient / 2 [half of all nurses running water] = 23.3 gpm peak demand).

If we then take the 23.3 gpm Peak Water Demand, and divide by a factor of 3 (Standard for Carson City), we arrive at an average water use of 7.77 gpm. 7.77 gpm x 24 hours in a day x 60 minutes in an hour = 11,188.8 gallons per day estimated daily usage for this project. Divided by the maximum 356 beds for this project, this comes to an average daily water use demand of 31.4 gallons per resident per day. This seems like a reasonable number for average daily usage per resident of the assisted living facility.

As a check, I researched to see if there is another assisted living facility which we could compare water usage to. I identified Sierra Place Senior Living located at 1111 W College Pkwy (Carson City APN 007-462-01) as a comparable source. I reached out to Carson City utilities billing who provided water usage quantities in thousands of gallons (See Attachment to this letter). Based on review of provided data, this comes to an average monthly demand of 161,000 gallons per month, or 5,322 gallons per day. Based on the 120 unit location, this comes to 44.35 gallons per day per room.

This amount is close, but more than the 31.4 gallons per day per room estimated per person based on the fixture unit count. However, typically as more rooms are added, your average demand goes down per room. Additionally per discussions with the applicant, the 356 beds is a maximum theoretical value. Rooms and living spaces will be modular, with families electing to provide their loved ones with larger living areas at additional costs. Realistically closer to 300 beds would be more realistic to what we can expect to see for a true number of residents at Oasis Assisted Living. I would like to note that Sierra Place Senior Living was built in 1997 and likely has many fixtures that use substantially more water than current low flow and water saving fixtures to be installed in the new Oasis Assisted Living Facility. However, in order to be conservative, we will take the average of the estimated daily demand from the fixture unit count for Oasis Assisted Living and the estimated daily demand from Sierra Place Senior Living (located at 1111 W College Pkwy). If we take the average of the 31.4 gallons per day per room from the fixture count, and the 44.4 gallons per day per room from Sierra Place Senior Living, it results in an estimated 37.9 gallons per resident per day. This calculates to an average daily water demand of 13,492 gallons (based on maximum theoretical of 356 beds). This number is intended to account for all domestic use associated with the residents, to include kitchen facilities, maintenance, and washing of clothes and linens. I think this is a reasonable value of expected domestic water usage, as the number of residents increases, typically individual water usage decreases.

Based on initial discussions with the Architect, we are looking at the following quantities of landscaping:

- 70 Large Shade Trees
- 700 Shrubs
- 5,000 square feet of turf (artificial turf)

If we assume 12 gallons per hour drip system per tree, and 2 gallons per hour drip system per shrub, this comes to a demand of 2,240 gph. If we assume a 30 minute run time for drip irrigation three days a week, this comes to 480 gallons per day (on average) for drip system irrigation.

The 5,000 proposed square foot putting green will be artificial turf and will require no water usage.

The applicant is proposing a 12 unit apartment building on site to house caregivers. It is assumed that each apartment will utilize 60 gallons per day. 60 gallons per day for 12 apartments results in a daily demand of 720 gallons for apartment use. It is also assumed that a peak flow of 9 gpm would occur from apartment use.

My office was also asked to analyze effects of the proposed fountain and indoor pool / spa losses. Based on best available research, it was determined that losses of 0.25 inches per day would be applied to both of these water features. A combined estimate of 1,140 square feet of surface area can be applied to the fountain and indoor pool area. 1,140 square feet divided by 12 inches per foot, divided by four (1/4 of an inch) results in a daily loss of 23.75 cubic feet, or 178 gallons of water per day losses. This number will be rounded up to 200 gallons per day for this analysis.

Combining the 480 gallons per day for drip irrigation, the 200 gallons per day for fountain and indoor pool / spa losses, as well as the 720 gallons per day for apartment (caregiver domestic use), this comes to 1,400 gallons per day of additional uses (beyond domestic use for caring for residents). If we add the 1,400 gallon per day additional water demands to the 13,492 gallon estimated daily demand, this comes to a maximum 14,892 gallon daily demand calculated for this project, or 41.8 gallons per bed per day.

If we combine the peak daily demand of 23.3 gpm for resident domestic use, plus a 9 gpm peak demand for apartment use, plus 3 gpm for water features, this comes to a peak demand of 35.3 gpm (instantaneous peak water demand).

Although the 41.8 gallons per bed per day estimate is reasonable, I was asked by Carson City to check against other similar facilities and their daily usage. Based on data from Carson City, average daily usage may be as much as 44.1 gallons per bed per day. If we adopt this more conservative value for planning purposes, based on 356 beds, we arrive at 15,700 gallons per day of water use .

If you have any questions or require further assistance, please do not hesitate to contact me directly.

Respectfully submitted,  
**WESTEX Consulting Engineers, LLC**

Christopher G. Moltz, P.E.  
Senior Project Manager  
[chris@westexconsulting.com](mailto:chris@westexconsulting.com)  
(775) 484-1013 (Direct)



ATTACHMENT: UB Consumption History Report for 1111 College (from Carson City Utilities)

October 17, 2022

Carson City Public Works Department  
ATTN: Christopher Gonzales, P.E.  
[cgonzales@carson.org](mailto:cgonzales@carson.org)  
775-283-7053

Attention: Mr. Christopher Gonzales, P.E.

**Subject: ADDENDUM LETTER NO. 2 FOR WATER MAIN ANALYSIS FOR OASIS ASSISTED LIVING**  
4500 N Carson Street  
Carson City APN 007-531-26  
File No: 2284.001-B

Mr. Gonzales,

**This letter is intended to serve as a second addendum letter to the Water Main Analysis for Oasis Assisted Living dated and Stamped October 3, 2022. A first addendum letter was written dated 10/14/2022. This letter supersedes and replaces the previous addendum letter dated 10/14/2022. Key changes include:**

- **Turf Grass has been replaced with artificial turf**
- **It has been clarified that Usage for Domestic Towers is intended to include all domestic functions associated with care of residents (including kitchen facilities, maintenance, and Washing of Clothes and Linens)**
- **Daily Water Losses for Pool and Fountain Accounted For**
- **Water Use for 12 Apartments (Domestic Caregivers) Accounted For**

Based on review and feedback from Carson City, I was told that additional information is required to determine peak water usage for this project (Oasis Assisted Living, a 356 maximum bed assisted living facility to be located at 4500 N Carson Street).

I reached out to IMEG Corporation who performed the water fixture count for the project (Attachment 3 of the Water Main Analysis). I spoke with Richard of IMEG Corporation (775-374-5684). He identified that the 279.6 TOTAL GPM flow on the fixture unit count was all fixtures running simultaneously. My original water main analysis mistakenly identified this as the peak flow, however, the peak flow will realistically be much less than this.

In order to determine peak flow and average daily flow, we will use the water fixture count and adjust it based on realistic maximum use.

Based on discussions with the applicant, there will be one caregiver for every six residents. These residents will likely not be able to function, let alone perform bathing and bathroom functions without assistance. Many will be in their beds and will have catheters, and will not perform standard bathroom and daily hygiene functions without the assistance of their caregiver. Additionally, residents won't sit in the bath or shower for long periods of time. Standard cleaning schedules are very brief showers (1 to 2

minutes) twice a week. Most of the caregiver's time is spent assisting with changing, medication, helping movement, and taking medical readings. A very small portion of their time in the room is running water fixtures. Accordingly, not all nurses will be running water fixtures at the same time. If we assume that at peak demand, half of all nurses will be running water fixtures at a given time, we come to a Peak Water Demand of 23.3 gpm. (279.6 gpm of all fixtures running at once / 6 nurses per patient / 2 [half of all nurses running water] = 23.3 gpm peak demand).

If we then take the 23.3 gpm Peak Water Demand, and divide by a factor of 3 (Standard for Carson City), we arrive at an average water use of 7.77 gpm.  $7.77 \text{ gpm} \times 24 \text{ hours in a day} \times 60 \text{ minutes in an hour} = 11,188.8 \text{ gallons per day}$  estimated daily usage for this project. Divided by the maximum 356 beds for this project, this comes to an average daily water use demand of 31.4 gallons per resident per day. This seems like a reasonable number for average daily usage per resident of the assisted living facility.

As a check, I researched to see if there is another assisted living facility which we could compare water usage to. I identified Sierra Place Senior Living located at 1111 W College Pkwy (Carson City APN 007-462-01) as a comparable source. I reached out to Carson City utilities billing who provided water usage quantities in thousands of gallons (See Attachment to this letter). Based on review of provided data, this comes to an average monthly demand of 161,000 gallons per month, or 5,322 gallons per day. Based on the 120 unit location, this comes to 44.35 gallons per day per room.

This amount is close, but more than the 31.4 gallons per day per room estimated per person based on the fixture unit count. However, typically as more rooms are added, your average demand goes down per room. Additionally per discussions with the applicant, the 356 beds is a maximum theoretical value. Rooms and living spaces will be modular, with families electing to provide their loved ones with larger living areas at additional costs. Realistically closer to 300 beds would be more realistic to what we can expect to see for a true number of residents at Oasis Assisted Living. I would like to note that Sierra Place Senior Living was built in 1997 and likely has many fixtures that use substantially more water than current low flow and water saving fixtures to be installed in the new Oasis Assisted Living Facility. However, in order to be conservative, we will take the average of the estimated daily demand from the fixture unit count for Oasis Assisted Living and the estimated daily demand from Sierra Place Senior Living (located at 1111 W College Pkwy). If we take the average of the 31.4 gallons per day per room from the fixture count, and the 44.4 gallons per day per room from Sierra Place Senior Living, it results in an estimated 37.9 gallons per resident per day. This calculates to an average daily water demand of 13,492 gallons (based on maximum theoretical of 356 beds). This number is intended to account for all domestic use associated with the residents, to include kitchen facilities, maintenance, and washing of clothes and linens. I think this is a reasonable value of expected domestic water usage, as the number of residents increases, typically individual water usage decreases.

Based on initial discussions with the Architect, we are looking at the following quantities of landscaping:

- 70 Large Shade Trees
- 700 Shrubs
- 5,000 square feet of turf (artificial turf)

If we assume 12 gallons per hour drip system per tree, and 2 gallons per hour drip system per shrub, this comes to a demand of 2,240 gph. If we assume a 30 minute run time for drip irrigation three days a week, this comes to 480 gallons per day (on average) for drip system irrigation.

The 5,000 proposed square foot putting green will be artificial turf and will require no water usage.

The applicant is proposing a 12 unit apartment building on site to house caregivers. It is assumed that each apartment will utilize 60 gallons per day. 60 gallons per day for 12 apartments results in a daily



demand of 720 gallons for apartment use. It is also assumed that a peak flow of 9 gpm would occur from apartment use.

My office was also asked to analyze effects of the proposed fountain and indoor pool / spa losses. Based on best available research, it was determined that losses of 0.25 inches per day would be applied to both of these water features. A combined estimate of 1,140 square feet of surface area can be applied to the fountain and indoor pool area. 1,140 square feet divided by 12 inches per foot, divided by four (1/4 of an inch) results in a daily loss of 23.75 cubic feet, or 178 gallons of water per day losses. This number will be rounded up to 200 gallons per day for this analysis.

Combining the 480 gallons per day for drip irrigation, the 200 gallons per day for fountain and indoor pool / spa losses, as well as the 720 gallons per day for apartment (caregiver domestic use), this comes to 1,400 gallons per day of additional uses (beyond domestic use for caring for residents). If we add the 1,400 gallon per day additional water demands to the 13,492 gallon estimated daily demand, this comes to a maximum 14,892 gallon daily demand.

For the sake of this analysis the maximum average total daily water demand is estimated to be at 14,892 gallons per day, which is less than the 15,000 gallon per day trigger for Growth Management Plan. The applicant understands that while this number is close to the 15,000 gallon per day trigger, the plans are conceptual at this time, and it is their full intention to modify plans as needed to stay under 15,000 gallons per day. Removal of additional landscape irrigation, as well as room reductions are both possibilities to the reduce the overall daily demand.

The estimated water demand is based on a maximum of 356 beds. However, I think actual water usage will be lower than this, based on the fact that the maximum number of beds will likely never be reached (due to modularity and customization of the floor plans). If only 300 beds are ever occupied, we can expect the average total daily water demand to be closer to 12,770 gallons per day (including irrigation).

If we combine the peak daily demand of 23.3 gpm for resident domestic use, plus a 9 gpm peak demand for apartment use, plus 3 gpm for water features, this comes to a peak demand of 35.3 gpm (instantaneous peak water demand).

If you have any questions or require further assistance, please do not hesitate to contact me directly.

Respectfully submitted,  
**WESTEX Consulting Engineers, LLC**

Christopher G. Moltz, P.E.  
Senior Project Manager  
[chris@westexconsulting.com](mailto:chris@westexconsulting.com)  
(775) 484-1013 (Direct)



ATTACHMENT: UB Consumption History Report for 1111 College (from Carson City Utilities)

## Heather Manzo

---

**From:** Christopher Moltz, P.E., <chris@westexconsulting.com>  
**Sent:** Tuesday, October 25, 2022 9:48 AM  
**To:** Heather Manzo  
**Cc:** 'Peter Wilday'  
**Subject:** RE: SUP for congregate care

This message originated outside of Carson City's email system. Use caution if this message contains attachments, links, or requests for information.

---

Heather,

The old number is 396 units. Please disregard that number.

The New number is 356 units.

Best Regards,

Christopher Moltz, P.E.  
Westex Consulting Engineers  
220 S. Rock Blvd, #12  
Reno, NV 89502  
Cell: (775) 484-1013  
Main Office: (775) 384-2898



---

**From:** Heather Manzo <HManzo@carson.org>  
**Sent:** Tuesday, October 25, 2022 8:18 AM  
**To:** Christopher Moltz, P.E. <chris@westexconsulting.com>  
**Cc:** 'Peter Wilday' <petewilday@gmail.com>  
**Subject:** RE: SUP for congregate care

Good Morning Chris and Pete,

This information is very helpful and I appreciate your quick reply. I have one question on the number of beds. The application states there would be a maximum of 396 beds, however the parking summary you have provided note there would be a maximum of 356 beds. I can condition a maximum bed count if you are proposing the lesser number. If the intended maximum is 396, please revise the memo to address parking.

For clarification as to the uses, the restaurants, events facility, amenities such as the pool are all not open to the public and are only intended to serve residents?

Thank you,

**Heather Manzo**



## Heather Manzo

---

**From:** Christopher Moltz, P.E. <chris@westexconsulting.com>  
**Sent:** Tuesday, October 25, 2022 9:53 AM  
**To:** Heather Manzo  
**Cc:** 'Peter Willday'  
**Subject:** RE: SUP for congregate care

This message originated outside of Carson City's email system. Use caution if this message contains attachments, links, or requests for information.

---

Heather,

Correct. All other uses are for the residents only. They will not be open to the public.

Best Regards,

Christopher Moltz, P.E.  
Westex Consulting Engineers  
220 S. Rock Blvd, #12  
Reno, NV 89502  
Cell: (775) 484-1013  
Main Office: (775) 384-7898



---

**From:** Heather Manzo <HManzo@carson.org>  
**Sent:** Tuesday, October 25, 2022 8:18 AM  
**To:** Christopher Moltz, P.E. <chris@westexconsulting.com>  
**Cc:** 'Peter Willday' <petewillday@gmail.com>  
**Subject:** RE: SUP for congregate care

Good Morning Chris and Pete,

This information is very helpful and I appreciate your quick reply. I have one question on the number of beds. The application states there would be a maximum of 396 beds, however the parking summary you have provided note there would be a maximum of 356 beds. I can condition a maximum bed count if you are proposing the lesser number. If the intended maximum is 396, please revise the memo to address parking.

For clarification as to the uses, the restaurants, events facility, amenities such as the pool are all not open to the public and are only intended to serve residents?

Thank you,

**Heather Manzo**  
Associate Planner  
108 E. Proctor Street

October 24, 2022

Carson City Planning Department  
ATTN: Christopher Gonzales, P.E.  
[hmanzo@carson.org](mailto:hmanzo@carson.org)  
775-283-7075

Attention: Heather Manzo

**Subject: PARKING CALCULATIONS FOR OASIS ASSISTED LIVING**  
4500 N Carson Street  
Carson City APN 007-531-26  
File No: 2284.001-B

Ms. Manzo,

This letter is intended to serve as a summary response addressing parking calculations for the proposed project (Oasis Assisted Living, a 356 maximum bed assisted living facility to be located at 4500 N Carson Street).

You sent an email to Mr. Pete Wilday about square footage of buildings, building heights and parking calculations. Mr. Pete Wilday has provided all information regarding building heights, and is attached to this letter for your records.

I am writing the remainder of this letter to address parking calculations.

Based on your email dated 10/24/2022 you identified "CCMC requires 1 parking space for every 5 beds and 1 space for every 3 employees for a congregate care facility. Additional parking will be required for the other types of uses proposed on site."

The only other proposed use on the project site is the 12 unit apartment on site. All other facilities are for the residents and staff.

Based on CCMC, Title 18 Appendix: Carson City Development Standards: Division 2 – Parking and Loading, (for a Congregate care housing / senior citizen home) one parking space is required for every 5 beds. Based on the 356 maximum beds, this comes to 71.2 parking spaces. Additionally, one parking space is required for every three employees, based on a maximum of 70 employees on site at any given time, this comes to 23.33 additional spaces required, for a total of 94.53 spaces (rounded up to 95 spaces).

The caregivers to this facility are typically in the United States on work visas only, and do not drive; however, without the drafting of a full-blown parking study, we will continue to adhere to Carson City Municipal Code. Based on Division 2 – Parking and Loading, (for a multiple family residential dwellings) two spaces are required for each dwelling unit (plus one additional guest parking space for every two units). Based on the 12 apartment units, this comes to 35 parking spaces.

10/25/22

When we add the 36 parking spaces for the apartments plus the 95 spaces for the staff and residents of the congregate care facility, this comes to 131 spaces required.

The total number of parking spaces provided for this project is 147 spaces (including ADA parking spaces).

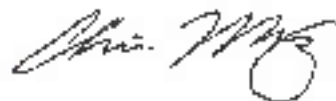
I pulled the current ADA access code ([www.access-board.gov](http://www.access-board.gov)). 101 to 150 parking spaces requires a minimum of four standard ADA parking spaces and one ADA van space (for a total of 5 spaces). Due to the nature of this being a congregate care facility, additional ADA spaces are proposed.

Of the 147 spaces provided, 131 standard parking spaces are required (including 6 guest spaces for the apartments). It is proposed that the remaining 16 spaces are ADA spaces (which exceeds the requirement per current ADA guidelines, of which at least a few will be ADA Van Spaces).

All proposed parking should fully satisfy both Carson City Municipal Code and ADA requirements.

If you have any questions or require further assistance, please do not hesitate to contact me directly.

Respectfully submitted,  
WESTEX Consulting Engineers, LLC



Christopher G. Moltz, P.E.  
Senior Project Manager  
[chris@westexconsulting.com](mailto:chris@westexconsulting.com)  
(775) 484-1013 (Direct)

ATTACHMENT: Summary Table of Building Sizes and Heights

TO: HEATHER MANZO  
 N: OASIS Assisted Living

10/24/22

RESPONSE: RFI 10/24/22

3 STORY: SAME PLANS: BUILDINGS:	SAME SQ. FT.	(CCMC) BLDG. HT.	USES IN BLDG.	PARKING REQ'D
1) TUSCAN TOWER	45,000 SF	44'-11"	RESIDENTIAL ROOMS & DINING I-2 OCCUPANCY TYPE II-A, 1 HOUR FULLY SPRINKLERED	125 Regular Parking Spaces
2) HAWAIIAN TOWER	45,000 SF	44'-11"		6 Guest Spaces
3) TAHOE TOWER	45,000 SF	44'-11"		4 Standard ADA Spaces
	135,000 SF TOTAL			
4) 3 STORY - 12 CARE GIVER APTS. FOR IN HOUSE USE ONLY	9,800 SF TOTAL	39'-0" TOTAL HT. TO RIDGE  SHEET (16)	CARE GIVER APTS - I-2 OCC. TYPE II-A 1 HR FULLY SPRINKLERED	1 ADA Van Space  147 Total Parking Spaces Provided
5) 1 STORY - WELCOME CENTER & COMMISSARY	2,000 SF 7,000 SF 9,000 SF TOTAL	40'-0" TO RIDGE OF WELCOME CENTER ENTRY SIGN - SHEET (10)	RECEPTION SALES & F&B COMMISSARY SHEET (9) (10)	(125 Regular Parking Spaces, 6 Guest Spaces, 16 ADA Spaces (including multiple van spaces)
6) 1 STORY - MAINTENANCE BLDG.	1,100 SF TOTAL	24'-0" HT. GROUNDS KEEPER (3) (4) (PK) SIMILAR	CLEANING & MAINTENANCE EQUIP. ST.	
7) 1 STORY AMENITY BLDG	9,600 SF TOTAL	35'-0" MAX VARIES SEE (14)	EVENTS CENTER & THERAPY POOL	
8) 1 STORY ADMINISTRATION BLDG. W/ STORAGE ROOMS	10,400 SF	37'-0" MAX TO RIDGE SEE (15)	STAFF, H.R. TRAINING, DOCTORS, NURSES 25% STORAGE	



Carson City Planning Division  
108 E. Proctor Street • Carson City NV 89701  
Phone: (775) 887-2180 • E-mail: [planning@carson.org](mailto:planning@carson.org)

FILE # LU-2022-0316

APPLICANT PHONE #  
PETER WILDAY 775-742-5644

MAILING ADDRESS, CITY, STATE, ZIP  
3710 GRANT DR. "H" RENO, 89509

EMAIL ADDRESS  
PETEWILDAY@GMAIL.COM

PROPERTY OWNER PHONE #  
MICHAEL HOHL R.V. CENTER

MAILING ADDRESS, CITY, STATE, ZIP 775-885-1701  
4500 N. CARSON ST. CARSON CITY

EMAIL ADDRESS 89706  
MIKE@MICHAELHOHL.COM

APPLICANT AGENT/REPRESENTATIVE PHONE #  
PETER WILDAY, ARCHITECT

MAILING ADDRESS, CITY STATE, ZIP

SAME

EMAIL ADDRESS

SAME

FOR OFFICE USE ONLY:

CCMC 18.02.080

## SPECIAL USE PERMIT

FEE\*: \$2,450.00 MAJOR ✓  
\$2,200.00 MINOR (Residential  
zoning districts)

+ + noticing fee

\*Due after application is deemed complete by  
staff

☐ SUBMITTAL PACKET – 4 Complete Packets (1 Unbound  
Original and 3 Copies) including:

- ☐ Application Form
- ☐ Detailed Written Project Description
- ☐ Site Plan
- ☐ Building Elevation Drawings and Floor Plans
- ☐ Special Use Permit Findings
- ☐ Master Plan Policy Checklist
- ☐ Applicant's Acknowledgment Statement
- ☐ Documentation of Taxes Paid-to-Date
- ☐ Project Impact Reports (Engineering)

☐ CD or USB DRIVE with complete application in PDF

Application Received and Reviewed By:

Submission Deadline: Planning Commission application  
submission schedule.

Note: Submittals must be of sufficient clarity and detail for  
all departments to adequately review the request. Additional  
information may be required.

Project's Assessor Parcel Number(s):

07-53-531-26

Street Address

4500 N. CARSON ST. CARSON CITY 89706

Project's Master Plan Designation

COMMERCIAL

Project's Current Zoning

RC-RETAIL COMMERCIAL

Nearest Major Cross Street(s)

ARROWHEAD DR  
MEDICAL PKWY.

Please provide a brief description of your proposed project and/or proposed use below. Provide additional pages to describe your request in more detail.

SEE ATTACHED

### PROPERTY OWNER'S AFFIDAVIT

JODA LLC, being duly deposited, do hereby affirm that I am the record owner of the subject property, and that I have  
knowledge of, and agree to, the filing of this application.

Signature

Address 2910 S. Carson St

Date 7/12/22

Use additional page(s) if necessary for additional owners.

STATE OF NEVADA  
COUNTY }

On July 15, 2022, Theodore Michael Hehl III, personally appeared before me, a notary public,  
personally known (or proved) to me to be the person whose name is subscribed to the foregoing document and who acknowledged to me that he/she  
executed the foregoing document.

Notary Public



NOTE: If your project is located within the Historic District, it may need to be scheduled before the Historic Resources Commission or the  
Airport Authority in addition to being scheduled for review by the Planning Commission. Planning staff can help you make this determination.

## **SPECIAL USE PERMIT**

### **DETAILED PROJECT DESCRIPTION:**

OASIS – assisted living will be a full service congregate care facility that will provide Skilled Nursing as well as less intensive assisted living services including memory care and hospice care. The project will include three connected three-story residential towers that encircle a shared central gardens amenity area. Each tower will have a different theme and restaurant dining area; The Tuscan tower will capture an Italian restaurant, 2. The Hawaiian Tower will feature an Asian restaurant, 3. The Tahoe Tower will feature an American restaurant. Dining choices and good food are highly valued by the residents. All restaurants will look out onto the central gardens and will be easily connected to each other around the garden's amenity area on the ground level. The restaurants will be serviced by the central commissary that will prepare all the food and wash all the dishes. Each restaurant will have 5 or 6 menu choices that will be served table side from rolling hot carts. Extended hours of operation will allow for more family participation in visits.

Each three-story tower will have 58 rooms with two resident elevators and one service elevator. Each room has the flexibility to be private or shared and has its own bathroom and outside deck. The number of beds housed will vary and will be driven by market demand. Each building could house as many as 132 beds at 90 percent occupancy. At the required rate of one caregiver per six residents each building could have as many as twenty-two caregivers on duty on the day shift and 11 caregivers on the night shift.

The Central Gardens amenity area will include 2 putting greens, 2 dog parks and indoor physical therapy pool and spa, flower and vegetable gardens, a water feature with walking paths and benches as well as a special event room for Sunday church services and other scheduled speaking and musical events as well as movie nights. Chaplain services will be available for residents and families in small chapels.

A separate 13,000 square foot on-site administrative building will include Human resources, training, operations, staff offices as well as a micro testing laboratory, a private pharmacy and other medical staff and storage facilities.

We are also requesting an alternate use for on site caregiver housing as shown on sheet 2 overall site plan and sheet 16 alternate Caregiver Apartments. The existing RC zoning allows for a mixed use with an S.U.P. The addition of this 12 unit apartment building would enhance the overall OASIS campus complex level of care by housing about 1/6 of the required caregivers on site. It is imperative to the residents that the caregivers are on duty at all times. Having a portion of this staff on site will give Oasis the ability to ensure this level of care. The location of this apartment building also shields the truck loading as well as trash pick up and grease interceptor maintenance from the Medical Parkway park loop roads. We appreciate your consideration of this request.

The proximity to the Carson Tahoe Regional Medical Center will be an advantage to residents of Oasis since the services offered there and the short response time will add to the overall health care availability in Carson City.

If there is any additional information that would provide a clearer picture of your proposal that you would like to add for presentation to the Planning Commission, please be sure to include it in your detailed description.

Please type and sign the statement on the following page at the end of your findings response.

### ACKNOWLEDGMENT OF APPLICANT

I certify that the forgoing statements are true and correct to the best of my knowledge and belief. I agree to fully comply with all conditions as established by the Planning Commission. I am aware that this permit becomes null and void if the use is not initiated within one-year of the date of the Planning Commission's approval; and I understand that this permit may be revoked for violation of any of the conditions of approval. I further understand that approval of this application does not exempt me from all City code requirements.

  
Applicant's Signature

PETER WILDAY  
Print Name

7/14/22  
Date  
10/4/22 (PW)

## **SPECIAL USE PERMIT FINDINGS**

### **TWO: PROPOSED USE: NOT DETRIMENTAL TO NEIGHBORHOODS:**

#### **(A) Adjacent Uses: RC**

**SOUTH: "CALFER" Brakes repair AM-PM and ARCO**

**NORTH: "CARSON RV" Sales Lot**

**EAST: "MY PLACE HOTEL, HAMPTON INN AND SUITES AND**

**TACO BELL" WEST: MEDICAL PARKWAY LOOP ROAD ENTRY  
PARK**

**(B) Oasis assisted living will be consistent with existing businesses in the neighborhood and will have a positive effect on the appearance and uses.**

**(C) Oasis assisted living will offer no detrimental use to the general neighborhood.**

**(D) Outdoor Lighting: The outdoor lighting at Oasis will be shielded from the neighbors and will be low level 2900 degree kelvin LED warm lighting as opposed to the bright cool lighting at other commercial uses.**

**(E) Landscaping: All landscaping will be new since the existing use is mostly asphalt for the RV sales areas. There are no existing trees. ( See Site Plan )**

**(F) Oasis assisted living will provide Carson City with a Premier Senior Living Care Facility that will stand the test of time and will be a proud addition to the Carson City Community.**

### **THREE: PROPOSED USE: NO DETRIMENTAL EFFECT ON VEHICULAR OR PEDESTRIAN TRAFFIC:**

Oasis assisted living serves only people who require different levels of care. No cars are allowed for residents. Caregivers will be shuttled to work or use mass transit when available, bicycles will be encouraged. Very little caregiver use is anticipated. Parking is provided primarily for medical staff and guests. The existing adjacent streets have been designed for more traffic than we will generate. Pedestrian traffic will be negligible.

### **FOUR: PROPOSED USE: WILL NOT OVERBURDEN CITY PUBLIC SERVICES AND FACILITIES:**

**(A) SCHOOLS-** caregivers may have children and could add to the student population- if the 100 caregivers had 25 percent with children that would add 25 to 50 children.

**(B) Police and Fire Protection-** all buildings are 100 percent fire sprinkled Oasis has 24- hour in-house security.



(C) WATER- There is a new 12" water main on our side of Medical Parkway in the 5030 pressure zone which has adequate capacity and pressure for fire protection.

(D) STORM DRAINAGE- our detention pond will connect to the existing 48" RCP in Medical Parkway.

(E) SEWER- We will connect our new sewer to the existing 10" PVC main in Medical Parkway.

(F) ROADS - no new roads are required.

(G) INFORMATION SOURCE - Development Engineering - Guillermo Munoz.

FIVE: Oasis meets the definition and specific standards for the CCMC section 18 04.195 RC zoned-mixed commercial uses with the approval of S.U.P Setbacks are 0-0" Height does not exceed 45 feet. All signs to meet division 4.7. Landscaping will exceed 25 percent of the site. Open space will exceed 60 percent of the site.

SIX: Oasis will provide benefits to the general public by having an assisted living facility of this high quality available with good freeway access for easy guest visits.

SEVEN: Oasis will not damage other properties in the area because there are no mitigation measures proposed.

## **SPECIAL USE PERMIT OASIS ASSISTED LIVING**

### **DEVELOPMENT CHECKLIST**

#### **CHAPTER 3: BALANCED LAND USE PATTERN**

Oasis assisted living meets all of the twelve goals of the Carson City Master Plan and adds a much needed large high quality congregate care facility as a complement to the Carson Tahoe Regional Medical Center Campus. Its location at the northern gateway to Carson City and adjacent to the medical center makes this six acre project the perfect priority in fill land use and will complement the existing architectural character of the area both in the use of materials and as well as the scale of buildings and quality of landscaping.

#### **CHAPTER 4: EQUITABLE DISTRIBUTION OF RECREATIONAL OPPORTUNITIES**

Oasis assisted living provides many self contained recreational opportunities for its residents and does not tax the city's existing facilities in any way. The project has approximately 60 percent open space and will be very well landscaped.

#### **CHAPTER 5: ECONOMIC VITALITY**

Oasis assisted living enhances a strong economic employment base since it will provide as many as 100 caregivers jobs as well as other medically related jobs including doctors, nurses, physical and occupational therapists, speech therapists, food and beverage staff, maintenance and administrative jobs. This diverse infusion of jobs in the North Carson City area will help the revitalization of underused retail spaces in our neighborhood.

#### **CHAPTER 6: LIVABLE NEIGHBORHOODS AND ACTIVITY CENTERS**

Oasis assisted living meets all of the applicable goals of the Carson City Master

#### **Plan. CHAPTER 7: CONNECTED CITY**

Oasis Assisted Living will not generate more than 80 peak hour trips and not more than 500 trips per day. We will use the ITE 10th edition for trip generation rates as suggested by Chris Martinovich for scoping. Our preliminary interval parking analysis indicates that we will require approximately 150 parking spaces. We have shown 169 spaces to account for an increase in Holiday guests visits. All other parking will remain consistent by employees.

Oasis assisted living is a part of the North gateway to Carson City and will promote the use of future transit and bicycle facilities by connecting to the Medical Parkway and North Carson street, multi-use pathways and sidewalks.

# Master Plan Policy Checklist

## Special Use Permits & Major Project Reviews & Administrative Permits

### PURPOSE

The purpose of a development checklist is to provide a list of questions that address whether a development proposal is in conformance with the goals and objectives of the 2006 Carson City Master Plan that are related to non residential and multi-family residential development. This checklist is designed for developers, staff, and decision-makers and is intended to be used as a guide only.

Development Name: OASIS - ASSISTED LIVING, MEMORY CARE - HOSPICE - SKILLED NURSING

Reviewed By: \_\_\_\_\_

Date of Review: \_\_\_\_\_

### DEVELOPMENT CHECKLIST

The following five themes are those themes that appear in the Carson City Master Plan and which reflect the community's vision at a broad policy level. Each theme looks at how a proposed development can help achieve the goals of the Carson City Master Plan. A check mark indicates that the proposed development meets the applicable Master Plan policy. The Policy Number is indicated at the end of each policy statement summary. Refer to the Comprehensive Master Plan for complete policy language.

#### CHAPTER 3: A BALANCED LAND USE PATTERN

The Carson City Master Plan seeks to establish a balance of land uses within the community by providing employment opportunities, a diverse choice of housing, recreational opportunities, and retail services.

##### Is or does the proposed development:

- ☒ Meet the provisions of the Growth Management Ordinance (1.1.d, Municipal Code 18.12)?
- ☒ Use sustainable building materials and construction techniques to promote water and energy conservation (7.1e, f)?
- ☒ Located in a priority infill development area (1.2a)?
- ☒ Provide pathway connections and easements consistent with the adopted Unified Pathways Master Plan and maintain access to adjacent public lands (1.4a)?



- ☒ Protect existing site features, as appropriate, including mature trees or other character-defining features (1.4c)?
- ☒ At adjacent county boundaries or adjacent to public lands, coordinated with the applicable agency with regards to compatibility, access and amenities (1.5c, b)?
- ☒ In identified Mixed-Use areas, promote mixed-use development patterns as appropriate for the surrounding context consistent with the land use descriptions of the applicable Mixed-Use designation, and meet the intent of the Mixed-Use Evaluation Criteria (2.1b, 2.2b, 2.3b, Land Use Districts, Appendix C)?
- ☒ Meet adopted standards (e.g. setbacks) for transitions between non-residential and residential zoning districts (2.1d)?
- ☒ Protect environmentally sensitive areas through proper setbacks, dedication, or other mechanisms (3.1b)?
- ☒ Sited outside the primary floodplain and away from geologic hazard areas or follows the required setbacks or other mitigation measures (3.3d, e)?
- ☒ Provide for levels of services (i.e. water, sewer, road improvements, sidewalks, etc.) consistent with the Land Use designation and adequate for the proposed development (Land Use table descriptions)?
- ☒ If located within an identified Specific Plan Area (SPA), meet the applicable policies of that SPA (Land Use Map, Chapter 8)?

## **CHAPTER 4: EQUITABLE DISTRIBUTION OF RECREATIONAL OPPORTUNITIES**

The Carson City Master Plan seeks to continue providing a diverse range of park and recreational opportunities to include facilities and programming for all ages and varying interests to serve both existing and future neighborhoods.

**Is or does the proposed development:**

- ☒ Provide park facilities commensurate with the demand created and consistent with the City's adopted standards (4.1b)?
- ☒ Consistent with the Open Space Master Plan and Carson River Master Plan (4.3a)?

## **CHAPTER 5: ECONOMIC VITALITY**

The Carson City Master Plan seeks to maintain its strong diversified economic base by promoting principles which focus on retaining and enhancing the strong employment base, include a broader range of retail services in targeted areas, and include the roles of technology, tourism, recreational amenities, and other economic strengths vital to a successful community.

**Is or does the proposed development:**

- ☒ Encourage a citywide housing mix consistent with the labor force and non-labor force populations (5.1)?
- ☒ Encourage the development of regional retail centers (5.2a)?
- ☒ Encourage reuse or redevelopment of underused retail spaces (5.2b)?
- ☒ Support heritage tourism activities, particularly those associated with historic resources, cultural institutions and the State Capitol (5.4a)?
- ☒ Promote revitalization of the Downtown core (5.6a)?
- ☒ Incorporate additional housing in and around Downtown, including lofts, condominiums, duplexes, live-work units (5.6c)?

## CHAPTER 6: LIVABLE NEIGHBORHOODS AND ACTIVITY CENTERS

The Carson City Master Plan seeks to promote safe, attractive and diverse neighborhoods, compact mixed-use activity centers, and a vibrant, pedestrian-friendly Downtown.

Is or does the proposed development:

- ☒ Use durable, long-lasting building materials (6.1a)?
- ☒ Promote variety and visual interest through the incorporation of varied building styles and colors, garage orientation and other features (6.1b)?
- ☒ Provide variety and visual interest through the incorporation of well-articulated building facades, clearly identified entrances and pedestrian connections, landscaping and other features consistent with the Development Standards (6.1c)?
- ☒ Provide appropriate height, density and setback transitions and connectivity to surrounding development to ensure compatibility with surrounding development for infill projects or adjacent to existing rural neighborhoods (6.2a, 9.3b 9.4a)?
- ☒ If located in an identified Mixed-Use Activity Center area, contain the appropriate mix, size and density of land uses consistent with the Mixed-Use district policies (7.1a, b)?
- ☐ If located Downtown:
  - ☐ Integrate an appropriate mix and density of uses (8.1a, e)?
  - ☐ Include buildings at the appropriate scale for the applicable Downtown Character Area (8.1b)?
  - ☐ Incorporate appropriate public spaces, plazas and other amenities (8.1d)?
- ☐ Incorporate a mix of housing models and densities appropriate for the project location and size (9.1a)?

NA

NA

## CHAPTER 7: A CONNECTED CITY

The Carson City Master Plan seeks promote a sense of community by linking its many neighborhoods, employment areas, activity centers, parks, recreational

amenities and schools with an extensive system of interconnected roadways, multi-use pathways, bicycle facilities, and sidewalks.

**Is or does the proposed development:**


- ☒ Promote transit-supportive development patterns (e.g. mixed-use, pedestrian-oriented, higher density) along major travel corridors to facilitate future transit (11.2b)?
- ☒ Maintain and enhance roadway connections and networks consistent with the Transportation Master Plan (11.2c)?
- ☒ Provide appropriate pathways through the development and to surrounding lands, including parks and public lands, consistent with the Unified Pathways Master Plan (12.3a, c)?

If there is any additional information that would provide a clearer picture of your proposal that you would like to add for presentation to the Planning Commission, please be sure to include it in your detailed description.

Please type and sign the statement on the following page at the end of your findings response.

### ACKNOWLEDGMENT OF APPLICANT

I certify that the forgoing statements are true and correct to the best of my knowledge and belief. I agree to fully comply with all conditions as established by the Planning Commission. I am aware that this permit becomes null and void if the use is not initiated within one-year of the date of the Planning Commission's approval; and I understand that this permit may be revoked for violation of any of the conditions of approval. I further understand that approval of this application does not exempt me from all City code requirements.



Applicant's Signature

PETER WILDAY

Print Name

7/14/22

Date

# Water Main Analysis

Project: Oasis Assisted Living  
4500 N Carson Street  
Carson City APN 007-531-26  
File No: 2284.001-B

Prepared by:

Christopher Moltz, P.E.  
[chris@westexconsulting.com](mailto:chris@westexconsulting.com)  
775-484-1013

October 3, 2022

Prepared for:

Peter Wilday Architects for Submittal to Carson City, NV





## **I. Introduction**

This report intends to serve as a Water Main Analysis for Oasis Assisted Living. The project is to be located on Carson City APN 007-531-26 (at 4500 N. Carson Street). The parcel is currently used by an existing business (Michael Hohl RV Center) which will be replaced by the proposed project: an up to 356 bed maximum assisted living facility. A Major Project Review Meeting was held with Carson City on October 26, 2021 (MPR-2021-0348). Per review of MPR meeting notes for this project, nine items (Items 6-14) were addressed towards the water requirements for this project:

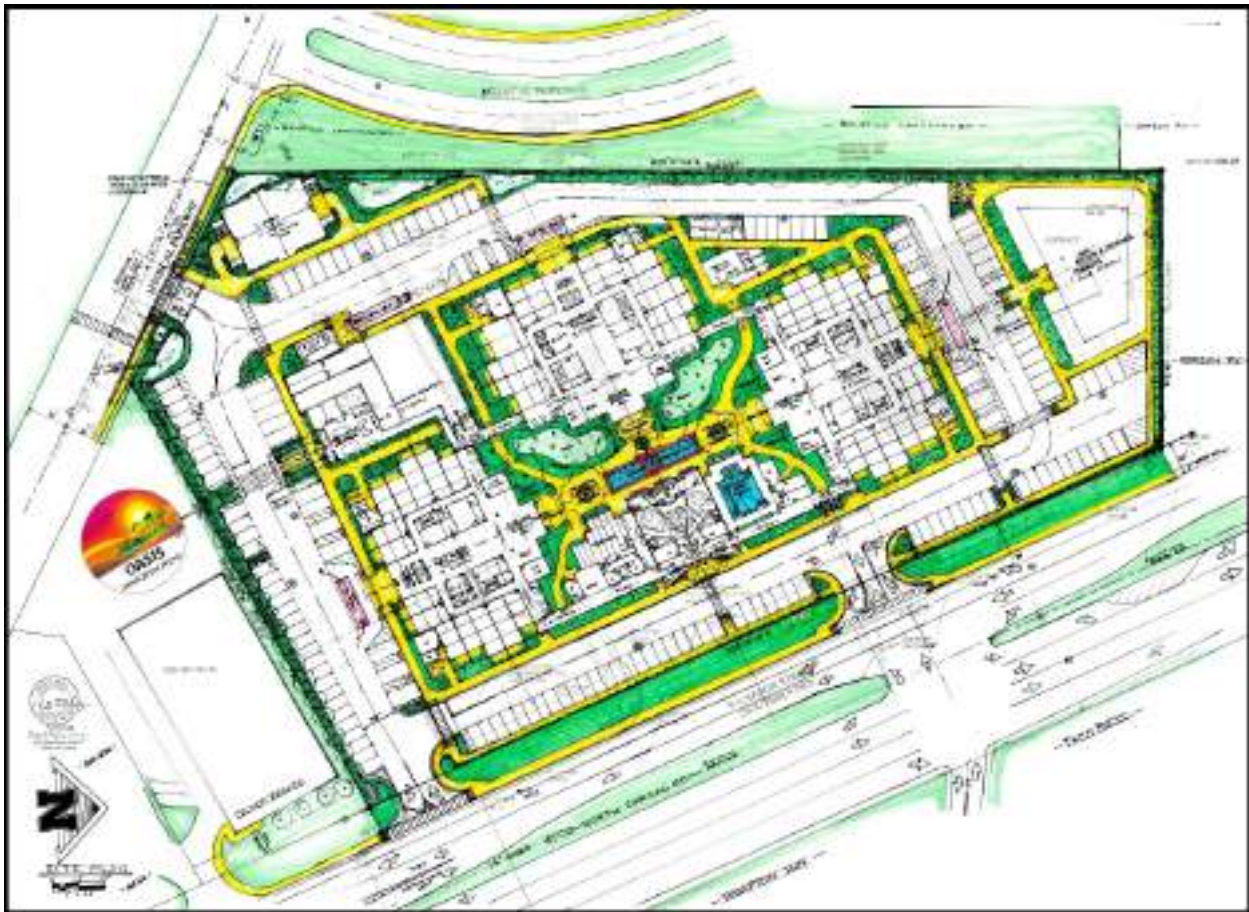
6. The existing water main is a 10-inch PVC on [the] east side of the property (N Carson St).
7. The project spans two pressure zones. The development shall be connected to the 12-inch water main in Medical Parkway, the 5030-pressure zone.
8. A wet stamped water main analysis must be submitted in accordance with CCDS 15.3.1(a) to show that adequate pressure will be delivered to the meter and fire flows meet the minimum requirements of the Carson City Fire Department. Please contact Michael Friend at (775) 283-7713 or [mfriender@carson.org](mailto:mfriender@carson.org) to schedule a fire hydrant flow test.
9. Due to minimal water information provided in the MPR application, additional requirements may apply.
10. Project shall comply with all City and State codes and standards.
11. The project shall be master metered for the water service. A reduced pressure principal backflow prevention assembly will be required to install located after the master meter. Attention is drawn to NRS 704.940 in regard to metering, charging and billing for water supplied to individual units.
12. During system adjustments, pressures may be lower and the applicant may wish to consider installing booster pumps to provide adequate pressures at the upper stories of the development. Booster pumps would be installed and maintained at the property owner's expense.
13. A fire loop will be private and check valves will be installed at the property line.
14. Water and sewer connection fees must be paid. If these fees were paid in the past, then the difference between the old and new amounts of water/sewer usages must be paid for. Please see CCMC 12.01.030 for the water connection fee schedule and 12.03.020 for the sewer connection fee schedule.

The purpose of this report is to address Item No. 8 of MPR letter for MPR-2021-0348.

If any findings, assumptions, conditions, or project plans are found to vary from those described in this report, we should be contacted immediately to verify that the recommendations contained herein remain applicable to the final project design. Accordingly, this report may be revised at any time.

## **II. Overview and Scope of Analysis**

The proposed development for this project is a 356 bed maximum assisted living facility. Multiple three story towers are proposed for the property. The location of this project is on Carson City APN 007-531-26. This project will replace the existing Michael Hohl RV Center currently on the property. Please reference Figure 1 (below) for a conceptual layout of the project.



