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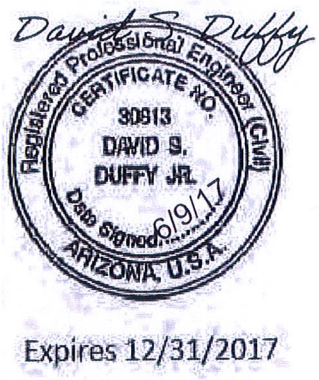


Expires 12/31/2017

October 27, 2016

Fred Fleet
COE & VAN LOO CONSULTANTS, INC.
4550 N. 12th Street
Phoenix, AZ 85014

RE: **The Villas at Cheney Estates Trip Generation Statement – Paradise Valley, Arizona**

Dear Mr. Fleet,

CivTech is pleased to provide this trip generation statement for The Villas at Cheney Estates development located on the northwest corner of Scottsdale Road and Northern Avenue alignment in Paradise Valley, Arizona. The approximately 9.6 acre site is proposed to consist of eight (8) dwelling units. The purpose of this trip generation statement is to document the amount of trips the development is anticipated to generate, the proposed access conditions of the site, the volume of peak hour turning movements that are expected to occur and the sight distance requirements for the corner clearance.

EXISTING CONDITIONS

The site encompasses approximately 9.6 acres and is located on the northwest corner of Scottsdale Road and Northern Avenue. The site is a previously graded, undeveloped dirt lot. Scottsdale Road forms the eastern boundary of the site. The northwest boundary of the site is adjacent to the Camelback Golf Club. The Northern Avenue alignment passes along the southern border of the site without plans for extension; a public works station as well as a drainage facility blocks its potential intersection with Scottsdale Road indicating no future plans to construct and intersection at the alignment. The Cheney Estates residential subdivision is located to the south of the Northern Avenue alignment and the Santo Thomas residential subdivisions are located to the east of Scottsdale Road. A driveway ramp is already constructed to Scottsdale Road to provide access to the site.

PROPOSED DEVELOPMENT AND TRIP GENERATION

The development is proposed to consist of eight (8) single family dwelling units. A site plan is included as **Exhibit A** within the **Attachments.**

Generated trips were estimated for the proposed development utilizing the data given in the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 9th Edition* and the methodology discussed in the ITE *Trip Generation Handbook, 3rd Edition*. The ITE *Trip Generation Manual* contains data collected by various transportation professionals for a wide range of different land uses. The data are summarized in the report and average rates and equations have been established that correlate the relationship between an independent variable that describes the development size and generated trips for each categorized land use. The report provides information for daily and peak hour trips.

Table 1 summarizes trip generation for the proposed development. This information is also presented in the **Attachments**.

Table 1 – Trip Generation Summary

Land Use	ITE Code	Size		Weekday Generated Trips						
				Daily	AM Peak Hour			PM Peak Hour		
		Quantity	Units	Total	Enter	Exit	Total	Enter	Exit	Total
Houses	210	8	DU	76	2	4	6	5	3	8

The development is expected to generate approximately 76 daily trips during a typical weekday, of which 6 trips are anticipated during the AM peak hour and 8 trips during the PM peak hour.

ACCESS CONDITIONS

Geometry

Access conditions are depicted in **Exhibit B** within the **Attachments**. Scottsdale Road, which provides access to the site, is classified by the City of Scottsdale as a suburban major arterial and is considered a major arterial by the Town of Paradise Valley. Scottsdale Road has a posted speed limit of 45 miles per hour and provides three (3) general lanes and one (1) bike lane in each direction, separated by a raised center median adjacent to the site.

Public access to the site is proposed at the existing driveway ramp to Scottsdale Road. At the driveway, Scottsdale Road's center median is configured to allow left turns in and left turns out with a refuge area for 2-stage left turns. Thus the existing configuration provides full access. A secondary driveway for emergency access is proposed east of the planned cul-de-sac. The existing driveway will provide sufficient access to the site and access to the Northern Avenue alignment is not required or desired.

Turning Movements

A simple north/south distribution is assumed for trips generated by the site such that 60 percent of trips are projected to enter/exit the site traveling to/from the south and the remaining 40 percent to/from the north. This distribution is applied to the trip generation of the site to project turning movements at the driveway. The results are summarized in **Table 2** and depicted in **Exhibit B** within the **Attachments**.

