HEXAGON TRANSPORTATION CONSULTANTS, INC.

May 6, 2011

Ms. Jacqueline R. Onciano
Planning Services Manager
Resource Management Agency – Planning Department
168 W. Alisal St., 2nd Floor
Salinas, CA 93901

Re: Peer Review of the Traffic Study Report for the Paraiso Springs Resort Project in Monterey County, California

Dear Ms. Onciano:

This letter report presents the results of Hexagon's peer review of the traffic impact study prepared for the Paraiso Springs Resort Development project in Monterey County, California. The purpose of this review is to ensure that the traffic report conforms to Monterey County standards, to confirm that accepted traffic study methods were used, and to ensure that the findings and recommendations contained in the report adequately address project impacts.

The project is located at the western end of Paraiso Springs Road, south of the City of Soledad in Monterey County. The project description contained in the traffic study for the project indicates that the project would include a 103-room destination resort hotel, 17 detached timeshare villas, and 60 attached timeshare units.

A traffic analysis report was prepared by Hatch Mott MacDonald (HMM) for the project, which evaluates the traffic impacts associated with the proposed project. This peer review consists of a technical evaluation of HMM's report, entitled *Paraiso Springs Resort Traffic Analysis Report*, dated January 21, 2011.

Scope of Review

The following issues were reviewed in the traffic study as part of the peer review:

1. Adequacy of Study Area
2. General Plan Buildout Traffic Forecasts
3. Trip Generation Analysis
4. Safety Impact Analysis
5. Roadway Design Standards

Review Results

The key findings of our peer review of the traffic report are presented in the following sections.

Adequacy of Study Area

The study area and study facilities included in the traffic impact study were reviewed to ensure that potential project impacts on the local transportation system are accurately identified.

Analyzing the one intersection and 13 individual roadway segments included in the traffic analysis is sufficient to accurately identify the potentially significant project impacts associated with the proposed project. Traffic volumes in the study area are relatively low and the magnitude

of traffic added by the project would not substantially affect traffic conditions at facilities located outside of the study area included in the traffic report.

General Plan Buildout Analysis

The traffic study includes a cumulative analysis which is based on Year 2030 General Plan buildout traffic volume forecasts for the area.

A review of the General Plan volumes for each of the study roadway segments indicates that the General Plan volumes appear to be reasonable, and may be a little conservative in some cases, as indicated in the traffic study.

However, Hexagon was not able to verify the 69% growth factor cited in the traffic study for General Plan conditions. Data contained in Appendix C "Traffic Data" of the *2007 Monterey County General Plan Draft EIR* indicates that the traffic growth from existing to 2030 buildout conditions would be approximately 75% (based on existing to existing plus project buildout ADT volumes on Arroyo Seco Road, 4,100 to 7,200). This difference likely will have only a minor effect on the level of service analysis and safety analysis and likely would not change the conclusions of the report. It is recommended that the values or methodology used to derive the 69% growth factor be documented in the report.

Trip Generation Analysis

A review of the trip generation estimates contained in the traffic report was conducted to verify that they are accurate, that representative land uses were chosen, and that the rates are based on the appropriate land-use data as published by the Institute of Transportation Engineers (ITE). The traffic study includes trip generation analyses for four different project development phases.

A review of the site traffic projections finds that the trip generation land-use categories and rates appear to be consistent with the project description.

However, a number of assumptions used in the trip generation analysis are not documented in the traffic study. Additionally, during the course of our review of the trip generation analysis, we made a few important observations. The County should consider having the following issues addressed before the environmental document is completed for this project:

- Trips attributable to hotel employees make up a sizable portion of the overall project trips. The source of the hotel employee trip rates or the assumptions used to develop these rates should be documented.
- The number of employees to be shuttled to the site does not appear to match assumptions documented in Footnote 4 of the trip generation table. Additionally, some of the employee numbers fluctuate from one phase to the next. For example, the number of weekday day employees shuttled with various phases is 34 with phase 1, 42 with phase 2, and 35 with phase 3.
- The assumptions used to allocate trips associated with the various employee shifts to the various study peak hours should be documented for clarity.
- It is not clear from our review of the trip generation table, how the 20% guest trip reduction (due to the shuttle) is calculated. Also, this number is lower under buildout than under Phase 3 conditions.