**Figure 1 – Conceptual Site Layout of Project.**

I reached out to Carson City Public Works to schedule a fire test flow and discuss the water main analysis for this project. When I first scheduled a fire flow test with the City, they a fire flow test along the eastern side of the project location in the 4960 pressure zone was ordered (see Attachment 1). However, the MPR notes from Carson City specified that the water main must connect to the 5030 pressure zone of Medical Pkwy.



I spoke with Michael Friend, P.E., Project Manager for Carson City about this and he forwarded me a recent fire flow test performed in the 5030 pressure zone on the north Medical Parkway loop (see Attachment 2). Unfortunately, based on discussions with Mr. Friend, there are no close hydrants in the 5030 pressure zone near the project to test from. The closest hydrant is the northern hydrant in the fire flow test he forwarded. His primary concern for what he is looking for is that the static pressure at the meter does not drop below 60 psi. Michael Friend once again reiterated the possible need for booster pumps on site after the meter due to the height of the proposed project.

An overview of the existing municipal water system can be seen below in Figure 2.



**Figure 1 – Overview of Existing Municipal Water System – Courtesy of Carson City Public Works Department. The separation between the 5030 and 4960 Pressure Zones can be seen as a Red Arrow.**

Per review of the MPR Letter, any Sewer Main Capacity Study should consult Section 15.3.1(a) of the CCDS. I pulled the municipal code for Section 15.3.1(a) which reads as follows:

**15.3.1 Water and Reclaimed Water Design Criteria.**

- a. Main Analysis. Water mains shall be analyzed to determine system capability to provide adequate flows and pressures. The analysis and calculations shall be provided to Carson City development engineering for review and approval, or the applicant may request that the analysis be done by the city. The cost to the city for performing the analysis shall be charged

to the developer. Water mains shall be designed to deliver a minimum of sixty (60) psi at the meter during peak demand periods and to provide adequate fire flow as required by the fire department. If project is an infill development where the existing system is incapable of providing sixty (60) psi, the utilities director may waive the requirement.

Subdivisions, PUD's and large commercial or industrial projects having a significant impact on the city water system as determined by the Carson City development engineering department shall provide an update of the city water model using a format that is compatible with the current model, or request the city perform the analysis as described above.

New construction or remodels adjacent to the existing Carson City water system where little or no additional system improvements are required; must provide a report with current date, project address (with location map), APN number, permit number, if available, comparing the required fire flow established by the building and safety department (UFC) and the "available" flow obtained by the actual fire flow data sheet, which shall be approved.

The report shall address system pressures at the project location to assure sixty (60) psi is available at all water meters during peak day demands.

Reclaimed water mains shall be analyzed to provide adequate flow and pressure at the points of service for new intended use. The analysis must consider future uses as determined by the utilities department.

Accordingly, the following sections intend to address the above scope of analysis.

### **III. Existing Water System and Surrounding Areas**

Based on information provided by Carson City and review of the MPR Meeting notes, this project will need to connect to the 5030 pressure main along Medical Pkwy. The water line in front of Medical Pkwy is a 12" PVC Main, which loops around the parkway. The fire flow test was performed on the northern edge of the Medical Pkwy loop (Attachment 2). Although the fire flow test was performed approximately 2,500 feet from the proposed project hookup location, it is on a looped system, and the elevation of the proposed project location meter location is at approximately 4758 feet, whereas the elevation of where the fire flow test was taken was at approximately 4828 feet (or 70 feet higher in elevation).

Static pressure at the point of connection should at a minimum match the static pressure at the residual hydrant (which was identified as 82 psi per the fire flow test), but realistically, we can assume the static pressure will be higher due to the 70 feet in elevation drop from the residual hydrant's location.

As previously mentioned, two Fire Flow Tests were conducted: one in the 5030 Pressure zone on Medical Pkwy (Attachment 2), and one in the 4960 Pressure Zone on North Carson Street (Attachment 1).

The largest building proposed is the three towers, each of which is proposed to be a 45,000 square foot building (under 45 feet tall) with IBC construction type IIA or IIIA. Based on review of the 2018 IFC Table B105.1(2), required fire flows for a 45,000

square foot building (Type IIA or IIIA) require a 3,000 gpm flow at 20 psi residual pressure for three hours.

Based on the fire flow test on Medical Pkwy (5030 Pressure Zone), there is not enough flow available to meet this requirement. The fire flow test for Medical Pkwy (Attachment 2) shows only a 2,100 gpm capacity at 20 psi residual pressure. However, the fire flow test for N. Carson Street (Attachment 1) shows a 3,100 gpm flow at 20 psi residual pressure. Based on review of these two tests, the 4060 pressure zone (along N. Carson Street), should be able to provide adequate fire flows for this project. Please note that all hydrants in the vicinity of the project are connected to the 4060 pressure zone.

#### **IV. Fixture Unit Counts and Water Demand for Project**

A fixture unit (F.U.) count was performed and supplied by IMEG Corporation for this project and can be seen in Attachment 3.

Based on the completed fixture unit count 1577.5 total fixture units were counted resulting in a maximum demand rate of 279.6 gpm.

In addition to the domestic water usage, we also need to approximate landscaping usage. Please note that due to the size of the project and the way landscaping systems work (in irrigation zones), not all landscaping will be irrigated at the same time. Accordingly, landscaping can and should be timed so that irrigation systems are not running at the same time as peak domestic water usage times. Based on initial discussions with the Architect, we are looking at the following quantities of landscaping:

- 70 Large Shade Trees
- 700 Shrubs
- 5,000 square feet of turf (putting green)

If we assume 12 gallons per hour drip system per tree, and 2 gallons per hour drip system per shrub, this comes to a demand of 2,240 or 37.33 gallons per minute (gpm) for the drip system. However, an irrigation system of this size will likely be split into at least seven zones for an instantaneous demand of 5.3 gpm for drip system irrigation.

Based on previous experience and irrigation design, it will be assumed that 1,000 sq. feet of turf requires a sprinkler flow rate of 7gpm. Although there is 5,000 proposed square feet of turf, we will assume that this will be broken into a minimum of four zones resulting in a maximum instantaneous flow rate of 8.75 gpm.

Based on the assumption that only drip or sprinkler irrigation systems will be running at the same time, and the irrigation system will run in zones at separate timing, the highest of the above numbers (8.75 gpm) will be used in this analysis as the peak irrigation flow rate.

If we add the 8.75 gpm maximum irrigation demand to the 279.6 gpm maximum domestic demand based on the water fixture units, we come to a peak water demand of 288.35 gpm.

When we plot the 288.35 gpm peak demand on the pressure curve of the fire flow test for the 5030 Pressure Zone on Medical Pkwy (Attachment 2), a pressure drop from 82 psi to 80 psi is observed. This is plenty more than the 60 psi required per Carson City Standards.

## **V. Conclusions:**

This project adjoins two pressure zones within the Carson City municipal water system: the 4960 Pressure Zone along N. Carson Street, and the 5030 Pressure Zone along Medical Pkwy.

Existing fire hydrants adjoining the property are located off N. Carson Street and the 4960 Pressure Zone. Based on the fire flow test in Attachment 1, these hydrants will provide enough fire flow capacity to the project (based on a maximum building size of 45,000 sq. feet and Type IIA or IIIA construction). Any additional hydrants that may be required for this project should come off the 4960 Pressure Zone.

The existing domestic water line and irrigation lines should come off the 5030 Pressure Zone on Medical Pkwy (as prescribed in the MPR meeting notes). The peak water demand based on the fixture count provided by IMEG Corporation is 279.6 gpm, and the maximum irrigation demand is assumed to be 8.75 gpm. This comes to a maximum demand of 288.35 gpm.

When we plot the 288.35 gpm peak demand on the pressure curve of the fire flow test for the 5030 Pressure Zone on Medical Pkwy (Attachment 2), a pressure drop from 82 psi to 80 psi is observed. This is plenty more than the 60 psi required per Carson City Standards.

## **VII. Disclaimer and Closeout:**

The recommendations presented in this report are based on preliminary assumptions and estimates, as well as the best available data at the time.

Our conclusions and recommendations may be invalidated, partially or in whole, by changes outside our control, such as new projects, or changes in land uses, or additional testing and modeling. This report may be subject to review and revision at any time. Opinions expressed in this report do not constitute a warranty of any kind, either express or implied.

If you, any design consultants, or plan reviewers have any questions, please contact me directly at (775) 484-1013 or at [chris@westexconsulting.com](mailto:chris@westexconsulting.com)

Respectfully submitted,  
**WESTEX Consulting Engineers, LLC**

A handwritten signature in blue ink, appearing to read "Chris Moltz", is centered below the company name.

Christopher Moltz, P.E.  
Senior Project Manager

**ATTACHMENT 1 – FIRE FLOW TEST FOR 4960 PRESSURE ZONE  
(N. CARSON STREET)**



# Fire Flow Test Data Sheet



Location of Test (Street and Cross Street): North Carson and Medical Parkway  
 Address Nearest Residual Hydrant: 4340 N Carson  
 Test Date: 8/9/2022 Test Time: 11:00  
 Testing Personnel: SW, AN, NR  
 Pressure Zone: 4960 Main Size: 10-inch  
 Comments: \_\_\_\_\_

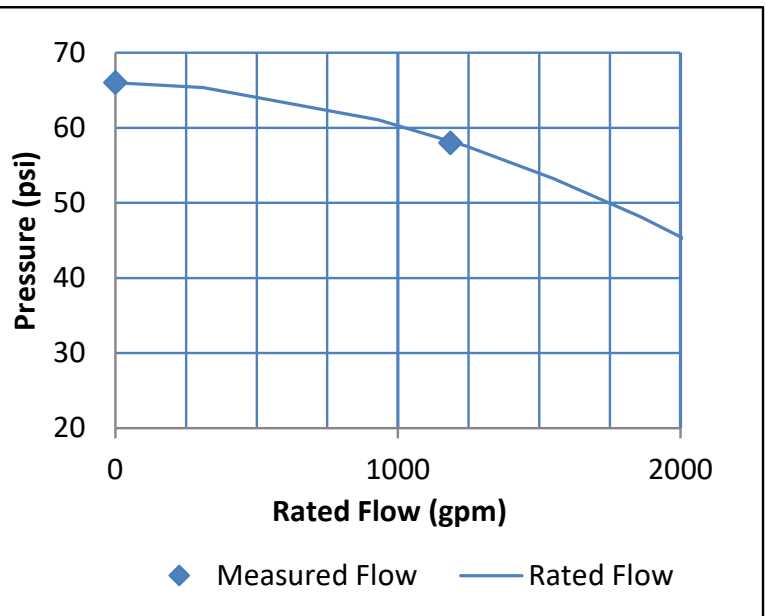
## Test Results:

Residual Hydrant		Flow Hydrant(s)					
Static:	66 psi		Hydrant Tester	Pitot Pressure (psi)	Discharge Diameter (in)	Outlet Coeff. (c)	Pitot Flow (gpm)
Residual:	58 psi						
Pressure Drop:	8 psi	Flow 1	HM1	16	2	1.307	624
	12 %	Flow 2	HM2	13	2	1.307	562
		Flow 3					
Total							1186

Area Map



Rated Flow



Rated Pressure (for Rated Capacity Calculation) 20 psi

**Rated Capacity at 20 psi residual pressure. 3,100 gpm**

Based on NFPA 291 - 2019 Edition and APWA Manual 17 - Fourth Edition

Pursuant to NFPA 291, fire flow test data over five years old should not be used.

Hydrant OBJECTID: 2666

Data Sheet File Name: Carson-Medical Parkway\_2.pdf

**ATTACHMENT 1 – FIRE FLOW TEST FOR 5030 PRESSURE ZONE  
(MEDICAL PKWY LOOP)**

# Fire Flow Test Data Sheet



Location of Test (Street and Cross Street): Medical Parkway-Medical Parkway Alt-2

Address Nearest Residual Hydrant: 1600 Medical Parkway

Test Date: 6/22/2022

Test Time: 9:19

Testing Personnel: KA, JR, CH

Pressure Zone: 5030 Main Size: 12-inch

Comments: Configuration 2 - No change to Local PRV and Goni Booster Off

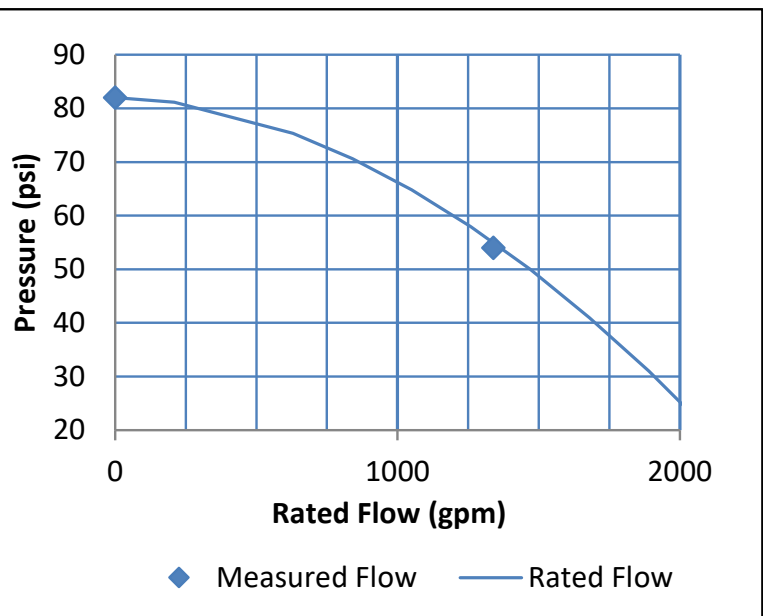
## Test Results:

Residual Hydrant		Flow Hydrant(s)					
Static:	82 psi		Hydrant Tester	Pitot Pressure (psi)	Discharge Diameter (in)	Outlet Coeff. (c)	Pitot Flow (gpm)
Residual:	54 psi						
Pressure Drop:	28 psi	Flow 1	HM1	16	2	1.307	624
	34 %	Flow 2	HM2	21	2	1.307	715
		Flow 3					
Total							1339

Area Map



Rated Flow



Rated Pressure (for Rated Capacity Calculation) 20 psi

Rated Capacity at 20 psi residual pressure. 2,100 gpm

Based on NFPA 291 - 2019 Edition and APWA Manual 17 - Fourth Edition

Pursuant to NFPA 291, fire flow test data over five years old should not be used.

Hydrant OBJECTID: 2247

Data Sheet File Name: MedicalPkwy-MedicalPkwy2.pdf

**ATTACHMENT 3 – FIXTURE UNIT COUNT FOR PROPOSED PROJECT  
(OASIS ASSISTED LIVING)**

# IMEG Corporation

## 2018 U.P.C.

Date: 7/26/2022

### PLUMBING FIXTURE CALCULATION FORM

FIXTURE	QTY.	CW F.U.	HW F.U.	CW Main	CW Branch	HW Branch	WASTE F.U.	TOTAL WASTE
WATER CLOSET, F/V 3.5 GPF, Heavy/Public	0	10	-	0	0	-	8	0
WATER CLOSET, F/V 3.5 GPF, Gen. Public	0	8	-	0	0	-	6	0
WATER CLOSET, G/T 3.5 GPF, Gen. Public	0	5.5	-	0	0	-	6	0
WATER CLOSET, F/V 1.6 GPF, Heavy/Public	0	8	-	0	0	-	6	0
WATER CLOSET, F/V 1.6 GPF, Gen. Public	26	5	-	130	130	-	4	104
WATER CLOSET, P.A. F/T 1.6 GPF, Gen. Pub.	0	2.5	-	0	0	-	5	0
WATER CLOSET, G/T 1.6 GPF, Private	211	2.5	-	527.5	527.5	-	3	633
URINAL, F/T, Gen. Public	0	2	-	0	0	-	5	0
URINAL, F/V + 1.0 GPF, Gen. Public	0	5	-	0	0	-	5	-
URINAL, F/V 1.0 GPF, Heavy/Public	0	5	-	0	0	-	5	0
URINAL, F/V 1.0 GPF, Gen. Public	7	4	-	28	28	-	4	28
LAVATORY, Heavy, Gen. Pub. & Private	233	1	0.75	233	174.75	174.75	1	233
SHOWER, Gen. Public, 2" trap	198	2	1.5	396	297	297	2	396
SHOWER, Group, Per Head, Contin. Use	0	5	3.75	0	0	0	5	0
WHIRLPOOL or BATHTUB	0	4	3	0	0	0	2	0
CLOTHES WASHER, Domestic	12	4	3	48	36	36	3	36
CLOTHES WASHER, Domestic, 3 or More	0	5	3.75	0	0	0	6	0
DISHWASHER, Domestic, Gen. Pub. & Private	0	0	3	0	0	0	2	0
WATER COOLER/FOUNTAIN, Gen. Public	0	0.5	-	0	0	-	0.5	0
WATER COOLER/FOUNTAIN, Heavy Public	0	0.75	-	0	0	-	0.5	0
DUAL WATER COOLER/FOUNT., Heavy Pub.	0	1.5	-	0	0	-	0.5	0
SINK, 1 Compartment, Domestic	0	2	1.5	0	0	0	2	0
SINK, 2 Compartment, Dom., w/ Disposal	0	2	1.5	0	0	0	2	0
SINK, 2 Comp., Dom., w/ Disposal & D.W.	0	2	1.5	0	0	0	2	0
BAR SINK, 1 Compartment, Private	13	1	0.75	13	9.75	9.75	1	13
SHAMPOO SINK, 1 Compartment, Gen. Public	3	2	1.5	6	4.5	4.5	2	6
Scrub Sink	0	4	3	0	0	0	3	0
SERVICE SINK or MOP BASIN, 2-3" trap	10	3	2.25	30	22.5	22.5	3	30
LAUNDRY SINK, 1 or 2 Compartment	0	2	1.5	0	0	0	2	0
SEMICIRCULAR WASH SINK	0	4	3	0	0	0	3	0
EMERGENCY SHOWER / EYEWASH	0	14	7.5	0	0	0	0	0
HOSE BIBB	20	2.5	-	50	50	-	-	-
HOSE BIBB w/ HOT & COLD	0	2	2	0	0	0	-	-
EVAP. COOLER MAKE-UP - 1/2"	0	4	-	0	0	-	-	-
EVAP. COOLER MAKE-UP - 1"	0	10	-	0	0	-	-	-
MISC. KIT. EQUIP. - 3/8" (CW ONLY)	0	1	-	0	0	-	-	-
MISC. KIT. EQUIP. - 1/2" (CW ONLY)	0	2	-	0	0	-	-	-
MISC. KIT. EQUIP. - 3/4" (CW ONLY)	0	4	-	0	0	-	-	-
MISC. KIT. EQUIP. - 1" (CW ONLY)	0	8	-	0	0	-	-	-
MISC. KIT. EQUIP. - 3/8" (HW ONLY)	0	-	1	0	-	0	-	-
MISC. KIT. EQUIP. - 1/2" (HW ONLY)	0	-	2	0	-	0	-	-
MISC. KIT. EQUIP. - 3/4" (HW ONLY)	1	-	4	4	-	4	-	-
MISC. KIT. EQUIP. - 1" (HW ONLY)	0	-	8	0	-	0	-	-
MISC. KIT. EQUIP. - 3/8" (H & CW)	0	1	0.75	0	0	0	-	-
MISC. KIT. EQUIP. - 1/2" (H & CW)	20	2	1.5	40	30	30	-	-
MISC. KIT. EQUIP. - 3/4" (H & CW)	0	4	3	0	0	0	-	-
MISC. KIT. EQUIP. - 1" (H & CW)	9	8	6	72	54	54	-	-
FLOOR DRAIN / SINK (1 1/2" TRAP)	0	-	-	-	-	-	3	0
FLOOR DRAIN / SINK (2" TRAP)	0	-	-	-	-	-	4	0
FLOOR DRAIN / SINK (3" TRAP)	0	-	-	-	-	-	6	0
FLOOR DRAIN / SINK (4" TRAP)	0	-	-	-	-	-	8	0
0	0	-	-	-	-	-	-	-
<b>TOTAL FIXTURE UNITS</b>				<b>1577.5</b>	<b>1364</b>	<b>632.5</b>		<b>1479</b>
<b>SYSTEM PREDOMINANCE</b>				<b>FLUSH TANK</b>				
<b>TOTAL GPM</b>				<b>279.6</b>		<b>148.7</b>		

# Sewer Main Analysis

Project: Oasis Assisted Living  
4500 N Carson Street  
Carson City APN 007-531-26  
File No: 2284.001-B

Prepared by:

Christopher Moltz, P.E.  
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775-484-1013

October 2, 2022

Prepared for:

Peter Wilday Architects for Submittal to Carson City, NV



## **I. Introduction**

This report intends to serve as a Sewer Main Analysis for Oasis Assisted Living. The project is to be located on Carson City APN 007-531-26 (at 4500 N. Carson Street). The parcel is currently used by an existing business (Michael Hohl RV Center) which will be replaced by the proposed project: an up to 356 bed maximum assisted living facility. A Major Project Review Meeting was held with Carson City on October 26, 2021 (MPR-2021-0348). Per review of MPR meeting notes for this project, two items (Items 15 and 16) were addressed towards the sewer requirements for this project:

15. The[re is an] existing sewer main is an 8-inch PVC on the southeast side of the property (N Carson St). There is an existing 10-inch PVC on the southwest side of the property (Medical Parkway). This main's capacity is unknown and would need to be verified. There is approximately 1,140 [feet] of downstream pipe in College Parkway that is at capacity. An analysis of the impact to the downstream main will need to be performed and may result in a pro-rata share agreement to upsize the pipe.

16. A wet stamped sewer main analysis must be submitted that includes addressing the effect of flows on the existing City system. See section 15.3.2 of CCDS.

The purpose of this report is to address both items called out in the MPR letter for MPR-2021-0348.

If any findings, assumptions, conditions, or project plans are found to vary from those described in this report, we should be contacted immediately to verify that the recommendations contained herein remain applicable to the final project design. Accordingly, this report may be revised at any time.

## **II. Overview and Scope of Analysis**

I reached out to Carson City Public Works regarding the sewer main analysis and had a few questions regarding the sewer comments in the MPR Letter. Darren Anderson, P.E., Senior Project Manager for Carson City Responded to my email. Please see below questions (from myself) and responses from Mr. Anderson

Question 1: Can you provide an overview map with all the sewerline locations identified on the MPR Meeting Notes?

Response 1: Image is below showing the sewer mains adjacent to the property





*Figure 1 – Overview of Existing Municipal Sewer System – Courtesy of Carson City Public Works Department*

**Question 2: Can you provide a capacity for the 8" Main?**

Response 2: The 8" main only has flow from the property in question at this point.

Question 3: Is the 10" Main's capacity unknown still?

Response 3: This is outside of the limits of our sewer model but by analyzing the collection area, the pipe is 35% full d/D and has a peak flow of 0.26 MGD

Question 4: When you say the capacity is unknown, what are you looking for: Are you looking for us to pull some manholes and measure the current height of



flows in the pipe? Or do you want us to calculate the maximum capacity of the pipeline based on diameter / change in elevation?

Response 4: Due to info provided above, you won't need to provide the existing flow information through further investigation. The analysis will need to consider the impacts to the 8" and 10" pipes due to the project.

Question 5: As far as the downstream pipe in College Parkway at Capacity and potential pro rata share, what are you looking for, just an estimated Sewer Demand (gallons per day) that can be used for any future pro rata share?

Response 5: Yes, please provide the peak flow to me once it is determined and I can input it into our model to determine the impacts to the sewer main in College Parkway.

Based on my conversation with Mr. Anderson, the 8" PVC main east of the property on N. Carson Street only carries sewage from the subject property at this time. Additionally, the 10" PVC main on the southwest side of the property (Medical Parkway) was identified as having a 35% full d/D and has a peak flow of 0.26 MGD. This report will analyze the peak sewage discharge from the proposed project, as well as its impact to the nearby sewer network. As part of this analysis, we will assume that all sewage from this project will be discharged to the 8" PVC sanitary sewer main along the north side of N. Carson Street. It is assumed that since the 8" PVC east of the subject property only accepts sewage from the existing Michael Hohl RV Center, the total (not the net) peak sewage discharge for the proposed project (Oasis Assisted Living) should be analyzed versus the existing 8" PVC sanitary sewer main. However, the net difference in peak sewage from the existing versus proposed project should be taken into account when generating downstream sewage flows at College Parkway for any future pro-rata share of costs for sewerline expansion.

Per review of the MPR Letter, any Sewer Main Capacity Study should consult Section 15.3.2 of the CCDS. I pulled the municipal code for Section 15.3.2 which reads as follows:

#### 15.3.2 Sewer Design Criteria.

- a. Main analysis. Sewer mains shall be analyzed to determine system capability to provide capacity for the ultimate tributary population with the calculations provided to the city. Except as otherwise provided in this paragraph, a sewage collection system for any project must be sized to carry the design peak hourly flow from the entire tributary area at buildout regardless of whether the tributary area is not located within the boundaries of the project, unless deemed unnecessary by the city engineer. Projects with less than ten (10) dwelling units or less than two hundred (200) fixture units are exempt from this criteria. Flow generation and peaking factors shall be per recommended standards for wastewater facilities (ten (10) state standards). Sewer mains are deemed to be at capacity when the design peak flow is at

depth/diameter ( $d/D$ ) = 0.50, for a pipe that is 15 inches or less in diameter, and depth/diameter ( $d/D$ ) = 0.75, for a pipe that is greater than fifteen (15) inches in diameter. Main analysis shall include a narrative report submitted to the utilities department with maps and calculations addressing the following:

Area of project

Tributary areas outside project

Adjacent areas

Contours usually extending a minimum of three hundred (300) feet beyond the project or as needed to evaluate localized tributary areas

Line layout, pipe size and slope

Predicted average and peak flows at major junction points including flow coming from outside the project area

Direction of flow

Zoning used to predict flows

Special areas such as hospitals, schools, large office or industrial buildings, etc.

Boundaries of areas within the project which are tributary to points of major flow

Floodplains

Scale

Predicted flow from each area

Peaking factors

Cumulative flow

Pipe capacities and depths of flow

Accordingly, the following sections intend to address the above scope of analysis.

### **III. Existing Sewer System and Surrounding Areas**

Based on information provided by Carson City and show in Figure 1 (Page 3), there are two sanitary sewer mains next to project location:

- A 10" PVC Main that flows west to east along Medical Parkway. Per Darren Anderson of Carson City Public Works, this main was identified as having a 35% full  $d/D$  and has a peak flow of 0.26 MGD.
- A 8" PVC Main that flows from the project location, south where it joins the 10" PVC Main at the southwest corner of Medical Parkway and N Carson Street. Per Darren Anderson, this main only accepts waste from the project location.

Accordingly, it is proposed that all sanitary sewage from this project will use this 8" PVC main.

Both of these mains meet at the southwest corner of Medical Parkway and N. Carson Street, where they continue in a single 10" PVC Main, in a southbound direction along the west side of N. Carson Street, until they reach the main along College Parkway which then heads east along College Parkway.

Review of Carson City topography contours were analyzed to determine an approximate slope of the sanitary sewer mains for their respective sections. Based on topography contours, the following slopes can be assumed:

- 8" PVC Main along N. Carson Street on East Side of property: 1.3%
- 10" PVC Main along Medical Pkwy on South Side of Property: 1.0%
- 10" PVC Main along the west side of N. Carson Street between Medical Pkwy and College Pkwy: 0.56%

The applicant is planning on fully utilizing the 8" main on the east side of the subject property. In addition to the subject property, the only other new property that could potentially tie into this line is the Carson RV sales lot directly to the north of the subject property. Anticipated flows from this property are anticipated to be low.

#### **IV. Estimated Peak Sewer Flows from Oasis Assisted Living**

This section intends to fully summarize flows from the project, as well as identify contributing flows to downstream sections of sanitary sewer mains.

First the average daily sewer demand must be calculated.

A fixture unit count was performed for both proposed number of water fixture units, and waste fixture units for the proposed project. A copy of this fixture unit count can be seen in Attachment 1.

Based on review of the fixture unit count in Attachment 1, total waste Fixture Units (F.U.) are anticipated to be 1,479 units.

Based on available information, there are different estimates for how much the sewage fixture units will generate.

Based on uniform plumbing code (UPC), 1,479 units equals a peak demand of 267.6 gpm.

Alternatively, if we assume a maximum demand of 200 gpd per resident x 356 maximum beds = 71,200 gpd. 71,200 gpd x 3 peaking factor = 213,600 gpd peak flow. 213,600 gpd peak flow / 1440 minutes per day = 148 gpm peak flow.

We have a range of estimated peak sewage flows from this project ranging between 148 gpm and 267.8 gpm, or 0.330 cfs to 0.596 cfs. This is a wide range of values, which we will analyze further later on.

Using Manning's Equation, the 8" PVC Main along the east side of the project location has a capacity of 0.80 cfs (assuming half full, 4" depth, Manning's Coefficient of 0.009 for PVC, and 1.3% slope). Based on this information, both of the proposed scenarios will still allow adequate flow in the 8" main along the west side of N. Carson Street.

Using Manning's Equation, the 10" PVC Main along Medical Parkway has a capacity of 1.27 cfs (assuming half full, 5" depth, Manning's Coefficient of 0.009 for PVC, and 1.0% slope). Carson City public works determined that the current maximum (peak) flow in this pipeline is calculated to be 0.26 MGD, which calculates to 0.40 cfs.

When we look at the flows generated by the hospital, surrounding clinics, and other medical buildings only amounting to a peak flow of 0.40 cfs, I think that the value based on the uniform public code (UPC) is likely too high (which generates a peak flow of 0.596 cfs). Additionally, even the 200 gpd per resident is likely a high estimate. This is not a residential community where the average resident will take a shower, get ready in the morning at the same time, go to work, and come back in the evening. Due to staffing and rotation between patients, as well as potential for assisting with showering and restroom duties, I think the peak sewer demand will be less than in a typical residential home, as these daily water use (and sewer) functions will be more spaced throughout the day.

The Carson Tahoe Regional Medical Center has 159 acute care beds, 153 private rooms, as well as 24-emergency care. Additionally, there are six other clinics that contribute (along with the Carson Tahoe Medical Center) to the 0.40 cfs peak flows running through the 10" main along Medical Pkwy. I will further reiterate that I find it hard to believe that this proposed project will create a higher sewage demand than the entire Carson Tahoe Regional Medical Center and surrounding clinics. However, for the sake of being conservative we will assume that this project will have a demand matching the existing peak sewer demand of Medical Parkway or 0.40 cfs.

If we combine the existing maximum flow in the Medical Pkwy sewer line of 0.40 cfs, plus the estimated 0.40 cfs peak demand for this project, it comes to a combined peak sewer demand of 0.80 cfs.

Both the proposed project sewer flows and the existing medical parkway sewer flows will meet at the southwest corner of Medical Pkwy and N. Carson Street, where they combine into a single 10" PVC sanitary sewer main that heads southbound along the west side of N. Carson Street. Using Manning's Equation, the 10" PVC Main along N. Carson Street between Medical Pkwy and College Pkwy has a capacity of 0.95 cfs (assuming half full, 5" depth, Manning's Coefficient of 0.009 for PVC, and 0.56% slope). When compared to the 0.80 cfs combined peak flows through the pipeline, the addition of this project will leave this pipeline at 84% of maximum capacity (this is based on the maximum flow of a 50% full pipeline for sewer pipes 15" or less in diameter). The pipeline will result in allowing 0.15 cfs available for future growth. Review of remaining

open buildable land around Medical Parkway only shows that there is room for approximately seven additional clinics around the Medical Pkwy loop. If we assume that these clinics will use about one third of the current water demand of the hospital and existing clinics, this comes to a peak demand of 0.12 cfs, which when added to existing flows, is less than the maximum capacity of the 10" water main along N. Carson Street, between Medical Pkwy and College Pkwy.

## **V. Estimated Existing Sewer Flows from Property and Estimating Pro-Rata Share**

The existing sewer flows from the current business are very low, and should not affect future capacities of sewer mains downstream of the proposed project; however, the existing sewer contribution will matter when it comes to determining any sort of pro-rata share to help expand the sewer main along College Parkway. It should be argued that the increase in peak sewer flows from the proposed project (not the total peak sewer flows from the proposed project) should be used in determining any sort of pro-rata share.

Additionally, due to the unknowns in peak sewage discharge, the only fair way to measure any future pro-rate cost sharing, would be to base future costs on actual peak sewage flows generated by this project (not the estimates in this report). This will be an easy measure in the future since this project will be the only contributing flows to the 8" main along the west side of N. Carson Street.

The existing project was determined to have the following waste fixture units in place as shown in Table 1 (below).

**Table 1 – Existing Waste Fixture Units for RV Sales Center**

Existing Waste Fixture Units			
Type of Fixture	Waste Fixture Units per Fixture	Number of Fixtures	Total Waste Fixture Units
Water Closet, 1.6 gpf General Public	4	4	16
Lavatory, Heavy, Gen. Public	1	4	4
Floor Drain / Sink 2" Trap	4	2	8
TOTAL			28

As can be seen in the previous page on Table 1, 28 waste fixture units contribute to existing sewer flows. Although this is a small amount compared to the calculated 1,479

waste fixture units of the proposed project, they still should be taken into consideration for any future pro-rata costs the applicant may be forced to pay in the future.  $1,479 \text{ future waste fixtures} - 28 \text{ existing waste fixtures} = 1,451 \text{ new waste fixtures}$ .  $1,451 \text{ new waste fixtures} / 1,479 \text{ total future waste fixtures} = 98.1\%$ . In order to determine any future pro-rata share, the actual peak sewage demand from the proposed project should be measured after the project is built, and then multiplied by 0.981 to determine the increase in peak sewage demand.

Let's assume that for this scenario, the peak sewage demand for the project is measured at 0.385 cfs. If we then take 0.385 cfs and multiply it by 0.981, we arrive at an increase in peak sewer demand of 0.378 cfs. It is the increase in peak sewer demand would then be plugged into the pro-rata share calculator for any downstream sewer improvements.

## **VI. Conclusions:**

Peak Sewer Capacity from this project is conservatively estimated to be 0.40 cfs.

This is only an estimate, and should be verified after this project is built.

All sewer flows from this project are anticipated to be placed into the 8" PVC main which runs along the west side of N. Carson Street from the project location, south towards Medical Pkwy.

The existing 8" PVC main along the west side of N. Carson Street has ample capacity to support the peak sewage flows from this project.

The existing 10" PVC main along the west side of N. Carson Street, between Medical Pkwy and College Pkwy is anticipated to have enough capacity for both this project, existing peak sewer flows from Medical Parkway, and any projected future growth around Medical Pkwy.

Any future pro-rata share should be based on the increase in peak sewage flows from the existing land use, not the total peak sewage flows.

## **VII. Disclaimer and Closeout:**

The recommendations presented in this report are based on best available data and reputable published data. Multiple assumptions are made and stated to come to the conclusions stated in this report. This project will be likely built in phases, and it is unlikely that all rooms will ever be filled at any given time. Accordingly, the findings in this report (such as peak sewage discharge) should be monitored and evaluated as the project is constructed, as there will likely be less real-world usage due to the unique nature of this project.

Our conclusions and recommendations may be invalidated, partially or in whole, by changes outside our control, such as new projects, or changes in land uses. This report may be subject to review and revision at any time. Opinions expressed in this report do not constitute a warranty of any kind, either express or implied.

If you, any design consultants, or plan reviewers have any questions, please contact me directly at (775) 484-1013 or at [chris@westexconsulting.com](mailto:chris@westexconsulting.com)

Respectfully submitted,  
**WESTEX Consulting Engineers, LLC**

A handwritten signature in blue ink, appearing to read "Chris Moltz", is centered below the company name.

Christopher Moltz, P.E.  
Senior Project Manager

**ATTACHMENT 1 – FIXTURE UNIT COUNT FOR PROPOSED PROJECT  
(OASIS ASSISTED LIVING)**



# IMEG Corporation

## 2018 U.P.C.

Date: 7/26/2022

### PLUMBING FIXTURE CALCULATION FORM

FIXTURE	QTY.	CW F.U.	HW F.U.	CW Main	CW Branch	HW Branch	WASTE F.U.	TOTAL WASTE
WATER CLOSET, F/V 3.5 GPF, Heavy/Public	0	10	-	0	0	-	8	0
WATER CLOSET, F/V 3.5 GPF, Gen. Public	0	8	-	0	0	-	6	0
WATER CLOSET, G/T 3.5 GPF, Gen. Public	0	5.5	-	0	0	-	6	0
WATER CLOSET, F/V 1.6 GPF, Heavy/Public	0	8	-	0	0	-	6	0
WATER CLOSET, F/V 1.6 GPF, Gen. Public	26	5	-	130	130	-	4	104
WATER CLOSET, P.A. F/T 1.6 GPF, Gen. Pub.	0	2.5	-	0	0	-	5	0
WATER CLOSET, G/T 1.6 GPF, Private	211	2.5	-	527.5	527.5	-	3	633
URINAL, F/T, Gen. Public	0	2	-	0	0	-	5	0
URINAL, F/V + 1.0 GPF, Gen. Public	0	5	-	0	0	-	5	-
URINAL, F/V 1.0 GPF, Heavy/Public	0	5	-	0	0	-	5	0
URINAL, F/V 1.0 GPF, Gen. Public	7	4	-	28	28	-	4	28
LAVATORY, Heavy, Gen. Pub. & Private	233	1	0.75	233	174.75	174.75	1	233
SHOWER, Gen. Public, 2" trap	198	2	1.5	396	297	297	2	396
SHOWER, Group, Per Head, Contin. Use	0	5	3.75	0	0	0	5	0
WHIRLPOOL or BATHTUB	0	4	3	0	0	0	2	0
CLOTHES WASHER, Domestic	12	4	3	48	36	36	3	36
CLOTHES WASHER, Domestic, 3 or More	0	5	3.75	0	0	0	6	0
DISHWASHER, Domestic, Gen. Pub. & Private	0	0	3	0	0	0	2	0
WATER COOLER/FOUNTAIN, Gen. Public	0	0.5	-	0	0	-	0.5	0
WATER COOLER/FOUNTAIN, Heavy Public	0	0.75	-	0	0	-	0.5	0
DUAL WATER COOLER/FOUNT., Heavy Pub.	0	1.5	-	0	0	-	0.5	0
SINK, 1 Compartment, Domestic	0	2	1.5	0	0	0	2	0
SINK, 2 Compartment, Dom., w/ Disposal	0	2	1.5	0	0	0	2	0
SINK, 2 Comp., Dom., w/ Disposal & D.W.	0	2	1.5	0	0	0	2	0
BAR SINK, 1 Compartment, Private	13	1	0.75	13	9.75	9.75	1	13
SHAMPOO SINK, 1 Compartment, Gen. Public	3	2	1.5	6	4.5	4.5	2	6
Scrub Sink	0	4	3	0	0	0	3	0
SERVICE SINK or MOP BASIN, 2-3" trap	10	3	2.25	30	22.5	22.5	3	30
LAUNDRY SINK, 1 or 2 Compartment	0	2	1.5	0	0	0	2	0
SEMICIRCULAR WASH SINK	0	4	3	0	0	0	3	0
EMERGENCY SHOWER / EYEWASH	0	14	7.5	0	0	0	0	0
HOSE BIBB	20	2.5	-	50	50	-	-	-
HOSE BIBB w/ HOT & COLD	0	2	2	0	0	0	-	-
EVAP. COOLER MAKE-UP - 1/2"	0	4	-	0	0	-	-	-
EVAP. COOLER MAKE-UP - 1"	0	10	-	0	0	-	-	-
MISC. KIT. EQUIP. - 3/8" (CW ONLY)	0	1	-	0	0	-	-	-
MISC. KIT. EQUIP. - 1/2" (CW ONLY)	0	2	-	0	0	-	-	-
MISC. KIT. EQUIP. - 3/4" (CW ONLY)	0	4	-	0	0	-	-	-
MISC. KIT. EQUIP. - 1" (CW ONLY)	0	8	-	0	0	-	-	-
MISC. KIT. EQUIP. - 3/8" (HW ONLY)	0	-	1	0	-	0	-	-
MISC. KIT. EQUIP. - 1/2" (HW ONLY)	0	-	2	0	-	0	-	-
MISC. KIT. EQUIP. - 3/4" (HW ONLY)	1	-	4	4	-	4	-	-
MISC. KIT. EQUIP. - 1" (HW ONLY)	0	-	8	0	-	0	-	-
MISC. KIT. EQUIP. - 3/8" (H & CW)	0	1	0.75	0	0	0	-	-
MISC. KIT. EQUIP. - 1/2" (H & CW)	20	2	1.5	40	30	30	-	-
MISC. KIT. EQUIP. - 3/4" (H & CW)	0	4	3	0	0	0	-	-
MISC. KIT. EQUIP. - 1" (H & CW)	9	8	6	72	54	54	-	-
FLOOR DRAIN / SINK (1 1/2" TRAP)	0	-	-	-	-	-	3	0
FLOOR DRAIN / SINK (2" TRAP)	0	-	-	-	-	-	4	0
FLOOR DRAIN / SINK (3" TRAP)	0	-	-	-	-	-	6	0
FLOOR DRAIN / SINK (4" TRAP)	0	-	-	-	-	-	8	0
0	0	-	-	-	-	-	-	-
<b>TOTAL FIXTURE UNITS</b>				<b>1577.5</b>	<b>1364</b>	<b>632.5</b>		<b>1479</b>
<b>SYSTEM PREDOMINANCE</b>				<b>FLUSH TANK</b>				
<b>TOTAL GPM</b>				<b>279.6</b>		<b>148.7</b>		

# CONCEPTUAL DRAINAGE STUDY

For

OASIS ASSISTED LIVING

CARSON CITY APN: 007-531-26

4500 N. CARSON STREET

CARSON CITY, NV 89706

Prepared For:

Peter B Wilday Architects

Prepared By:



P.O. Box 18871, Reno, Nevada 89511  
[chris@westexconsulting.com](mailto:chris@westexconsulting.com)  
(775) 484-1013



File No.: 2284.001-B  
October 4, 2022

October 4, 2022

Peter B Wilday Architects

**Re: Conceptual Drainage Study for Oasis Assisted Living**  
Carson City APN 007-531-26  
4500 N Carson Street, Carson City, NV 89706  
File No.: 2284.001-B

Dear Mr. Wilday,

WESTEX Consulting Engineers, LLC (Westex) is pleased to present this report containing the results of our Conceptual Drainage Study utilizing the methodology and requirements as set forth in Carson City Municipal Code and the Carson City Drainage Manual. This report relies on FHWA Hydraulic Toolbox 5.1 water modeling software as well as NOAA Atlas 14 rainfall intensity data.

As discussed in further details in the attached report, the key takeaway items are:

- A single detention basin is proposed for this project to capture the increase in runoff for the 10 year, 24-hour storm event.
- A rectangular drainage basin geometry with a bottom width of 25 ft long, by 10 ft wide, with 3H:1V side slopes, and a 3 foot depth was assumed. Based on detention basin analysis, it was determined that in order to reduce the peak runoff flows from Sub-Basin 2 from 2.4 cfs down to 1.15 cfs, a 0.20 ft (2.4" wide) rectangular weir needs to be installed 1.25 feet above the base elevation of the bottom of the detention basin. It is assumed that any outflows will be captured and then piped to the drainage sump to be located at the south end of the property.
- Based on review of the preliminary site layout, some minor spacing changes and modifications to the site layout would be required (a few feet of building and walkway movement) to make this basin fit on the existing site plan. However, the site plan is only in the conceptual stage, and any and all drainage calcs should be revisited after a grading plan has been completed.
- The existing flow paths for the 24-hour, 100 year storm event will continue to be followed versus pre-development conditions.
- Stormwater quantity and quality mitigation measures will need be determined as the plans for the site are further developed. This project is only in conceptual planning at this time, but it is anticipated both temporary and permanent BMPs will be required for this project.

We appreciate your selecting Westex Consulting Engineers to perform this Conceptual Drainage study. If you, any design consultants, or plan reviewers have any questions, please contact me directly at (775) 484-1013 or at [chris@westexconsulting.com](mailto:chris@westexconsulting.com)

Respectfully submitted,  
**WESTEX Consulting Engineers, LLC**



Christopher Moltz, P.E.  
Senior Project Manager

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## **I INTRODUCTION**

This report presents the results of the Conceptual Drainage Study for Oasis Assisted Living. The conclusions and recommendations contained in this report are based on:

- Site visits and review of Existing Drainage Facilities
- Review of Existing Site Topography, Conceptual Site Layout, and Proposed Land Use
- FHWA Hydraulic Toolbox 5.1 Water Modeling Software
- NOAA 14 Atlas Precipitation Data
- The methodology and outline stated in the Carson City Drainage Manual effective July 1, 2021.

If any findings, assumptions, conditions, or project plans are found to vary from those described in this report, we should be contacted immediately to verify that the recommendations contained herein remain applicable to the final project design. Accordingly, this report may be revised at any time.

### **A. Description of Project**

The purpose of this report is to provide analysis for the impact this proposed project will have on drainage (Oasis Assisted Living). The proposed project is to build an up to 356 bed maximum occupancy assisted living facility. This project is to be located located within the NW¼ NE¼ Section 6, T.15N., R.20E., M.D.B.&M., on Carson City APN 007-531-26. The parcel is currently used by an existing business (Michael Hohl RV Center) which will be replaced by the proposed project. Accordingly, the existing Michael Hohl RV Center will be considered the “existing site conditions” for this project. Per review of the Carson City Drainage Manual, “Onsite detention storage shall be sized to detain sufficient runoff to limit post-development flows from a 10-year storm (Q10) to the flows under the predevelopment condition.”

### **B. Existing Site Conditions**

The existing property is Carson City APN 007-531-26. It is listed as 6.10 acres in size per the Carson City Assessor’s office. A general location map of the project’s location can be seen in Attachment 1 and on the following page in Figure 1.

The site is currently occupied by a recreational vehicle (RV) sales lot (Michael Hohl RV Center). Approximately 4.5 acres of the existing parcel is impermeable surfaces (pavement or concrete, or existing structures). An zoomed aerial overview of the subject parcel can be seen in Attachment 2. A topography survey of the subject parcel was performed as well as a site visit to the property to document the existing lot and drainage patterns. A copy of the topography survey can be see in Attachment 3. Review of the topography survey identifies an average slope of 1.6% from the north end of the property to the southern end of the property.