Table 2 – Projected Turning Movements

Time Period	NB Left	SB Right	EB Left	EB right
Daily	23	15	15	23
AM Peak Hour	1	1	2	2
PM Peak Hour	3	2	1	2

The site is expected to generate approximately 3 or fewer vehicle trips in any turning movement in or out of the site during any 1-hour period. The ±135 feet of existing storage for the northbound left turn lane is expected to be sufficient for the future queuing demand of the movement. A right turn deceleration lane is not required per the Town's criteria but is required by the City of Scottsdale as Scottsdale Road is classified as a major arterial. As the development is expected to generate very few trips during the peak hours and the driveway was already constructed and

exists without a right turn lane, the developer proposes to maintain the existing driveway conditions and not construct a new southbound right turn lane.

The driveway will provide approximately 75 feet from the edge of pavement of Scottsdale Road to the keypad to the gate. This provides sufficient space for 2-3 vehicles without queuing in front of the sidewalk or street. Given that the development consist of only 8 dwelling units and the expected peak ingress volume of 5 vehicles per hour, the provided storage on site is sufficient for typical ingress operation. The CC&Rs will limit these 8 lots to one trash hauler and one landscape maintenance company so that there will not be multiple trash trucks/landscape truck with their trailers backed up at the gate.

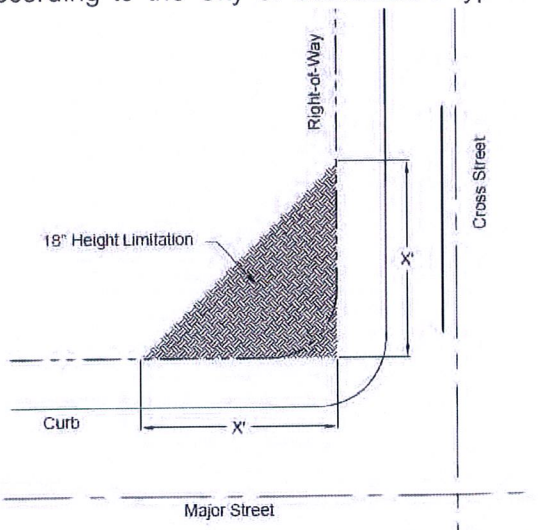
Intersection Corner Clearance

Intersection Corner Clearance triangles, often called by other names, is a triangle at intersections that is designated to remain clear of obstructing vegetation and bulky physical objects. The purpose may include providing additional visibility of pedestrians, reserving area for potential signal equipment, and partial sight visibility for approaching vehicles. A corner clearance is not a replacement for measurement of sight distance, discussed in a later section.

Per the Town of Paradise Valley's Municipal Code Section 8-1-13, updated in 2002, a sight triangle should measure 50 feet along each side of the property boundaries. Per Section 8-1-13.F, the triangle is "...eligible for modification by the Town Engineer if one or both of the intersection streets are controlled by stop signs or traffic signals..." The town code does not provide alternative sight triangle dimensions for stop-controlled intersections, and the existing wall is also beneficial to serve as a sound and privacy barrier between individual residencies and Scottsdale Road. This study considers criteria from the City of Phoenix and the City of Scottsdale.

CivTech is aware that Paradise Valley had used City of Phoenix guidelines for corner clearances at driveways. Phoenix corner clearances at driveways is measured similarly at right-of-way boundaries with the major road dimension at 20 feet and the dimension along the driveway at 10 feet.

The City of Scottsdale also has established corner clearance requirements, which would require a triangle measured 25 feet along the right-of-way limits for intersections with arterial roads. Since the driveway intersects Scottsdale Road which is controlled by the City of Scottsdale, it is recommended that corner clearance be provided according to the City of Scottsdale's typical requirements. As the driveway to the site is private and does not provide right-of-way, however, it is recommended that the east-west segment of the corner clearance triangle be designated along the curb return of the driveway which the plat indicates is 25 feet from the centerline of the driveway. Note that Scottsdale's local residential roadway segment provides 24 feet of right-of-way from the centerline. A depiction of the required corner clearance is shown to the right.

