October 3, 2018

To: Mr. Paul Mood
Town Engineer
Town of Paradise Valley
6401 E Lincoln Drive
Paradise Valley, AZ 85253

Re: Tonn Residence
5429 E Solano Drive
Paradise Valley, AZ 85253
LDG Project #1512117

DRAINAGE MEMORANDUM

Dear Mr. Mood:

In accordance with the Town of Paradise Valley Hillside Ordinance, we have prepared this drainage memorandum and preliminary grading and drainage plans related to the construction of a new single family residence, located at 5429 E E Solano Drive, Paradise Valley, AZ 85253 and also being Lot 18 of Stone Canyon East, a subdivision recorded in book 81 of maps, page 34, MCR, being a portion of the NE ¼ of Section 17, Township 2 North, Range 4 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

The goal of this memorandum is to describe the existing and proposed drainage conditions and to identify the potential improvements to mitigate the drainage impact to the subject and the neighboring properties. A complete and comprehensive drainage report in compliance with the Town and Maricopa County Rules and Regulations will be prepared for the formal Hillside Committee review submittal, once the architectural and grading and drainage plan design parameters are well defined.

The project site is located on the north side of the Camelback Mountain, within a residential subdivision and it is zoned R-43 (Hillside). The property is surrounded by large residential lots (south, east and west) and East Solano Drive right-of-way on the north side. There is existing single-family residence that will be demolished. Architectural plans call for a new 6,267 s.f. single family residence to be constructed matching the finish floor elevation and approximately the limits of the building pad of the existing home. The project will consist of a one-story structure with garages, pool area, an access driveway to East Solano Drive, and retaining walls. Existing septic system will be abandoned in accordance with the Maricopa County Environmental Services Department standards and regulations.

Site is located in FEMA Flood Zone "X" according to Flood Insurance Rate Map (FIRM) #: 04013C, Panel 1765 of 4425, Suffix L, dated October 16th, 2013, as published by FEMA. The FIRM Panel defines Zone "X" as follows: "Areas determined to be outside the 0.2% annual chance floodplain".

The area is well known with its drainage challenges, high erosion potential, multiple diversions of the historic flows upstream of the subject property, created by steep driveways, building pads, and onsite and offsite infrastructure that is not capable of conveying the estimated peak discharges. Per statements provided by the neighbors, provided photos

and input by the Town's staff for the aftermath of the 2013 and 2014 storms, the properties in the vicinity are extremely vulnerable from even less than 100-year storm events.

We have recreated the historic topography of the site based on gathered maps, provided by the City of Phoenix Records Department. The mountainous terrain slopes northwesterly with an average slope of 16%. The lot is covered with large boulders, rock outcroppings and native desert vegetation. Field reconnaissance inspections and provided topographic survey were used to clearly identify the distinctive flow paths that enter the property.

USGS, Maricopa County maps, aerial photography and surveyed topography for the site were reviewed and used to establish the tributary areas and conveyance corridors. Limits of the tributary area of each sub-basin were further adjusted based on the field observations, identified drainage structures as well as noted diversion of the historic flows that existed before the residences upstream of the subject property were built. The Town has also provided records for the existing homes surrounding the project lot and we were able to review what drainage structures, means and methods or lack of such were used to address the offsite flows impacting their sites.

Drainage maps were prepared for both the historic (1969) and current conditions. Since the diversions of flows upstream were done before the preparation of the earliest available detailed topographic map, it was determined that similar to the 1969 peak discharges reach the cul-de-sac of San Miguel Avenue. An estimated flow split percentage upstream was determined conservatively for the property of interest and for an extreme storm event and intensity. Often a long and less than 100-year storm event would produce different diversion splits that most likely would have a less impact to the subject project but may create a bigger impact to some of the surrounding properties. It is assumed that the potential development of the property located at 5500 E San Miguel Ave., which is just south of the subject site, will not alter the historic flows, which could adversely impact the project site.