**Figure 1 – Site Location of existing Michael Hohl RV Center and proposed project (Oasis Assisted Living), to be located on a Carson City APN 007-531-26. An approximate location of the subject property is shown as a blue outline. (Imagery from Carson City, MapGeo GIS)**

## **II EXISTING AND PROPOSED HYDROLOGY**

### **A. Existing and Proposed Drainage Basin Boundaries**

The proposed project plans on removal of the existing business and buildings (Michael Hohl RV Center) and replacing it with the new proposed use (Oasis Assisted Living).

The existing property consists of the following elements:

- Existing RV Sales Center and Parking Lot

An overview of the drainage system including the subject parcel and surrounding parcel can be seen in Figure 2 on the following page. A zoomed image on the southern portion of the parcel can be seen in Figure 3 (page 4).



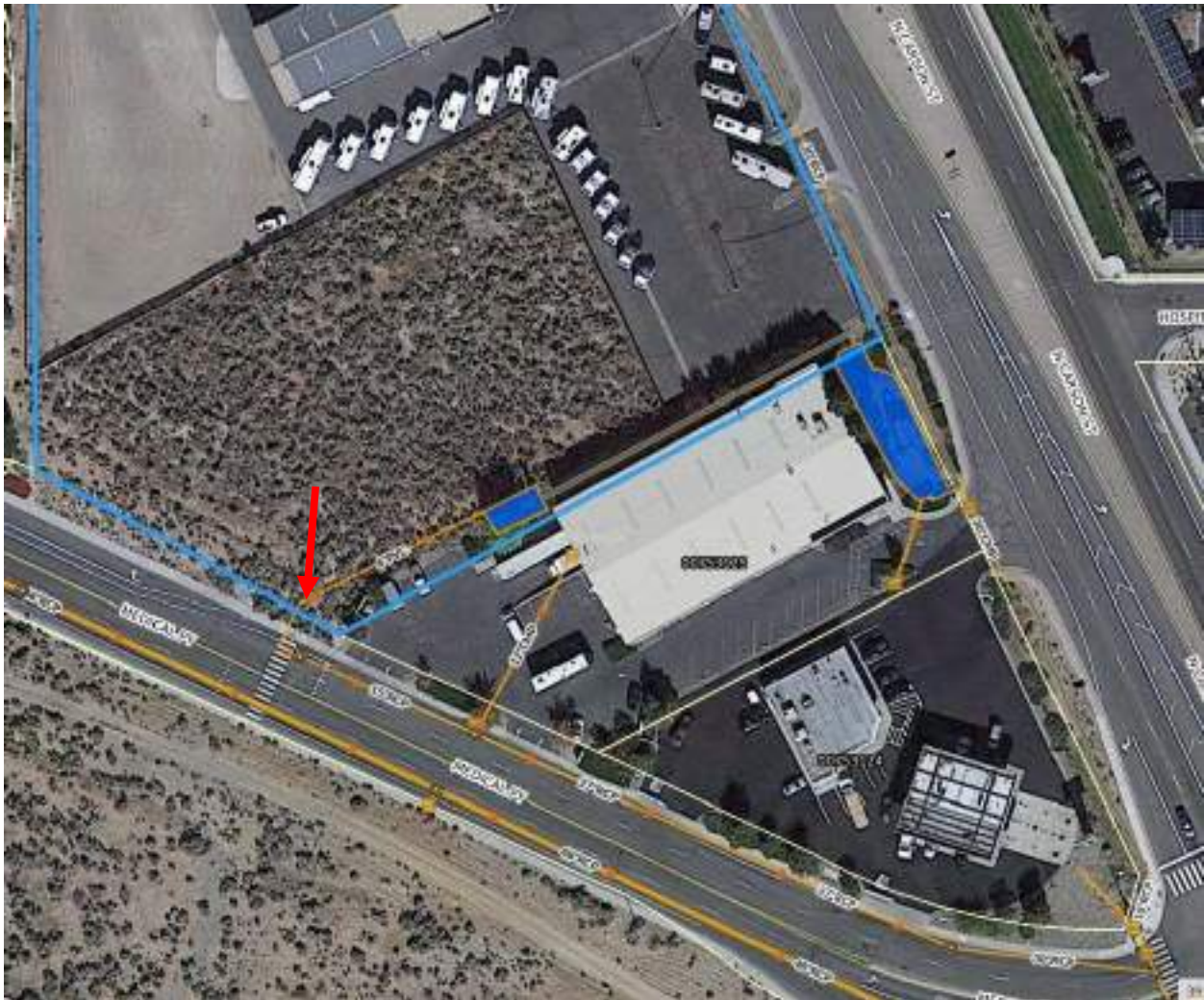


**Figure 2 – Overview of Existing Drainage Features on and around the subject parcel. An approximate location of the subject property is shown as a blue outline. Two existing drainage paths exist. There is a drainage path along the east side of the subject property along the west side of N. Carson Street (red arrows), as well as a drainage path on the south side of the property along Medical Pkwy (green arrows). Both drainage paths join up at the yellow arrow where they enter a 48" RCP that heads east along Arrowhead Pkwy. (Imagery from Carson City, MapGeo GIS, courtesy of Carson City Public Works). These are the existing 100 year storm paths for the subject property.**

From review of Figure 2 (above), Figure 3 (following page), and Figure 4 (page 5) we can see that there are two drainage features that abut the subject property. The first being a large drainage ditch that runs along the west side of N. Carson Street (from north to south). This drainage ditch is an open dirt channel, however, there are multiple crossings (driveways) along the east side of the subject property in which the drainage channel passes underneath the



driveway locations in drainage pipes. The sizes for these pipelines are 24" CMP (corrugated metal pipe), a 30" CMP, and a 24" RCP (reinforced concrete pipe). These flows congregate further south until they enter a 18" RCP at the northwest corner of Medical Pkwy and N. Carson Street, which then combines with flows from the AM PM gas station located on the corner. From there, the drainage ditch pipeline and AM PM gas station flows combine into a 27" RCP, which then combines with flows from the site off Medical Pkwy, and dumps into a 48" RCP that heads from west to east across Medical Pkwy / Arrowhead Drive (see Figure 4, page 5).

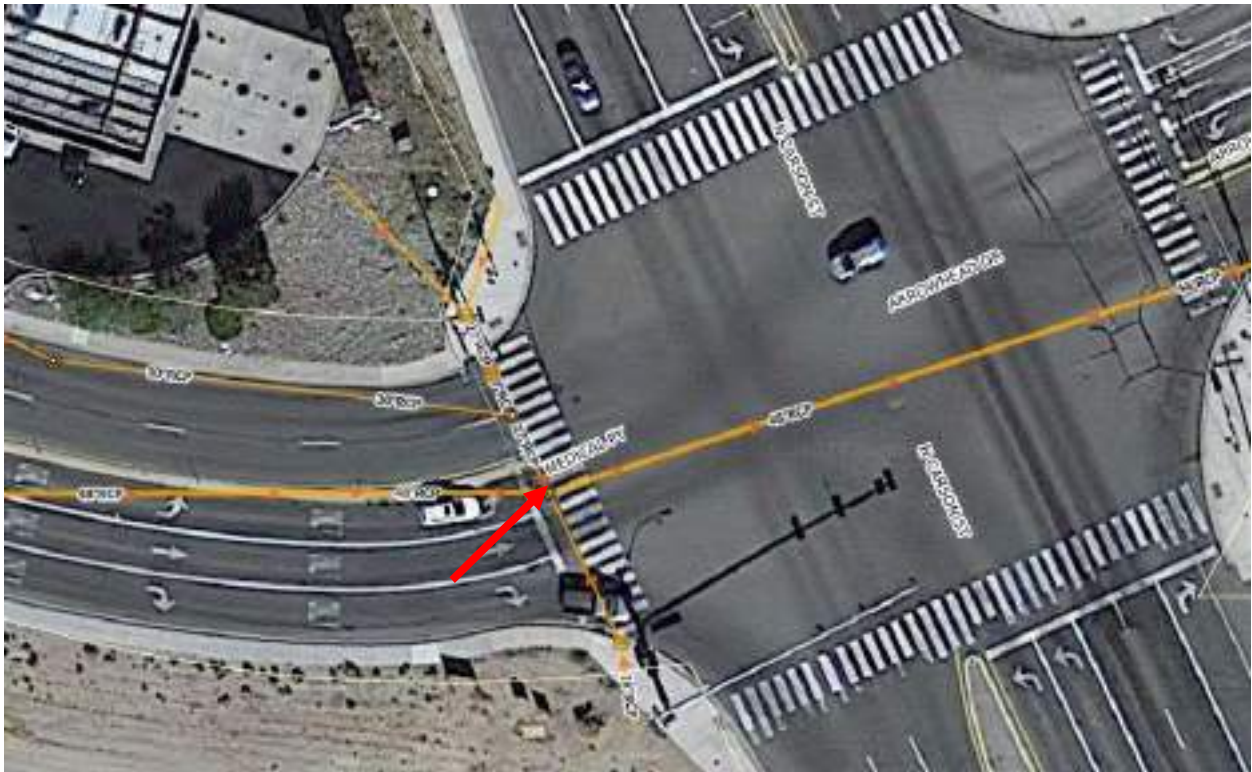


**Figure 3 – Zoomed Overview of Existing Drainage Features on and around the south end of the subject parcel. An approximate location of the subject property is shown as a blue outline. Location of 15" RCP daylighting on the subject property identified with red arrow. (Imagery from Carson City, MapGeo GIS, courtesy of Carson City Public Works)**

In Figure 3 (above) we can see that flows from the southwest portion of the subject property appears to enter a drainage basin and enter a 6" PVC pipe which then dumps into a 15" PVC along Medical Pkwy; however, this does not appear to be case for what is actually observed in the field (confirmed by a site visit and the topography survey). There is a very old PVC pipe



found in the field, but it is broken and above ground, and does not function in any sort of capacity. Additionally, any remnants of a drainage basin are a shallow depression in the ground as shown through topography contours on the topography survey, however, the size and capacity of this basin is indeterminate at this time, and years of neglect has caused it to become non-functional. In its current state, we can assume that there is no detention occurring. There is a low point where the 15" RCP stormdrain daylight on the subject property. From here flows enter the pipeline directly from the subject property, and the passes under Medical Pkwy. And image of the daylighting 15" RCP as identified in Figure 3 (previous page) as a red arrow can be seen in Figure 5 (following page). As can be seen in Figure 5, the existing RCP is approximately 2/3rds filled with dirt and debris. This pipeline needs to be cleaned so that it can function as designed.



**Figure 4 – Zoomed Overview of Existing Stormdrain Features at the corner of Medical Pkwy and N. Carson Street. An approximate location of the subject property is shown as a blue outline. (Imagery from Carson City, MapGeo GIS, courtesy of Carson City Public Works)**



**Figure 5 – Buried 15” RCP which daylights and extends south into Medical Pkwy. The entrance to the RCP is mostly buried (approximately 2/3rds) by sediment and debris. This RCP will need to be cleared of debris in order for it to function properly.**

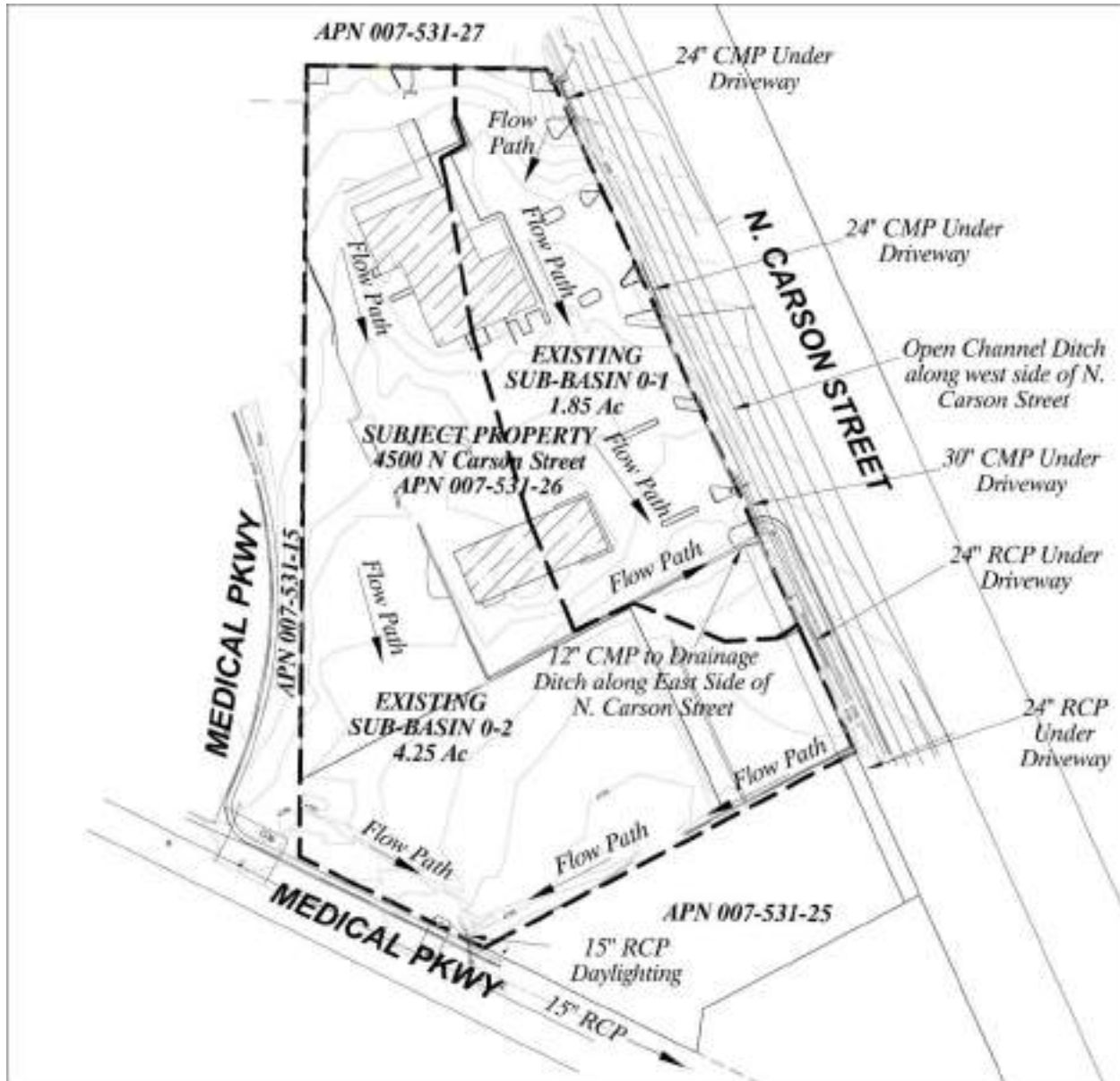
#### **B. Existing 10 Year Period, 24-Hour Duration and 100 Year Period, 24-Hour Duration Storm Flows**

Using our knowledge of how the existing and surrounding drainage system works in conjunction with the performed site visit and topography survey, it has been identified that there are two sub-basins associated with existing site conditions. An overview of the existing site conditions and sub-basins can be seen on the following page in Figure 6.

All of the flows for Sub-Basin 0-1 congregate and enter a 12” buried CMP which drains directly into the main drainage ditch along the east side of the subject property. The area contributing to Sub-Basin 0-1 is 1.85 acres in size. Of the 1.85 total acres in Sub-Basin 0-1, 0.06 acres are planter areas and the remaining 1.79 acres are impervious (concrete, paving, or building areas).



All of the flows for Sub-Basin 0-2 congregate and enter a 15" buried RCP which is the start of a buried stormdrain system along Medical Pkwy. The area contributing to Sub-Basin 0-2 is 4.25 acre in size. Of the total 4.25 acres in Sub-Basin 0-2, 2.32 acres are pervious areas (primarily a graded dirt lot and an unmaintained sagebrush lot filled with natural vegetation) and the remaining 1.93 acres are impervious (concrete, paving, or building areas).



**Figure 6 – Overview of Existing Sub-basins. Two Sub-Basins are evident. Sub-Basin 0-1 is 1.85 acres in size and drains directly to the drainage ditch on the east side of the property via a 12" buried CMP. Sub-Basin 0-2 is 4.25 acres in size and flows and drains to the southern end of the property, where it enters a 15" RCP pipeline.**

Using the information from Figure 6, we can determine existing flows for the property. Per the Carson City Drainage Manual, existing runoff for the project was determined using the rational method since the subject property is less than 100 acres in size. There are no flows identified as coming from offsite and draining onto the subject property. All flows appear to be developed onsite only. Time of concentration was determined using the Velocity method as published in Part 630 Hydrology of the "National Engineering Handbook (USDA, NRCS, May 2010)".

A time of concentration of 5 minutes was determined for Sub-Basin 0-1. Additionally, we previously determined that of the 1.85 total acres in Sub-Basin 0-1, 0.06 acres are planter areas and the remaining 1.79 acres are impervious (concrete, paving, or building areas). Paved surfaces have low slopes, and were assigned a dimensionless runoff coefficient of 0.85. Planter areas were assigned a dimensionless runoff coefficient of 0.20. A combined weighted C-value of 0.83 was assigned to Sub-Basin 0-1. Pursuant to the Carson City Drainage Manual, rainfall intensity was determined by NOAA Atlas 14 (Attachment 4). Calculations were made using the FHWA Hydraulic Toolbox version 5.1 to determine the Pre-Development flow rate for the 10-year, 24 hour storm and 100-year, 24 hour storm event.

A time of concentration of 11.5 minutes was determined for Sub-Basin 0-2. Additionally, we previously determined that of the total 4.25 acres in Sub-Basin 0-2, 2.32 acres are previous areas (0.85 compacted dirt lot and 1.47 undeveloped sagebrush area with natural vegetation) and the remaining 1.93 acres are impervious (concrete, paving, or building areas). Paved surfaces have low slopes, and were assigned a dimensionless runoff coefficient of 0.85. The packed compacted dirt lot on the west side of the property was assigned a dimensionless runoff coefficient of 0.4. The undeveloped sagebrush area with natural vegetation on the south side of the property was assigned a dimensionless runoff coefficient of 0.15. A combined weighted C-value of 0.52 was assigned to Sub-Basin 0-2. Pursuant to the Carson City Drainage Manual, rainfall intensity was determined by NOAA Atlas 14 (Attachment 4). Calculations were made using the FHWA Hydraulic Toolbox version 5.1 to determine the Pre-Development flow rate for the 10-year, 24 hour storm and 100-year, 24 hour storm event.

Results of pre-development (existing site) flow calculations for both the 10-year, 24 hour storm and 100-year, 24 hour storm can be seen in Table 1, below. FHWA Hydraulic Toolbox printouts can be found in Attachment 5.

**Table 1 – Pre-Development (Existing) Site Flows**

<b>Sub-Basin</b>	<b>10-year, 24 hour flow (c.f.s.)</b>	<b>100-year, 24 hour flow (c.f.s.)</b>
Sub-Basin 0-1	3.8	7.4
Sub-Basin 0-2	4.0	7.7
<b>TOTAL</b>	<b>7.8</b>	<b>15.1</b>

### **C. Existing Drainage Problems**

No existing drainage problems were identified, except for the mostly buried 15" CMP found to be daylighting on the southern end of the project location (see Figure 5 on page 6). Additionally, the 12" CMP that drains from Sub-Basin 0-1 to the ditch on the west side of N. Carson Street was found to have a lot of sediment in the pipeline as well. Both of these areas will need to be cleaned of debris and sediment.

### **D. On-Site and Downstream Drainage**

On-site and downstream drainage has been adequately described in Section II A: Existing and Proposed Drainage Basins.

### **E. Existing Floodplain**

The entire parcel is identified as being in either the X Shaded or X Unshaded Floodplain per FEMA on panel 3200010084F (See Attachment 6).

### **F. Existing Irrigation**

There is no existing irrigation on the property. There are small planter areas with juniper bushes; however, I don't think these planter areas are connected to any sort of drip irrigation system.

### **G. Sensitive and Critical Areas**

There are no sensitive or critical areas identified associated with the subject parcel.

## **III EROSION AND SEDIMENT CONTROL MEASURES**

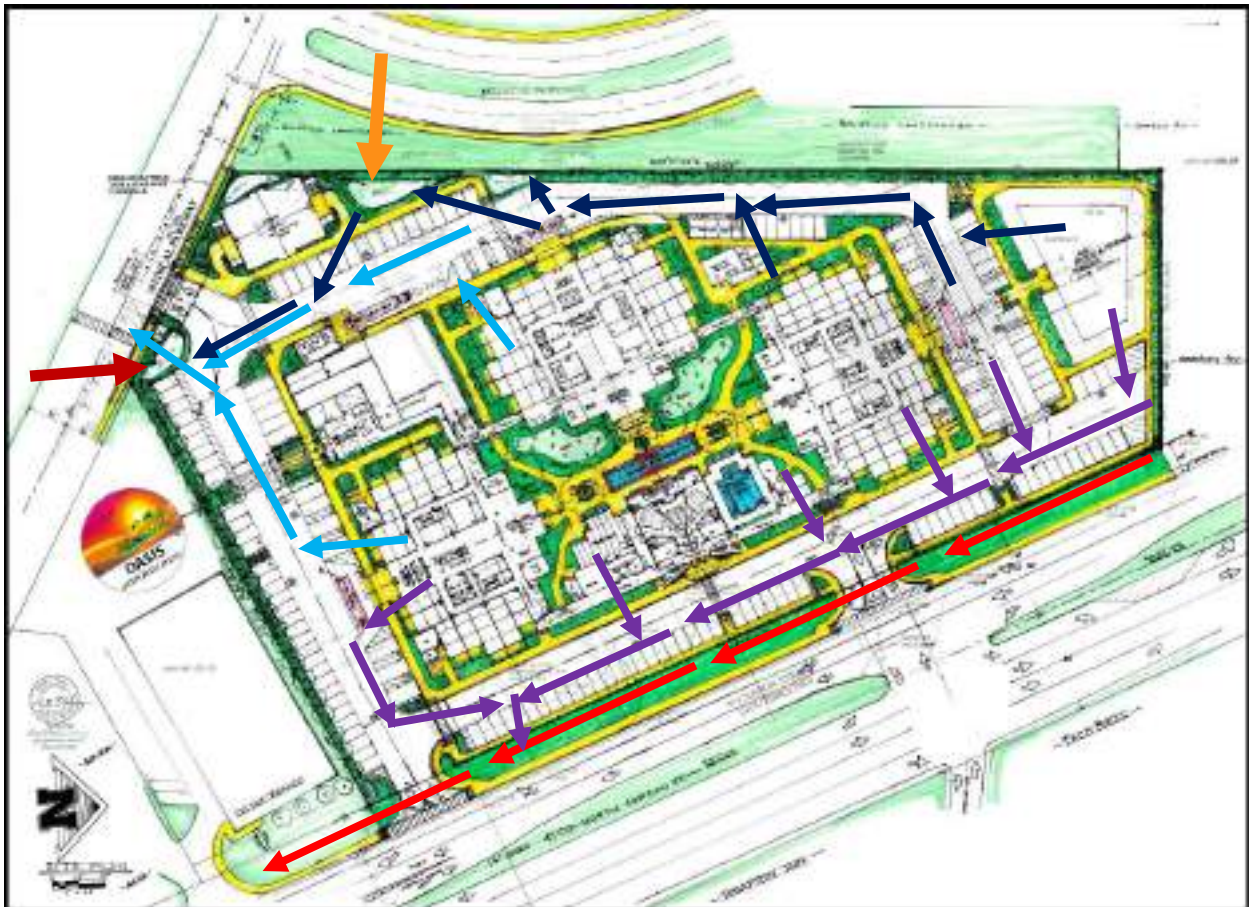
### **A. Erosion Control Plan Standards**

A future grading plan will include an Erosion Control Plan as part future engineering design submittal these plans will conform to Division 13 of Carson City Development Standards for erosion and sediment control plan requirements, as well as any applicable Erosion Control BMPs. Anticipated temporary erosion control measures include appropriate placement of storm drain inlet protect, silt fences, and fiber roll placement. Permanent slope stabilization techniques will likely be required around any slopes over 4:1. Potential areas include the existing ditch along the west side of N. Carson Street or as part of detention basin slopes. Permanent slope stabilization mitigation measures would likely include rip rap (large angular rock).

#### IV PROPOSED DRAINAGE FACILITIES (ON-SITE AND OFF-SITE)

##### A. Routing of Site Flows

The proposed project plans on removal of the existing business and buildings (Michael Hohl RV Center) and replacing it with the new proposed use (Oasis Assisted Living). A conceptual site layout of the proposed project can be seen on below in Figure 7. An overview of the proposed drainage sub-basins can be seen in Figure 8 on Page 12.



**Figure 7 – Conceptual Site Layout of Project.** Applicant is looking at burying the existing drainage ditch along the west side of N. Carson Street (Red Arrows). Drainage will be collected in underground piping and be piped to match existing flow paths. This means that flows will either be directed to the drainage ditch along the west side of N. Carson Street via the purple arrows. Or to the 15" CMP along Medical Pkwy at the south side of the subject property (refer to light blue arrows for flows from Sub-Basin 3, and dark blue arrows for flows from Sub-Basin 2). The proposed detention basin for Sub-Basin 2 is shown as a large orange arrow. The proposed drainage sump where overflows from the Sub-Basin 2 detention pond will comeingle with flows from Sub-Basin 3 (before entering the 15" stormdrain for Medical Pkwy) is shown as a large red arrow.



Proposed drainage runoff is planned to match the existing drainage runoff from the subject property for the 10-year, 24 hours storm event. The buildings and center area will be at the highest elevation. The proposed parking lot is relatively flat (assume 1% slopes for asphalt and concrete surfaces, as well as 0.5% concrete valley gutters to collect flows). Because of this it is planned that all on-site drainage will be collected in a network on buried pipelines and funneled as needed. This means that the drainage can be adjusted as needed in the final design. The applicant is looking at the option to burying and piping the existing drainage ditch in front of the subject property along the west side of N. Carson Street in order to create a nice landscape buffer on the east side of the property. It is initially proposed that Sub-Basins are created (similar to how the drainage works under existing site conditions). Sub-Basin 1 would be sized so that it matches the flows of existing Sub-Basin 0-1 for the 10-year, 24 hour storm event, and would drain directly into the drainage ditch on the east side of the property (west side of N. Carson Street). The existing Sub-Basin 0-2 area would likely be further split into two further Sub-Basins: Sub-Basin 2 and 3. Both Sub-Basins 2 and 3 would gather the remaining flows from the property, and any increase in flows would be offset by a detention basin to be located on site in Sub-Basin 2, and would then be routed into the 15" CMP along Medical Pkwy.





**Figure 8 – Overview of Proposed Sub-basins. Three Sub-Basins are evident. Sub-Basin 1 is 2.68 acres in size and drains directly to the drainage ditch on the east side of the property (100 year flowpath) via a 12" buried CMP. Sub-Basin 2 is 1.56 acres in size and flows and drains to a detention basin in the southwest corner of the proposed lot, followed by an overflow to a drainage sump in Sub-Basin 3. Sub-Basin 3 is 1.81 acres in size and flows into a proposed drainage sump in the southern portion of the lot. Here the flows from both Sub-Basin 2 and Sub-Basin 3 will comeingle before entering the 15" RCP pipeline along Medical Pkwy (100 year flowpath).**

## **B. Post Development 10 Year Period, 24-Hour Duration and 100 Year Period, 24-Hour Duration Storm Flows**

Using our knowledge of how the existing and surrounding drainage system works in conjunction with the performed site visit and topography survey, it has been identified that there will be three sub-basins associated with the proposed drainage for this project. An overview of the existing site conditions and sub-basins can be seen on the previous page in Figure 8.

Since this is drainage report is at the conceptual phase, and grading for the site has not yet been determined, and drainage sub-basin boundaries will likely move based on final development and grading plans, a weighted dimensionless runoff coefficient (C-value) will be determined based on proposed land uses and square footages. This weighted dimensionless runoff coefficient will allow us to easily adjust sub-basin boundaries to size them appropriately for this analysis. Any numbers will likely need to be fine tuned at the Technical Drainage Study phase. Based on mapped areas identified in the site layout, it has been determined that of the 6.10 acre proposed site layout, 0.99 acres are proposed to be landscaped areas and 5.06 acres are anticipated to be low-sloped paved surfaces, including asphalt, drive aisles, concrete walkways, and buildings. There is a proposed 0.03 acre fountain and 0.02 acre pool that has no way of draining to any stormdrain features. These areas can be considered completely retained. The landscaped areas will be given a dimensionless C-value of 0.20. The paved areas, walkways, and buildings will be given a dimensionless C-value of 0.85. A combined weighted C-value of 0.74 was calculated and assigned to the future development.

All of the flows for Sub-Basin 1 will congregate and enter the main drainage ditch along the east side of the subject property. The area contributing to Sub-Basin 1 is 2.68 acres in size. No detention is proposed for Sub-Basin 1.

All of the flows for Sub-Basin 2 will be piped and congregate on the southwest corner of the property where a series of detentions basin will capture any excess storm flows. An overflow will be placed from the detention basin, where it will be piped to the detention basin for Sub-Basin 3. The area contributing to Sub-Basin 2 is 1.56 acres in size.

All of the flows for Sub-Basin 3 will be piped and congregate on the southern edge of the property where a detention sump is located. Flows from both the Sub-Basin 2 detention basin, and Sub-Basin 3 will meet here before entering the existing 15" buried RCP which is the start of a buried stormdrain system along Medical Pkwy. The area contributing to Sub-Basin 3 is 1.81 acres in size.

Using the above information we can determine proposed flows for the property. Per the Carson City Drainage Manual, existing runoff for the project was determined using the rational method since the subject property is less than 100 acres in size. There are no flows identified as coming from offsite and draining onto the subject property. All flows appear to be developed onsite only. Time of concentration was determined using the Velocity method as published in Part 630 Hydrology of the "National Engineering Handbook (USDA, NRCS, May 2010)".

A time of concentration of 10 minutes was determined for Sub-Basin 1. Pursuant to the Carson City Drainage Manual, rainfall intensity was determined by NOAA Atlas 14 (Attachment 4).

Calculations were made using the FHWA Hydraulic Toolbox version 5.1 to determine the Post-Development flow rate for the 10-year, 24 hour storm and 100-year, 24 hour storm event.

A time of concentration of 8 minutes was determined for Sub-Basin 2. Pursuant to the Carson City Drainage Manual, rainfall intensity was determined by NOAA Atlas 14 (Attachment 4). Calculations were made using the FHWA Hydraulic Toolbox version 5.1 to determine the Post-Development flow rate for the 10-year, 24 hour storm and 100-year, 24 hour storm event.

A time of concentration of 8 minutes was determined for Sub-Basin 3. Pursuant to the Carson City Drainage Manual, rainfall intensity was determined by NOAA Atlas 14 (Attachment 4). Calculations were made using the FHWA Hydraulic Toolbox version 5.1 to determine the Post-Development flow rate for the 10-year, 24 hour storm and 100-year, 24 hour storm event.

Results of post-development flow calculations for both the 10-year, 24 hour storm and 100-year, 24 hour storm can be seen in Table 2, below. FHWA Hydraulic Toolbox printouts for the proposed drainage basins can be found in Attachment 7.

**Table 2 – Post-Development Site Flows**

<b>Sub-Basin</b>	<b>10-year, 24 hour flow (c.f.s.)</b>	<b>100-year, 24 hour flow (c.f.s.)</b>
Sub-Basin 1	3.8	7.4
Sub-Basin 2	2.4	4.7
Sub-Basin 3	2.8	6.3
<b>TOTAL</b>	9.0	18.4

### **C. Sizing of Proposed Detention Basin**

A detention basin is proposed to be installed in Sub-Basin 2. After flows are reduced by the detention basin in Sub-Basin 2, they will be piped to a drainage sump located at the south side of the property where they will comeingle with the flows from Sub-Basin 3 and enter the 15" stormdrain along Medical Pkwy. Sub-basin 1 has been sized so that it matches the predevelopment flows of Sub-Basin 0-1, therefore no detention is required for Sub-Basin 1. The net difference between pre-development flows for Sub-Basin 0-2, and post- development flows for Sub-Basins 2 and 3 must be captured for the 10-year, 24 hour storm event per the Carson City Drainage Manual. Per review of Table 1 (page 8), the 10-year, 24 hour storm event flow for Sub-Basin 0-2 is 4.0 cfs. Per review of Table 2 (above), the combined 10-year, 24 hour storm event flow for Sub-Basins 2 and 3 is 5.2 cfs. This results in 1.2 cfs which must be captured. It is proposed that all of the 1.2 cfs flows are captured from Sub-Basin 2 and the proposed detention basin.

The FHWA Hydraulic Toolbox 5.1 was utilized to size the drainage basin and reduce the peak runoff for the 10-year, 24 hour storm event. Precipitation Curves and Inflow Hydrograph Data was utilized based on NOAA 14 Atlas Data and results of Rational Method Analysis for post development Sub-Basin 2 (refer to previous Section and Attachment 7). A drainage basin geometry with a bottom width of 25 ft long, by 10 ft wide, with 3H:1V side slopes, and a 3 foot depth was assumed. Based on detention basin analysis, it was determined that in order to reduce the peak runoff flows from Sub-Basin 2 from 2.4 cfs down to 1.15 cfs, a 0.20 ft (2.4" wide) rectangular weir needs to be installed 1.25 feet above the base elevation of the bottom of the detention basin. It is assumed that any outflows will be captured and then piped to the drainage sump to be located at the south end of the property. Refer to Attachment 8 for FHWA Printouts of the detention basin analysis and sizing. Please note that this is only preliminary sizing based on a rectangular detention basin. Based on review of the preliminary site layout, some minor spacing changes and modifications to the site layout would be required (a few feet of building and walkway movement) to make this basin fit on the existing site plan.

In order to make sure the proposed detention basin would drain within 48 hours, the USDA Web Soil Survey was consulted (Attachment 9). Based on the findings of the USDA web soil survey, the entire property is comprised of Surpass Coarse Sandy Loam (2 to 4 percent slopes), which has a limiting soil infiltration layer (Kast) of 1.98 to 5.95 in/hr). Accordingly, we can anticipate the entire detention basin to infiltrate within 8 hours of the end of the storm event (this is based on the weir height placement of 1.25 feet above the basin bottom).

#### **D. Stormwater Quantity and Quality Mitigation Measures**

Stormwater quantity and quality mitigation measures will need be determined as the plans for the site are further developed. This project is only in conceptual planning at this time, but it is anticipated both temporary and permanent BMPs will be required for this project. Some anticipated BMPs and mitigation measure include (but are not limited to) the following:

- Permanent Slope Stabilization for Drainage Ditches and Detention Basin Slopes (likely placement of rip rap)
- Storm Drainage Inlet Protection
- Street Sweeping
- Fiber Roll Placement
- Silt Fences
- Roof Runoff Controls (SC-1)
- Efficient Irrigation (SC-2)
- Trash Enclosures (SC-6)
- Outdoor Material Storage Areas (SC-8)
- Storm Drain System Signs (SC-3)
- Catch Basin Inserts

#### **E. Floodplain Modifications (If Applicable)**

Floodplain modifications are not applicable to this project.

## **V CONCLUSIONS**

### **A. Compliance with the CCMC and the Carson City Development Standards**

This Conceptual Drainage Study has been completed through review of the Carson City Municipal Code, Carson City Development Standards, and the methodology and outline stated in the Carson City Drainage Manual effective July 1, 2021.

### **B. Compliance with FEMA (If Applicable)**

No modifications are required are proposed for the floodplain for FEMA. This section is not applicable to this project. All floodzones identified on the project site are Zone X shaded or Zone X unshaded.

### **C. Effect of Development on Off-Site Flow Rates and Properties**

This development will not affect off-site flow rates and properties for the 24-hr, 10 year storm event. Although the proposed development will slightly increase flows over the existing site conditions, a single detention basin is proposed to capture the increase in storm runoff as a result of this project.

The existing flow paths for the 24-hour, 100 year storm event will continue to be followed versus pre-development conditions.

### **D. Implementation Measures Necessary for Project Completion**

Stormwater quantity and quality mitigation measures will need be determined as the plans for the site are further developed. This project is only in conceptual planning at this time, but it is anticipated both temporary and permanent BMPs will be required for this project. Some anticipated BMPs and mitigation measure include (but are not limited to) the following:

- Permanent Slope Stabilization for Drainage Ditches and Detention Basin Slopes (likely placement of rip rap)
- Storm Drainage Inlet Protection
- Street Sweeping
- Fiber Roll Placement
- Silt Fences
- Roof Runoff Controls (SC-1)
- Efficient Irrigation (SC-2)
- Trash Enclosures (SC-6)
- Outdoor Material Storage Areas (SC-8)
- Storm Drain System Signs (SC-3)
- Catch Basin Inserts



## **ADDITIONAL NOTES**

Our conclusions and recommendations may be invalidated, partially or in whole, by changes outside our control, such as changes to the conceptual site layout, the surrounding properties, new projects, or changes in land uses. This report may be subject to review and revision at any time. Opinions expressed in this report do not constitute a warranty of any kind, either express or implied.

## **REFERENCES**

*"Carson City Drainage Manual". Carson City, NV: Carson City Public Works Department Storm Water management Program, 2021.*

*"National Engineering Handbook, Part 630 Hydrology". Washington, D.C.: United States Department of Agriculture, Natural Resources Conservation Service, May 2010.*

## **LIST OF ATTACHMENTS**

ATTACHMENT 1 – GENERAL LOCATION MAP OF PROJECT LOCATION  
(From Carson City MapGeo GIS Software)

ATTACHMENT 2 – ZOOMED AERIAL OVERVIEW OF SUBJECT PARCEL  
(From Carson City MapGeo GIS Software)

ATTACHMENT 3 – TOPOGRAPHY SURVEY OF EXISTING PROPERTY

ATTACHMENT 4 – NOAA ATLAS 14 PRECIPITATION ESTIMATES

ATTACHMENT 5 – FHWA HYDRAULIC TOOLBOX 5.1 PRINTOUTS FOR RATIONAL  
METHOD (EXISTING DRAINAGE)

ATTACHMENT 6 – FEMA PANEL 3200010084F

ATTACHMENT 7 – FHWA HYDRAULIC TOOLBOX 5.1 PRINTOUTS FOR RATIONAL  
METHOD (PROPOSED DRAINAGE)

ATTACHMENT 8 – FHWA HYDRAULIC TOOLBOX 5.1 PRINTOUTS FOR  
DETENTION BASIN SIZING

ATTACHMENT 9 – USDA WEB SOIL SURVEY FOR PROJECT LOCATION



**ATTACHMENT 1 – GENERAL LOCATION MAP OF PROJECT LOCATION  
(From Carson City MapGeo GIS Software)**







**ATTACHMENT 2 – ZOOMED AERIAL OVERVIEW OF SUBJECT PARCEL  
(From Carson City MapGeo GIS Software)**







## **ATTACHMENT 3 – TOPOGRAPHY SURVEY OF EXISTING PROPERTY**

5	4	3	2
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CC  
P.

38

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**BASIS OF BEARINGS**

THE BASIS OF BEARINGS FOR THIS MAP IS  
CARSON CITY SURVEY CONTROL  
MONUMENT C0094  
ELEV. -4755.50

**BASIS OF BEARINGS**  
THE BASIS OF BEARINGS FOR THIS MAP IS  
PER GPS OBSERVATIONS OF CARSON CITY  
CONTROL MONUMENTS CC016 & CC054.  
ALL DISTANCES SHOWN ARE GROUND.  
SCALE FACTOR: 1.0002.



## **ATTACHMENT 4 – NOAA ATLAS 14 PRECIPITATION ESTIMATES**





**NOAA Atlas 14, Volume 1, Version 5**  
**Location name: Carson City, Nevada, USA\***  
**Latitude: 39.1992°, Longitude: -119.7792°**  
**Elevation: 4760.94 ft\*\***

\* source: ESRI Maps  
 \*\* source: USGS



**POINT PRECIPITATION FREQUENCY ESTIMATES**

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic,  
 Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel  
 Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

[PF\\_tabular](#) | [PF\\_graphical](#) | [Maps & aerals](#)

**PF tabular**

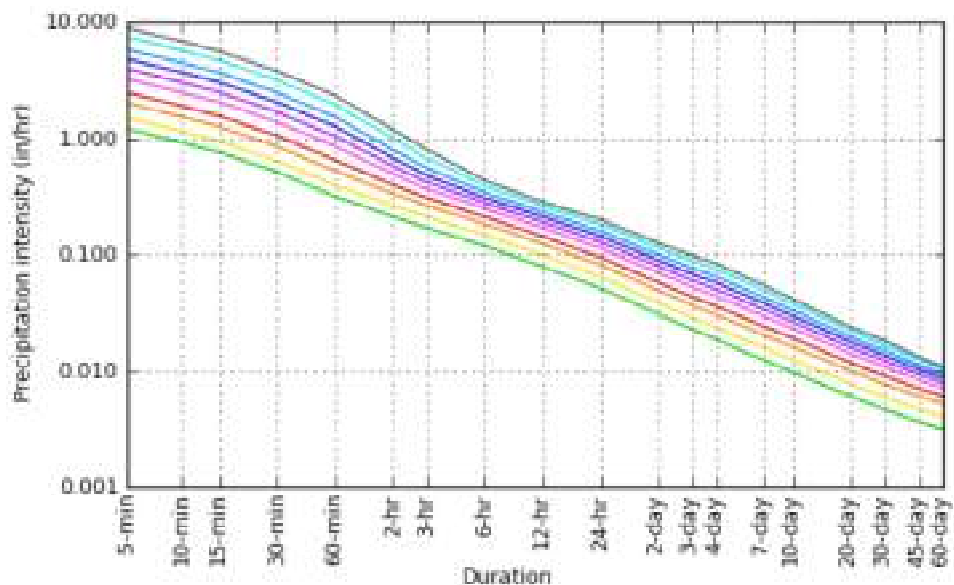
<b>PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)<sup>1</sup></b>										
<b>Duration</b>	<b>Average recurrence interval (years)</b>									
	<b>1</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>200</b>	<b>500</b>	<b>1000</b>
<b>5-min</b>	<b>1.21</b> (0.792-1.09)	<b>1.51</b> (1.31-1.79)	<b>2.00</b> (1.72-2.38)	<b>2.48</b> (2.11-2.94)	<b>3.26</b> (2.69-3.86)	<b>3.97</b> (3.18-4.74)	<b>4.82</b> (3.72-5.82)	<b>5.84</b> (4.33-7.16)	<b>7.46</b> (5.21-9.36)	<b>8.93</b> (5.94-11.4)
<b>10-min</b>	<b>0.918</b> (0.792-1.09)	<b>1.15</b> (0.996-1.36)	<b>1.53</b> (1.31-1.81)	<b>1.89</b> (1.61-2.23)	<b>2.48</b> (2.05-2.95)	<b>3.02</b> (2.42-3.61)	<b>3.67</b> (2.83-4.43)	<b>4.45</b> (3.29-5.45)	<b>5.68</b> (3.97-7.12)	<b>6.80</b> (4.52-8.69)
<b>15-min</b>	<b>0.760</b> (0.656-0.896)	<b>0.948</b> (0.820-1.12)	<b>1.26</b> (1.08-1.50)	<b>1.56</b> (1.33-1.84)	<b>2.06</b> (1.69-2.43)	<b>2.50</b> (2.00-2.98)	<b>3.04</b> (2.34-3.66)	<b>3.68</b> (2.72-4.51)	<b>4.69</b> (3.28-5.88)	<b>5.62</b> (3.74-7.18)
<b>30-min</b>	<b>0.512</b> (0.442-0.606)	<b>0.638</b> (0.554-0.756)	<b>0.850</b> (0.728-1.01)	<b>1.05</b> (0.894-1.24)	<b>1.38</b> (1.14-1.64)	<b>1.68</b> (1.34-2.01)	<b>2.04</b> (1.58-2.46)	<b>2.47</b> (1.83-3.03)	<b>3.16</b> (2.21-3.96)	<b>3.78</b> (2.52-4.83)
<b>60-min</b>	<b>0.317</b> (0.273-0.374)	<b>0.395</b> (0.342-0.468)	<b>0.525</b> (0.450-0.623)	<b>0.651</b> (0.553-0.769)	<b>0.856</b> (0.705-1.01)	<b>1.04</b> (0.832-1.24)	<b>1.26</b> (0.975-1.53)	<b>1.53</b> (1.13-1.88)	<b>1.96</b> (1.37-2.45)	<b>2.34</b> (1.56-2.99)
<b>2-hr</b>	<b>0.212</b> (0.190-0.244)	<b>0.264</b> (0.234-0.302)	<b>0.336</b> (0.296-0.382)	<b>0.399</b> (0.348-0.454)	<b>0.494</b> (0.420-0.566)	<b>0.580</b> (0.481-0.671)	<b>0.676</b> (0.546-0.792)	<b>0.795</b> (0.622-0.944)	<b>1.00</b> (0.747-1.24)	<b>1.19</b> (0.858-1.51)
<b>3-hr</b>	<b>0.170</b> (0.153-0.191)	<b>0.211</b> (0.191-0.238)	<b>0.264</b> (0.236-0.297)	<b>0.307</b> (0.273-0.346)	<b>0.369</b> (0.322-0.417)	<b>0.422</b> (0.361-0.481)	<b>0.481</b> (0.404-0.553)	<b>0.557</b> (0.458-0.651)	<b>0.682</b> (0.544-0.833)	<b>0.802</b> (0.623-1.02)
<b>6-hr</b>	<b>0.119</b> (0.107-0.133)	<b>0.148</b> (0.133-0.166)	<b>0.184</b> (0.164-0.205)	<b>0.211</b> (0.188-0.236)	<b>0.249</b> (0.218-0.280)	<b>0.278</b> (0.241-0.315)	<b>0.308</b> (0.262-0.352)	<b>0.342</b> (0.286-0.396)	<b>0.392</b> (0.319-0.462)	<b>0.437</b> (0.348-0.523)
<b>12-hr</b>	<b>0.078</b> (0.070-0.088)	<b>0.098</b> (0.088-0.110)	<b>0.123</b> (0.110-0.139)	<b>0.143</b> (0.127-0.161)	<b>0.170</b> (0.148-0.192)	<b>0.190</b> (0.164-0.216)	<b>0.211</b> (0.179-0.242)	<b>0.232</b> (0.193-0.270)	<b>0.260</b> (0.211-0.309)	<b>0.283</b> (0.225-0.341)
<b>24-hr</b>	<b>0.051</b> (0.047-0.057)	<b>0.064</b> (0.058-0.071)	<b>0.081</b> (0.073-0.090)	<b>0.095</b> (0.085-0.105)	<b>0.113</b> (0.101-0.126)	<b>0.128</b> (0.114-0.142)	<b>0.144</b> (0.127-0.160)	<b>0.160</b> (0.139-0.179)	<b>0.182</b> (0.156-0.205)	<b>0.199</b> (0.169-0.227)
<b>2-day</b>	<b>0.031</b> (0.027-0.035)	<b>0.039</b> (0.035-0.044)	<b>0.049</b> (0.044-0.055)	<b>0.058</b> (0.051-0.065)	<b>0.069</b> (0.061-0.079)	<b>0.079</b> (0.069-0.090)	<b>0.089</b> (0.077-0.102)	<b>0.100</b> (0.086-0.114)	<b>0.114</b> (0.096-0.132)	<b>0.126</b> (0.105-0.148)
<b>3-day</b>	<b>0.023</b> (0.020-0.026)	<b>0.029</b> (0.025-0.032)	<b>0.037</b> (0.033-0.041)	<b>0.043</b> (0.038-0.049)	<b>0.052</b> (0.046-0.059)	<b>0.060</b> (0.052-0.068)	<b>0.068</b> (0.059-0.077)	<b>0.076</b> (0.065-0.088)	<b>0.088</b> (0.074-0.102)	<b>0.098</b> (0.081-0.114)
<b>4-day</b>	<b>0.019</b> (0.016-0.021)	<b>0.023</b> (0.021-0.027)	<b>0.030</b> (0.027-0.034)	<b>0.036</b> (0.032-0.041)	<b>0.044</b> (0.038-0.050)	<b>0.050</b> (0.044-0.057)	<b>0.057</b> (0.049-0.065)	<b>0.065</b> (0.055-0.074)	<b>0.075</b> (0.063-0.087)	<b>0.083</b> (0.068-0.098)
<b>7-day</b>	<b>0.012</b> (0.011-0.014)	<b>0.016</b> (0.014-0.018)	<b>0.020</b> (0.018-0.023)	<b>0.024</b> (0.021-0.027)	<b>0.030</b> (0.026-0.034)	<b>0.034</b> (0.029-0.039)	<b>0.038</b> (0.033-0.044)	<b>0.043</b> (0.037-0.049)	<b>0.050</b> (0.042-0.058)	<b>0.055</b> (0.045-0.064)
<b>10-day</b>	<b>0.010</b> (0.009-0.011)	<b>0.012</b> (0.011-0.014)	<b>0.016</b> (0.014-0.018)	<b>0.019</b> (0.017-0.022)	<b>0.023</b> (0.020-0.026)	<b>0.026</b> (0.023-0.030)	<b>0.030</b> (0.025-0.034)	<b>0.033</b> (0.028-0.038)	<b>0.038</b> (0.032-0.044)	<b>0.041</b> (0.034-0.048)
<b>20-day</b>	<b>0.006</b> (0.005-0.007)	<b>0.008</b> (0.007-0.009)	<b>0.010</b> (0.009-0.011)	<b>0.012</b> (0.010-0.013)	<b>0.014</b> (0.012-0.016)	<b>0.016</b> (0.014-0.018)	<b>0.018</b> (0.015-0.020)	<b>0.020</b> (0.017-0.022)	<b>0.022</b> (0.019-0.025)	<b>0.024</b> (0.020-0.028)
<b>30-day</b>	<b>0.005</b> (0.004-0.005)	<b>0.006</b> (0.005-0.007)	<b>0.008</b> (0.007-0.009)	<b>0.009</b> (0.008-0.010)	<b>0.011</b> (0.010-0.012)	<b>0.012</b> (0.011-0.014)	<b>0.013</b> (0.012-0.015)	<b>0.015</b> (0.013-0.017)	<b>0.017</b> (0.014-0.019)	<b>0.018</b> (0.015-0.021)
<b>45-day</b>	<b>0.004</b> (0.003-0.004)	<b>0.005</b> (0.004-0.005)	<b>0.006</b> (0.005-0.007)	<b>0.007</b> (0.006-0.008)	<b>0.008</b> (0.007-0.009)	<b>0.009</b> (0.008-0.010)	<b>0.010</b> (0.009-0.012)	<b>0.011</b> (0.010-0.013)	<b>0.012</b> (0.011-0.014)	<b>0.013</b> (0.011-0.015)
<b>60-day</b>	<b>0.003</b> (0.003-0.004)	<b>0.004</b> (0.004-0.005)	<b>0.005</b> (0.005-0.006)	<b>0.006</b> (0.005-0.007)	<b>0.007</b> (0.006-0.008)	<b>0.008</b> (0.007-0.009)	<b>0.009</b> (0.008-0.010)	<b>0.009</b> (0.008-0.010)	<b>0.010</b> (0.009-0.011)	<b>0.011</b> (0.009-0.012)

<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).  
 Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.  
 Please refer to NOAA Atlas 14 document for more information.