We feel that additional clarification with respect to the trip generation analysis and assumptions would help to make the environmental document for this project more defensible and would

provide additional clarity, with respect to the analysis of the project, for those reviewing the Draft EIR.

Traffic Safety Impact Analysis

The safety impact analysis included in the traffic report relies on procedures and methodologies contained in AASHTO's *Highway Safety Manual (HSM)*. Specifically, Part C of the HSM contains the predictive method for estimating expected average crash frequency for a variety of roadway facilities. One of the applications that the predictive method in the HSM can be used for is comparing the expected average crash frequency of an existing facility under different traffic volume conditions. Although not explicitly stated in the traffic study, it appears as though the safety impact analysis uses the predictive method as outlined in Part C of the HSM. It is our opinion that this method is an acceptable method for evaluating the change in accident frequency on a given facility as a result of traffic volume changes.

Our review of the safety impact analysis in the traffic study indicates that, for the most part, the procedures in the HSM were correctly applied. However, it appears as though the following items need clarification or further consideration:

- The safety analysis does not consider intersections. The HSM procedure is intended to evaluate all intersections and segments on a given route. In this case, the route is Clark Road and Paraiso Springs Road between the project site and the Clark Road/Arroyo Seco Road intersection. As such, the County should consider adding the two main intersections on the route (Clark Road/Arroyo Seco Road and Clark Road/Paraiso Springs Road) to the safety analysis to get a complete picture of the likely change in accident frequency due to the added project traffic volume.
- Crash Modification Factors (CMFs) for lane width and shoulder width were applied in the analysis. However, CMFs for grade, horizontal curvature, and vertical curvature do not seem to have been applied. Consideration should be given to these additional geometric features of the study route, as they can have an effect on accident frequency. If it is determined that use of these other CMFs is not necessary, then explanation should be provided in the traffic report to document this.
- The sharp curve in Paraiso Springs Road, near the Panziera property driveway, should be evaluated as a curved segment. If the accident frequency is substantially higher with this segment evaluated as a curve, then stop signs should be added at this location to create a stop-controlled intersection as a way to reduce the accident frequency.
- Hexagon was able to reproduce the predicted accident frequencies calculated in Exhibits 13 and 15. Therefore, it appears as though the CMFs for lane and shoulder widths were applied correctly. However, we were not able to reproduce the lane and shoulder width CMFs calculated in Exhibits 14 and 16. We recommend adding additional discussion to the text of the report indicating how these CMFs were calculated.
- The calculated predicted crash frequency results were not weighted based on actual crash frequency data. Although the analysis presented in the traffic report is conservative, we recommend that the calculated frequencies be adjusted, or weighted, based on actual observed crash frequencies. This is accomplished by using the Empirical Bayes Method, as describe in Part C of the HSM, which improves the reliability of the estimate. Completion of this step would make the analysis more accurate and help to avoid the possibility that an overestimate of predicted accident frequency leads to the requirement of potentially costly roadway improvements, which otherwise may not be needed. This is especially important since the predicted accident frequency for the 19-year historic period (2.6 accidents) is higher than the actual observed accident frequency (2 accidents) for

this same period. Consideration should be given to weighting the calculated predicted crash frequency results with actual observed crash frequency data.

Note that the issues identified above likely will not have a significant effect on the accident analysis results because of the relatively short study segments and very low traffic volumes. However, they should be considered as they will provide for a more complete and reliable safety analysis.

The traffic study does not identify the thresholds used for determining what magnitude of increase in accident frequency would be considered significant, thereby warranting roadway improvements. It is recommended that the risk assessment thresholds identified in *Guidelines for Geometric Design of Very Low-Volume Roads* (see below) be considered for use as the thresholds.