Computations have been performed to estimate the 100-year design storm peak discharges for each sub-basin and to analyze the capacity of the proposed drainage structures. Computer program DDMS provided by FCDMC was utilized to generate the rational model, considering upstream diversion in the network and to estimate the peak discharges. Four sub-basins were delineated to contribute run-off to the site. They have a total area of 20.83 acres.

The peak discharge of Sub-basin 13 was estimated at 72 cfs. It runs through a 30" cmp pipe under the pool deck of 5505 E San Miguel Ave. and then following the path of a natural wash reaches the cul-de-sac. Based on the provided by the Town photos of the aftermath of the 9/8/14 storm event, the wash could carry and dump onto the cul-de-sac over 1' of dirt. The crown slope of the cul-de-sac, the 7" vertical curb and the slope of the driveway of 5501 E San Miguel and its finish floor elevation, make this property extremely vulnerable. We have reviewed the original hillside grading and drainage plans for this home and it appears that the proposed design did not anticipate the impact from off-site flows to the site. The peak flows of 72 cfs from Sub-basin 13 continues downstream until it reaches 5701 N 54th St lot. Per the provided by the Town hillside grading and drainage plan for this property, an 18" storm drain pipe runs under the house and conveys the flows further down onto N 54th Street. The size of the pipe does not have the capacity to safely convey the estimated peak discharge. It appears that a ditch that runs behind the property and diverts some of the flows to the south and then west onto N 54th Street was constructed at some point, most likely to mitigate the impact to the residence.

The peak discharge of Sub-basin 11 was estimated at 64 cfs, carried to the cul-de-sac by a steep (25% - 30% slope) asphalt driveway. Considering the existing crown cross section of the cul-de-sac, the existing 7" high concrete curb, which is higher than the driveway entrance of 5501 E San Miguel and accumulated dirt berm near the southwest property corner of 5506 E San Miguel Ave., we estimated that 80% of this peak discharge reaches 5500 E San Miguel Ave. and 20% enters 5506 E San Miguel Ave. via a pavement depression. The flows run northwesterly until they reach the north property line. Estimated 55 cfs (80% from Sub-basin 11 and Sub-basin 14) run between 5429 E Solano Dr. and 5701 N 54th St. and ultimately reaches a drop inlet structure at E Solano Dr. right-of-way.

Estimated 17 cfs (20% from Sub-basin 11 and Sub-basin 12) are routed between 5429 E Solano Dr. and 5501 E Solano Dr. and ultimately reaches E Solano Dr. right-of-way.

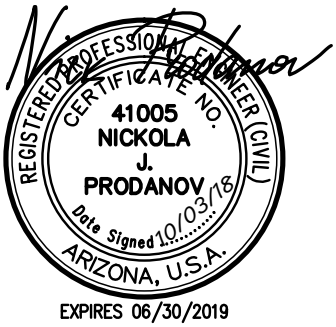
The lowest finish floor elevation is set at 1498.65. Grading around the residence provides for positive drainage away from the structures as shown on the Grading and Drainage plan. Diversion swale along the south retaining wall

captures the sheet flows coming from south and routes them to the wash that runs along the westerly property line. Ultimate outfall is located at the northwest property line at elevation of 1466.70. On-site retention is proposed for the post development run-off and is provided through underground storm water detention 36" dia. tanks. Prepared preliminary grading and drainage plan proposes installation of check dams at end of the swale and rock outlet structures at the storm drain pipe outlet to minimize the amount of the eroded material deposits, which would improve the performance of the drainage systems downstream.

A Drainage Easement and Maintenance Agreement for Drainage Easement Area will be required for this project. Required maintenance of the proposed drainage structures - storm drain system, check dams, inlets, scuppers, roof drains will responsibility of the homeowner.

In conclusion, the project site has the potential to collect, convey and discharge runoff safely and effectively. The proposed improvements reduce the drainage impact to the neighboring lots and will not result in significant changes to the existing and historic drainage patterns or magnitudes.

Respectfully Submitted,



EXPIRES 06/30/2019

Nick Prodanov, PE, PMP
Principal
Land Development Group, LLC

Enclosures:
Exhibit 1 Drainage Maps
Exhibit 2 Aerial Maps
Exhibit 3 Drainage Calculations