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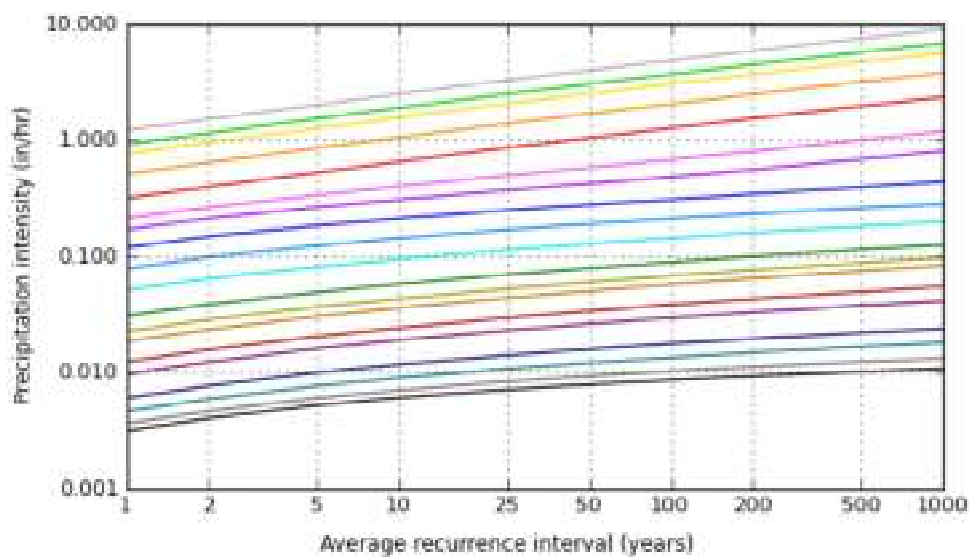
**PF graphical**

PDS-based intensity-duration-frequency (IDF) curves  
Latitude: 39.1992°, Longitude: -119.7792°



Average recurrence interval (years)

- 1
- 2
- 5
- 10
- 25
- 50
- 100
- 200
- 500
- 1000



Duration

- |        |        |
|--------|--------|
| 5-min  | 2-day  |
| 10-min | 3-day  |
| 15-min | 4-day  |
| 30-min | 7-day  |
| 60-min | 10-day |
| 2-hr   | 20-day |
| 3-hr   | 30-day |
| 6-hr   | 45-day |
| 12-hr  | 60-day |
| 24-hr  |        |

NOAA Atlas 14, Volume 1, Version 5

Created (GMT): Tue Oct 4 00:06:24 2022

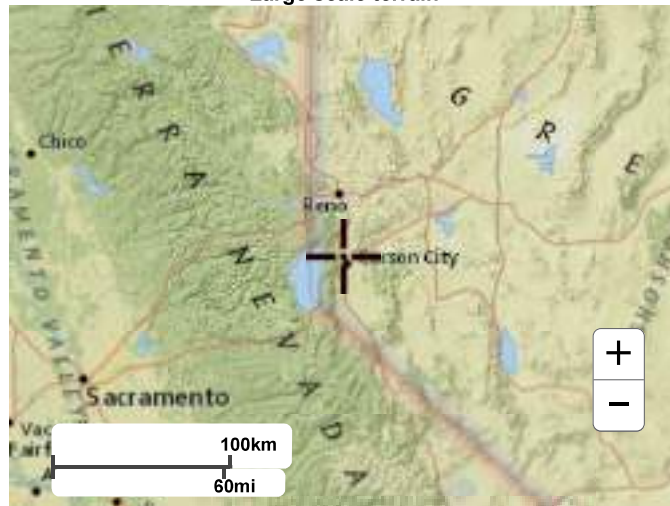
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## Maps & aerials

Small scale terrain



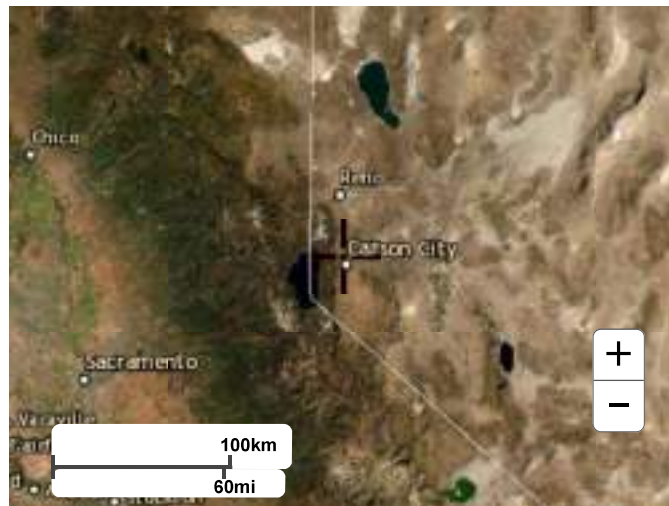
Large scale terrain



Large scale map



Large scale aerial

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**ATTACHMENT 5 – FHWA HYDRAULIC TOOLBOX 5.1 PRINTOUTS FOR RATIONAL  
METHOD (EXISTING DRAINAGE)**

Rational Method Analysis BASIN 0-1 - 10 year

Parameters

Parameter	Value	Units
Name	Rational Method Analysis BASIN 0-1 - 10 year	
Runoff Coefficient (C)	0.83	[Dimensionless]
Area (A)	1.85	[acres]
Rainfall Intensity (I)	2.47	[in/hr]
Compute I - IDF Curves	Compute...	
Time of concentration (Tc)	5.00	[minutes]
Recurrence Year	10 year	
Flowrate (Q)	3.8	[cfs]
Compute Hydrograph	Compute...	

OK

Cancel

Rational Method -- IDF Computation

IDF curve computation

☐ Hydro 35 Data (Eastern US)
 ☐ NOAA Atlas 2 Data (Western US)
 ☒ User Supplied Data
 

Define Storm Data...

Get NOAA Atlas 14 Data

Time of Concentration

Time of concentration: 5.0 min

☒ Specified to
 

tc: 5.00 (min)

☐ Compute to
 

Define Parameters...

☐ Minimum tc: 5.00 (min)

Intensity Computation

Compute Intensity

Intensity: 2.475 in/hr

5-min10-min15-min30-min

1-yr.	No data computed yet				
2-yr.	No data computed yet				
5-yr.	No data computed yet				
10-yr.	2.480	1.890	1.560	1.050	0.690
25-yr.	No data computed yet				
50-yr.	No data computed yet				
100-yr.	4.820	3.670	3.040	2.040	1.260
200-yr.	No data computed yet				
500-yr.	No data computed yet				

IDF equation:  $i = 18.85 / (T_c + 7.756)^{0.7974}$

Intensity-Duration-Frequency-Curves

\* IDF equation is given in U.S. Customary Units

Export IDF table...

Done



Rational Method Analysis BASIN 0-1 - 100 year

Parameters

Parameter	Value	Units
Name	Rational Method Analysis BASIN 0-1 - 100 year	
Runoff Coefficient (C)	0.83	[Dimensionless]
Area (A)	1.85	[acres]
Rainfall Intensity (I)	4.80	[in/hr]
Compute I - IDF Curves	Compute...	
Time of concentration (Tc)	5.00	[minutes]
Recurrence Year	100 year	
Flowrate (Q)	7.4	[cfs]
Compute Hydrograph	Compute...	

OK

Cancel

Rational Method -- IDF Computation

IDF curve computation:

☐ Hydro 35 Data (Eastern US)
 ☐ NOAA Atlas 2 Data (Western US)
 ☒ User Supplied Data

Define Storm Data...

Get NOAA Atlas 14 Data

Time of Concentration

Time of concentration: 5.0 min

☒ Specified tc
 

tc: 5.00 (min)

☐ Compute tc
 

Define Parameters...

☐ Minimum tc: 5.00 (min)

Intensity Computation

Compute Intensity

Intensity: 4.798 in/hr

5-min10-min15-min20-min

1-yr.	No data computed yet			
2-yr.	No data computed yet			
5-yr.	No data computed yet			
10-yr.	2.480	1.890	1.560	1.050
25-yr.	No data computed yet			
50-yr.	No data computed yet			
100-yr.	4.820	3.670	3.040	1.260
200-yr.	No data computed yet			
500-yr.	No data computed yet			

IDF equation:  $i = 40.15 / (T_c + 8.397)^{0.8186}$

Intensity-Duration-Frequency-Curves

\* IDF equation is given in U.S. Customary Units

Export IDF table...

Done

**Rational Method Analysis BASIN 0-2 - 10 year**

Parameters

Parameter	Value	Units
Name	Rational Method Analysis BASIN 0-2 - 10 year	
Runoff Coefficient (C)	0.52	[Dimensionless]
Area (A)	4.25	[acres]
Rainfall Intensity (I)	1.78	[in/hr]
Compute I - IDF Curves	Compute...	
Time of concentration (Tc)	11.50	[minutes]
Recurrence Year	10 year	
Flowrate (Q)	4.0	[cfs]
Compute Hydrograph	Compute...	

OK Cancel

**Rational Method -- IDF Computation**

☐ Hydro 35 Data (Eastern US)  
☐ NOAA Atlas 2 Data (Western US)  
☒ User Supplied Data  
 Define Storm Data...  
 Get NOAA Atlas 14 Data

Time of Concentration  
 Time of concentration: 11.5 min  
☒ Specified to  
 tc: 11.50 (min)  
☐ Compute to  
 Define Parameters...  
☐ Minimum to: 5.00 (min)

Intensity Computation  
 Compute Intensity  
 Intensity: 1.782 in/hr

\* IDF equation is given in U.S. Customary Units

Export IDF table...

	5-min	10-min	15-min	30-min
1-yr.	No data computed yet			
2-yr.	No data computed yet			
5-yr.	No data computed yet			
10-yr.	2.480	1.890	1.560	1.060
25-yr.	No data computed yet			
50-yr.	No data computed yet			
100-yr.	4.820	3.670	3.040	2.040
200-yr.	No data computed yet			
500-yr.	No data computed yet			

IDF equation:  $i = 18.85 / (T_c + 7.756)^{0.7974}$

**Intensity-Duration-Frequency-Curves**

Done

Rational Method Analysis BASIN 0-2 - 100 year

Parameters

Parameter	Value	Units
Name	Rational Method Analysis BASIN 0-2 - 100 year	
Runoff Coefficient (C)	0.52	[Dimensionless]
Area (A)	4.25	[acres]
Rainfall Intensity (I)	3.47	[in/hr]
Compute I - IDF Curves	Compute...	
Time of concentration (Tc)	11.50	[minutes]
Recurrence Year	100 year	
Flowrate (Q)	7.7	[cfs]
Compute Hydrograph	Compute...	

OK Cancel

Rational Method -- IDF Computation

IDF curve computation

☐ Hydro 35 Data (Eastern US)  
☐ NOAA Atlas 2 Data (Western US)  
☒ User Supplied Data  
 Define Storm Data...  
 Get NOAA Atlas 14 Data

Time of Concentration

Time of concentration: 11.5 min

☒ Specified to  
 tc: 11.50 (min)  
☐ Compute to  
 Define Parameters...  
☐ Minimum to: 5.00 (min)

Intensity Computation

Compute Intensity

Intensity: 3.471 in/hr

\* IDF equation is given in U.S. Customary Units

Export IDF table...

	5-min	10-min	15-min	30-min	60-min
1-yr.	No data computed yet				
2-yr.	No data computed yet				
5-yr.	No data computed yet				
10-yr.	2.480	1.890	1.560	1.050	0.680
25-yr.	No data computed yet				
50-yr.	No data computed yet				
100-yr.	4.820	3.670	3.040	2.040	1.260
200-yr.	No data computed yet				
500-yr.	No data computed yet				

IDF equation:  $i = 40.15 / (T_c + 8.397)^{0.8186}$

Intensity-Duration-Frequency-Curves

Done

**ATTACHMENT 6 – FEMA PANEL 3200010084F**











**ATTACHMENT 7 – FHWA HYDRAULIC TOOLBOX 5.1 PRINTOUTS FOR RATIONAL  
METHOD (PROPOSED DRAINAGE)**

**Rational Method Analysis BASIN 1 - 10 year**

Parameters

Parameter	Value	Units
Name	Rational Method Analysis BASIN 1 - 10 year	
Runoff Coefficient (C)	0.74	[Dimensionless]
Area (A)	2.68	[acres]
Rainfall Intensity (I)	1.90	[in/hr]
Compute I - IDF Curves	<b>Compute...</b>	
Time of concentration (Tc)	10.00	[minutes]
Recurrence Year	10 year	
Flowrate (Q)	3.8	[cfs]
Compute Hydrograph	<b>Compute...</b>	

OK Cancel

**Rational Method -- IDF Computation**

IDF curve computation

☐ Hydro 35 Data (Eastern US)  
☐ NOAA Atlas 2 Data (Western US)  
☒ User Supplied Data

Define Storm Data...

Get NOAA Atlas 14 Data

Time of Concentration

Time of concentration: 10.0 min

☒ Specified to  
 tc: 10.00 (min)

☐ Compute to  
 Define Parameters...

☐ Minimum to: 5.00 (min)

Intensity Computation

Compute Intensity

Intensity: 1.901 in/hr

\* IDF equation is given in U.S. Customary Units

Export IDF table...

Done

	5-min	10-min	15-min	30-min
1-yr.	No data computed yet			
3-yr.	No data computed yet			
5-yr.	No data computed yet			
10-yr.	2.480	1.890	1.560	1.090
25-yr.	No data computed yet			
50-yr.	No data computed yet			
100-yr.	4.820	3.670	3.040	2.040
300-yr.	No data computed yet			
500-yr.	No data computed yet			

IDF equation:  $i = 18.85 / (T_c + 7.756)^{0.7974}$

**Intensity-Duration-Frequency-Curves**

**Rational Method Analysis BASIN 1 - 100 year**

Parameters

Parameter	Value	Units
Name	Rational Method Analysis BASIN 1 - 100 year	
Runoff Coefficient (C)	0.74	[Dimensionless]
Area (A)	2.68	[acres]
Rainfall Intensity (I)	3.70	[in/hr]
Compute I - IDF Curves	Compute...	
Time of concentration (Tc)	10.00	[minutes]
Recurrence Year	100 year	
Flowrate (Q)	7.4	[cfs]
Compute Hydrograph	Compute...	

OK Cancel

**Rational Method -- IDF Computation**

☐ IDF curve computation  
☐ Hydro 35 Data (Eastern US)  
☐ NOAA Atlas 2 Data (Western US)  
☒ User Supplied Data  
 Define Storm Data...  
 Get NOAA Atlas 14 Data

Time of Concentration  
 Time of concentration: 10.0 min  
☒ Specified to  
 tc: 10.00 (min)  
☐ Compute to  
 Define Parameters...  
☐ Minimum tc: 5.00 (min)

Intensity Computation  
 Compute Intensity  
 Intensity: 3.701 in/hr

\* IDF equation is given in U.S. Customary Units

Export IDF table...

	5-min	10-min	15-min	30-min
1-yr.	No data computed yet			
2-yr.	No data computed yet			
5-yr.	No data computed yet			
10-yr.	2.480	1.890	1.560	1.050
25-yr.	No data computed yet			
50-yr.	No data computed yet			
100-yr.	4.820	3.670	3.040	2.040
200-yr.	No data computed yet			
500-yr.	No data computed yet			

IDF equation:  $i = 40.15 / (T_c + 8.397)^{0.8186}$

**Intensity-Duration-Frequency-Curves**

Done

Rational Method Analysis BASIN 2 - 10 year

Parameters

Parameter	Value	Units
Name	Rational Method Analysis BASIN 2 - 10 year	
Runoff Coefficient (C)	0.74	[Dimensionless]
Area (A)	1.56	[acres]
Rainfall Intensity (I)	2.09	[in/hr]
Compute I - IDF Curves	Compute...	
Time of concentration (Tc)	8.00	[minutes]
Recurrence Year	10 year	
Flowrate (Q)	2.4	[cfs]
Compute Hydrograph	Compute...	

OK
Cancel

Rational Method -- IDF Computation

IDF curve computation

- Hydro 35 Data (Eastern US)
- NOAA Atlas 2 Data (Western US)
- ☒ User Supplied Data

Define Storm Data...

Get NOAA Atlas 14 Data

Time of Concentration
Time of concentration: 8.0 min

- ☒ Specified to

tc: 8.00 (min)
- ☐ Compute to

Define Parameters...

☐ Minimum to: 5.00 (min)

Intensity Computation

Compute Intensity

Intensity: 2.091 in/hr

	5-min	10-min	15-min	30-min
1-yr.	No data computed yet			
2-yr.	No data computed yet			
5-yr.	No data computed yet			
10-yr.	2.480	1.890	1.560	1.050
25-yr.	No data computed yet			
50-yr.	No data computed yet			
100-yr.	4.820	3.670	3.040	2.040
200-yr.	No data computed yet			
500-yr.	No data computed yet			

IDF equation:  $i = 18.85 / (T_c + 7.756)^{0.7974}$

Intensity-Duration-Frequency-Curves

\* IDF equation is given in U.S. Customary Units

Export IDF table...
Done

Rational Method Analysis BASIN 2 - 100 year

Parameters

Parameter	Value	Units
Name	Rational Method Analysis BASIN 2 - 100 year	
Runoff Coefficient (C)	0.74	[Dimensionless]
Area (A)	1.56	[acres]
Rainfall Intensity (I)	4.07	[in/hr]
Compute I - IDF Curves	Compute...	
Time of concentration (Tc)	8.00	[minutes]
Recurrence Year	100 year	
Flowrate (Q)	4.7	[cfs]
Compute Hydrograph	Compute...	

OK

Cancel

Rational Method -- IDF Computation

IDF curve computation:

☐ Hydro 35 Data (Eastern US)
 ☐ NOAA Atlas 2 Data (Western US)
 ☒ User Supplied Data

Define Storm Data...

Get NOAA Atlas 14 Data

Time of Concentration

Time of concentration: 8.0 min

☒ Specified tc
 

tc:  (min)

☐ Compute tc
 

Define Parameters...

☐ Minimum tc:  (min)

Intensity Computation

Compute Intensity

Intensity: 4.067 in/hr

	5-min	10-min	15-min	20-min	30-min
1-yr.	No data computed yet				
2-yr.	No data computed yet				
5-yr.	No data computed yet				
10-yr.	2.480	1.890	1.560	1.050	0.69
25-yr.	No data computed yet				
50-yr.	No data computed yet				
100-yr.	4.820	3.670	3.040	2.040	1.260
200-yr.	No data computed yet				
500-yr.	No data computed yet				

IDF equation:  $i = 40.15 / (T_c + 8.397)^{0.8186}$

Intensity-Duration-Frequency-Curves

\* IDF equation is given in U.S. Customary Units

Export IDF table...

Done



Parameters

Parameter	Value	Units
Name	Rational Method Analysis BASIN 3 - 10 year	
Runoff Coefficient (C)	0.74	[Dimensionless]
Area (A)	1.81	[acres]
Rainfall Intensity (I)	2.09	[in/hr]
Compute I - IDF Curves	Compute...	
Time of concentration (Tc)	8.00	[minutes]
Recurrence Year	10 year	
Flowrate (Q)	2.8	[cfs]
Compute Hydrograph	Compute...	

OK

Cancel

IDF curve computation

☐ Hydro 35 Data (Eastern US)
 ☐ NOAA Atlas 2 Data (Western US)
 ☒ User Supplied Data

Define Storm Data...

Get NOAA Atlas 14 Data

Time of Concentration

Time of concentration: 8.0 min

☒ Specified to
 

tc:  (min)

☐ Compute to
 

Define Parameters...

☐ Minimum to:  (min)

Intensity Computation

Compute Intensity

Intensity: 2.091 in/hr

5-min

10-min

15-min

30-min

1-yr.	No data computed yet			
3-yr.	No data computed yet			
5-yr.	No data computed yet			
10-yr.	2.480	1.890	1.560	1.090
25-yr.	No data computed yet			
50-yr.	No data computed yet			
100-yr.	4.820	3.670	3.040	2.040
200-yr.	No data computed yet			
500-yr.	No data computed yet			

IDF equation:  $i = 18.85 / (T_c + 7.756)^{0.7974}$

Intensity-Duration-Frequency-Curves

Export IDF table...

Done

\* IDF equation is given in U.S. Customary Units



Rational Method Analysis BASIN 3 - 100 year

Parameters

Parameter	Value	Units
Name	Rational Method Analysis BASIN 3 - 100 year	
Runoff Coefficient (C)	0.74	[Dimensionless]
Area (A)	2.06	[acres]
Rainfall Intensity (I)	4.07	[in/hr]
Compute I - IDF Curves	Compute...	
Time of concentration (Tc)	8.00	[minutes]
Recurrence Year	100 year	
Flowrate (Q)	6.3	[cfs]
Compute Hydrograph	Compute...	

OK Cancel

Rational Method -- IDF Computation

IDF curve computation

☐ Hydro 35 Data (Eastern US)  
☐ NOAA Atlas 2 Data (Western US)  
☒ User Supplied Data  
 Define Storm Data...  
 Get NOAA Atlas 14 Data

Time of Concentration

Time of concentration: 8.0 min

☒ Specified to  
 tc: 8.00 (min)  
☐ Compute to  
 Define Parameters...  
☐ Minimum to: 5.00 (min)

Intensity Computation

Compute Intensity

Intensity: 4.067 in/hr

\* IDF equation is given in U.S. Customary Units

Export IDF table...

	5-min	10-min	15-min	30-min
1-yr.	No data computed yet			
2-yr.	No data computed yet			
5-yr.	No data computed yet			
10-yr.	2.480	1.890	1.560	1.050
25-yr.	No data computed yet			
50-yr.	No data computed yet			
100-yr.	4.820	2.670	3.040	2.040
200-yr.	No data computed yet			
500-yr.	No data computed yet			

IDF equation:  $i = 40.15 / (T_c + 8.397)^{0.8186}$

Intensity-Duration-Frequency-Curves

Done

**ATTACHMENT 8 – FHWA HYDRAULIC TOOLBOX 5.1 PRINTOUTS FOR  
DETENTION BASIN SIZING**

Storage Capacity Input

×

Storage capacity

☐ Known Volume
 ☒ Known Geometry

Define

Length: 25.00 (ft)

Width: 10.00 (ft)

Depth: 3.00 (ft)

Side Slope: 0.33 (ft/ft)

Base Elevation: 4658.00 (ft)

Number of Data Points: 20

OK

Cancel

Elevation Discharge Input

×

Discharges

Weir 2

Add Known Discharge

Add Weir

Add Standpipe

Add Riser

Delete

Weir Editor...

Parameter	Value	Units
Name	Weir 2	
Weir Type	Rectangular	
Weir Length	0.20	ft
Weir Coefficient	3.100	
Height above Base Elev	1.25	ft
Base Elevation	4658.00	ft

OK

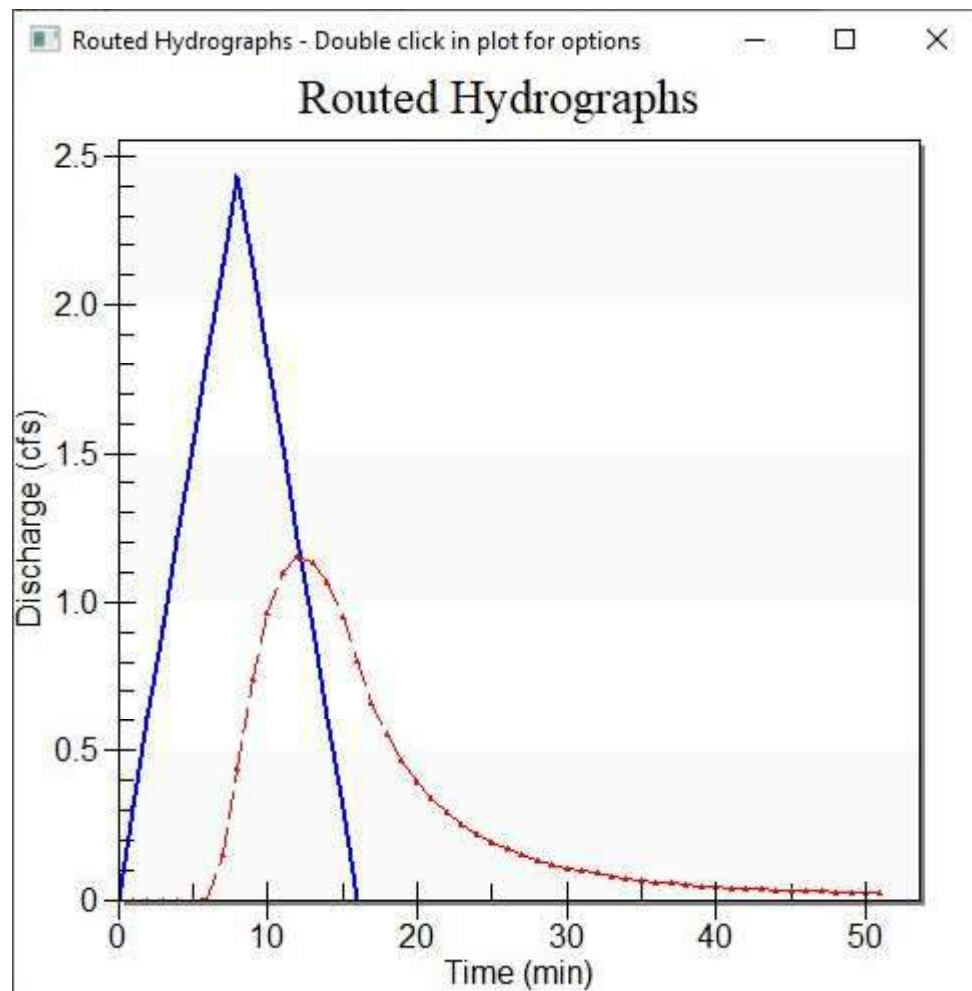
Cancel

Inflow Hydrograph

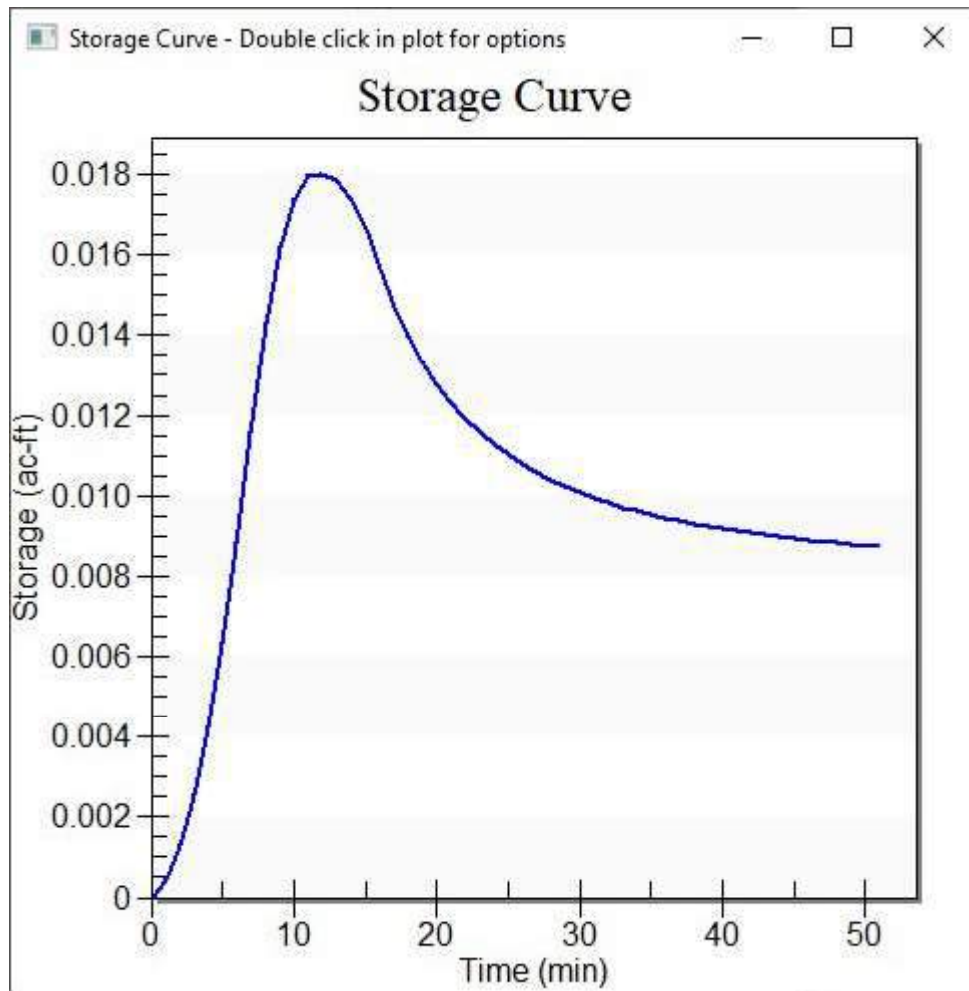


Number	Time (min)	Inflow Discharge (cfs)
1	0.0	0.0
2	1.0	0.3043
3	2.0	0.6086
4	3.0	0.9129
5	4.0	1.2172
6	5.0	1.5215
7	6.0	1.8258
8	7.0	2.1301
9	8.0	2.4344
10	9.0	2.1301
11	10.0	1.8258
12	11.0	1.5215
13	12.0	1.2172
14	13.0	0.9129
15	14.0	0.6086
16	15.0	0.3043
17	16.0	0.0

Number of x, y points:







## **ATTACHMENT 9 – USDA WEB SOIL SURVEY FOR PROJECT LOCATION**

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Web Soil Survey - Home

Web Soil Survey

https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

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Area of Interest (AOI)Soil MapSoil Data ExplorerDownload Soils Data

Search

Map Unit Legend

Carson City Area, Nevada (NV629)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
58	Surpass coarse sandy loam, 2 to 4 percent slopes MLRA 26	16.3	100.0%
Totals for Area of Interest		16.3	100.0%

Soil Map

Map Unit Description

Printable Version

Report — Map Unit Description

Carson City Area, Nevada

58—Surpass coarse sandy loam, 2 to 4 percent slopes MLRA 26

Map Unit Setting

National map unit symbol: 2w4dx  
Elevation: 4,590 to 5,250 feet  
Mean annual precipitation: 8 to 14 inches  
Mean annual air temperature: 48 to 52 degrees F  
Frost-free period: 90 to 120 days  
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Surpass and similar soils: 85 percent  
Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Surpass

Setting

Landform: Alluvial fans  
Landform position (two-dimensional): Footslope  
Landform position (three-dimensional): Base slope  
Down-slope shape: Linear  
Across-slope shape: Convex  
Parent material: Mixed alluvium

Typical profile

A - 0 to 14 inches: coarse sandy loam  
Bw - 14 to 26 inches: gravelly sandy loam  
C - 26 to 66 inches: gravelly loamy sand

Properties and qualities

Slope: 2 to 4 percent  
Depth to restrictive feature: More than 80 inches  
Drainage class: Well drained  
Runoff class: Low  
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)  
Depth to water table: More than 80 inches  
Frequency of flooding: Rare  
Frequency of ponding: None  
Calcium carbonate, maximum content: 1 percent  
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)  
Available water supply, 0 to 60 inches: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e  
Land capability classification (nonirrigated): 6e  
Hydrologic Soil Group: A  
Ecological site: R026XX010NV - LOAMY 10-12 P.2

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# TRAFFIC IMPACT STUDY

For

**OASIS ASSISTED LIVING**

**CARSON CITY APN: 007-531-26**

**4500 N. CARSON STREET**

**CARSON CITY, NV 89706**

Prepared For:

Peter B Wilday Architects

Prepared By:



P.O. Box 18871, Reno, Nevada 89511  
[chris@westexconsulting.com](mailto:chris@westexconsulting.com)  
(775) 484-1013



File No.: 2284.001-B  
October 1, 2022



October 1, 2022

Peter B Wilday Architects

**Re: Traffic Impact Study for Oasis Assisted Living**  
Carson City APN 007-531-26  
4500 N Carson Street, Carson City, NV 89706  
File No.: 2284.001-B

Dear Mr. Wilday,

WESTEX Consulting Engineers, LLC (Westex) is pleased to present this report containing the results of our Traffic Impact Study at the referenced property.

As discussed in further details in the attached report, the key takeaway items are:

- Based on review of Level of Service (LOS) Analysis performed with HCS 2022 traffic software, the proposed project (Oasis Assisted Living) will have minimal impact to the existing roadway network. No decrease in LOS was observed as a result of this project.
- All Levels of Service (LOS) obtained through HCS 2022 simulations resulted in a LOS of D or higher both with and without the proposed project. This meets or exceeds the LOS of D recommended by the Transportation Research Board
- No traffic improvements are anticipated or required due to this project (Oasis Assisted Living).
- There are no site specific hazards or considerations identified which may cause the need for improvements or geometry changes to the local roadway network.
- Egress traffic from the proposed project location should be controlled with stop signs.
- Two lanes should be installed for eastbound egress traffic at the N. Carson Street and Monk Ct / Project Driveway. A separate left / through lane and a separate right turn lane should be installed, which is controlled by a single stop sign. The remaining two driveways only require a single egress (exit) lane.
- The right-in / right-out project driveway along N. Carson Street should be designed to NDOT standards, and have a "pork chop" installed to prevent vehicles from turning left (the wrong way) onto southbound N. Carson Street.

We appreciate your selecting Westex Consulting Engineers to perform this Traffic Impact Study and trust that the results will fulfill project design requirements. If you, any design consultants, or plan reviewers have any questions, please contact me directly at (775) 484-1013 or at [chris@westexconsulting.com](mailto:chris@westexconsulting.com)

Respectfully submitted,  
**WESTEX Consulting Engineers, LLC**



Christopher Moltz, P.E.  
Senior Project Manager

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## I INTRODUCTION AND SUMMARY

This report presents the results of Traffic Impact Study for Oasis Assisted Living. The site location is shown in Figure 1 (page 7), and the proposed site layout is shown in Figure 2 (page 8). This study was performed in general accordance with our approved proposal and work order authorization.

The conclusions and recommendations contained in this report are based on:

- Site visits and traffic counts performed during the AM and PM Peak Hours on Thursday, July 28, 2022 and Friday, July 29, 2022.
- Methodology contained within the *“Highway Capacity Manual (HCM) 7<sup>th</sup> Edition”* (Published 2022 by the Transportation Research Board (TRB))
- Level of Service (LOS) analysis from MacTrans HCS 2022 Traffic Modeling Software
- Published trip generation data from the *“Trip Generation Manual: 11<sup>th</sup> Edition”* (Published September 2021 by the Institute of Transportation Engineers)

If any findings, assumptions, conditions, or project plans are found to vary from those described in this report, we should be contacted immediately to verify that the recommendations contained herein remain applicable to the final project design. Accordingly, this report may be revised at any time.

### A. Purpose of Report and Study Objectives

The purpose of this report is to analyze the traffic impact of the proposed project (Oasis Assisted Living), to be located within the NW¼ NE¼ Section 6, T.15N., R.20E., M.D.B.&M., on Carson City APN 007-531-26. The parcel is currently used by an existing business (Michael Hohl RV Center) which will be replaced by the proposed project. Per discussions with Carson City, it was determined that a traffic impact study for the project should include analysis of the following intersections for both the current (2022) and future (2050) traffic volumes:

- N Carson Street and Medical Pkwy / Arrowhead Dr
- Medical Pkwy and Medical Pkwy (Where the loop stops)
- Any project Driveways (both along N Carson Street or Medical Pkwy)

Carson City has adopted the 2050 RTC traffic model for future traffic volumes. It was determined that this traffic study must adopt the 2050 RTC traffic model for future traffic volumes for intersections to be analyzed, as well as new traffic counts must be obtained for the AM and PM Peak Hours.

### B. Executive Summary

This Executive Summary is intended to concisely and accurately summarize the findings and impacts this proposed project will have on traffic for the surrounding roadway network.

## **1. Site Location and Study Area**

The site location of this proposed project is Carson City APN 007-531-26. This parcel has an existing commercial business (Michael Hohl RV Center) which is to be removed and replaced with the Oasis Assisted Living. The subject parcel is located within the Carson City, on the western side of North Carson Street. The address is listed as 4500 N Carson Street per the Carson City Assessor's Office. The project is bound on the north by another retail commercial property, on the east by N. Carson Street, on the south by another retail commercial property and Medical Parkway, and on the east by another thin strip of retail commercial property, as well as Medical Parkway a little further east. Carson Street is a four lane road (two lanes in each direction), which connects the project location with I-580 to the north and the intersection of Medical Parkway / Arrowhead Drive to the south. Carson Street runs all the way through Carson City from north to south. Arrowhead Drive turns into Medical Parkway west of N. Carson Street. Arrowhead Drive is a four lane road (two lanes each direction) in the vicinity of the project location. The proposed project will two access driveways off N. Carson Street and one off Medical Parkway.

Five intersections were analyzed for current (2022) and future (2050) traffic volumes, both with and without the proposed project. The intersections analyzed in this report are:

- N. Carson Street and the existing Project Driveway / Monk Ct
- N. Carson Street and the proposed Right In / Right Out Project Driveway
- N. Carson Street and Medical Pkwy / Arrowhead Dr
- Medical Pkwy and the proposed Project Driveway
- Medical Pkwy and Medical Pkwy

## **2. Development Description**

The proposed development for this project is a 356 bed maximum assisted living facility (ITE Land Use: 620 Nursing Home). The location of this project is on Carson City APN 007-531-26. This project will replace the existing Michael Hohl RV Center currently on the property. Please reference Figures 1 and 2 (pages 7 and 8) for an overview of the proposed project. The project will have three driveways as points of ingress / egress. The three driveways proposed are: the existing main entrance into the Michael Hohl RV Center along N. Carson Street (aligned with Monk Ct across the street), a new right-in / right-out driveway to be located on the southeast corner of the property along N. Carson Street, and a new third proposed driveway along Medical Pkwy.

## **3. Principal Findings**

Based on review of Level of Service (LOS) Analysis performed with HCS 2022 traffic software (Summarized in Tables 7-10 (pages 14-16) it can be seen that the proposed project (Oasis Assisted Living) will have minimal impact to the surrounding traffic network.

The Highway Capacity Manual, 7<sup>th</sup> Edition recommends a Level of Service (LOS) of D or better. The LOS meets or exceeds what is considered acceptable under all turning movements and traffic scenarios.



Based on field observations during the AM and PM Peak Hours, as well as HCS 2022 software analysis, no changes to the existing roadway network are recommended or required due to this project.

Per review of NDOT crash data (2015-2017), the number of crashes in the vicinity of this project can be considered extremely low.

#### **4. Conclusions**

Direct access to the site from both N. Carson Street and Medical Parkway is anticipated to be good, due to the un-interrupted flows and direct and close access to I-580 from both N. Carson Street and Arrowhead Drive. The proposed driveway locations will provide effective accessibility to the site. This has been confirmed with HCS2022 traffic modeling software.

No traffic improvements are anticipated or required due to this project (Oasis Assisted Living).

This project will have minimal impact to the surrounding traffic network. Minimal increases in delay are observed, and no Level of Service reductions were observed as a result of this project.

There are no site specific hazards or considerations identified which may cause the need for improvements or geometry changes to the local roadway network, or as a result of this project.

#### **5. Recommendations**

Egress traffic from the proposed project location should be controlled with stop signs.

Two egress lanes should be installed for eastbound traffic at the N. Carson Street and Monk Ct / Project Driveway. A separate left / through lane and a separate right turn lane should be installed, which is controlled by a single stop sign. The remaining two driveways only require a single egress (exit) lane. Refer to proposed lane geometry in Attachment 2.

The right-in / right-out project driveway along N. Carson Street should be designed to NDOT standards, and have a "pork chop" installed to prevent vehicles from turning left (the wrong way) onto southbound N. Carson Street.

No traffic improvements are anticipated or required due to this project (Oasis Assisted Living).

## **II PROPOSED DEVELOPMENT**

### **A. Land Use and Intensity**

The proposed project plans on removal of the existing business and buildings (Michael Hohl RV Center) and replacing it with the new proposed use (Oasis Assisted Living).

The existing property consists of the following elements:

- Existing RV Sales Center

Trips from the existing project can be reduced from the proposed land use. Typically ITE data would be used to determine AM and PM Peak Hour Trips to and from the existing project; however, since AM and PM Peak Hour counts were actually performed at the project driveway, the actual traffic to and from the existing project will be used in this analysis. For a summary of the existing Peak Hour Trips which can be removed from the new trips generated, refer to Table 1, below.

**Table 1 – Existing Peak Hour Trips for RV Sales Center**

<b>Existing Business: Michael Hohl RV Sales Center Observed Peak Hour Trips During Traffic Counts</b>	
<b>AM Peak Hour</b>	<b>PM Peak Hour</b>
7 Trips	5 Trips
5 entering, 2 exiting	1 entering, 4 exiting

The proposed project intends to build the following elements:

- An assisted living facility (nursing home) with a maximum of 356 Beds

ITE Land Use: 620 Nursing Home was determined to be an acceptable land use for the this project.