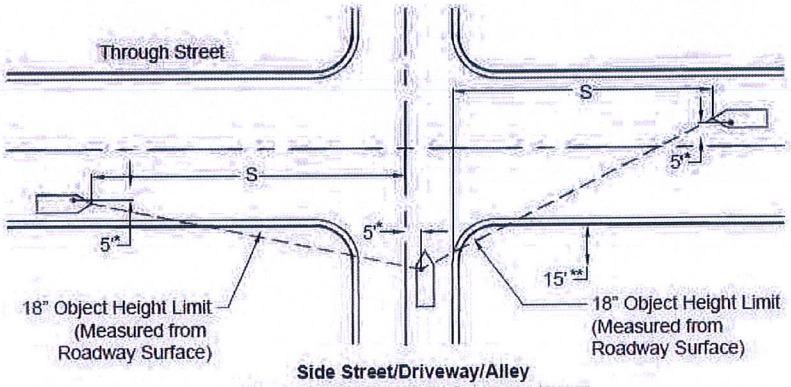


Source: City of Scottsdale Design Standards & Policies Manual, Section 5-3

Sight Distance

Adequate sight distance must be provided at intersections. A sight triangle at a stop controlled intersection is the area encompassed by the line of sight from a stopped vehicle on the minor roadway to the approaching vehicle on the major roadway; there must be sufficient unobstructed sight distance along both approaches of a street or driveway intersection and across their included corners to allow operators of vehicles to see each other in time to prevent a collision. There must also be sufficient sight distance along the major street to allow a driver intending to turn left into the site to see a vehicle approaching in the opposite direction.

Per City of Scottsdale guidelines, standard methodology described by the American Association of State Highway Transportation Officials (AASHTO) is used for intersections and driveways. AASHTO presents the vertex of sight triangles along the driveway to be 14.5 feet back from the face-of-curb (Scottsdale rounds to 15 feet). The existing wall is approximately 15 feet back from the face-of-curb, so the sight distance triangles for minor street vehicles would be contained on the street side of the wall if it remains. A depiction of the required sight distance measurements is shown to the below and the lengths along the street per AASHTO methodology are summarized in **Table 3**.



Side Street/Driveway/Alley
(Applies to stop controlled side street or all approaches to a signalized intersection for right-on-red traffic.

* 5 feet measured to nearest lane line or centerline.

**15 feet measured from face-of-curb or edge-of-travelway.

S = Intersection sight distance in feet on drivers left and right for right turns, left turns and through traffic. (See *2004 AASHTO Geometric Design of Highways and Streets* for additional sight distance requirements.)

Source: City of Scottsdale Design Standards & Policies Manual, Section 5-3

Table 3 – Projected Turning Movements

Site Access	To Left from Driveway (ft)	To Right from Driveway (ft)	Ahead on Major Road (ft)
Site Access (55 mph design speed on Scottsdale Road)	680	780	575

It is recommended to designate sight distance triangles according to the distances in **Table 3**.

CONCLUSIONS

From the above it can be concluded that;

- Northern Avenue is not planned and is not proposed to be extended from east of the site to Scottsdale Road. A public works station as well as a drainage facility blocks its potential intersection with Scottsdale Road indicating no future plans to construct and intersection at the alignment. The existing driveway to the parcel will provide sufficient access to the site and access to the Northern Avenue alignment is not required or desired.
- The development is expected to generate approximately 76 daily trips during a typical weekday, of which 6 trips are anticipated during the AM peak hour and 8 trips during the PM peak hour.
- The site is expected to generate approximately 3 or fewer vehicle trips in any turning movement in or out of the site during any 1-hour period.
- The ±135 feet of existing storage for the northbound left turn lane is expected to be sufficient for the future queuing demand of the movement.
- A right turn deceleration lane is not required per the town's criteria but is required by the City of Scottsdale as Scottsdale Road is classified as a major arterial. As the development is expected to generate very few trips during the peak hours, the developer proposes to maintain the existing driveway conditions and not construct a new southbound right turn lane.
- The City of Scottsdale also has established corner clearance requirements, which would require a triangle measured 25 feet along the right-of-way limits for intersections with arterial roads. Since the driveway intersects Scottsdale Road which is controlled by the City of Scottsdale, it is recommended that corner clearance be provided according to the City of Scottsdale's typical requirements.
    - As the driveway to the site is private and does not provide right-of-way, however, it is recommended that the east-west segment of the corner clearance triangle be designated along the curb return of the driveway which the plat indicates is 25 feet from the centerline of the driveway. Note that Scottsdale's local residential roadway segment provides 24 feet of right-of-way from the centerline.
- It is recommended to designate sight distance triangles according to the distances in **Table 3**.

Thank you for your consideration of this assessment. Should you have any comments or questions or wish to discuss this information further, please contact me at (480) 659-4250.
Sincerely,

CivTech

David Duffy, P.E.

Attachments:
Exhibit A: Site Plan
Exhibit B: Roadway Conditions and Driveway Traffic Volumes
Trip Generation Calculations
Sight Distance Analysis