Per review of data for ITE Land Use: 620 Nursing Home, 356 beds will create an AM Peak Hour demand of 71 trips and a PM Peak Hour demand of 117 trips.

A summary of peak hour trips for this project can be seen on the following page in Table 2.

**Table 2 – Assigned Peak Hour Trips for 356 Bed Nursing Home**

<b>ITE Land Use: 620 Nursing Home (356 Beds Maximum)</b>	
<b>AM Peak Hour</b>	<b>PM Peak Hour</b>
71 Trips	117 Trips
45 entering, 26 exiting	48 entering, 69 exiting

A summary of the net peak hour trips associated with this project (proposed trips minus existing trips) can be seen below in Table 3.

**Table 3 – Net Trips Generated from Change in Use of Parcel**

<b>ITE Land Use: 620 Nursing Home (356 Beds Maximum)</b>	
<b>AM Peak Hour</b>	<b>PM Peak Hour</b>
71 Trips	117 Trips
45 entering, 26 exiting	48 entering, 69 exiting
<b>Existing Business: Michael Hohl RV Sales Center Observed Peak Hour Trips During Traffic Counts</b>	
<b>AM Peak Hour</b>	<b>PM Peak Hour</b>
-7 Trips	-5 Trips
-5 entering, -2 exiting	-1 entering, -4 exiting
<b>Net Peak Hour Trips</b>	
<b>AM Peak Hour</b>	<b>PM Peak Hour</b>
64 Trips	112 Trips
40 entering, 24 exiting	47 entering, 65 exiting

## **B. Location**

The proposed project (Oasis Assisted Living) is to be located on Carson City APN 007-531-26. Currently this parcel has an existing commercial business (Michael Hohl RV Center) which is to

be removed and replaced with the Oasis Assisted Living. The subject parcel is located within the Carson City, on the western side of North Carson Street. The address is listed as 4500 N Carson Street per the Carson City Assessor's Office. The project is bound on the north by another retail commercial property, on the east by N. Carson Street, on the south by another retail commercial property and Medical Parkway, and on the east by another thin strip of retail commercial property, as well as Medical Parkway a little further east. The project is located in Carson City, approximately 900 feet south of I-580, 400 feet north of the Medical Parkway / Arrowhead Drive / North Carson Street intersection, and only 20 feet east of the Medical Parkway loop.

North Carson Street provides the only current vehicle access to the project location. However, the parcel has direct access to Medical Parkway on the south, and this proposed project plans on installing an additional access driveway along Medical Parkway. North Carson Street is identified as a minor arterial per the NDOT road functional classification map for Carson City Urbanized North, and has four lanes (two lanes in each direction) in the vicinity of the project location. Carson Street runs between I-580 on the north, and I-580 / HWY 50 / US 395 on the south. Carson Street runs north and south through the middle of Carson City, and used to be the only route for traffic traveling northbound and southbound on US 395 (prior to the completion of the Carson City by-pass). The proposed project location is located on North Carson Street between the last traffic light, and the I-580 on ramps / off ramps for N Carson Street. North Carson Street is free-flowing in the vicinity of the project location.

Arrowhead Drive turns into Medical Parkway west of North Carson Street. Arrowhead Drive provides direct access to both I-580 as well as portions of Carson City north of US 50 and east of I-580. Arrowhead Drive is classified as a minor collector per the NDOT road functional classification map for Carson City Urbanized North. Medical Parkway is classified as a minor collector as well, and has four lanes (two lanes in each direction) in the vicinity of the project location as well. Medical Parkway is unique in that it heads east and west, but as you go west on the road, it slowly turns clockwise in a loop and T-intersects with itself approximately 850 feet west of N Carson Street.

The intersection of N. Carson Street and Arrowhead Drive / Medical Parkway is a signalized intersection.

The intersection of Medical Parkway and Medical Parkway is a one way stop control, with east / west Medical Parkway under free flowing (uninterrupted) traffic conditions, and southbound Medical Parkway (which intersects with Medical Parkway on the north side) being controlled by a one way stop control.

All existing and proposed driveways are controlled by one way stop controls. The main entrance to the existing Michael Hohl RV Center is centered directly across from Monk Court (which is located on the east side of N. Carson Street). Monk Court is a local road that provides access to a hotel and Taco Bell restaurant located across the street.

An overview of the site location can be seen on the following page in Figure 1.



**Figure 1 – Site Location of existing Michael Hohl RV Center and proposed project (Oasis Assisted Living), to be located on a Carson City APN 007-531-26. An approximate location of the subject property is shown as a blue outline. (Imagery from Carson City, MapGeo GIS)**

### **C. Site Plan**

A conceptual site plan can be seen on the following page Figure 2, as well as in Attachment 1. The main entrance to the property for the existing Michael Hohl RV Center along N. Carson Street will be retained, and continue to be aligned with Monk Court across the street. The existing access along N. Carson Street will continue to allow traffic movements into and out of the project location from all directions. A second access will be installed along N. Carson Street at the very southeast corner of the property. This second access will be a right in / right out only. A third access is proposed along Medical Parkway. The access along Medical Parkway will allow traffic movement in all directions.





**Figure 2 – Conceptual Site Layout of Project. Three access driveways are proposed, with the all direction access driveway for N. Carson Street as a blue arrow, the right in / right out identified as a red arrow, and the Medical Parkway access driveway Identified as a Purple Arrow.**

#### **D. Phasing and Timing**

This project can be considered a single phase project as far as traffic is concerned.

### **III AREA CONDITIONS**

#### **A. Study Area**

The site location of this proposed project is Carson City APN 007-531-26. This parcel has an existing commercial business (Michael Hohl RV Center) which is to be removed and replaced with the Oasis Assisted Living. The subject parcel is located within the Carson City, on the western side of North Carson Street. The address is listed as 4500 N Carson Street per the Carson City Assessor's Office. The project is bound on the north by another retail commercial property, on the east by N. Carson Street, on the south by another retail commercial property and Medical Parkway, and on the east by another thin strip of retail commercial property, as well

as Medical Parkway a little further east. Carson Street is a four lane road (two lanes in each direction), which connects the project location with I-580 to the north and the intersection of Medical Parkway / Arrowhead Drive to the south. Carson Street runs all the way through Carson City from north to south. Arrowhead Drive turns into Medical Parkway west of N. Carson Street. Arrowhead Drive is a four lane road (two lanes each direction) in the vicinity of the project location. The proposed project will two access driveways off N. Carson Street and one off Medical Parkway.

Five intersections were analyzed for current (2022) and future (2050) traffic volumes, both with and without the proposed project. The intersections analyzed in this report are:

- N. Carson Street and the existing Project Driveway / Monk Ct
- N. Carson Street and the proposed Right In / Right Out Project Driveway
- N. Carson Street and Medical Pkwy / Arrowhead Dr
- Medical Pkwy and the proposed Project Driveway
- Medical Pkwy and Medical Pkwy

## **B. Study Area and Lane Use**

The proposed study area is the previously mentioned intersections of N. Carson Street and the existing Project Driveway / Monk Ct, N. Carson Street and the proposed Right In / Right Out Project Driveway, N. Carson Street and Medical Pkwy / Arrowhead Dr, Medical Pkwy and the proposed Project Driveway, and Medical Pkwy and Medical Pkwy.

This area is unique in that N. Carson Street provides direct access to I-580, and so does Arrowhead Drive. N. Carson Street only accepts southbound I-580 offramp traffic and provides northbound I-580 onramp traffic. Consequently, Arrowhead Drive only accepts northbound I-580 offramp traffic as well and provides southbound I-580 onramp traffic. Carson Street also provides access through the middle of Carson City. Due to the unique access points associated with both roadways, we can expect to see traffic utilizing different roadways and access points to and from the proposed project.

N. Carson Street is a four lane road (two lanes in each direction) in the vicinity of the project location, which runs uninterrupted between I-580 to the north, and stops at a signalized intersection with Arrowhead Drive / Medical Parkway south of the project location. The main driveway to the existing Michael Hohl RV Center located on the subject property is aligned with Monk Ct across the street. Both Monk Ct and the existing main driveway are controlled with stop signs, leaving N. Carson Street free flowing. Based on observations during the AM and PM Peak Hours the existing lane geometry appears to be adequately designed and sufficient for the roadway speeds (given the long sight distances). No hazardous conditions were observed based during site visits.

Medical Pkwy is a two lane road in the vicinity of the project location (two lanes in each direction). Medical Pkwy provides a clockwise looped road which goes around the Carson Tahoe Regional Medical Center and intersects with itself on the north side. Where Medical Parkway intersects with itself, east / west medical parkway remains free flowing and southbound Medical Parkway is controlled by a single stop control. The intersection of Medical Pkwy / Arrowhead Drive and N. Carson Street is signalized (controlled with a stop light). Based on

observations during the AM and PM Peak Hours, this approach functions as it should. No hazardous conditions were observed based on existing lane geometry during site visits.

It is proposed that all egress traffic from the proposed project driveways (Oasis Assisted Living) will be controlled with stop signs. All site traffic will utilize one of three driveways for access to or from the property (an all direction access driveway aligned across the street from Monk Ct on N. Carson Street, a right in / right out driveway on the southeast corner of the parcel on N. Carson Street, and an all direction access driveway on Medical Pkwy). Based on the low numbers of observed traffic, long sight distances, and HCS 2022 Analysis, it was determined that a single egress lane would be sufficient for all egress traffic from the project driveways for the proposed project (Oasis Assisted Living), with the exception of the main all direction driveway on N. Carson Street. For this driveway, it is proposed that there are two egress lanes, one for right turns, and one for left and through traffic out of the project driveway. An overview of proposed lane geometry can be seen in Attachment 2.

### **C. Site Accessibility**

Direct access to the site from both N. Carson Street and Medical Parkway is anticipated to be good, due to the un-interrupted flows and direct and close access to I-580 from both N. Carson Street and Arrowhead Drive. The proposed driveway locations will provide effective accessibility to the site.

An overview of the site location can be seen on page 7, in Figure 1

### **D. Condition of Existing Roads**

Based on a site visit and review of existing pavement, the existing roads appear to be in good overall condition. No material failures or condition issues were identified based on a visual review. Review of the 2022 Carson City Pavement Condition Index from April 2022 reveals the rankings for roads within the study area as either Good (86-100) or Satisfactory (71-85).

## **IV METHODOLOGY**

Methodology used for this report is based on intersection Level of Service (LOS) analysis from the Highway Capacity Manual (HCM) 7<sup>th</sup> Edition (Published 2022 by the Transportation Research Board (TRB)). In summary, there are different Levels of Service which can be assigned to an intersection, and they are all based on the average delay (in seconds per vehicle). Levels of service assigned vary between signalized intersections and un-signalized intersections. Table 4 (following page) shows the average delay (in seconds per vehicle) and assigned Level of Service for un-signalized intersections. Table 5 (following page) shows the average delay (in seconds per vehicle) and assigned Level of Service for signalized intersections. Since both un-signalized intersections and signalized intersections are being analyzed in this report, both tables are applicable to this analysis. Two way stop controls should be analyzed by individual movement, but four way stop controls, and signalized intersections should be analyzed in terms of average vehicle delay of all movements.

**Table 4 – Un-signalized Intersections – Assigned Level of Service (LOS) Based on Average Delay (Seconds/Vehicle)**

Average Delay (Seconds/Vehicle)	Assigned Level of Service (LOS)
< 10	A
10 - 15	B
15 - 25	C
25 - 35	D
35 - 50	E
> 50	F

**Table 5 – Signalized Intersections – Assigned Level of Service (LOS) Based on Averaged Delay (Seconds/Vehicle)**

Average Delay (Seconds/Vehicle)	Assigned Level of Service (LOS)
< 10	A
10 - 20	B
20 - 35	C
35 - 55	D
55 - 80	E
> 80	F

Based on the above discussed LOS analysis provided by the Highway Capacity Manual (7<sup>th</sup> Edition), the existing road conditions were analyzed using HCS 2022 (MacTrans Highway Capacity Software) based on Highway Capacity Manual methodology to determine applicable Levels of Service to all current intersections for both 2022 current traffic volumes, as well as future 2050 future traffic volumes (both with and without the proposed project).

Please note that some assumptions were made in this traffic analysis. The assumptions made for this analysis are:

- Distribution of trips to and from the project site will be primarily based on AM and PM Peak Hour Traffic Counts
- 2050 RTC Traffic Model will be used to determine future traffic volumes

These assumptions were made on engineering judgment based on review of nearby streets, access roads, proximity to major intersections, and proximity to the highway, traffic counts, site visits, and personal knowledge of these intersections.

## **V EXISTING TRAFFIC**

### **A. Site Generated Traffic (2022)**

Before trip assignment (number of trips for given traffic movements) can be determined, estimated trip distribution needs to be determined first. Trip distribution is the expected directions vehicles are to come from into and out of the proposed site. Trip distribution was based on traffic counts performed during the AM and PM Peak Hours. For a visual overview of Trip Distribution, please see Attachment 3.

In order to determine site traffic (trip assignment), trip generation data was analyzed, determined, and assigned movement volumes based on observed trip distribution. For more information on estimated trips to be generated, refer to Section II. A. of this report. Trip assignment analysis was performed based on observed traffic flows during the AM and PM Peak hours, as well as review of intersection geometry, observations during the AM and PM Peak hours, and engineering analysis and judgement. Trip assignment for traffic from the proposed project can be seen in Attachment 4.

### **B. Baseline (Existing) Traffic (2022)**

Traffic counts were performed in order to obtain existing AM and PM Peak Hour traffic volumes for the intersections analyzed. Traffic Counts were performed during the AM and PM Peak hours on Thursday, July 28, 2022 and Friday, July 29, 2022.

The results of the AM and PM Peak hour traffic counts can be seen in Attachment 5.

### **C. Total Traffic (2022)**

The total traffic for current (2022) conditions is simply the addition of the existing traffic plus the anticipated site generated traffic (projected trip assignment). Total traffic (2022 Baseline Traffic Plus Project) conditions can be seen in Attachment 6.

## **VI PROJECTED TRAFFIC (2050)**

### **A. Site Generated Traffic (2050)**

Trip distribution and trip generation for the proposed project will remain constant. Therefore, the trip distribution figure seen in Attachment 3, and the trip assignment figure in Attachment 4 are still applicable to 2050 projected traffic to and from the project.



## B. Future Traffic (2050)

Future traffic volumes should be projected based on a reputable cited source. Based on previous discussions with Bryan Byrne, P.E. Transportation / Traffic Engineer for Carson City, Nevada, the 2050 RTC Traffic Model has been adopted by the City and should be used to project future traffic growth for the area.

The 2050 RTC Traffic Model was reviewed for sections of roadway analyzed in this report. The sections of roadway were analyzed, and the difference in average annual daily traffic (AADT) volumes between 2030 constrained traffic volumes and projected 2050 future volumes were used to calculate a growth factor, which was then applied to the 2022 AM and PM Peak Hour traffic counts obtained for each intersection. An overview of the 2030 ADT constrained traffic volumes, projected 2050 ADT constrained traffic volumes, and anticipated growth factor can be seen below in Table 6. The 2050 baseline (future) traffic volumes for intersections analyzed can be seen in Attachment 7.

**Table 6 – Calculated Growth Factors (Based on 2050 RTC Traffic Model)**

Year	Roadway			
	N. Carson Street north of Medical Pkwy	N. Carson Street south of Medical Pkwy	Arrowhead Dr	Medical Pkwy
2030 ADT Constrained	18,772	19,525	4,514	4,098
2050 ADT Constrained	21,399	21,846	5,577	5,205
Difference (2050 vs 2030)	2,627	2,321	1,063	1,107
Total Growth Percentage	13.99%	11.89%	23.55%	27.01%
Growth Percentage Per Year	0.70%	0.59%	1.18%	1.35%
Total Growth Percentage Expected (from 2022 to 2050)	19.6%	16.6%	33.0%	37.8%

## C. Total Traffic (2050)

The total traffic for 2050 is simply the addition of the 2050 baseline (future) traffic plus the anticipated site generated traffic. Total anticipated traffic for 2050 conditions can be seen in Attachment 8.

## VII IMPROVEMENT ANALYSIS

Based on the previously discussed LOS analysis discussed in Section IV. Methodology, both the existing (2022) road conditions, the existing (2022) road conditions plus proposed project, the future (2050) road conditions, and future (2050) road conditions plus proposed project were analyzed using HCS 2022 (MacTrans Highway Capacity Software) based on Highway Capacity Manual 7<sup>th</sup> Edition methodology to determine applicable Levels of Service to the proposed intersection.

This Level of Service (LOS) analysis is the determining factor into which any improvements are required for any of these intersections. Results of HCS 2022 analysis are discussed in the following section: VIII. Findings.

## VIII FINDINGS

### A. Site Accessibility

Direct access to the site from both N. Carson Street and Medical Parkway is anticipated to be good, due to the un-interrupted flows and direct and close access to I-580 from both N. Carson Street and Arrowhead Drive. The proposed driveway locations will provide effective accessibility to the site.

### B. Traffic Impacts

Tables 7-10 (pages 14-16) show the average delay (in seconds per vehicle) and assigned Level of Service (LOS) for the intersections analyzed for both 2022 and 2050 scenarios both with and without the proposed project (Oasis Assisted Living).

Supporting HCS 2022 software printouts of which Tables 7-10 summarize can be seen in Attachments 9-13.

**Table 7 – Summary of Delay and Corresponding Level of Service (LOS) for Intersections Analyzed for 2022 Existing Traffic Volumes**

Year	Scenario	Intersection	Intersection Type	Approach Movement	AM Peak Hour		PM Peak Hour	
					Delay (s/veh)	LOS	Delay (s/veh)	LOS
2022	Existing Traffic	N. Carson Street and Project Driveway / Monk Ct	Two Way Stop Control (N. Carson Street is Uninterrupted)	Eastbound Left	-	-	-	-
				Eastbound Right	10.6	B	10.1	B
				Westbound Left	12.2	B	16.5	C
				Westbound Right	9.4	A	11.0	B
				Northbound Left	11.7	B	11.1	B
				Southbound Left	8.4	A	10.0	A
		N. Carson Street and Right In / Right Out Driveway	One Way Stop Control (N. Carson Street is Uninterrupted)	Eastbound Right	-	-	-	-
		N. Carson Street and Medical Pkwy / Arrowhead Dr	Signalized	Overall	33.0	C	34.3	C
		Medical Pkwy and Project Driveway	One Way Stop Control (Medical Parkway is Uninterrupted)	Eastbound Left	-	-	-	-
				Southbound	-	-	-	-
		Medical Pkwy and Medical Pkwy	One Way Stop Control (East / West Medical Parkway is Uninterrupted)	Eastbound Left	8.0	A	7.4	A
				Southbound Left	11.7	B	10.1	B
				Southbound Right	9.8	A	8.5	A

**Table 8 – Summary of Delay and Corresponding Level of Service (LOS) for Intersections Analyzed for 2022 Existing Traffic Volumes plus Proposed Project**

Year	Scenario	Intersection	Intersection Type	Approach Movement	AM Peak Hour		PM Peak Hour	
					Delay (s/veh)	LOS	Delay (s/veh)	LOS
2022	Existing Traffic Plus Project	N. Carson Street and Project Driveway / Monk Ct	Two Way Stop Control (N. Carson Street is Uninterrupted)	Eastbound Left	14.7	B	14.4	B
				Eastbound Right	10.6	B	10.3	B
				Westbound Left	12.8	B	17.6	C
				Westbound Right	9.4	A	10.9	B
				Northbound Left	11.7	B	10.8	B
				Southbound Left	8.4	A	9.9	A
		N. Carson Street and Right In / Right Out Driveway	One Way Stop Control (N. Carson Street is Uninterrupted)	Eastbound Right	10.9	B	10.5	B
		N. Carson Street and Medical Pkwy / Arrowhead Dr	Signalized	Overall	33.1	C	34.6	C
		Medical Pkwy and Project Driveway	One Way Stop Control (Medical Parkway is Uninterrupted)	Eastbound Left	8.0	A	7.4	A
				Southbound	9.8	A	9.1	A
		Medical Pkwy and Medical Pkwy	One Way Stop Control (East / West Medical Parkway is Uninterrupted)	Eastbound Left	8.0	A	7.4	A
				Southbound Left	11.8	B	10.1	B
				Southbound Right	9.8	A	8.5	A

**Table 9 – Summary of Delay and Corresponding Level of Service (LOS) for Intersections Analyzed for 2050 Future Traffic Volumes**

Year	Scenario	Intersection	Intersection Type	Approach Movement	AM Peak Hour		PM Peak Hour	
					Delay (s/veh)	LOS	Delay (s/veh)	LOS
2050	Future Traffic	N. Carson Street and Project Driveway / Monk Ct	Two Way Stop Control (N. Carson Street is Uninterrupted)	Eastbound Left	-	-	-	-
				Eastbound Right	11.2	B	10.6	B
				Westbound Left	13.4	B	19.8	C
				Westbound Right	9.6	A	11.7	B
				Northbound Left	13.3	B	12.3	B
				Southbound Left	8.6	A	10.7	B
		N. Carson Street and Right In / Right Out Driveway	One Way Stop Control (N. Carson Street is Uninterrupted)	Eastbound Right	-	-	-	-
		N. Carson Street and Medical Pkwy / Arrowhead Dr	Signalized	Overall	37.7	D	41.8	D
		Medical Pkwy and Project Driveway	One Way Stop Control (Medical Parkway is Uninterrupted)	Eastbound Left	-	-	-	-
				Southbound	-	-	-	-
		Medical Pkwy and Medical Pkwy	One Way Stop Control (East / West Medical Parkway is Uninterrupted)	Eastbound Left	8.4	A	7.5	A
				Southbound Left	13.7	B	10.9	B
				Southbound Right	10.4	B	8.6	A

**Table 10 – Summary of Delay and Corresponding Level of Service (LOS) for Intersections Analyzed for 2050 Future Traffic Volumes plus Proposed Project**

Year	Scenario	Intersection	Intersection Type	Approach Movement	AM Peak Hour		PM Peak Hour	
					Delay (s/veh)	LOS	Delay (s/veh)	LOS
2050	Future Traffic Plus Project	N. Carson Street and Project Driveway / Monk Ct	Two Way Stop Control (N. Carson Street is Uninterrupted)	Eastbound Left	18.8	C	18.5	C
				Eastbound Right	11.2	B	10.8	B
				Westbound Left	14.1	B	21.9	C
				Westbound Right	9.6	A	11.7	B
				Northbound Left	13.4	B	11.7	B
				Southbound Left	8.6	A	10.7	B
		N. Carson Street and Right in / Right Out Driveway	One Way Stop Control (N. Carson Street is Uninterrupted)	Eastbound Right	11.6	B	11.1	B
		N. Carson Street and Medical Pkwy / Arrowhead Dr	Signalized	Overall	37.9	D	42.3	D
		Medical Pkwy and Project Driveway	One Way Stop Control (Medical Parkway is Uninterrupted)	Eastbound Left	8.4	A	7.5	A
				Southbound	10.6	B	9.4	A
		Medical Pkwy and Medical Pkwy	One Way Stop Control (East / West Medical Parkway is Uninterrupted)	Eastbound Left	8.4	A	7.5	A
				Southbound Left	13.9	B	11.1	B
				Southbound Right	10.5	B	8.6	A

Based on review of Level of Service (LOS) Analysis performed with HCS 2022 traffic software (Summarized in Tables 7-10 (pages 14-16) it can be seen that the proposed project (Oasis Assisted Living) will have minimal impact to the surrounding traffic network. The largest impact will be for egress traffic which is leaving the proposed project. When comparing Table 7 to Table 8, and Table 9 to Table 10, we can see that with the addition of this project, the average increase in delay for all approaches is less than one second. Additionally, the worst increase in delay is only 2.1 seconds for the Westbound Left turn from Monk Ct onto southbound N. Carson Street during the 2050 PM Peak Hour. No decreases in Level of Service (LOS) are observed as a result of this project.

All intersections and turning movements under 2050 scenarios (both with and without the project) received a LOS of D or better. The Highway Capacity Manual, 7<sup>th</sup> Edition recommends a Level of Service (LOS) of D or better. The LOS meets or exceeds what is considered acceptable under all turning movements and traffic scenarios.

### C. Need for Traffic / Roadway Improvements

Per review of HCS 2022 Analysis and traffic counts performed, as well as field observations, all intersections seem to perform well under all traffic scenarios. Even taking into account projected traffic in 2050, all Levels of Service were identified as LOS D or better (which meets High Capacity Manual recommendations for Levels of Service).

No need for traffic improvements are anticipated due to this project or its impact to the surrounding roadway network.

No need for traffic improvement are anticipated due to existing or projected traffic in 2050.

Egress traffic from the proposed project driveways should be controlled with stop signs.

Based on the proposed geometry in Attachment 2, two egress lanes should be installed for eastbound egress traffic at the N. Carson Street and Monk Ct / Project Driveway. A separate left / through lane and a separate right turn lane should be installed, which is controlled by a single stop sign. The remaining two driveways only require a single egress (exit) lane.

The right-in / right-out project driveway along N. Carson Street should be designed to NDOT standards, and have a “pork chop” installed to prevent vehicles from turning left (the wrong way) onto southbound N. Carson Street.

#### **D. Site Specific Hazards / Considerations**

The site was reviewed to determine if there are any site specific hazards or considerations regarding the proposed project access. Site Visits were performed on Thursday, July 28, 2022 and Friday, July 29, 2022 to perform AM and PM Peak Hour traffic counts. During these site visits it was determined that the existing geometry at the project location seems adequate. Although the roadway speed is 45 mph (on N. Carson Street), the wide open and unobstructed site distances allow plenty of visibility for traffic turning into or out of the project location.

NDOT Crash Data (2015-2017) was reviewed for number and severity of crashes at the project location (Figure 3, below). Only one “property damage only” crash was identified in the vicinity of the proposed project. Accordingly we can consider the number and severity of crashes based on available data to be very low.



**Figure 3 – NDOT Crash Data 2015-2017 at project location. Accessed on 9/25/2022. Project Driveway Locations have been identified as red arrows.**



## **IX RECOMMENDATIONS**

### **A. Site Accessibility**

Egress traffic from the proposed project location should be controlled with stop signs.

Based on the proposed geometry in Attachment 2, two lanes should be installed for eastbound egress traffic at the N. Carson Street and Monk Ct / Project Driveway. A separate left / through lane and a separate right turn lane should be installed, which is controlled by a single stop sign. The remaining two driveways only require a single egress (exit) lane.

The right-in / right-out project driveway along N. Carson Street should be designed to NDOT standards, and have a “pork chop” installed to prevent vehicles from turning left (the wrong way) onto southbound N. Carson Street.

### **B. Traffic Impacts**

Based on review of Level of Service (LOS) Analysis performed with HCS 2022 traffic software (Summarized in Tables 7-10 (pages 14-16) it can be seen that the proposed project (Oasis Assisted Living) will have minimal impact to the surrounding traffic network.

No traffic or roadway improvements are anticipated or required due to this project (Oasis Assisted Living).

## **ADDITIONAL NOTES**

The recommendations presented in this report are based on best available data and reputable published data. Multiple assumptions are made and stated to come to the conclusions stated in this report. By nature, future traffic predictions are only predictions based on the best available data at the time.

Our conclusions and recommendations may be invalidated, partially or in whole, by changes outside our control, such as changes to the local traffic network, new projects, or changes in land uses. This report may be subject to review and revision at any time. Opinions expressed in this report do not constitute a warranty of any kind, either express or implied.

## REFERENCES

*“Highway Capacity Manual: 7<sup>th</sup> Edition: A Guide For Multimodal Mobility Analysis”. Washington, D.C.: Transportation Research Board, 2022.*

*“Trip Generation Manual: 11<sup>th</sup> Edition”. Washington, D.C.: Institute of Transportation Engineers, September 2021.*

## **LIST OF ATTACHMENTS**

ATTACHMENT 1 – CONCEPTUAL SITE PLAN FOR PROPOSED PROJECT

ATTACHMENT 2 – EXISTING / PROPOSED LANE GEOMETRY FOR  
INTERSECTIONS ANALYZED

ATTACHMENT 3 – TRIP DISTRIBUTION

ATTACHMENT 4 – TRIP ASSIGNMENT FOR PROJECT

ATTACHMENT 5 – CURRENT 2022 BASELINE TRAFFIC

ATTACHMENT 6 – CURRENT 2022 BASELINE TRAFFIC PLUS PROPOSED  
PROJECT

ATTACHMENT 7 – FUTURE 2050 BASELINE TRAFFIC

ATTACHMENT 8 – FUTURE 2050 BASELINE TRAFFIC PLUS PROPOSED  
PROJECT

ATTACHMENT 9 – HCS 2022 ANALYSIS FOR N. CARSON STREET AND THE  
PROJECT DRIVEWAY / MONK CT

ATTACHMENT 10 – HCS 2022 ANALYSIS FOR N. CARSON STREET AND THE  
RIGHT IN-RIGHT OUT PROJECT DRIVEWAY

ATTACHMENT 11 – HCS 2022 ANALYSIS FOR N. CARSON STREET AND  
ARROWHEAD DR / MEDICAL PKWY

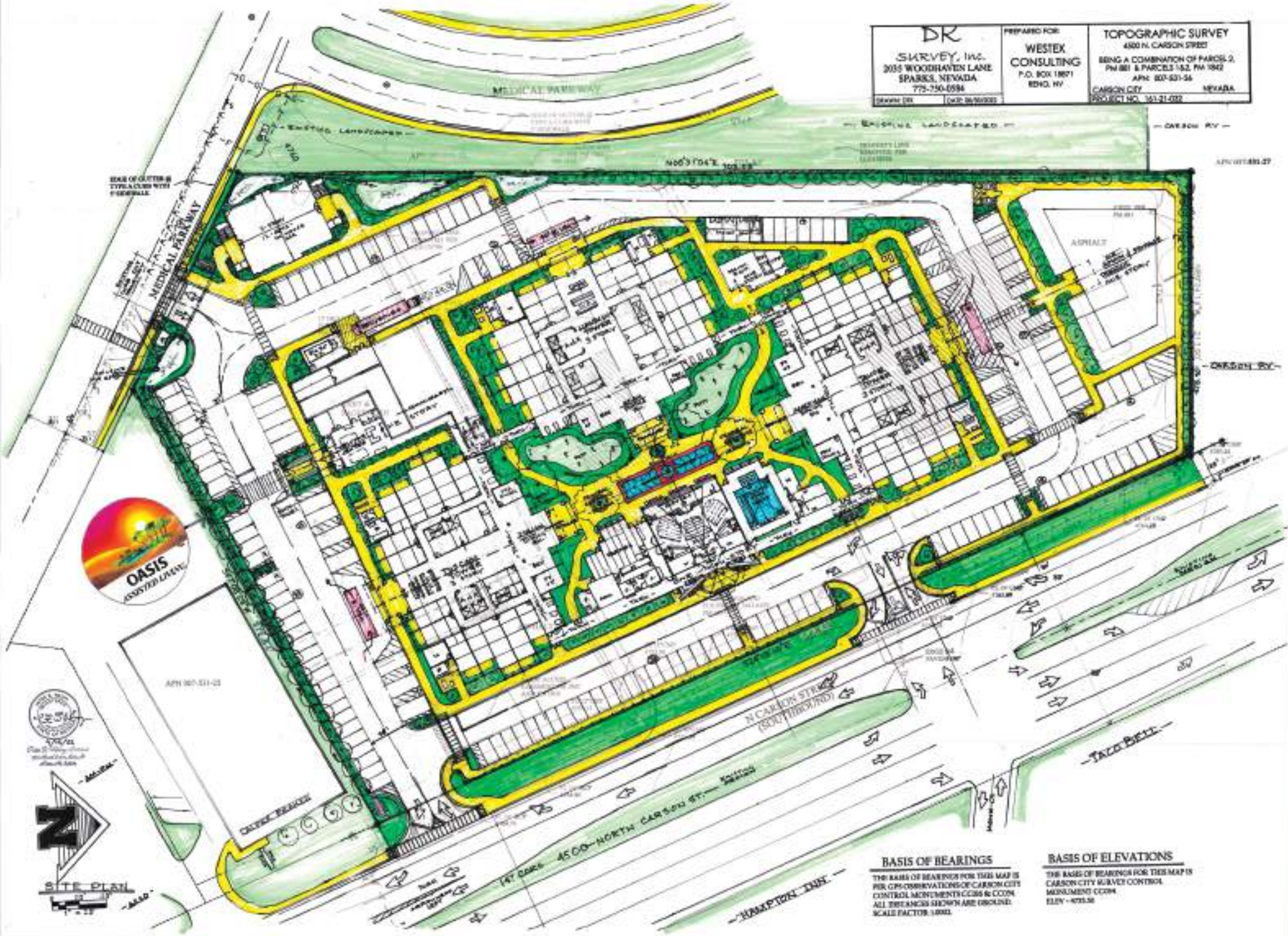
ATTACHMENT 12 – HCS 2022 ANALYSIS FOR MEDICAL PKWY AND THE  
PROJECT DRIVEWAY

ATTACHMENT 13 – HCS 2022 ANALYSIS FOR MEDICAL PKWY AND MEDICAL  
PKWY

**ATTACHMENT 1 – CONCEPTUAL SITE PLAN FOR PROPOSED PROJECT**



<b>DR</b> SKIRVEY, INC. 3035 WOODHAVEN LANE SPARKS, NEVADA 773-250-0594 WWW.SKIRVEY.COM	PREPARED FOR <b>WESTEX</b> CONSULTING P.O. BOX 18871 RENO, NV	<b>TOPOGRAPHIC SURVEY</b> 4800 N. CARSON STREET BEING A COMBINATION OF PARCELS 2, PHASE 1 & PARCELS 152, PHASE 2 APRIL 2003-2014 CARSON CITY, NEVADA PROJECT NO. 361-21-032



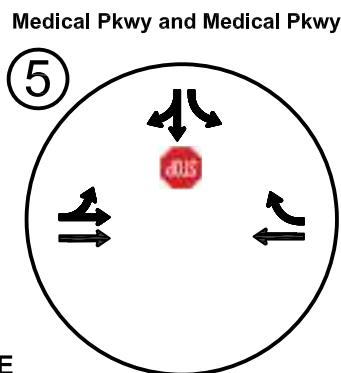
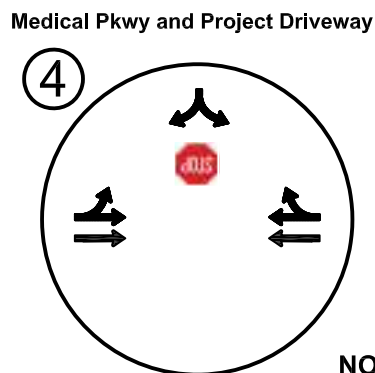
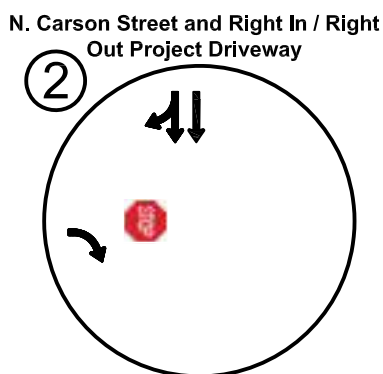
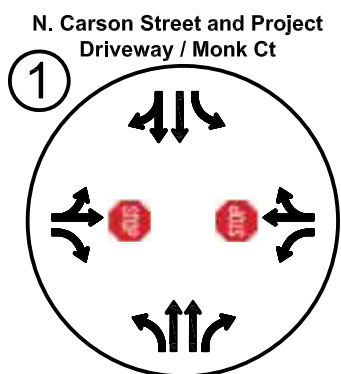
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 PER GPS OBSERVATIONS OF CARSON CITY  
 CONTROL MONUMENTS CC366 & CC304.  
 ALL THEREAFTER SHOWN ARE DERIVED  
 SCALE FACTOR: 1.0002

**BASIS OF ELEVATIONS**  
 THE BASIS OF ELEVATIONS FOR THIS MAP IS  
 CARSON CITY NAVY CONTROL  
 MONUMENT CC304  
 ELEV - 4703.56



**ATTACHMENT 2 – EXISTING / PROPOSED LANE GEOMETRY FOR  
INTERSECTIONS ANALYZED**

# Proposed Lane Geometry for Intersections Analyzed

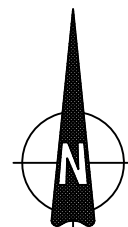


PROJECT NO: 2284.001-B



PO Box 18871  
Reno, NV 89511  
(775) 484-1013  
chris@westexconsulting.com

NO SCALE



\* Aerial Imagery Obtained from Google Earth

## **ATTACHMENT 3 – TRIP DISTRIBUTION**

# Ingress Trip Distribution (Trips into Site)



% AM TRIP DISTRIBUTION  
(%) PM TRIP DISTRIBUTION\*

\*If AM and PM Trip Distribution are anticipated to be the same, PM Trip Distribution Not Shown

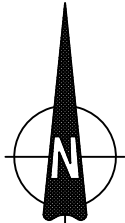
PROJECT NO: 2284.001-B



WESTEX  
Consulting Engineers

PO Box 18871  
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(775) 484-1013  
chrls@westexconsulting.com

NO SCALE



\* Aerial Imagery Obtained from Google Earth



# Egress Trip Distribution (Trips out of Site)



% AM TRIP DISTRIBUTION  
(%) PM TRIP DISTRIBUTION\*

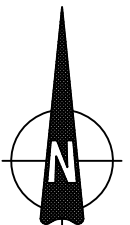
\*If AM and PM Trip Distribution are anticipated to be the same,  
PM Trip Distribution Not Shown

PROJECT NO: 2284.001-B



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chrls@westexconsulting.com

NO SCALE



\* Aerial Imagery Obtained from Google Earth

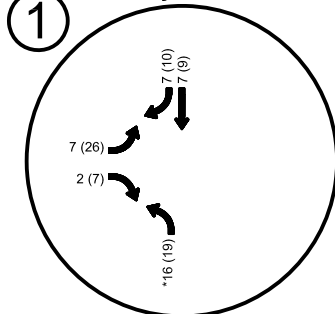


## **ATTACHMENT 4 – TRIP ASSIGNMENT FOR PROJECT**

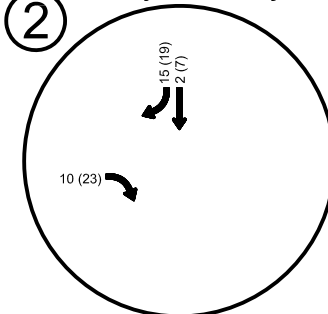
# Trip Assignment for Oasis Assisted Living



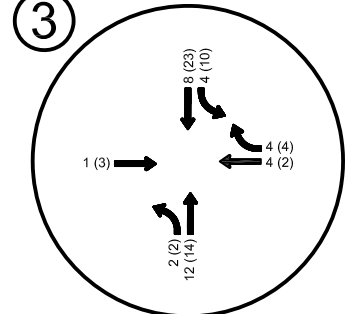
1 N. Carson Street and Project Driveway / Monk Ct



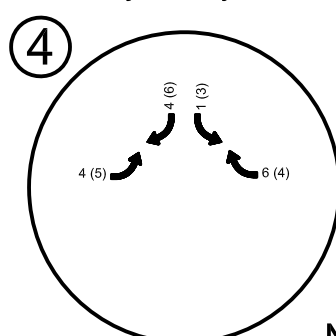
2 N. Carson Street and Right In / Right Out Project Driveway



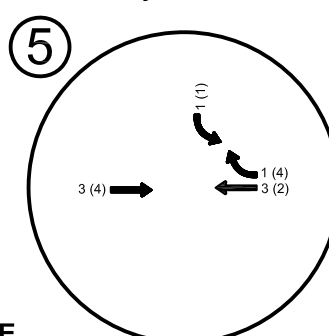
3 N. Carson Street and Medical Pkwy / Arrowhead Drive



4 Medical Pkwy and Project Driveway



5 Medical Pkwy and Medical Pkwy

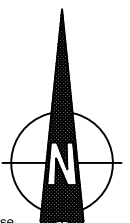


PROJECT NO: 2284.001-B



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NO SCALE



\*Half assumed to be U-Turns and will use Right In - Right Out Driveway to the South

# AM PEAK HOUR VOLUME  
# PM PEAK HOUR VOLUME

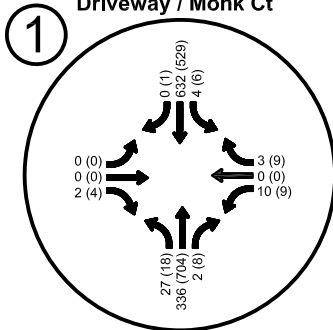
\*\* Aerial Imagery Obtained from Google Earth

## **ATTACHMENT 5 – CURRENT 2022 BASELINE TRAFFIC**

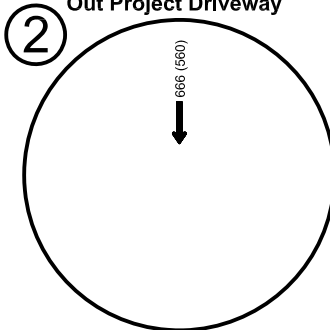
# Current (2022) Baseline Traffic



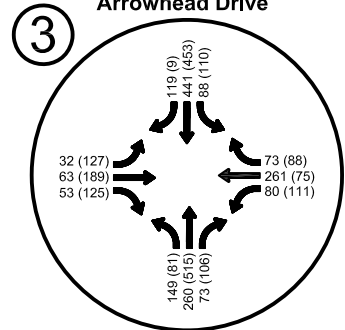
**1** N. Carson Street and Project Driveway / Monk Ct



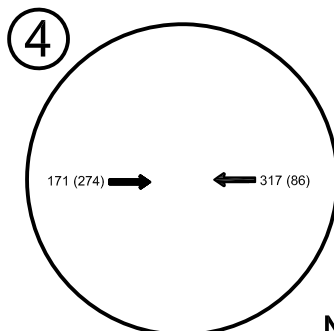
**2** N. Carson Street and Right In / Right Out Project Driveway



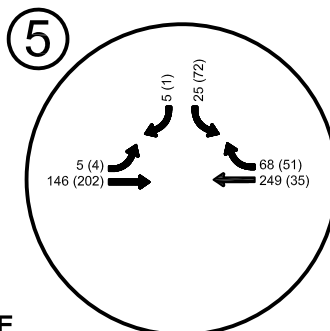
**3** N. Carson Street and Medical Pkwy / Arrowhead Drive



**4** Medical Pkwy and Project Driveway



**5** Medical Pkwy and Medical Pkwy

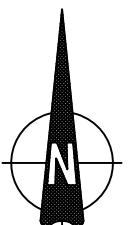


NO SCALE

PROJECT NO: 2284.001-B



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# AM PEAK HOUR VOLUME  
(#) PM PEAK HOUR VOLUME

\* Aerial Imagery Obtained from Google Earth

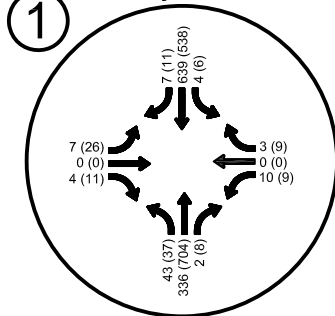
**ATTACHMENT 6 – CURRENT 2022 BASELINE TRAFFIC PLUS PROPOSED  
PROJECT**



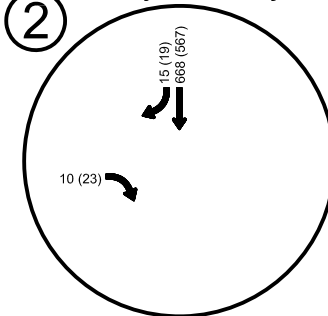
# Current (2022) Baseline Traffic Plus Proposed Project



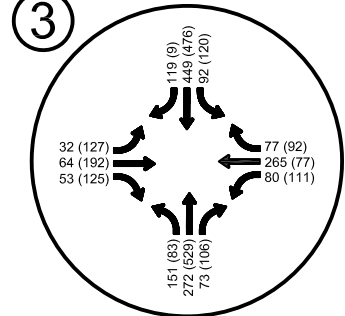
1 N. Carson Street and Project Driveway / Monk Ct



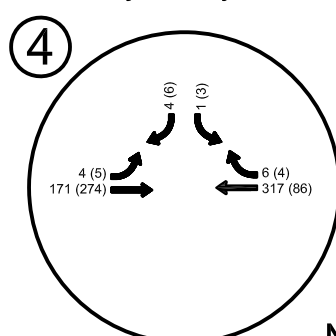
2 N. Carson Street and Right In / Right Out Project Driveway



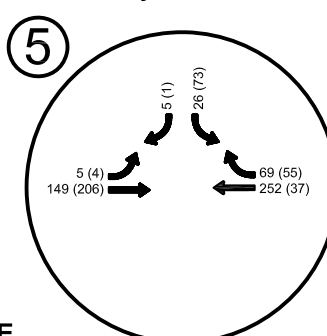
3 N. Carson Street and Medical Pkwy / Arrowhead Drive



4 Medical Pkwy and Project Driveway



5 Medical Pkwy and Medical Pkwy

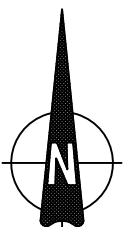


NO SCALE

PROJECT NO: 2284.001-B



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# AM PEAK HOUR VOLUME  
(#) PM PEAK HOUR VOLUME

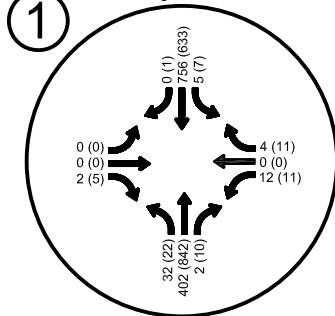
\* Aerial Imagery Obtained from Google Earth

## **ATTACHMENT 7 – FUTURE 2050 BASELINE TRAFFIC**

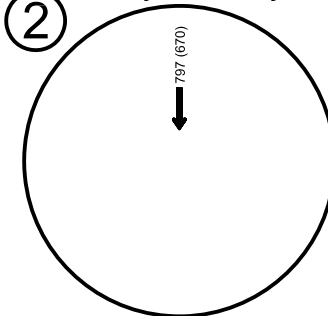
# Future (2050) Baseline Traffic



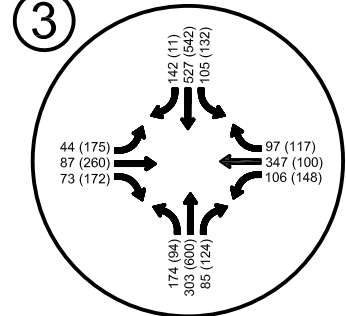
1 N. Carson Street and Project Driveway / Monk Ct



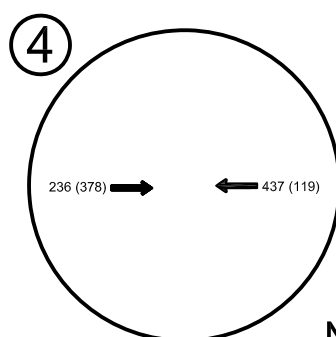
2 N. Carson Street and Right In / Right Out Project Driveway



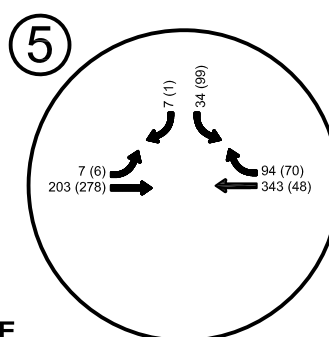
3 N. Carson Street and Medical Pkwy / Arrowhead Drive



4 Medical Pkwy and Project Driveway



5 Medical Pkwy and Medical Pkwy

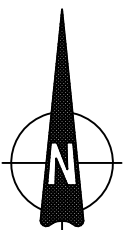


NO SCALE

PROJECT NO: 2284.001-B



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# AM PEAK HOUR VOLUME  
(#) PM PEAK HOUR VOLUME

\* Aerial Imagery Obtained from Google Earth

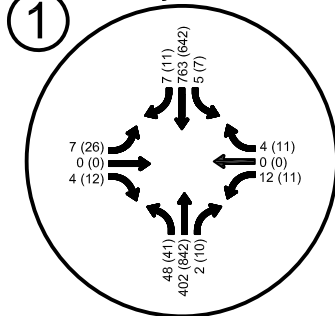
**ATTACHMENT 8 – FUTURE 2050 BASELINE TRAFFIC PLUS PROPOSED  
PROJECT**



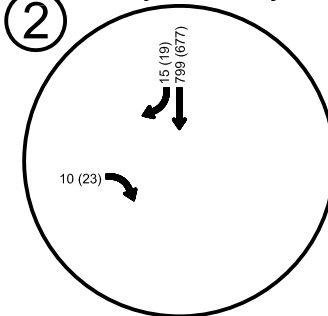
# Future (2050) Baseline Traffic Plus Proposed Project



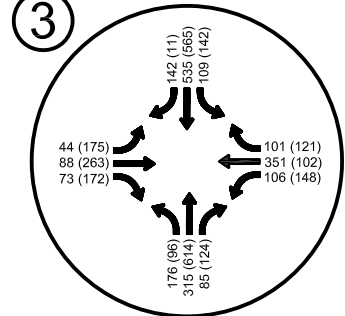
1 N. Carson Street and Project Driveway / Monk Ct



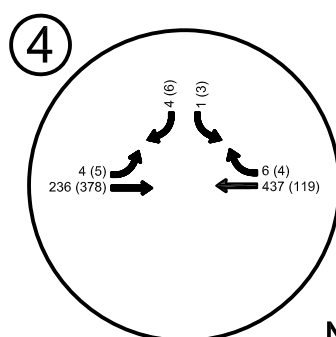
2 N. Carson Street and Right In / Right Out Project Driveway



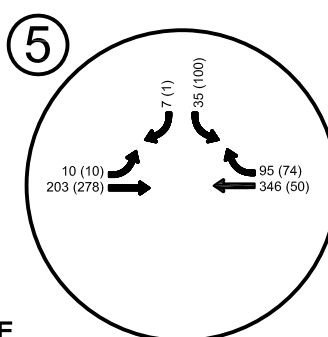
3 N. Carson Street and Medical Pkwy / Arrowhead Drive



4 Medical Pkwy and Project Driveway



5 Medical Pkwy and Medical Pkwy

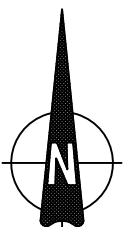


NO SCALE

PROJECT NO: 2284.001-B



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# AM PEAK HOUR VOLUME  
(#) PM PEAK HOUR VOLUME

\* Aerial Imagery Obtained from Google Earth



**ATTACHMENT 9 – HCS 2022 ANALYSIS FOR N. CARSON STREET AND THE  
PROJECT DRIVEWAY / MONK CT**

# HCS Two-Way Stop-Control Report

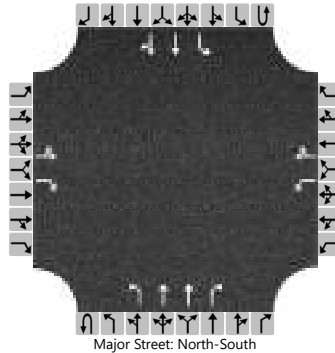
## General Information

Analyst	Christopher Moltz, P.E.
Agency/Co.	Westex Consulting
Date Performed	9/30/2022
Analysis Year	2022
Time Analyzed	AM Peak Hour
Intersection Orientation	North-South
Project Description	2022 Baseline

## Site Information

Intersection	N Carson St / Project Driveway / Monk Ct
Jurisdiction	Carson City
East/West Street	Project Driveway / Monk Ct
North/South Street	N. Carson Street
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	1		1	1	0	0	1	2	1	0	1	2	0
Configuration		LT		R		L		TR		L	T	R		L	T	TR
Volume (veh/h)		0	0	2		10	0	3	22	5	336	2	1	3	632	0
Percent Heavy Vehicles (%)		3	3	3		3	3	3	3	3			3	3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized	No								No							
Median Type   Storage	Left Only								5							

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9	6.4	4.1			6.4	4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96	6.46	4.16			6.46	4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3	2.5	2.2			2.5	2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33	2.53	2.23			2.53	2.23		

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0		2		11		3		29				4		
Capacity, c (veh/h)		0		650		509		825		565				1070		
v/c Ratio				0.00		0.02		0.00		0.05				0.00		
95% Queue Length, Q <sub>95</sub> (veh)				0.0		0.1		0.0		0.2				0.0		
Control Delay (s/veh)				10.6		12.2		9.4		11.7				8.4		
Level of Service (LOS)				B		B		A		B				A		
Approach Delay (s/veh)					11.6				0.9				0.1			
Approach LOS					B				A				A			

# HCS Two-Way Stop-Control Report

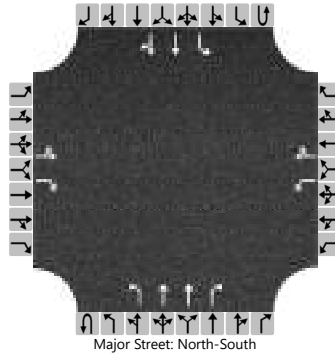
## General Information

Analyst	Christopher Moltz, P.E.
Agency/Co.	Westex Consulting
Date Performed	9/30/2022
Analysis Year	2022
Time Analyzed	PM Peak Hour
Intersection Orientation	North-South
Project Description	2022 Baseline

## Site Information

Intersection	N Carson St / Project Driveway / Monk Ct
Jurisdiction	Carson City
East/West Street	Project Driveway / Monk Ct
North/South Street	N. Carson Street
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	1		1	1	0	0	1	2	1	0	1	2	0
Configuration		LT		R		L		TR		L	T	R		L	T	TR
Volume (veh/h)		0	0	4		9	0	9	18	0	704	8	1	5	529	1
Percent Heavy Vehicles (%)		3	3	3		3	3	3	3	3			3	3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized	No								No							
Median Type   Storage	Left Only								5							

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9	6.4	4.1			6.4	4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96	6.46	4.16			6.46	4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3	2.5	2.2			2.5	2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33	2.53	2.23			2.53	2.23		

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0		4		10		10		20				7		
Capacity, c (veh/h)		0		706		323		613		612				732		
v/c Ratio				0.01		0.03		0.02		0.03				0.01		
95% Queue Length, Q <sub>95</sub> (veh)				0.0		0.1		0.0		0.1				0.0		
Control Delay (s/veh)				10.1		16.5		11.0		11.1				10.0		
Level of Service (LOS)				B		C		B		B				A		
Approach Delay (s/veh)					13.7				0.3				0.1			
Approach LOS					B				A				A			

# HCS Two-Way Stop-Control Report

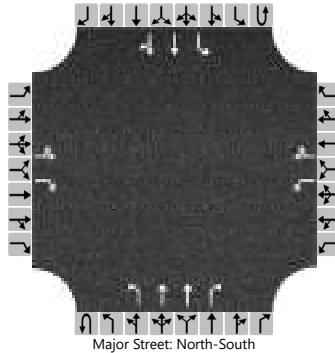
## General Information

Analyst	Christopher Moltz, P.E.
Agency/Co.	Westex Consulting
Date Performed	9/30/2022
Analysis Year	2022
Time Analyzed	AM Peak Hour
Intersection Orientation	North-South
Project Description	2022 plus Project

## Site Information

Intersection	N Carson St / Project Driveway / Monk Ct
Jurisdiction	Carson City
East/West Street	Project Driveway / Monk Ct
North/South Street	N. Carson Street
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	1		1	1	0	0	1	2	1	0	1	2	0
Configuration		LT		R		L		TR		L	T	R		L	T	TR
Volume (veh/h)		7	0	4		10	0	3	30	13	336	2	1	3	639	7
Percent Heavy Vehicles (%)		3	3	3		3	3	3	3	3			3	3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized	No								No							
Median Type   Storage	Left Only								5							

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9	6.4	4.1			6.4	4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96	6.46	4.16			6.46	4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3	2.5	2.2			2.5	2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33	2.53	2.23			2.53	2.23		

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		8		4		11		3		47				4		
Capacity, c (veh/h)		379		642		475		825		583				1070		
v/c Ratio		0.02		0.01		0.02		0.00		0.08				0.00		
95% Queue Length, Q <sub>95</sub> (veh)		0.1		0.0		0.1		0.0		0.3				0.0		
Control Delay (s/veh)		14.7		10.6		12.8		9.4		11.7				8.4		
Level of Service (LOS)		B		B		B		A		B				A		
Approach Delay (s/veh)	13.2				12.0				1.3				0.1			
Approach LOS	B				B				A				A			

# HCS Two-Way Stop-Control Report

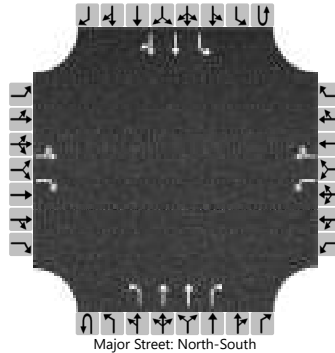
## General Information

Analyst	Christopher Moltz, P.E.
Agency/Co.	Westex Consulting
Date Performed	9/30/2022
Analysis Year	2022
Time Analyzed	PM Peak Hour
Intersection Orientation	North-South
Project Description	2022 plus Project

## Site Information

Intersection	N Carson St / Project Driveway / Monk Ct
Jurisdiction	Carson City
East/West Street	Project Driveway / Monk Ct
North/South Street	N. Carson Street
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	1		1	1	0	0	1	2	1	0	1	2	0
Configuration		LT		R		L		TR		L	T	R		L	T	TR
Volume (veh/h)		26	0	11		10	0	3	27	10	704	8	1	5	538	11
Percent Heavy Vehicles (%)		3	3	3		3	3	3	3	3			3	3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized	No								No							
Median Type   Storage	Left Only								5							

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9	6.4	4.1			6.4	4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96	6.46	4.16			6.46	4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3	2.5	2.2			2.5	2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33	2.53	2.23			2.53	2.23		

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		28		12		11		3		40				7		
Capacity, c (veh/h)		410		695		296		613		657				734		
v/c Ratio		0.07		0.02		0.04		0.01		0.06				0.01		
95% Queue Length, Q <sub>95</sub> (veh)		0.2		0.1		0.1		0.0		0.2				0.0		
Control Delay (s/veh)		14.4		10.3		17.6		10.9		10.8				9.9		
Level of Service (LOS)		B		B		C		B		B				A		
Approach Delay (s/veh)	13.2				16.1				0.5				0.1			
Approach LOS	B				C				A				A			



# HCS Two-Way Stop-Control Report

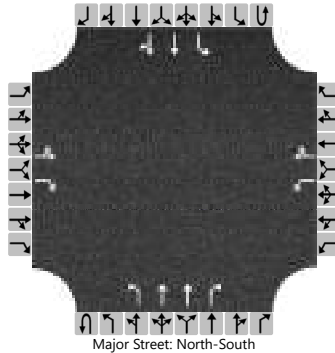
## General Information

Analyst	Christopher Moltz, P.E.
Agency/Co.	Westex Consulting
Date Performed	9/30/2022
Analysis Year	2050
Time Analyzed	AM Peak Hour
Intersection Orientation	North-South
Project Description	2050 Baseline

## Site Information

Intersection	N Carson St / Project Driveway / Monk Ct
Jurisdiction	Carson City
East/West Street	Project Driveway / Monk Ct
North/South Street	N. Carson Street
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	1		1	1	0	0	1	2	1	0	1	2	0
Configuration		LT		R		L		TR		L	T	R		L	T	TR
Volume (veh/h)		0	0	2		12	0	4	26	6	402	2	1	4	756	0
Percent Heavy Vehicles (%)		3	3	3		3	3	3	3	3			3	3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized	No								No							
Median Type   Storage	Left Only								5							

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9	6.4	4.1			6.4	4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96	6.46	4.16			6.46	4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3	2.5	2.2			2.5	2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33	2.53	2.23			2.53	2.23		

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0		2		13		4		35				5		
Capacity, c (veh/h)		0		587		442		783		468				1013		
v/c Ratio				0.00		0.03		0.01		0.07				0.01		
95% Queue Length, Q <sub>95</sub> (veh)				0.0		0.1		0.0		0.2				0.0		
Control Delay (s/veh)				11.2		13.4		9.6		13.3				8.6		
Level of Service (LOS)				B		B		A		B				A		
Approach Delay (s/veh)					12.4				1.0				0.1			
Approach LOS					B				A				A			

# HCS Two-Way Stop-Control Report

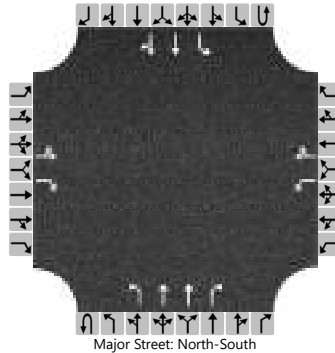
## General Information

Analyst	Christopher Moltz, P.E.
Agency/Co.	Westex Consulting
Date Performed	9/30/2022
Analysis Year	2050
Time Analyzed	PM Peak Hour
Intersection Orientation	North-South
Project Description	2050 Baseline

## Site Information

Intersection	N Carson St / Project Driveway / Monk Ct
Jurisdiction	Carson City
East/West Street	Project Driveway / Monk Ct
North/South Street	N. Carson Street
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	1		1	1	0	0	1	2	1	0	1	2	0
Configuration		LT		R		L		TR		L	T	R		L	T	TR
Volume (veh/h)		0	0	5		11	0	11	22	0	842	10	1	6	633	1
Percent Heavy Vehicles (%)		3	3	3		3	3	3	3	3			3	3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized	No								No							
Median Type   Storage	Left Only								5							

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9	6.4	4.1			6.4	4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96	6.46	4.16			6.46	4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3	2.5	2.2			2.5	2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33	2.53	2.23			2.53	2.23		

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0		5		12		12		24				8		
Capacity, c (veh/h)		0		649		255		547		517				637		
v/c Ratio				0.01		0.05		0.02		0.05				0.01		
95% Queue Length, Q <sub>95</sub> (veh)				0.0		0.1		0.1		0.1				0.0		
Control Delay (s/veh)				10.6		19.8		11.7		12.3				10.7		
Level of Service (LOS)				B		C		B		B				B		
Approach Delay (s/veh)					15.8				0.3				0.1			
Approach LOS					C				A				A			

# HCS Two-Way Stop-Control Report

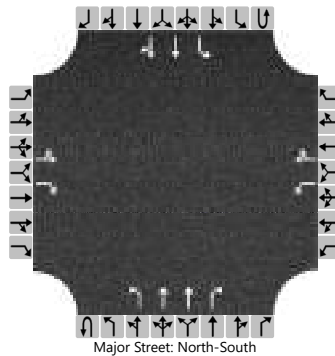
## General Information

Analyst	Christopher Moltz, P.E.
Agency/Co.	Westex Consulting
Date Performed	9/30/2022
Analysis Year	2050
Time Analyzed	AM Peak Hour
Intersection Orientation	North-South
Project Description	2050 plus Project

## Site Information

Intersection	N Carson St / Project Driveway / Monk Ct
Jurisdiction	Carson City
East/West Street	Project Driveway / Monk Ct
North/South Street	N. Carson Street
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	1		1	1	0	0	1	2	1	0	1	2	0
Configuration		LT		R		L		TR		L	T	R		L	T	TR
Volume (veh/h)		7	0	4		12	0	4	34	14	402	2	1	4	763	7
Percent Heavy Vehicles (%)		3	3	3		3	3	3	3	3			3	3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized	No								No							
Median Type   Storage	Left Only								5							

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9	6.4	4.1			6.4	4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96	6.46	4.16			6.46	4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3	2.5	2.2			2.5	2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33	2.53	2.23			2.53	2.23		

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		8		4		13		4		52				5		
Capacity, c (veh/h)		313		581		410		783		482				1013		
v/c Ratio		0.02		0.01		0.03		0.01		0.11				0.01		
95% Queue Length, Q <sub>95</sub> (veh)		0.1		0.0		0.1		0.0		0.4				0.0		
Control Delay (s/veh)		16.8		11.2		14.1		9.6		13.4				8.6		
Level of Service (LOS)		C		B		B		A		B				A		
Approach Delay (s/veh)	14.8				13.0				1.4				0.1			
Approach LOS	B				B				A				A			

# HCS Two-Way Stop-Control Report

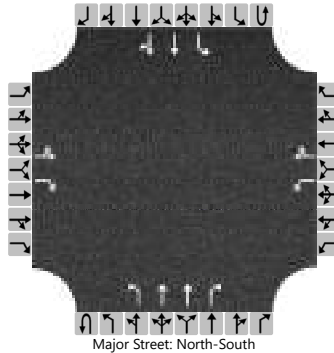
## General Information

Analyst	Christopher Moltz, P.E.
Agency/Co.	Westex Consulting
Date Performed	9/30/2022
Analysis Year	2050
Time Analyzed	PM Peak Hour
Intersection Orientation	North-South
Project Description	2050 plus Project

## Site Information

Intersection	N Carson St / Project Driveway / Monk Ct
Jurisdiction	Carson City
East/West Street	Project Driveway / Monk Ct
North/South Street	N. Carson Street
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	1		1	1	0	0	1	2	1	0	1	2	0
Configuration		LT		R		L		TR		L	T	R		L	T	TR
Volume (veh/h)		26	0	12		11	0	11	31	17	842	10	1	6	642	11
Percent Heavy Vehicles (%)		3	3	3		3	3	3	3	3			3	3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized	No								No							
Median Type   Storage	Left Only								5							

## Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9	6.4	4.1			6.4	4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96	6.46	4.16			6.46	4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3	2.5	2.2			2.5	2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33	2.53	2.23			2.53	2.23		

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		28		13		12		12		52				8		
Capacity, c (veh/h)		341		639		225		547		586				637		
v/c Ratio		0.08		0.02		0.05		0.02		0.09				0.01		
95% Queue Length, Q <sub>95</sub> (veh)		0.3		0.1		0.2		0.1		0.3				0.0		
Control Delay (s/veh)		16.5		10.8		21.9		11.7		11.7				10.7		
Level of Service (LOS)		C		B		C		B		B				B		
Approach Delay (s/veh)	14.7				16.8				0.6				0.1			
Approach LOS	B				C				A				A			

**ATTACHMENT 10 – HCS 2022 ANALYSIS FOR N. CARSON STREET AND THE  
RIGHT IN-RIGHT OUT PROJECT DRIVEWAY**

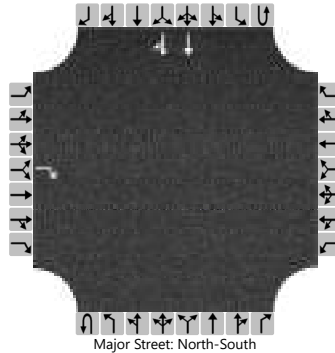


# HCS Two-Way Stop-Control Report

## General Information

Analyst	Christopher Moltz, P.E.	Intersection	N Carson Street / Right In-Right Out Driveway
Agency/Co.	Westex Consulting	Jurisdiction	Carson City
Date Performed	9/30/2022	East/West Street	Right In-Right Out Driveway
Analysis Year	2022	North/South Street	N Carson Street
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	2022 plus Project		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	1		0	0	0	0	0	0	0	0	0	2	0
Configuration				R											T	TR
Volume (veh/h)				10											668	15
Percent Heavy Vehicles (%)				3												
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized	No															
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)				6.9												
Critical Headway (sec)				6.96												
Base Follow-Up Headway (sec)				3.3												
Follow-Up Headway (sec)				3.33												

## Delay, Queue Length, and Level of Service

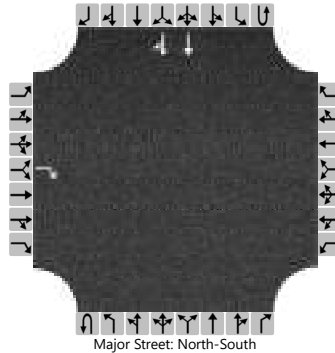
Flow Rate, v (veh/h)				11												
Capacity, c (veh/h)				623												
v/c Ratio				0.02												
95% Queue Length, Q <sub>95</sub> (veh)				0.1												
Control Delay (s/veh)				10.9												
Level of Service (LOS)				B												
Approach Delay (s/veh)	10.9															
Approach LOS	B															

# HCS Two-Way Stop-Control Report

## General Information

Analyst	Christopher Moltz, P.E.	Intersection	N Carson Street / Right In-Right Out Driveway
Agency/Co.	Westex Consulting	Jurisdiction	Carson City
Date Performed	9/30/2022	East/West Street	Right In-Right Out Driveway
Analysis Year	2022	North/South Street	N Carson Street
Time Analyzed	PM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	2022 plus Project		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	1		0	0	0	0	0	0	0	0	0	2	0
Configuration				R											T	TR
Volume (veh/h)				23											567	19
Percent Heavy Vehicles (%)				3												
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized	No															
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)				6.9												
Critical Headway (sec)				6.96												
Base Follow-Up Headway (sec)				3.3												
Follow-Up Headway (sec)				3.33												

## Delay, Queue Length, and Level of Service

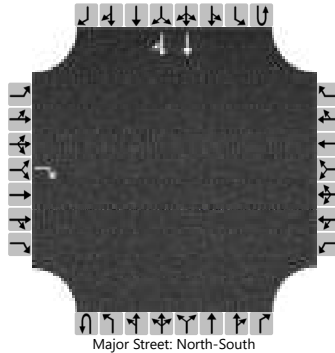
Flow Rate, v (veh/h)				25												
Capacity, c (veh/h)				674												
v/c Ratio				0.04												
95% Queue Length, Q <sub>95</sub> (veh)				0.1												
Control Delay (s/veh)				10.5												
Level of Service (LOS)				B												
Approach Delay (s/veh)	10.5															
Approach LOS	B															

# HCS Two-Way Stop-Control Report

## General Information

Analyst	Christopher Moltz, P.E.	Intersection	N Carson Street / Right In-Right Out Driveway
Agency/Co.	Westex Consulting	Jurisdiction	Carson City
Date Performed	9/30/2022	East/West Street	Right In-Right Out Driveway
Analysis Year	2050	North/South Street	N Carson Street
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	2050 plus Project		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	1		0	0	0	0	0	0	0	0	0	2	0
Configuration				R											T	TR
Volume (veh/h)				10											799	15
Percent Heavy Vehicles (%)				3												
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized	No															
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)				6.9												
Critical Headway (sec)				6.96												
Base Follow-Up Headway (sec)				3.3												
Follow-Up Headway (sec)				3.33												

## Delay, Queue Length, and Level of Service

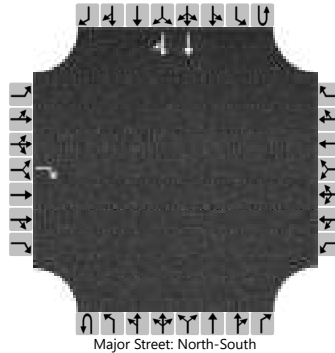
Flow Rate, v (veh/h)				11												
Capacity, c (veh/h)				560												
v/c Ratio				0.02												
95% Queue Length, Q <sub>95</sub> (veh)				0.1												
Control Delay (s/veh)				11.6												
Level of Service (LOS)				B												
Approach Delay (s/veh)	11.6															
Approach LOS	B															

# HCS Two-Way Stop-Control Report

## General Information

Analyst	Christopher Moltz, P.E.	Intersection	N Carson Street / Right In-Right Out Driveway
Agency/Co.	Westex Consulting	Jurisdiction	Carson City
Date Performed	9/30/2022	East/West Street	Right In-Right Out Driveway
Analysis Year	2050	North/South Street	N Carson Street
Time Analyzed	PM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	2050 plus Project		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	1		0	0	0	0	0	0	0	0	0	2	0
Configuration				R											T	TR
Volume (veh/h)				23											677	19
Percent Heavy Vehicles (%)				3												
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized	No															
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)				6.9												
Critical Headway (sec)				6.96												
Base Follow-Up Headway (sec)				3.3												
Follow-Up Headway (sec)				3.33												

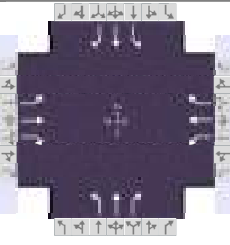
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)				25												
Capacity, c (veh/h)				617												
v/c Ratio				0.04												
95% Queue Length, Q <sub>95</sub> (veh)				0.1												
Control Delay (s/veh)				11.1												
Level of Service (LOS)				B												
Approach Delay (s/veh)	11.1															
Approach LOS	B															

**ATTACHMENT 11 – HCS 2022 ANALYSIS FOR N. CARSON STREET AND  
ARROWHEAD DR / MEDICAL PKWY**










# HCS Signalized Intersection Results Summary

General Information				Intersection Information		
Agency	Westex Consulting Engineers			Duration, h	0.250	
Analyst	Christopher Moltz, P.E.	Analysis Date	9/30/2022	Area Type	Other	
Jurisdiction	Carson City	Time Period	AM Peak Hour	PHF	0.92	
Urban Street	Carson/Arrowhead/Medi...	Analysis Year	2022	Analysis Period	1> 7:00	
Intersection	Carson/Arrowhead/Medi...	File Name	Signalized - N Carson and Medical and Arrowhea...			
Project Description	2022 Baseline - AM Peak Hour					

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	32	63	53	80	261	73	149	260	73	88	441	119

Signal Information														
Cycle, s	120.0	Reference Phase	2											
Offset, s	0	Reference Point	End											
Uncoordinated	No	Simult. Gap E/W	On	Green	8.2	0.8	66.2	4.1	3.3	17.4				
				Yellow	4.0	4.0	4.0	4.0	0.0	4.0				
Force Mode	Fixed	Simult. Gap N/S	On	Red	0.0	0.0	0.0	0.0	0.0	0.0				

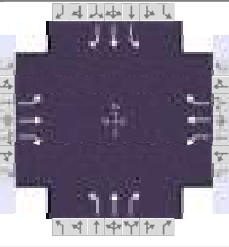
																																																																																																																																																																																																																		
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Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	2.0	3.0	2.0	3.0	2.0	3.0	2.0	3.0
Phase Duration, s	8.1	21.4	11.5	24.7	17.0	75.0	12.2	70.2
Change Period, ( $Y+R_c$ ), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Allow Headway ( $MAH$ ), s	3.0	3.0	3.0	3.0	3.0	0.0	3.0	0.0
Queue Clearance Time ( $g_s$ ), s	4.3	5.9	7.8	19.9	12.8		8.4	
Green Extension Time ( $g_e$ ), s	0.0	0.8	0.1	0.8	0.2	0.0	0.1	0.0
Phase Call Probability	0.69	1.00	0.94	1.00	1.00		0.96	
Max Out Probability	0.00	0.00	0.00	0.00	0.00		0.00	

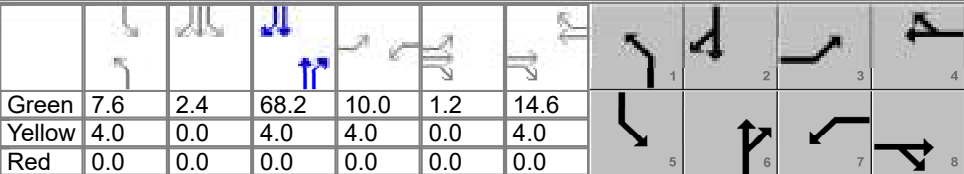
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate ( $v$ ), veh/h	35	68	58	87	284	79	162	283	79	96	479	129
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1767	1856	1572	1767	1856	1572	1767	1856	1572	1767	1856	1572
Queue Service Time ( $g_s$ ), s	2.3	3.9	3.9	5.8	17.9	5.3	10.8	8.8	2.6	6.4	18.7	4.8
Cycle Queue Clearance Time ( $g_c$ ), s	2.3	3.9	3.9	5.8	17.9	5.3	10.8	8.8	2.6	6.4	18.7	4.8
Green Ratio ( $g/C$ )	0.25	0.14	0.14	0.06	0.17	0.17	0.11	0.59	0.59	0.07	0.55	0.55
Capacity ( $c$ ), veh/h	61	269	228	110	320	272	191	1098	930	120	1023	867
Volume-to-Capacity Ratio ( $X$ )	0.573	0.255	0.253	0.792	0.886	0.292	0.847	0.257	0.085	0.794	0.468	0.149
Back of Queue ( $Q$ ), ft/ln ( 95 th percentile)												
Back of Queue ( $Q$ ), veh/ln ( 95 th percentile)	1.9	3.2	2.7	4.8	13.1	3.6	8.5	6.4	1.6	5.3	12.4	3.0
Queue Storage Ratio ( $RQ$ ) ( 95 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay ( $d_1$ ), s/veh	57.1	45.6	45.5	55.5	48.5	43.3	52.5	11.8	10.5	55.1	16.3	13.1
Incremental Delay ( $d_2$ ), s/veh	3.1	0.2	0.2	4.8	3.3	0.2	4.0	0.6	0.2	4.4	1.5	0.4
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay ( $d$ ), s/veh	60.2	45.7	45.8	60.3	51.8	43.5	56.5	12.4	10.7	59.5	17.8	13.5
Level of Service (LOS)	E	D	D	E	D	D	E	B	B	E	B	B
Approach Delay, s/veh / LOS	48.9	D		51.9	D		25.8	C		22.7	C	
Intersection Delay, s/veh / LOS	33.0						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.14	B	2.14	B	2.08	B	2.09	B
Bicycle LOS Score / LOS	0.75	A	1.23	A	1.35	A	1.65	B

# HCS Signalized Intersection Results Summary

General Information					Intersection Information		
Agency	Westex Consulting Engineers				Duration, h	0.250	
Analyst	Christopher Moltz, P.E.	Analysis Date	9/30/2022	Area Type	Other		
Jurisdiction	Carson City	Time Period	PM Peak Hour	PHF	0.92		
Urban Street	Carson/Arrowhead/Medi...	Analysis Year	2022	Analysis Period	1> 7:00		
Intersection	Carson/Arrowhead/Medi...	File Name	Signalized - N Carson and Medical and Arrowhea...				
Project Description	2022 Baseline - PM Peak Hour						

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	127	189	125	111	75	88	81	515	106	110	453	9

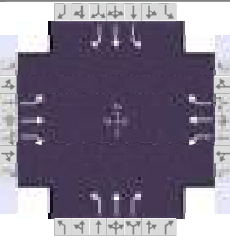
Signal Information													
Cycle, s	120.0	Reference Phase	2										
Offset, s	0	Reference Point	End	Green	7.6	2.4	68.2	10.0	1.2	14.6			
Uncoordinated	No	Simult. Gap E/W	On	Yellow	4.0	0.0	4.0	4.0	0.0	4.0			
Force Mode	Fixed	Simult. Gap N/S	On	Red	0.0	0.0	0.0	0.0	0.0	0.0			

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	2.0	3.0	2.0	3.0	2.0	3.0	2.0	3.0
Phase Duration, s	15.2	19.8	14.0	18.6	11.6	72.2	14.0	74.6
Change Period, ( $Y+R_c$ ), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Allow Headway ( $MAH$ ), s	3.0	3.1	3.0	3.1	3.0	0.0	3.0	0.0
Queue Clearance Time ( $g_s$ ), s	11.2	15.0	10.1	8.8	7.9		10.0	
Green Extension Time ( $g_e$ ), s	0.1	0.9	0.1	0.9	0.1	0.0	0.2	0.0
Phase Call Probability	0.99	1.00	0.98	1.00	0.95		0.98	
Max Out Probability	0.12	0.00	0.02	0.00	0.00		0.00	

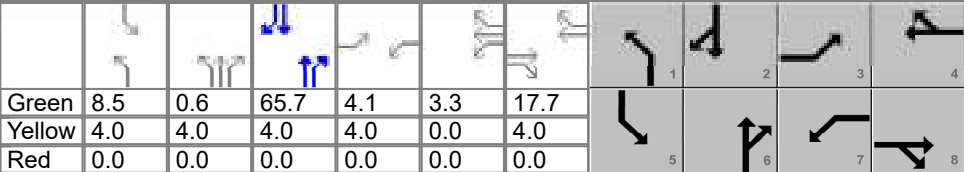














Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate ( $v$ ), veh/h	138	205	136	121	82	96	88	560	115	120	492	10
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1767	1856	1572	1767	1856	1572	1767	1856	1572	1767	1856	1572
Queue Service Time ( $g_s$ ), s	9.2	13.0	9.9	8.1	4.8	6.8	5.9	22.4	4.1	8.0	17.8	0.3
Cycle Queue Clearance Time ( $g_c$ ), s	9.2	13.0	9.9	8.1	4.8	6.8	5.9	22.4	4.1	8.0	17.8	0.3
Green Ratio ( $g/C$ )	0.31	0.13	0.13	0.08	0.12	0.12	0.06	0.57	0.57	0.08	0.59	0.59
Capacity ( $c$ ), veh/h	165	245	208	147	226	191	112	1055	894	147	1092	925
Volume-to-Capacity Ratio ( $X$ )	0.838	0.839	0.655	0.822	0.361	0.499	0.788	0.531	0.129	0.815	0.451	0.011
Back of Queue ( $Q$ ), ft/ln ( 95 th percentile)												
Back of Queue ( $Q$ ), veh/ln ( 95 th percentile)	8.0	10.1	6.9	6.7	4.0	4.8	4.9	14.2	2.5	6.5	11.6	0.2
Queue Storage Ratio ( $RQ$ ) ( 95 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay ( $d_1$ ), s/veh	53.5	50.8	49.5	54.1	48.4	49.3	55.4	16.0	12.0	54.1	13.8	10.2
Incremental Delay ( $d_2$ ), s/veh	11.6	2.9	1.3	5.4	0.4	0.8	4.6	1.9	0.3	4.1	1.3	0.0
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay ( $d$ ), s/veh	65.1	53.8	50.8	59.6	48.8	50.0	60.0	17.9	12.3	58.2	15.2	10.2
Level of Service (LOS)	E	D	D	E	D	D	E	B	B	E	B	B
Approach Delay, s/veh / LOS	56.2	E		53.6	D		21.9	C		23.4	C	
Intersection Delay, s/veh / LOS	34.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.14	B	2.14	B	2.09	B	2.08	B
Bicycle LOS Score / LOS	1.28	A	0.98	A	1.75	B	1.51	B

# HCS Signalized Intersection Results Summary

General Information				Intersection Information		
Agency	Westex Consulting Engineers			Duration, h	0.250	
Analyst	Christopher Moltz, P.E.	Analysis Date	9/30/2022	Area Type	Other	
Jurisdiction	Carson City	Time Period	AM Peak Hour	PHF	0.92	
Urban Street	Carson/Arrowhead/Medi...	Analysis Year	2022	Analysis Period	1> 7:00	
Intersection	Carson/Arrowhead/Medi...	File Name	Signalized - N Carson and Medical and Arrowhea...			
Project Description	2022 plus Project - AM Peak Hour					

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	32	64	53	80	265	77	151	272	73	92	449	119

Signal Information												
Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End	Green	8.5	0.6	65.7	4.1	3.3	17.7		
Uncoordinated	No	Simult. Gap E/W	On	Yellow	4.0	4.0	4.0	4.0	0.0	4.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	0.0	0.0	0.0	0.0	0.0	0.0		

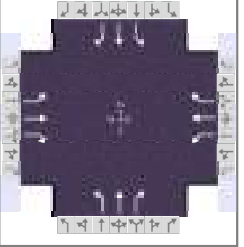
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	2.0	3.0	2.0	3.0	2.0	3.0	2.0	3.0
Phase Duration, s	8.1	21.7	11.5	25.0	17.1	74.4	12.5	69.7
Change Period, ( $Y+R_c$ ), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Allow Headway ( $MAH$ ), s	3.0	3.0	3.0	3.0	3.0	0.0	3.0	0.0
Queue Clearance Time ( $g_s$ ), s	4.3	6.0	7.8	20.2	12.9		8.7	
Green Extension Time ( $g_e$ ), s	0.0	0.9	0.1	0.8	0.2	0.0	0.1	0.0
Phase Call Probability	0.69	1.00	0.94	1.00	1.00		0.96	
Max Out Probability	0.00	0.00	0.00	0.00	0.00		0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate ( $v$ ), veh/h	35	70	58	87	288	84	164	296	79	100	488	129
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1767	1856	1572	1767	1856	1572	1767	1856	1572	1767	1856	1572
Queue Service Time ( $g_s$ ), s	2.3	4.0	3.9	5.8	18.2	5.6	10.9	9.4	2.6	6.7	19.4	4.9
Cycle Queue Clearance Time ( $g_c$ ), s	2.3	4.0	3.9	5.8	18.2	5.6	10.9	9.4	2.6	6.7	19.4	4.9
Green Ratio ( $g/C$ )	0.25	0.15	0.15	0.06	0.18	0.18	0.11	0.59	0.59	0.07	0.55	0.55
Capacity ( $c$ ), veh/h	61	273	232	110	325	275	193	1088	922	125	1017	862
Volume-to-Capacity Ratio ( $X$ )	0.573	0.255	0.249	0.792	0.887	0.304	0.849	0.272	0.086	0.798	0.480	0.150
Back of Queue ( $Q$ ), ft/ln ( 95 th percentile)												
Back of Queue ( $Q$ ), veh/ln ( 95 th percentile)	1.9	3.3	2.7	4.8	13.2	3.8	8.6	6.8	1.6	5.5	12.7	3.1
Queue Storage Ratio ( $RQ$ ) ( 95 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay ( $d_1$ ), s/veh	57.1	45.3	45.3	55.5	48.3	43.1	52.5	12.2	10.8	54.9	16.6	13.4
Incremental Delay ( $d_2$ ), s/veh	3.1	0.2	0.2	4.8	3.3	0.2	4.0	0.6	0.2	4.3	1.6	0.4
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay ( $d$ ), s/veh	60.2	45.5	45.5	60.3	51.6	43.4	56.4	12.8	11.0	59.2	18.3	13.7
Level of Service (LOS)	E	D	D	E	D	D	E	B	B	E	B	B
Approach Delay, s/veh / LOS	48.7	D		51.7	D		25.8	C		23.2	C	
Intersection Delay, s/veh / LOS	33.1						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.14	B	2.14	B	2.08	B	2.09	B
Bicycle LOS Score / LOS	0.75	A	1.24	A	1.38	A	1.67	B

























# HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Westex Consulting Engineers			Duration, h	0.250
Analyst	Christopher Moltz, P.E.	Analysis Date	9/30/2022	Area Type	Other
Jurisdiction	Carson City	Time Period	PM Peak Hour	PHF	0.92
Urban Street	Carson/Arrowhead/Medi...	Analysis Year	2022	Analysis Period	1> 7:00
Intersection	Carson/Arrowhead/Medi...	File Name	Signalized - N Carson and Medical and Arrowhea...		
Project Description	2022 plus Project - PM Peak Hour				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	127	192	125	111	77	92	83	529	106	120	476	9

Signal Information												
Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	7.8	3.0	67.2	10.0	1.2	14.8		
				Yellow	4.0	0.0	4.0	4.0	0.0	4.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	0.0	0.0	0.0	0.0	0.0	0.0		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	2.0	3.0	2.0	3.0	2.0	3.0	2.0	3.0
Phase Duration, s	15.2	20.1	14.0	18.8	11.8	71.2	14.8	74.2
Change Period, ( $Y+R_c$ ), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Allow Headway ( $MAH$ ), s	3.0	3.1	3.0	3.1	3.0	0.0	3.0	0.0
Queue Clearance Time ( $g_s$ ), s	11.2	15.2	10.1	9.1	8.0		10.7	
Green Extension Time ( $g_e$ ), s	0.1	0.9	0.1	0.9	0.1	0.0	0.2	0.0
Phase Call Probability	0.99	1.00	0.98	1.00	0.95		0.99	
Max Out Probability	0.12	0.00	0.02	0.00	0.00		0.00	

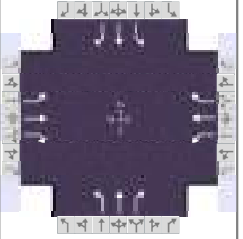
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate ( $v$ ), veh/h	138	209	136	121	84	100	90	575	115	130	517	10
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1767	1856	1572	1767	1856	1572	1767	1856	1572	1767	1856	1572
Queue Service Time ( $g_s$ ), s	9.2	13.2	9.8	8.1	5.0	7.1	6.0	23.7	4.2	8.7	19.2	0.3
Cycle Queue Clearance Time ( $g_c$ ), s	9.2	13.2	9.8	8.1	5.0	7.1	6.0	23.7	4.2	8.7	19.2	0.3
Green Ratio ( $g/C$ )	0.31	0.13	0.13	0.08	0.12	0.12	0.06	0.56	0.56	0.09	0.59	0.59
Capacity ( $c$ ), veh/h	165	248	210	147	229	194	114	1039	881	158	1086	920
Volume-to-Capacity Ratio ( $X$ )	0.838	0.840	0.646	0.822	0.365	0.514	0.790	0.553	0.131	0.824	0.477	0.011
Back of Queue ( $Q$ ), ft/ln ( 95 th percentile)												
Back of Queue ( $Q$ ), veh/ln ( 95 th percentile)	8.0	10.2	6.9	6.7	4.1	5.0	5.0	15.0	2.6	7.1	12.4	0.2
Queue Storage Ratio ( $RQ$ ) ( 95 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay ( $d_1$ ), s/veh	53.5	50.7	49.3	54.1	48.3	49.2	55.3	16.8	12.5	53.7	14.3	10.4
Incremental Delay ( $d_2$ ), s/veh	11.6	2.9	1.2	5.4	0.4	0.8	4.5	2.1	0.3	4.1	1.5	0.0
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay ( $d$ ), s/veh	65.1	53.7	50.5	59.6	48.6	50.0	59.8	18.9	12.8	57.8	15.8	10.4
Level of Service (LOS)	E	D	D	E	D	D	E	B	B	E	B	B
Approach Delay, s/veh / LOS	56.0		E	53.4		D	22.8		C	24.1		C
Intersection Delay, s/veh / LOS	34.6						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.14	B	2.14	B	2.09	B	2.08	B
Bicycle LOS Score / LOS	1.28	A	0.99	A	1.78	B	1.57	B

# HCS Signalized Intersection Results Summary

## General Information

Agency	Westex Consulting Engineers			Duration, h	0.250
Analyst	Christopher Moltz, P.E.	Analysis Date	9/30/2022	Area Type	Other
Jurisdiction	Carson City	Time Period	AM Peak Hour	PHF	0.92
Urban Street	Carson/Arrowhead/Medi...	Analysis Year	2050	Analysis Period	1> 7:00
Intersection	Carson/Arrowhead/Medi...	File Name	Signalized - N Carson and Medical and Arrowhea...		
Project Description	2050 Baseline - AM Peak Hour				



## Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	44	87	73	106	347	97	174	303	85	105	527	142

## Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	9.6	1.3	57.6	4.8	0.8	22.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	4.0	4.0	4.0		
				Red	0.0	0.0	0.0	0.0	0.0	0.0		

## Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	2.0	3.0	2.0	3.0	2.0	3.0	2.0	3.0
Phase Duration, s	8.8	26.0	13.6	30.8	18.8	66.9	13.6	61.6
Change Period, ( $Y+R_c$ ), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Allow Headway ( $MAH$ ), s	3.0	3.0	3.0	3.0	3.0	0.0	3.0	0.0
Queue Clearance Time ( $g_s$ ), s	5.2	7.3	9.7	25.8	14.6		9.6	
Green Extension Time ( $g_e$ ), s	0.0	1.1	0.1	1.0	0.2	0.0	0.1	0.0
Phase Call Probability	0.80	1.00	0.98	1.00	1.00		0.98	
Max Out Probability	0.00	0.00	0.01	0.01	0.00		0.00	

## Movement Group Results

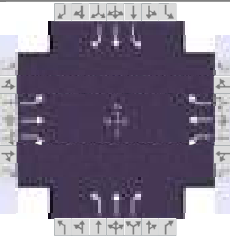
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate ( $v$ ), veh/h	48	95	79	115	377	105	189	329	92	114	573	154
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1767	1856	1572	1767	1856	1572	1767	1856	1572	1767	1856	1572
Queue Service Time ( $g_s$ ), s	3.2	5.3	5.2	7.7	23.8	6.7	12.6	12.3	3.6	7.6	27.9	6.8
Cycle Queue Clearance Time ( $g_c$ ), s	3.2	5.3	5.2	7.7	23.8	6.7	12.6	12.3	3.6	7.6	27.9	6.8
Green Ratio ( $g/C$ )	0.26	0.18	0.18	0.08	0.22	0.22	0.12	0.52	0.52	0.08	0.48	0.48
Capacity ( $c$ ), veh/h	70	340	288	141	414	351	218	972	824	141	891	755
Volume-to-Capacity Ratio ( $X$ )	0.679	0.278	0.275	0.818	0.910	0.300	0.867	0.339	0.112	0.811	0.643	0.204
Back of Queue ( $Q$ ), ft/ln ( 95 th percentile)												
Back of Queue ( $Q$ ), veh/ln ( 95 th percentile)	2.7	4.3	3.6	6.3	17.7	4.6	9.6	8.9	2.3	6.2	18.0	4.5
Queue Storage Ratio ( $RQ$ ) ( 95 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay ( $d_1$ ), s/veh	56.9	42.2	42.1	54.4	45.4	38.8	51.6	16.5	14.4	54.3	23.5	18.0
Incremental Delay ( $d_2$ ), s/veh	4.2	0.2	0.2	4.4	12.4	0.2	4.0	0.9	0.3	4.2	3.6	0.6
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay ( $d$ ), s/veh	61.1	42.3	42.3	58.7	57.8	39.0	55.7	17.5	14.7	58.5	27.0	18.6
Level of Service (LOS)	E	D	D	E	E	D	E	B	B	E	C	B
Approach Delay, s/veh / LOS	46.4		D	54.7		D	28.9		C	29.8		C
Intersection Delay, s/veh / LOS	37.7						D					

## Multimodal Results

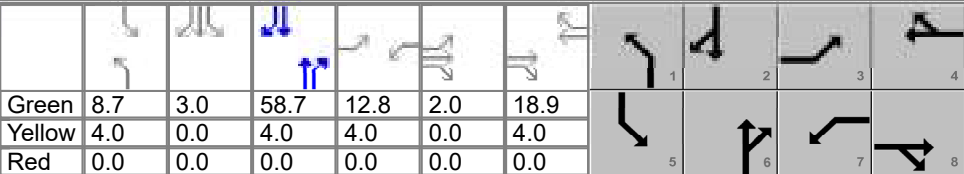
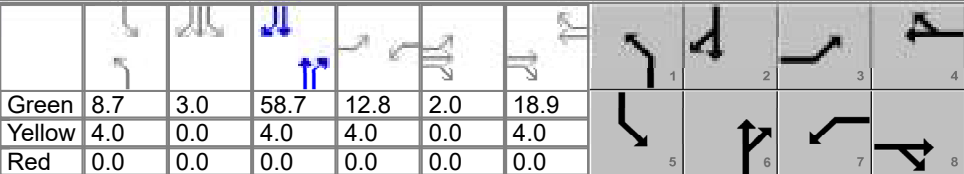
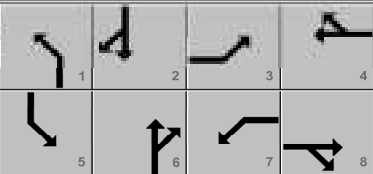
	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	2.14		B	2.13		B	2.09		B	2.10		B
Bicycle LOS Score / LOS	0.85		A	1.47		A	1.50		A	1.88		B



# HCS Signalized Intersection Results Summary

General Information				Intersection Information		
Agency	Westex Consulting Engineers			Duration, h	0.250	
Analyst	Christopher Moltz, P.E.	Analysis Date	9/30/2022	Area Type	Other	
Jurisdiction	Carson City	Time Period	PM Peak Hour	PHF	0.92	
Urban Street	Carson/Arrowhead/Medi...	Analysis Year	2050	Analysis Period	1> 7:00	
Intersection	Carson/Arrowhead/Medi...	File Name	Signalized - N Carson and Medical and Arrowhea...			
Project Description	2050 Baseline - PM Peak Hour					

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	175	260	172	148	100	117	94	600	124	132	542	11

Signal Information												
Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	8.7	3.0	58.7	12.8	2.0	18.9		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	0.0	4.0	4.0	0.0	4.0		
				Red	0.0	0.0	0.0	0.0	0.0	0.0		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	2.0	3.0	2.0	3.0	2.0	3.0	2.0	3.0
Phase Duration, s	18.7	24.9	16.8	22.9	12.7	62.7	15.6	65.7
Change Period, ( $Y+R_c$ ), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Allow Headway ( $MAH$ ), s	3.0	3.1	3.0	3.1	3.0	0.0	3.0	0.0
Queue Clearance Time ( $g_s$ ), s	14.7	19.8	12.7	10.9	8.8		11.6	
Green Extension Time ( $g_e$ ), s	0.0	1.1	0.1	1.2	0.1	0.0	0.2	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	0.97		0.99	
Max Out Probability	1.00	0.05	0.76	0.00	0.00		0.00	

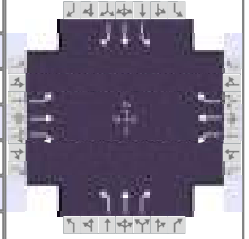
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate ( $v$ ), veh/h	190	283	187	161	109	127	102	652	135	143	589	12
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1767	1856	1572	1767	1856	1572	1767	1856	1572	1767	1856	1572
Queue Service Time ( $g_s$ ), s	12.7	17.8	13.4	10.7	6.3	8.9	6.8	33.2	5.7	9.6	27.1	0.4
Cycle Queue Clearance Time ( $g_c$ ), s	12.7	17.8	13.4	10.7	6.3	8.9	6.8	33.2	5.7	9.6	27.1	0.4
Green Ratio ( $g/C$ )	0.34	0.17	0.17	0.11	0.16	0.16	0.07	0.49	0.49	0.10	0.51	0.51
Capacity ( $c$ ), veh/h	217	323	273	188	292	248	127	908	770	171	954	809
Volume-to-Capacity Ratio ( $X$ )	0.878	0.876	0.684	0.856	0.372	0.513	0.802	0.718	0.175	0.837	0.617	0.015
Back of Queue ( $Q$ ), ft/ln ( 95 th percentile)												
Back of Queue ( $Q$ ), veh/ln ( 95 th percentile)	11.4	13.8	8.9	9.5	5.1	6.2	5.6	21.0	3.8	7.8	17.3	0.3
Queue Storage Ratio ( $RQ$ ) ( 95 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay ( $d_1$ ), s/veh	51.8	48.3	46.5	52.7	45.2	46.3	54.8	24.1	17.1	53.2	20.7	14.3
Incremental Delay ( $d_2$ ), s/veh	26.1	10.3	1.1	18.5	0.3	0.6	4.4	4.9	0.5	4.1	3.0	0.0
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay ( $d$ ), s/veh	77.9	58.6	47.6	71.2	45.5	46.9	59.2	29.0	17.6	57.3	23.7	14.3
Level of Service (LOS)	E	E	D	E	D	D	E	C	B	E	C	B
Approach Delay, s/veh / LOS	61.0	E		56.4	E		30.7	C		30.0	C	
Intersection Delay, s/veh / LOS	41.8						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.14	B	2.14	B	2.10	B	2.09	B
Bicycle LOS Score / LOS	1.58	B	1.14	A	1.95	B	1.72	B

# HCS Signalized Intersection Results Summary

## General Information

Agency	Westex Consulting Engineers			Duration, h	0.250
Analyst	Christopher Moltz, P.E.	Analysis Date	9/30/2022	Area Type	Other
Jurisdiction	Carson City	Time Period	AM Peak Hour	PHF	0.92
Urban Street	Carson/Arrowhead/Medi...	Analysis Year	2050	Analysis Period	1> 7:00
Intersection	Carson/Arrowhead/Medi...	File Name	Signalized - N Carson and Medical and Arrowhea...		
Project Description	2050 plus Project - AM Peak Hour				



## Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	44	88	73	106	351	101	176	315	85	109	535	142

## Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	9.9	1.1	57.2	4.8	0.8	22.3		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	4.0	4.0	4.0		
				Red	0.0	0.0	0.0	0.0	0.0	0.0		

## Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	2.0	3.0	2.0	3.0	2.0	3.0	2.0	3.0
Phase Duration, s	8.8	26.3	13.6	31.1	19.0	66.3	13.9	61.2
Change Period, ( $Y+R_c$ ), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Allow Headway ( $MAH$ ), s	3.0	3.0	3.0	3.0	3.0	0.0	3.0	0.0
Queue Clearance Time ( $g_s$ ), s	5.2	7.3	9.7	26.1	14.8		9.9	
Green Extension Time ( $g_e$ ), s	0.0	1.2	0.1	1.0	0.2	0.0	0.1	0.0
Phase Call Probability	0.80	1.00	0.98	1.00	1.00		0.98	
Max Out Probability	0.00	0.00	0.01	0.01	0.00		0.00	

## Movement Group Results

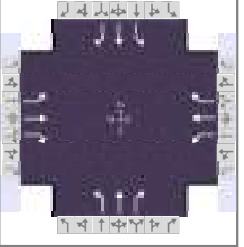
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate ( $v$ ), veh/h	48	96	79	115	382	110	191	342	92	118	582	154
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1767	1856	1572	1767	1856	1572	1767	1856	1572	1767	1856	1572
Queue Service Time ( $g_s$ ), s	3.2	5.3	5.2	7.7	24.1	7.0	12.8	13.1	3.6	7.9	28.7	6.8
Cycle Queue Clearance Time ( $g_c$ ), s	3.2	5.3	5.2	7.7	24.1	7.0	12.8	13.1	3.6	7.9	28.7	6.8
Green Ratio ( $g/C$ )	0.26	0.19	0.19	0.08	0.23	0.23	0.12	0.52	0.52	0.08	0.48	0.48
Capacity ( $c$ ), veh/h	70	345	292	141	419	355	220	963	816	145	884	749
Volume-to-Capacity Ratio ( $X$ )	0.679	0.278	0.272	0.818	0.911	0.309	0.868	0.356	0.113	0.815	0.658	0.206
Back of Queue ( $Q$ ), ft/ln ( 95 th percentile)												
Back of Queue ( $Q$ ), veh/ln ( 95 th percentile)	2.7	4.3	3.6	6.3	17.9	4.8	9.7	9.4	2.3	6.5	18.5	4.5
Queue Storage Ratio ( $RQ$ ) ( 95 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay ( $d_1$ ), s/veh	56.9	41.9	41.9	54.4	45.3	38.7	51.6	17.0	14.8	54.2	23.9	18.2
Incremental Delay ( $d_2$ ), s/veh	4.2	0.2	0.2	4.4	12.7	0.2	4.0	1.0	0.3	4.2	3.8	0.6
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay ( $d$ ), s/veh	61.1	42.1	42.1	58.7	58.0	38.9	55.6	18.1	15.0	58.3	27.8	18.9
Level of Service (LOS)	E	D	D	E	E	D	E	B	B	E	C	B
Approach Delay, s/veh / LOS	46.2		D	54.7		D	29.1		C	30.4		C
Intersection Delay, s/veh / LOS	37.9						D					

## Multimodal Results

	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.14	B	2.13	B	2.09	B	2.10	B
Bicycle LOS Score / LOS	0.86	A	1.49	A	1.52	B	1.90	B









# HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Westex Consulting Engineers			Duration, h	0.250
Analyst	Christopher Moltz, P.E.	Analysis Date	9/30/2022	Area Type	Other
Jurisdiction	Carson City	Time Period	PM Peak Hour	PHF	0.92
Urban Street	Carson/Arrowhead/Medi...	Analysis Year	2050	Analysis Period	1> 7:00
Intersection	Carson/Arrowhead/Medi...	File Name	Signalized - N Carson and Medical and Arrowhea...		
Project Description	2050 plus Project - PM Peak Hour				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( $v$ ), veh/h	175	263	172	148	102	121	96	614	124	142	565	11

Signal Information												
Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	8.8	3.6	57.8	12.8	2.0	19.1		
				Yellow	4.0	0.0	4.0	4.0	0.0	4.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	0.0	0.0	0.0	0.0	0.0	0.0		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4	1	6	5	2
Case Number	2.0	3.0	2.0	3.0	2.0	3.0	2.0	3.0
Phase Duration, s	18.7	25.1	16.8	23.1	12.8	61.8	16.4	65.3
Change Period, ( $Y+R_c$ ), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Allow Headway ( $MAH$ ), s	3.0	3.1	3.0	3.1	3.0	0.0	3.0	0.0
Queue Clearance Time ( $g_s$ ), s	14.7	20.0	12.7	11.2	9.0		12.3	
Green Extension Time ( $g_e$ ), s	0.0	1.1	0.1	1.2	0.1	0.0	0.2	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	0.97		0.99	
Max Out Probability	1.00	0.05	0.76	0.00	0.00		0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate ( $v$ ), veh/h	190	286	187	161	111	132	104	667	135	154	614	12
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1767	1856	1572	1767	1856	1572	1767	1856	1572	1767	1856	1572
Queue Service Time ( $g_s$ ), s	12.7	18.0	13.3	10.7	6.4	9.2	7.0	35.0	5.8	10.3	29.0	0.4
Cycle Queue Clearance Time ( $g_c$ ), s	12.7	18.0	13.3	10.7	6.4	9.2	7.0	35.0	5.8	10.3	29.0	0.4
Green Ratio ( $g/C$ )	0.34	0.18	0.18	0.11	0.16	0.16	0.07	0.48	0.48	0.10	0.51	0.51
Capacity ( $c$ ), veh/h	217	326	276	188	296	251	130	893	757	183	949	804
Volume-to-Capacity Ratio ( $X$ )	0.878	0.877	0.677	0.856	0.375	0.525	0.804	0.747	0.178	0.845	0.647	0.015
Back of Queue ( $Q$ ), ft/ln ( 95 th percentile)												
Back of Queue ( $Q$ ), veh/ln ( 95 th percentile)	11.4	14.0	8.9	9.5	5.2	6.4	5.7	22.2	3.8	8.2	18.4	0.3
Queue Storage Ratio ( $RQ$ ) ( 95 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay ( $d_1$ ), s/veh	51.8	48.2	46.3	52.7	45.1	46.3	54.7	25.2	17.7	52.9	21.4	14.4
Incremental Delay ( $d_2$ ), s/veh	26.1	10.7	1.1	18.5	0.3	0.6	4.3	5.7	0.5	4.1	3.4	0.0
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay ( $d$ ), s/veh	77.9	58.9	47.4	71.2	45.4	46.9	59.1	30.9	18.2	56.9	24.8	14.5
Level of Service (LOS)	E	E	D	E	D	D	E	C	B	E	C	B
Approach Delay, s/veh / LOS	61.1	E		56.2	E		32.2	C		31.0	C	
Intersection Delay, s/veh / LOS	42.3						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.14	B	2.14	B	2.10	B	2.10	B
Bicycle LOS Score / LOS	1.58	B	1.15	A	1.98	B	1.78	B

**ATTACHMENT 12 – HCS 2022 ANALYSIS FOR MEDICAL PKWY AND THE  
PROJECT DRIVEWAY**

# HCS Two-Way Stop-Control Report

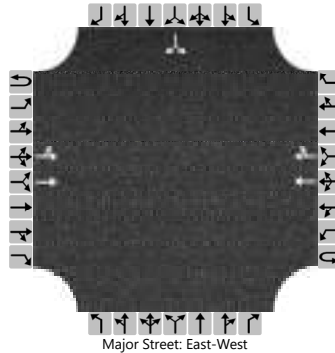
## General Information

Analyst	Christopher Moltz, P.E.
Agency/Co.	Westex Consulting
Date Performed	9/30/2022
Analysis Year	2022
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	2022 plus Project

## Site Information

Intersection	Medical Pkwy / Project Driveway
Jurisdiction	Carson City
East/West Street	Medical Pkwy
North/South Street	Project Driveway
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	2	0		0	0	0		0	1	0
Configuration		LT	T				T	TR							LR	
Volume (veh/h)		4	171				317	6						1		4
Percent Heavy Vehicles (%)		3												3		3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.16												6.86		6.96
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.23												3.53		3.33

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		4													5	
Capacity, c (veh/h)		1197													750	
v/c Ratio		0.00													0.01	
95% Queue Length, Q <sub>95</sub> (veh)		0.0													0.0	
Control Delay (s/veh)		8.0	0.0												9.8	
Level of Service (LOS)		A	A												A	
Approach Delay (s/veh)	0.2												9.8			
Approach LOS	A												A			

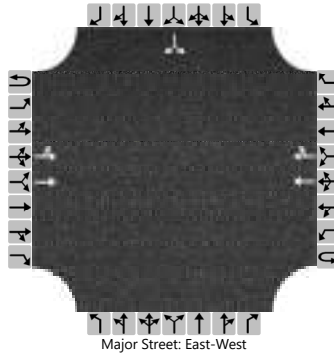


# HCS Two-Way Stop-Control Report

## General Information

Analyst	Christopher Moltz, P.E.	Intersection	Medical Pkwy / Project Driveway
Agency/Co.	Westex Consulting	Jurisdiction	Carson City
Date Performed	9/30/2022	East/West Street	Medical Pkwy
Analysis Year	2022	North/South Street	Project Driveway
Time Analyzed	PM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	2022 plus Project		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	2	0		0	0	0		0	1	0
Configuration		LT	T				T	TR							LR	
Volume (veh/h)		5	274				86	4						3		6
Percent Heavy Vehicles (%)		3												3		3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.16												6.86		6.96
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.23												3.53		3.33

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		5													10	
Capacity, c (veh/h)		1486													881	
v/c Ratio		0.00													0.01	
95% Queue Length, Q <sub>95</sub> (veh)		0.0													0.0	
Control Delay (s/veh)		7.4	0.0												9.1	
Level of Service (LOS)		A	A												A	
Approach Delay (s/veh)	0.2												9.1			
Approach LOS	A												A			

# HCS Two-Way Stop-Control Report

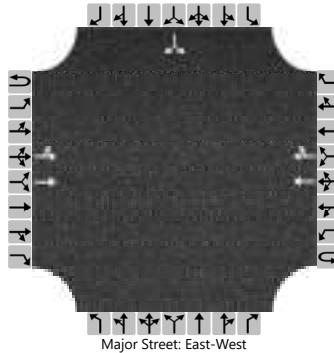
## General Information

Analyst	Christopher Moltz, P.E.
Agency/Co.	Westex Consulting
Date Performed	9/30/2022
Analysis Year	2050
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	2050 plus Project

## Site Information

Intersection	Medical Pkwy / Project Driveway
Jurisdiction	Carson City
East/West Street	Medical Pkwy
North/South Street	Project Driveway
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	2	0		0	0	0		0	1	0
Configuration		LT	T				T	TR							LR	
Volume (veh/h)		4	236				437	6						1		4
Percent Heavy Vehicles (%)		3												3		3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.16												6.86		6.96
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.23												3.53		3.33

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		4													5	
Capacity, c (veh/h)		1070													652	
v/c Ratio		0.00													0.01	
95% Queue Length, Q <sub>95</sub> (veh)		0.0													0.0	
Control Delay (s/veh)		8.4	0.0												10.6	
Level of Service (LOS)		A	A												B	
Approach Delay (s/veh)	0.2												10.6			
Approach LOS	A												B			

# HCS Two-Way Stop-Control Report

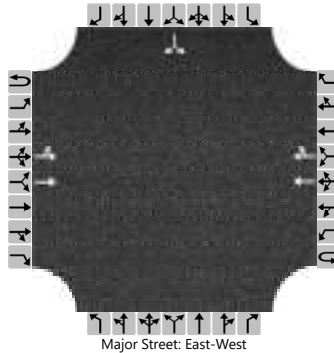
## General Information

Analyst	Christopher Moltz, P.E.
Agency/Co.	Westex Consulting
Date Performed	9/30/2022
Analysis Year	2050
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	2050 plus Project

## Site Information

Intersection	Medical Pkwy / Project Driveway
Jurisdiction	Carson City
East/West Street	Medical Pkwy
North/South Street	Project Driveway
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	2	0		0	0	0		0	1	0
Configuration		LT	T				T	TR							LR	
Volume (veh/h)		5	378				119	4						3		6
Percent Heavy Vehicles (%)		3												3		3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.16												6.86		6.96
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.23												3.53		3.33

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		5													10	
Capacity, c (veh/h)		1441													820	
v/c Ratio		0.00													0.01	
95% Queue Length, Q <sub>95</sub> (veh)		0.0													0.0	
Control Delay (s/veh)		7.5	0.0												9.4	
Level of Service (LOS)		A	A												A	
Approach Delay (s/veh)	0.1												9.4			
Approach LOS	A												A			

**ATTACHMENT 13 – HCS 2022 ANALYSIS FOR MEDICAL PKWY AND MEDICAL  
PKWY**

# HCS Two-Way Stop-Control Report

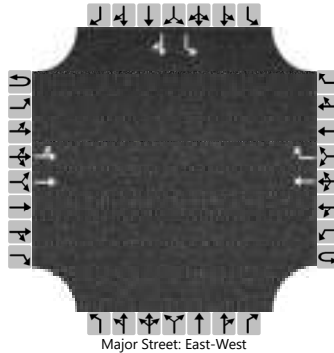
## General Information

Analyst	Christopher Moltz, P.E.
Agency/Co.	Westex Consulting
Date Performed	9/30/2022
Analysis Year	2022
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	2022 Baseline

## Site Information

Intersection	Medical Pkwy / Medical Pkwy
Jurisdiction	Carson City
East/West Street	Medical Pkwy
North/South Street	Medical Pkwy
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	1	1		0	0	0		1	1	0
Configuration		LT	T				T	R						L		TR
Volume (veh/h)		5	146				249	68						25	0	5
Percent Heavy Vehicles (%)		3												3	3	3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized					No											
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.5	6.5	6.2
Critical Headway (sec)		4.16												7.56	6.56	6.26
Base Follow-Up Headway (sec)		2.2												3.5	4.0	3.3
Follow-Up Headway (sec)		2.23												3.53	4.03	3.33

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		5												27		5
Capacity, c (veh/h)		1204												565		763
v/c Ratio		0.00												0.05		0.01
95% Queue Length, Q <sub>95</sub> (veh)		0.0												0.2		0.0
Control Delay (s/veh)		8.0	0.0											11.7		9.8
Level of Service (LOS)		A	A											B		A
Approach Delay (s/veh)	0.3												11.4			
Approach LOS	A												B			



# HCS Two-Way Stop-Control Report

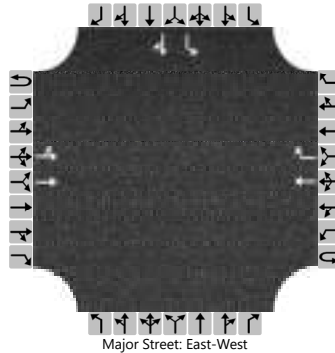
## General Information

Analyst	Christopher Moltz, P.E.
Agency/Co.	Westex Consulting
Date Performed	9/30/2022
Analysis Year	2022
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	2022 Baseline

## Site Information

Intersection	Medical Pkwy / Medical Pkwy
Jurisdiction	Carson City
East/West Street	Medical Pkwy
North/South Street	Medical Pkwy
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	1	1		0	0	0		1	1	0
Configuration		LT	T				T	R						L		TR
Volume (veh/h)		4	202				35	51						72	0	1
Percent Heavy Vehicles (%)		3												3	3	3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized					No											
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.5	6.5	6.2
Critical Headway (sec)		4.16												7.56	6.56	6.26
Base Follow-Up Headway (sec)		2.2												3.5	4.0	3.3
Follow-Up Headway (sec)		2.23												3.53	4.03	3.33

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		4												78		1
Capacity, c (veh/h)		1491												789		1030
v/c Ratio		0.00												0.10		0.00
95% Queue Length, Q <sub>95</sub> (veh)		0.0												0.3		0.0
Control Delay (s/veh)		7.4	0.0											10.1		8.5
Level of Service (LOS)		A	A											B		A
Approach Delay (s/veh)	0.2												10.0			
Approach LOS	A												B			

# HCS Two-Way Stop-Control Report

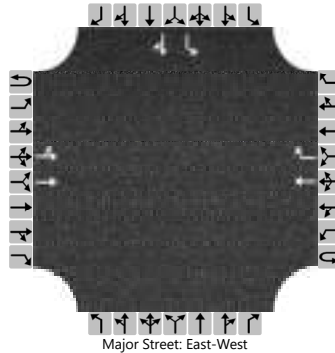
## General Information

Analyst	Christopher Moltz, P.E.
Agency/Co.	Westex Consulting
Date Performed	9/30/2022
Analysis Year	2022
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	2022 plus Project

## Site Information

Intersection	Medical Pkwy / Medical Pkwy
Jurisdiction	Carson City
East/West Street	Medical Pkwy
North/South Street	Medical Pkwy
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	1	1		0	0	0		1	1	0
Configuration		LT	T				T	R						L		TR
Volume (veh/h)		5	149				252	69						26	0	5
Percent Heavy Vehicles (%)		3												3	3	3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized					No											
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.5	6.5	6.2
Critical Headway (sec)		4.16												7.56	6.56	6.26
Base Follow-Up Headway (sec)		2.2												3.5	4.0	3.3
Follow-Up Headway (sec)		2.23												3.53	4.03	3.33

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		5												28		5
Capacity, c (veh/h)		1199												560		760
v/c Ratio		0.00												0.05		0.01
95% Queue Length, Q <sub>95</sub> (veh)		0.0												0.2		0.0
Control Delay (s/veh)		8.0	0.0											11.8		9.8
Level of Service (LOS)		A	A											B		A
Approach Delay (s/veh)	0.3												11.4			
Approach LOS	A												B			

# HCS Two-Way Stop-Control Report

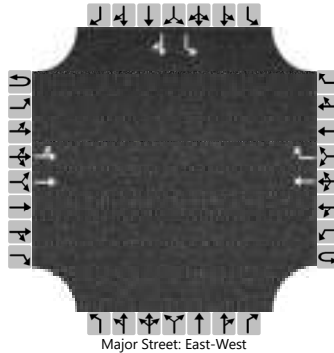
## General Information

Analyst	Christopher Moltz, P.E.
Agency/Co.	Westex Consulting
Date Performed	9/30/2022
Analysis Year	2022
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	2022 plus Project

## Site Information

Intersection	Medical Pkwy / Medical Pkwy
Jurisdiction	Carson City
East/West Street	Medical Pkwy
North/South Street	Medical Pkwy
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	1	1		0	0	0		1	1	0
Configuration		LT	T				T	R						L		TR
Volume (veh/h)		4	206				37	55						73	0	1
Percent Heavy Vehicles (%)		3												3	3	3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized					No											
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.5	6.5	6.2
Critical Headway (sec)		4.16												7.56	6.56	6.26
Base Follow-Up Headway (sec)		2.2												3.5	4.0	3.3
Follow-Up Headway (sec)		2.23												3.53	4.03	3.33

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		4												79		1
Capacity, c (veh/h)		1483												784		1027
v/c Ratio		0.00												0.10		0.00
95% Queue Length, Q <sub>95</sub> (veh)		0.0												0.3		0.0
Control Delay (s/veh)		7.4	0.0											10.1		8.5
Level of Service (LOS)		A	A											B		A
Approach Delay (s/veh)	0.2												10.1			
Approach LOS	A												B			

# HCS Two-Way Stop-Control Report

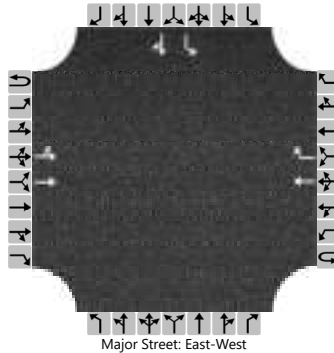
## General Information

Analyst	Christopher Moltz, P.E.
Agency/Co.	Westex Consulting
Date Performed	9/30/2022
Analysis Year	2050
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	2050 Baseline

## Site Information

Intersection	Medical Pkwy / Medical Pkwy
Jurisdiction	Carson City
East/West Street	Medical Pkwy
North/South Street	Medical Pkwy
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	1	1		0	0	0		1	1	0
Configuration		LT	T				T	R						L		TR
Volume (veh/h)		7	203				343	94						34	0	7
Percent Heavy Vehicles (%)		3												3	3	3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized					No											
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.5	6.5	6.2
Critical Headway (sec)		4.16												7.56	6.56	6.26
Base Follow-Up Headway (sec)		2.2												3.5	4.0	3.3
Follow-Up Headway (sec)		2.23												3.53	4.03	3.33

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		8												37		8
Capacity, c (veh/h)		1076												449		668
v/c Ratio		0.01												0.08		0.01
95% Queue Length, Q <sub>95</sub> (veh)		0.0												0.3		0.0
Control Delay (s/veh)		8.4	0.1											13.7		10.4
Level of Service (LOS)		A	A											B		B
Approach Delay (s/veh)	0.3												13.2			
Approach LOS	A												B			

# HCS Two-Way Stop-Control Report

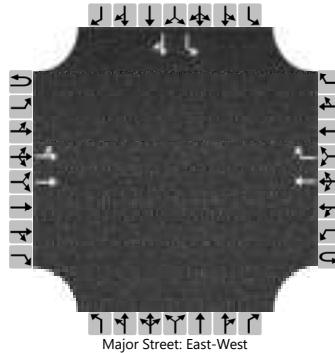
## General Information

Analyst	Christopher Moltz, P.E.
Agency/Co.	Westex Consulting
Date Performed	9/30/2022
Analysis Year	2050
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	2050 Baseline

## Site Information

Intersection	Medical Pkwy / Medical Pkwy
Jurisdiction	Carson City
East/West Street	Medical Pkwy
North/South Street	Medical Pkwy
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	1	1		0	0	0		1	1	0
Configuration		LT	T				T	R						L		TR
Volume (veh/h)		6	278				48	70						99	0	1
Percent Heavy Vehicles (%)		3												3	3	3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized					No											
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.5	6.5	6.2
Critical Headway (sec)		4.16												7.56	6.56	6.26
Base Follow-Up Headway (sec)		2.2												3.5	4.0	3.3
Follow-Up Headway (sec)		2.23												3.53	4.03	3.33

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		7												108		1
Capacity, c (veh/h)		1448												715		1011
v/c Ratio		0.00												0.15		0.00
95% Queue Length, Q <sub>95</sub> (veh)		0.0												0.5		0.0
Control Delay (s/veh)		7.5	0.0											10.9		8.6
Level of Service (LOS)		A	A											B		A
Approach Delay (s/veh)	0.2												10.9			
Approach LOS	A												B			



# HCS Two-Way Stop-Control Report

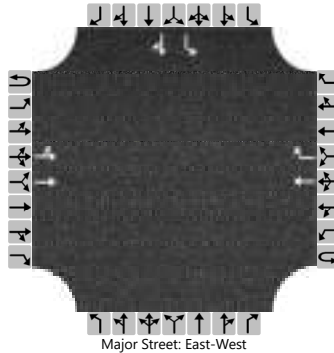
## General Information

Analyst	Christopher Moltz, P.E.
Agency/Co.	Westex Consulting
Date Performed	9/30/2022
Analysis Year	2050
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	2050 plus Project

## Site Information

Intersection	Medical Pkwy / Medical Pkwy
Jurisdiction	Carson City
East/West Street	Medical Pkwy
North/South Street	Medical Pkwy
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	1	1		0	0	0		1	1	0
Configuration		LT	T				T	R						L		TR
Volume (veh/h)		10	203				346	95						35	0	7
Percent Heavy Vehicles (%)		3												3	3	3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized					No											
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.5	6.5	6.2
Critical Headway (sec)		4.16												7.56	6.56	6.26
Base Follow-Up Headway (sec)		2.2												3.5	4.0	3.3
Follow-Up Headway (sec)		2.23												3.53	4.03	3.33

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		11												38		8
Capacity, c (veh/h)		1072												441		666
v/c Ratio		0.01												0.09		0.01
95% Queue Length, Q <sub>95</sub> (veh)		0.0												0.3		0.0
Control Delay (s/veh)		8.4	0.1											13.9		10.5
Level of Service (LOS)		A	A											B		B
Approach Delay (s/veh)	0.5												13.4			
Approach LOS	A												B			

# HCS Two-Way Stop-Control Report

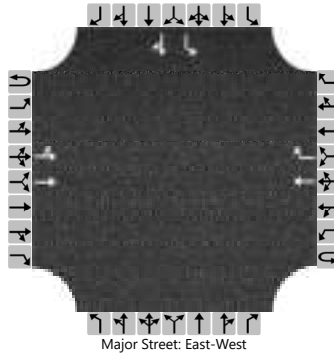
## General Information

Analyst	Christopher Moltz, P.E.
Agency/Co.	Westex Consulting
Date Performed	9/30/2022
Analysis Year	2050
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	2050 plus Project

## Site Information

Intersection	Medical Pkwy / Medical Pkwy
Jurisdiction	Carson City
East/West Street	Medical Pkwy
North/South Street	Medical Pkwy
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	1	1		0	0	0		1	1	0
Configuration		LT	T				T	R						L		TR
Volume (veh/h)		10	278				50	74						100	0	1
Percent Heavy Vehicles (%)		3												3	3	3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized					No											
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.5	6.5	6.2
Critical Headway (sec)		4.16												7.56	6.56	6.26
Base Follow-Up Headway (sec)		2.2												3.5	4.0	3.3
Follow-Up Headway (sec)		2.23												3.53	4.03	3.33

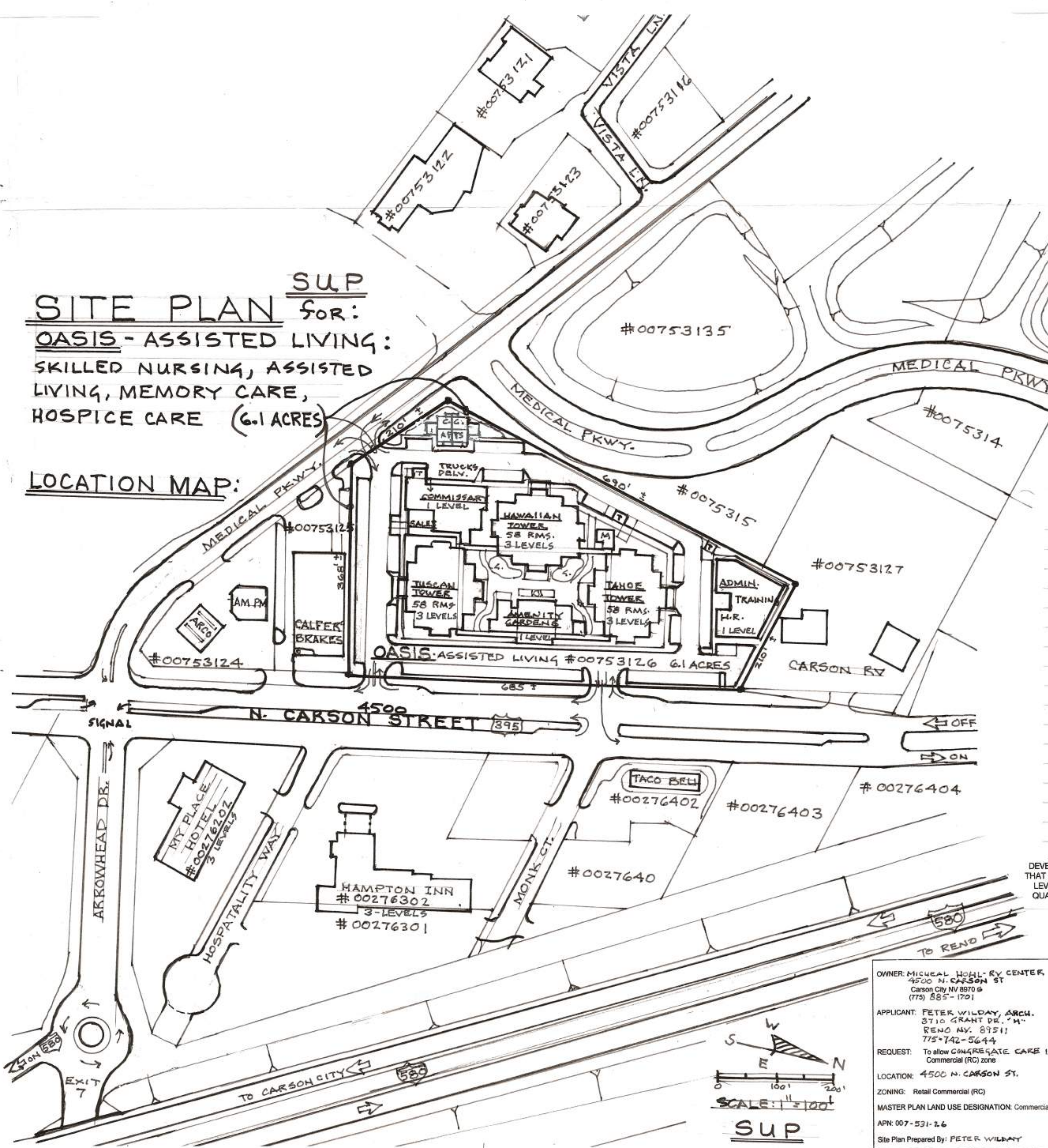
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		11												109		1
Capacity, c (veh/h)		1440												700		1009
v/c Ratio		0.01												0.16		0.00
95% Queue Length, Q <sub>95</sub> (veh)		0.0												0.5		0.0
Control Delay (s/veh)		7.5	0.1											11.1		8.6
Level of Service (LOS)		A	A											B		A
Approach Delay (s/veh)	0.3												11.1			
Approach LOS	A												B			



# SITE PLAN <sup>SUP</sup> FOR: OASIS - ASSISTED LIVING: SKILLED NURSING, ASSISTED LIVING, MEMORY CARE, HOSPICE CARE (6.1 ACRES)

## LOCATION MAP:



**PW**  
PETER WILDAY  
Architect, LTD

3710 GRANT DR., SUITE H  
RENO NEVADA 89509  
775-742-5644  
PETERWILDAY@GMAIL.COM



## SHEET INDEX

1. SITE PLAN & MAP
2. OVERALL SITE PLAN
3. GROUND-FLOOR PLAN
4. LEVELS 2 & 3 - F. PLAN
5. ROOMS - FLOOR PLAN
6. ROOMS - DETAILS
7. ROOMS - ROOF PLAN
8. ROOMS - SECTIONS
9. COMMISSARY - F. PLAN
10. ROOF PLAN & ELEVATIONS
11. ROOMS - ELEVATIONS
12. AMENITY AREA - PLAN
13. AMENITY AREA - ROOF P.
14. AMENITY AREA - SECTIONS
15. ADMIN. - PLAN, ROOF, ELEV.
16. ALT. CARE - CIVIL APTS.

DEVELOP A SCALABLE, EFFICIENT CUTTING EDGE FACILITY  
THAT CAN ACCOMMODATE THE GROWING DEMAND FOR ALL  
LEVELS OF ASSISTED LIVING WHILE OFFERING A BETTER  
QUALITY OF LIFE FOR A COMPETITIVELY MARKET DRIVEN  
PRICE.

OWNER: MICHAEL HOHL-RY CENTER  
4500 N. CARSON ST  
CARSON CITY NV 89706  
(775) 885-1701

APPLICANT: PETER WILDAY, ARCH.  
3710 GRANT DR., SUITE H  
RENO NV. 89511  
775-742-5644

REQUEST: To allow CONGREGATE CARE IN  
Commercial (RC) zone

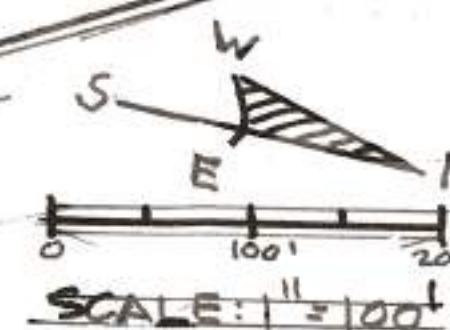
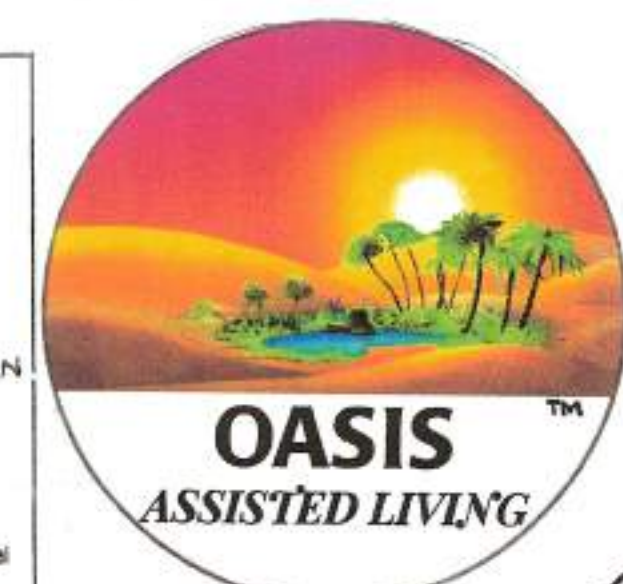
LOCATION: 4500 N. CARSON ST.

ZONING: Retail Commercial (RC)

MASTER PLAN LAND USE DESIGNATION: Commercial

APN: 007-531-26

Site Plan Prepared By: PETER WILDAY



**SUP**

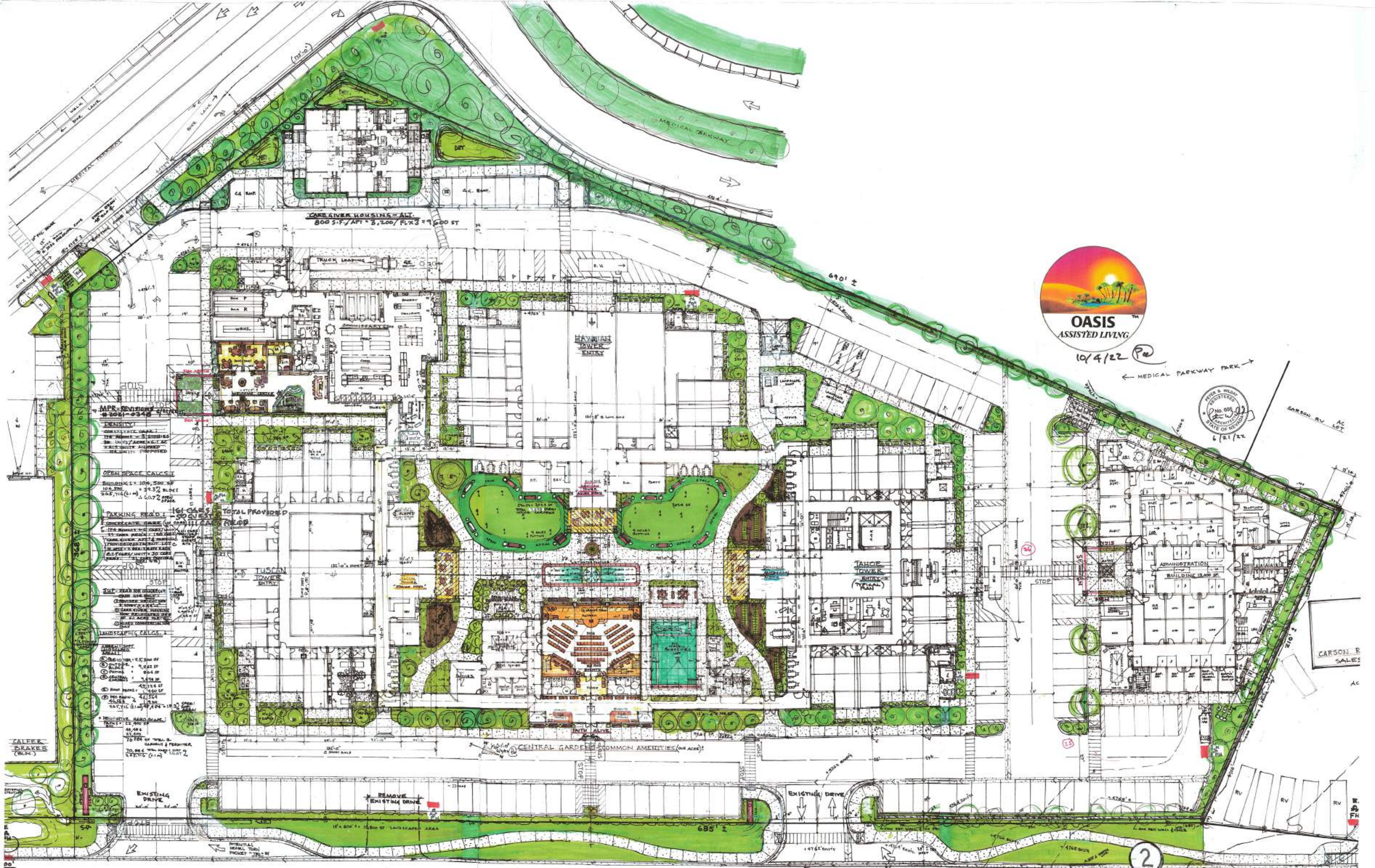


**TOPOGRAPHIC SURVEY**  
4500 N. CARSON STREET  
BEING A COMBINATION OF PARCEL 2,  
PM 881 & PARCELS 1&2, PM 1842  
APN: 007-531-26  
CARSON CITY NEVADA  
PROJECT NO. 161-21-032

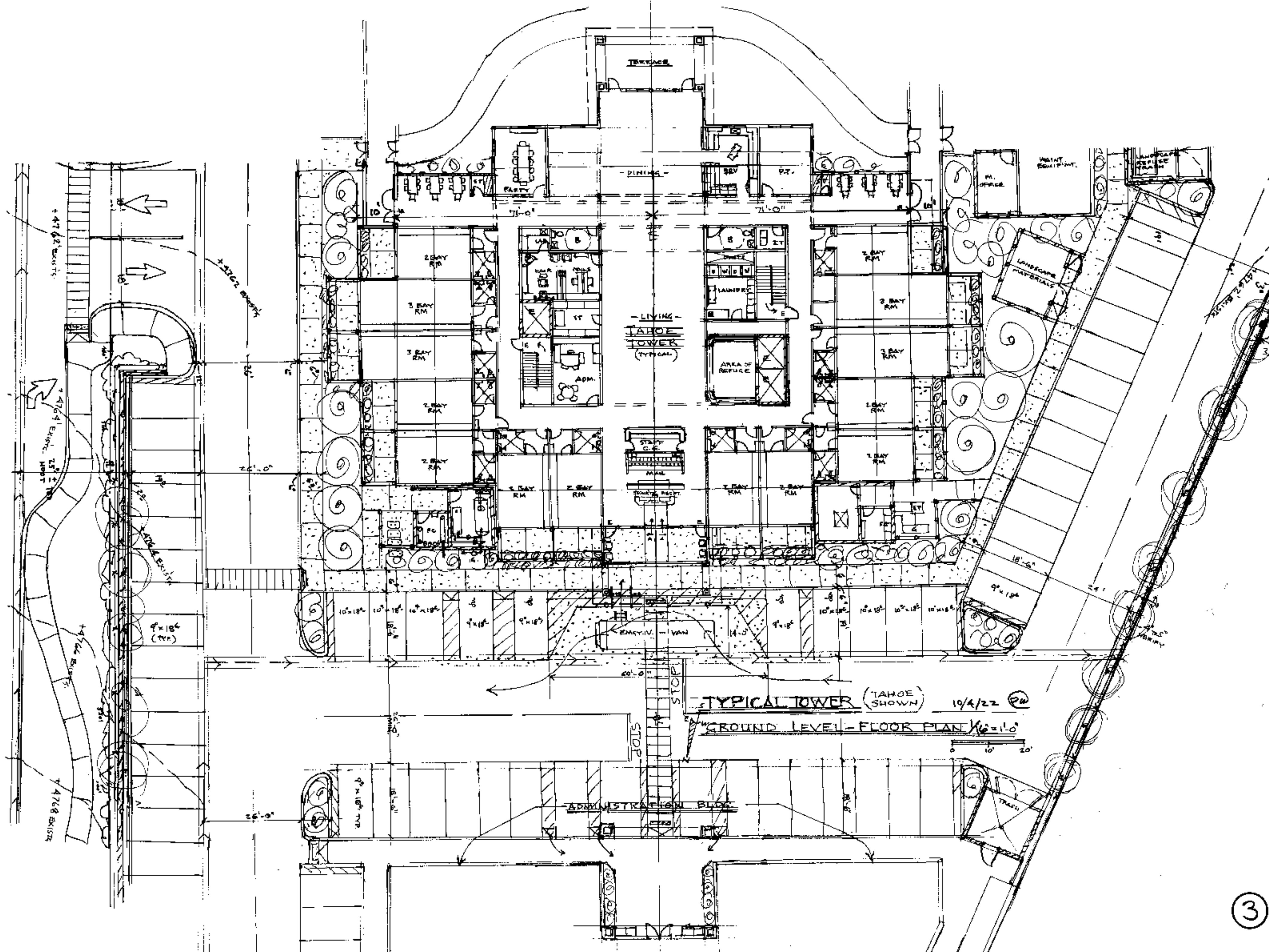


AP IS  
10/4/22  
REVISED:  
9/17/22





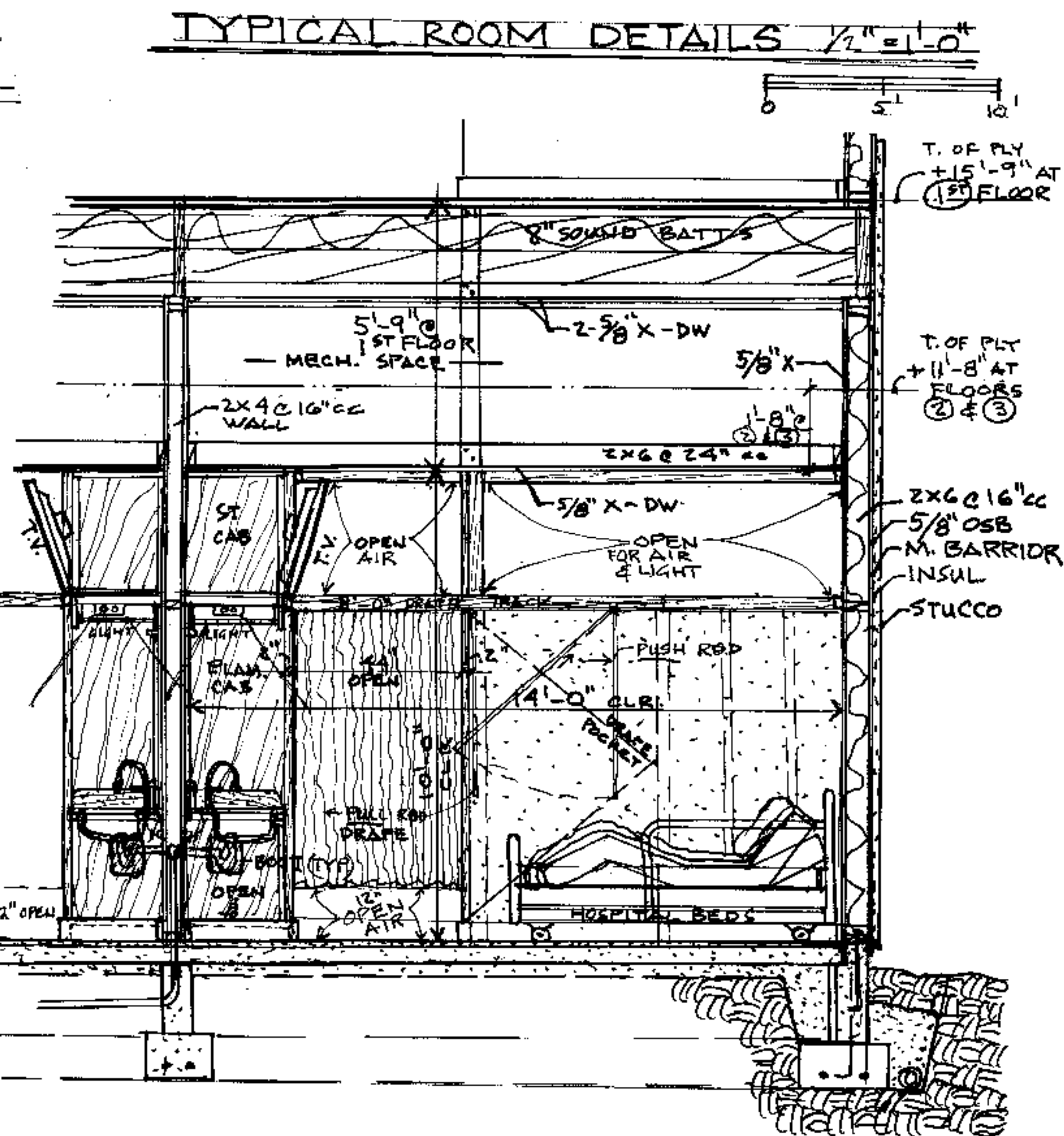


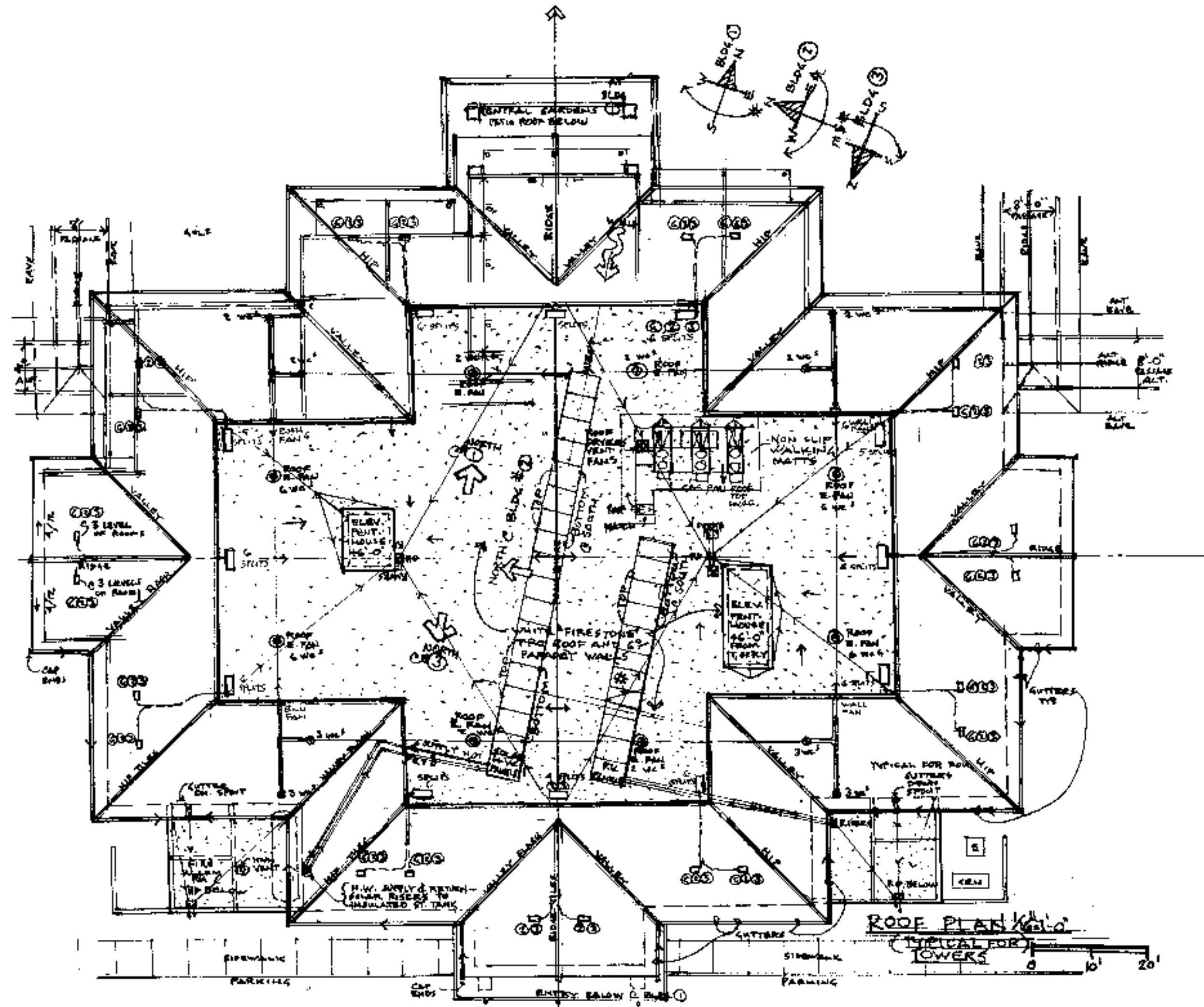




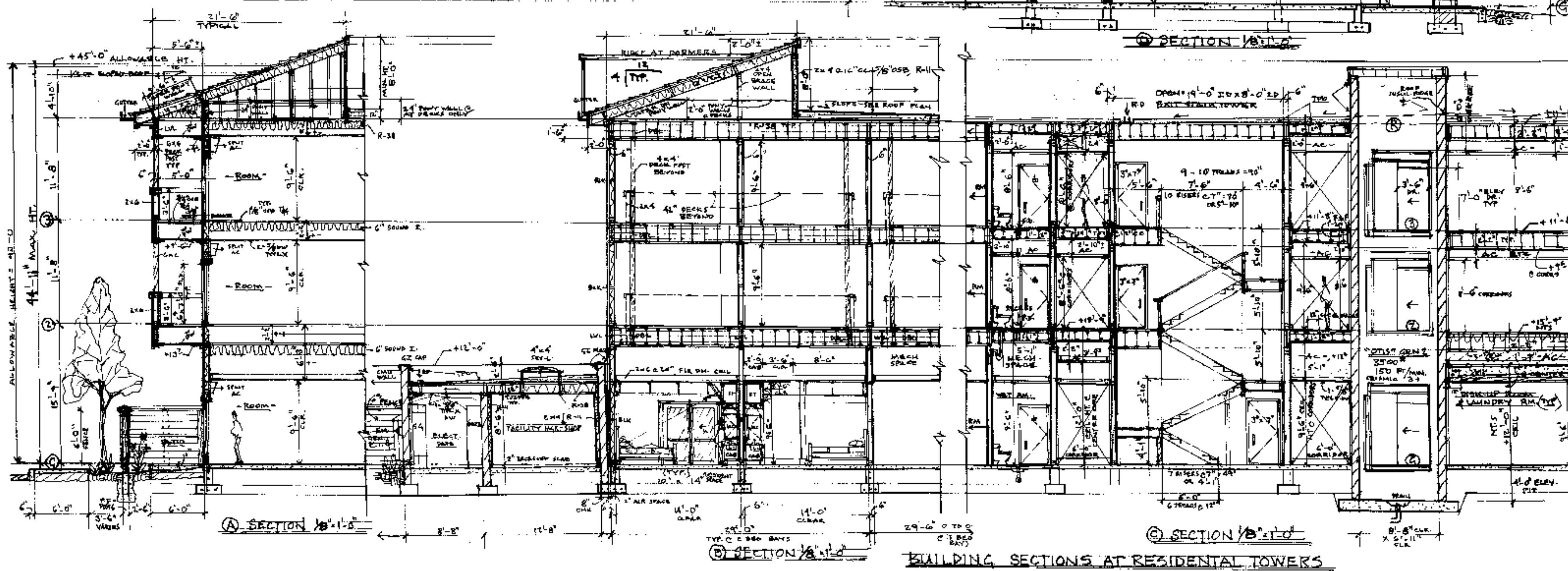
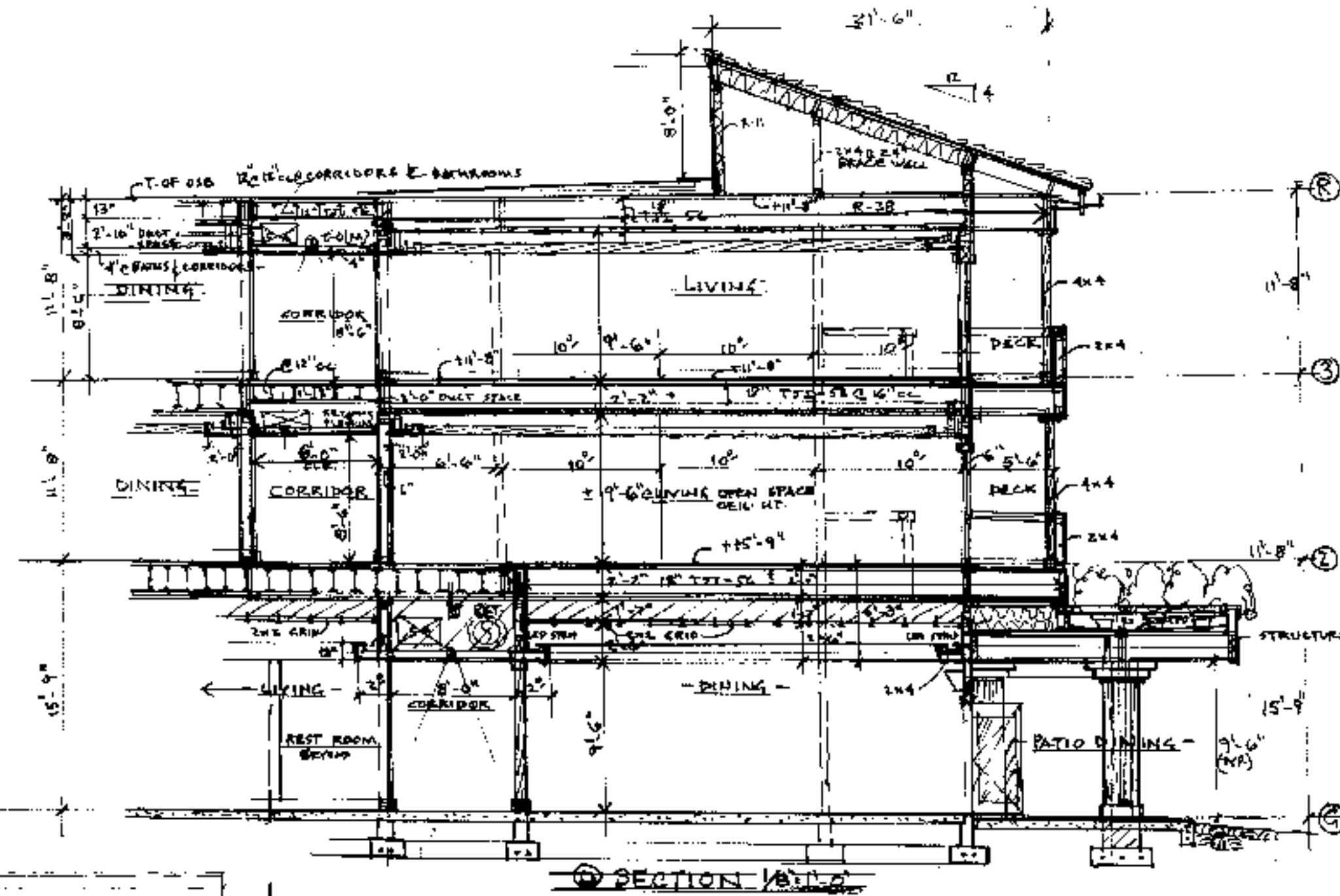
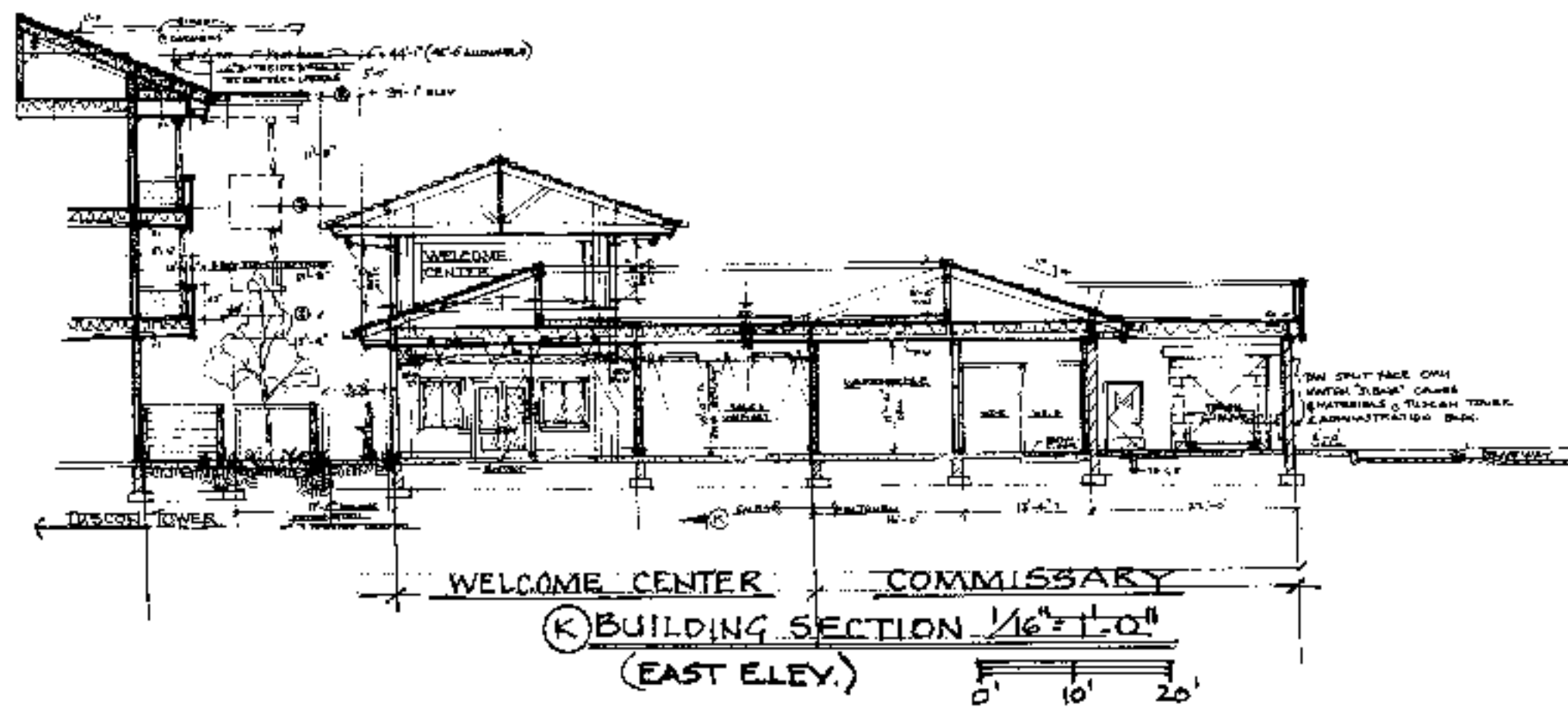


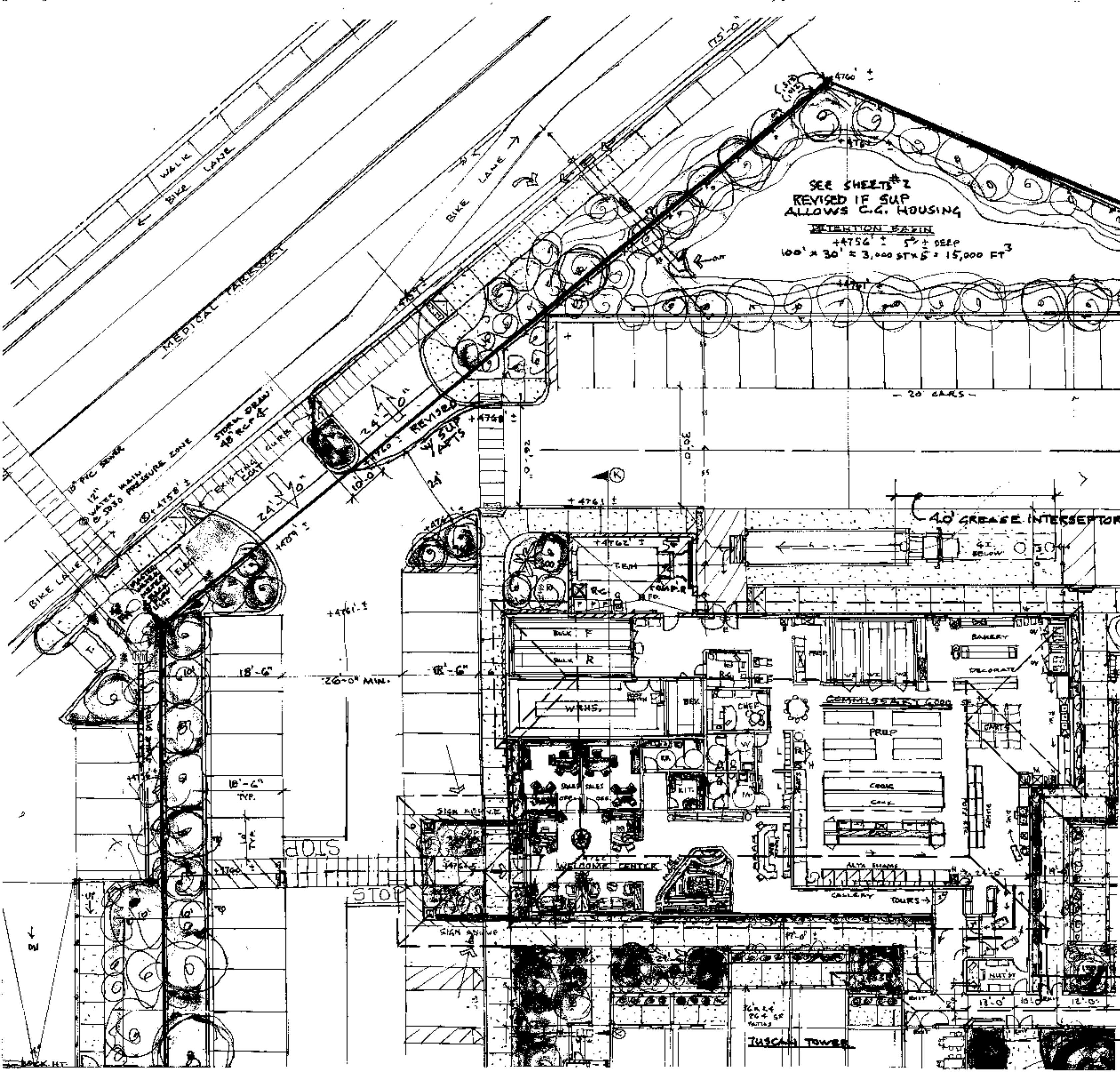




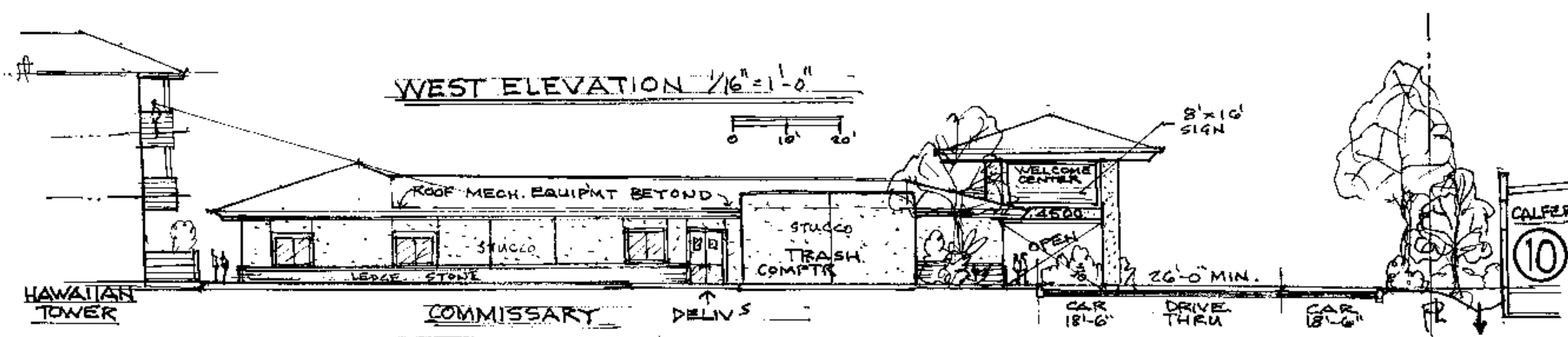




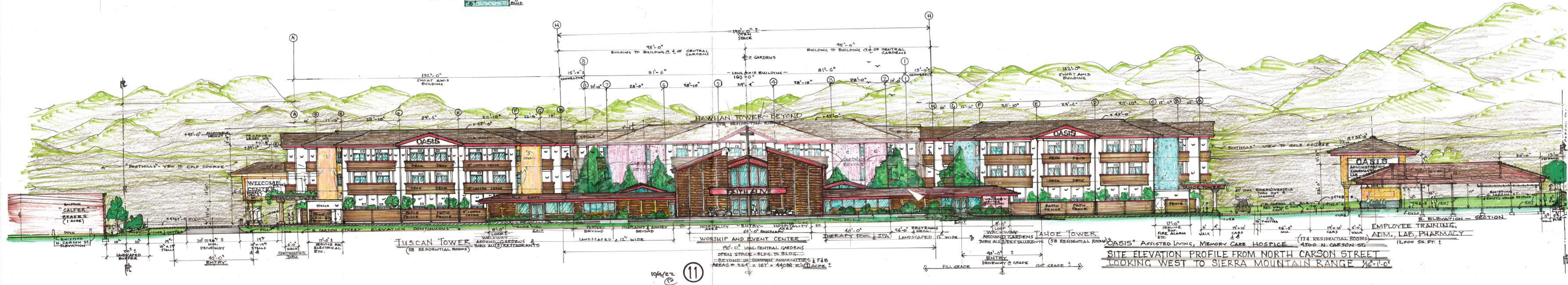




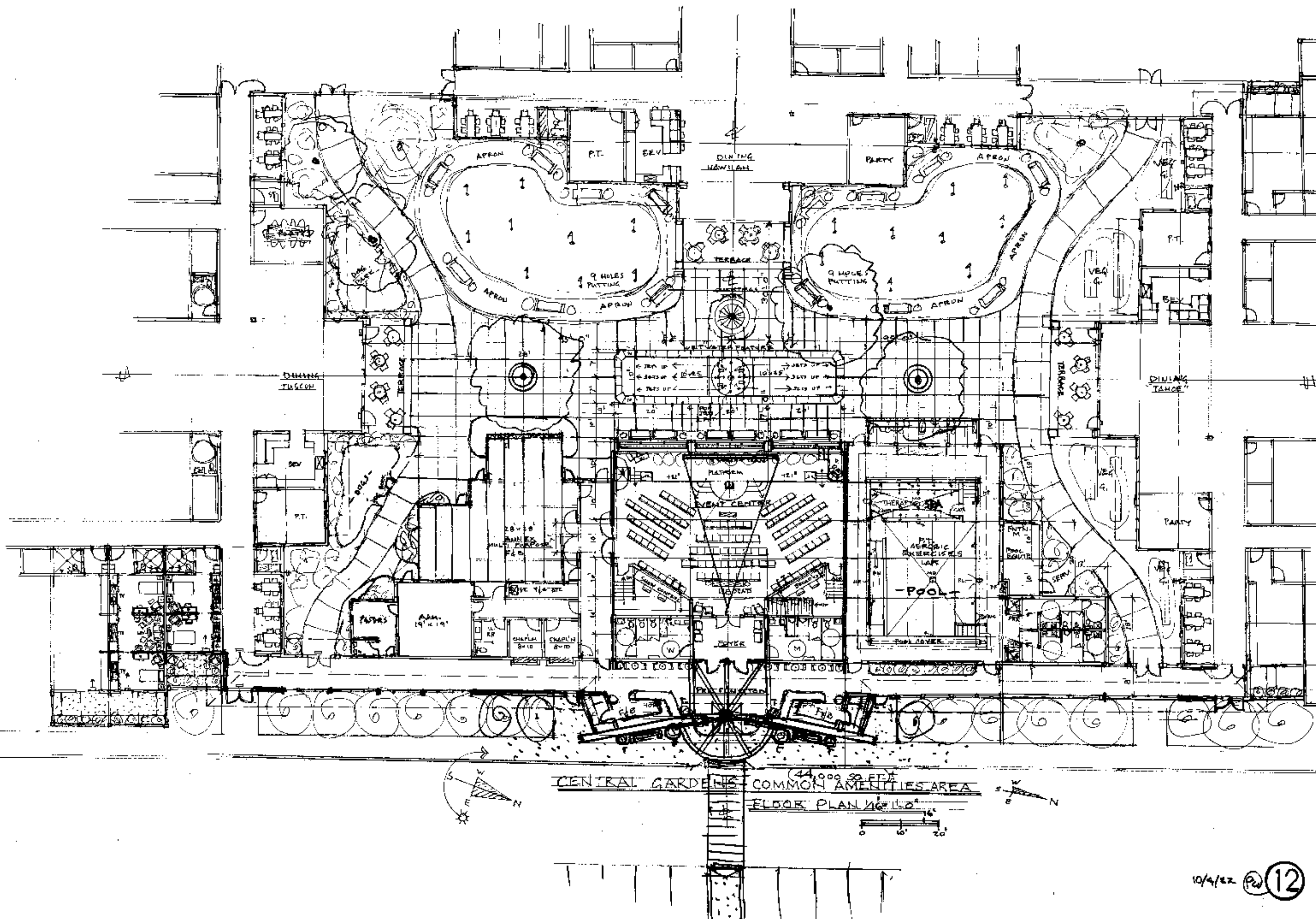












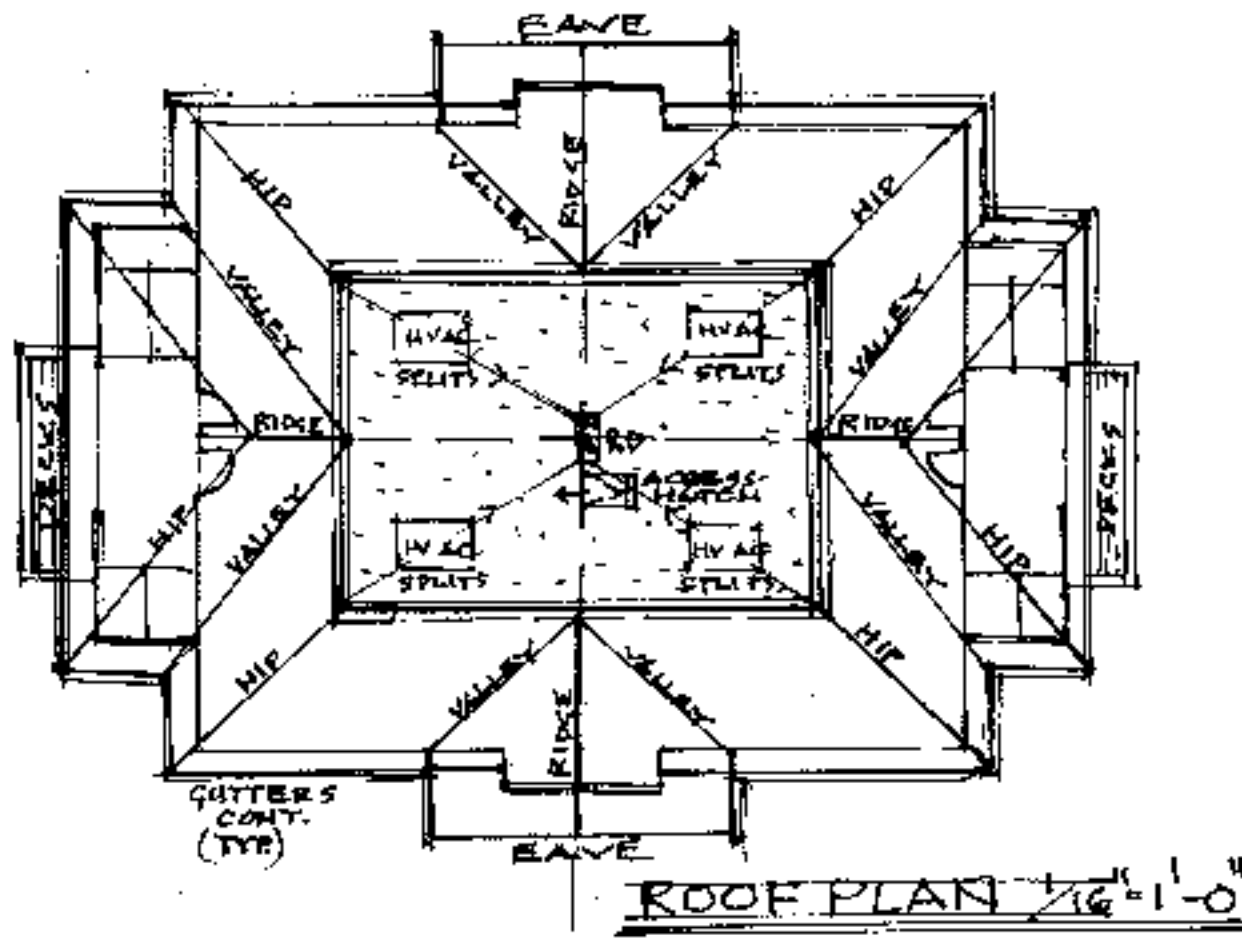






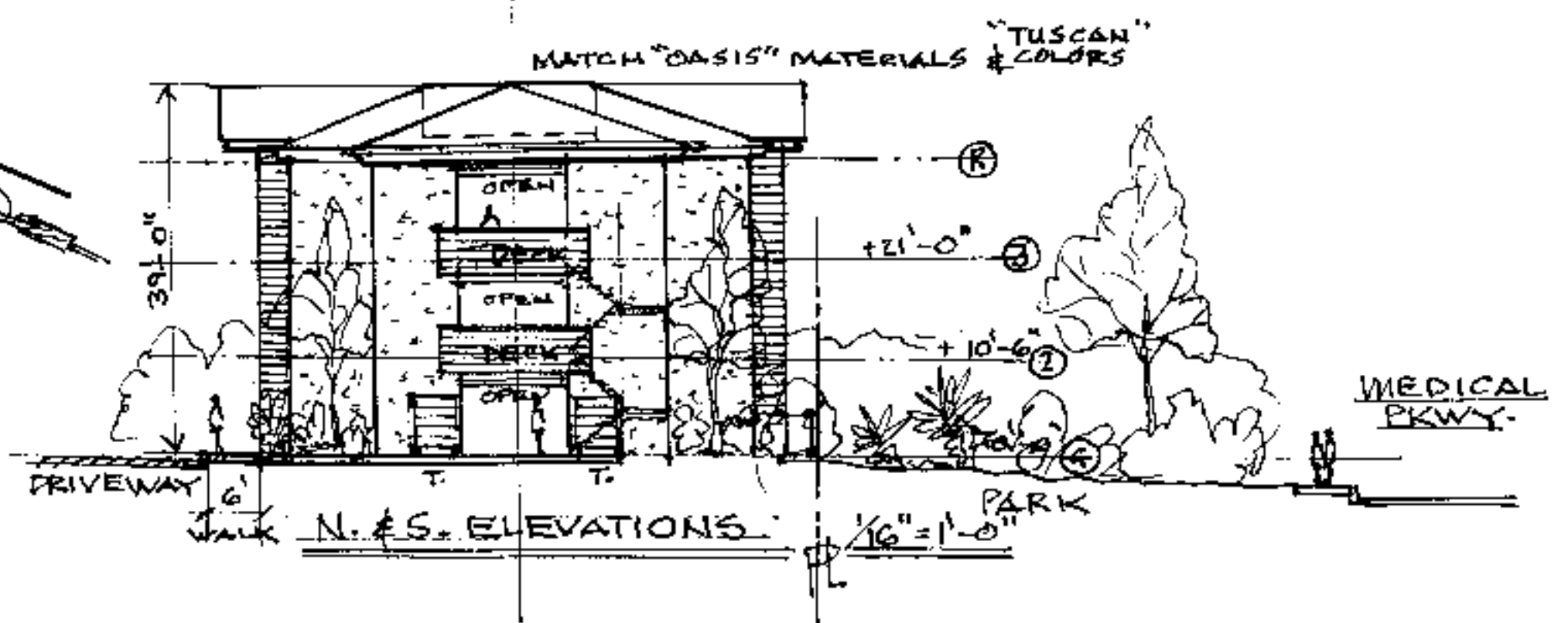
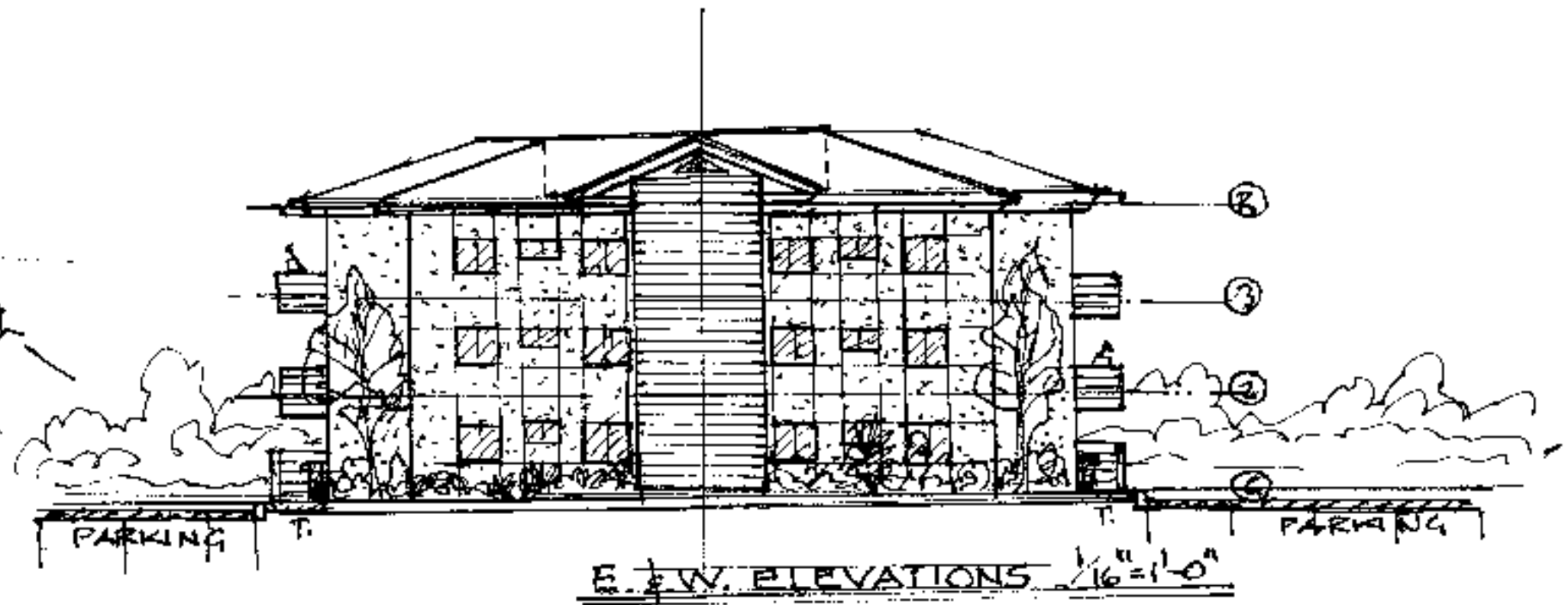
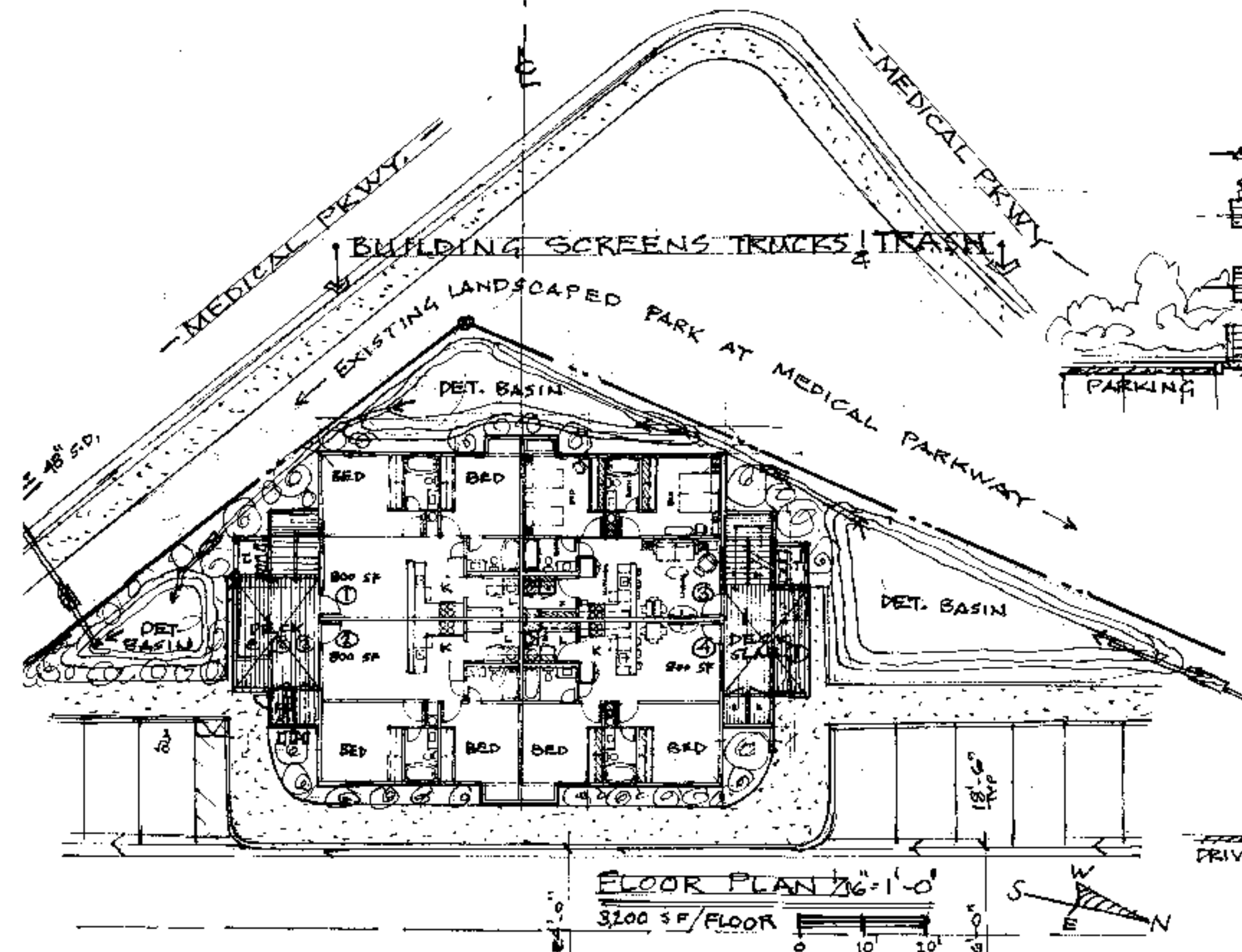






# SUP-ALTERNATE REQUESTED: CARE-GIVER HOUSING

12 - 2 BEDROOM - 2 BATH  
APARTMENTS - FULL SPRINKLERS -  
ONE CAR/UNIT - ONLY AVAILABLE  
FOR "OASIS" CAREGIVERS AS  
SHARED OCCUPANCY APTS -  
24 BEDROOMS x 1.5 C.G./BED ROOM  
AVERAGE = 36 C.G. LIVING ON SITE -  
OR ABOUT 1/3 OF C.G. WORK-FORCE



90° TRUCK LOADING  
TRASH COMP. GREASE INT.