The traffic analysis compares the projected accident frequencies with the project to accident frequencies associated with "historic" conditions when the site was previously in operation (i.e., pre-2005 conditions). This comparison is useful to gain perspective on how the projected traffic volumes and accident conditions will compare to previous times when roadway volumes were similar. However, we recommend using existing conditions for the baseline to which project conditions are compared for the purpose of determining significant changes in accident frequency. This provides a more conservative analysis and evaluates the change in accident frequency in comparison to conditions that drivers know and understand today. The comparison of project conditions to existing conditions and the use of some threshold of significance should be combined with engineering judgment to determine if roadway improvements are necessary to remedy a potentially significant increase in accident frequency.

Safety Analysis Thresholds of Significance

The traffic study relies on the AASHTO publication *Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT ≤ 400)* to determine if roadway improvements are warranted. This document was developed to present design guidelines for the unique operating characteristics of very low-volume local roads. It recognizes that developing such roadways to traditional design standards (such as those in AASHTO's *A Policy on Geometric Design of Highways and Streets*) could be very costly and may not provide significant additional safety or operational benefits. The design philosophy of very low-volume local roads employs a risk assessment approach in which safety and cost (i.e., cost effectiveness) are the only factors used to define minimum design criteria. Other factors such as level of service, delay, and driver comfort/ convenience are not considered of sufficient importance to influence the fundamental design criteria for very low-volume local roads. According to *Guidelines for Geometric Design of Very Low-Volume Local Roads,* the following risk assessment thresholds are used for new construction:

- For urban or low-speed facilities, an acceptable safety risk is represented by an action or proposed action that is expected to result in no more than one additional traffic crash per mile of roadway every 4 to 6 years.
- For rural or high-speed facilities, an acceptable safety risk is represented by an action or proposed action that is expected to result in no more than one additional traffic crash per mile of roadway every 6 to 9 years.

There are no thresholds cited for evaluating existing roadways in which traffic volumes would increase due to a proposed development project. However, we feel that these same thresholds could be used to assess the magnitude of likely safety impacts on an existing road associated with a new development project in which the "action" or "proposed action", referenced in the thresholds above, would be the change in traffic volume attributable to the proposed

development project. Note that these are not thresholds for identifying significant environmental impacts. Instead, these thresholds provide a tool to assist the County and the applicant's design engineer in determining when and if safety improvements should be made. Engineering judgment should be used on a case-by-case basis in instances where these thresholds are met and roadway improvements are considered.

Roadway Design Standards

The design guidelines presented in *Guidelines for Geometric Design of Very Low-Volume Local Roads* are based on two unique fundamental characteristics for very low-volume local roads:

1. These roads carry very low traffic volumes (400 vehicles per day or less). As such, encounters between vehicles, that represent opportunities for accidents to occur, are rare and multiple vehicle collisions are extremely rare events.
2. The local nature of the road means that most drivers using the road have traveled on it before and are familiar with its features.

Based on the functional roadway classifications provided in the AASHTO document, Paraiso Springs Road and Clark Road would currently be classified as Rural Minor Access Roads. Such roads primarily provide access to properties and are predominantly used by drivers that are familiar with the area.

With the development of the proposed project, a higher proportion of traffic on these roadways would be made up of drivers that may not be familiar with the area (hotel guests and tourists). As such, the functional classification of Paraiso Springs Road and Clark Road would shift to that of Rural Recreational and Scenic Roads. The important distinction here is that the design standards for rural recreational and scenic roads are a little more conservative given the fact that a higher proportion of drivers are unfamiliar with the terrain and roadway facility.

For Rural Recreational and Scenic Roads, the following design standards apply:

- Total Roadway Width: 20 feet for design speeds of 40 mph or more. The total roadway width includes the traveled way width and any available shoulder.
- Clear Zone Width: 6 feet or more should be considered in areas where it can be provided at low cost and with minimal social/environmental impacts. Where constraints of cost, terrain, right-of-way, or potential social/environmental impacts make this impractical, clear recovery areas less than 6 feet in width (including designs with no recovery zone), may be used. In all cases engineering judgment should be used when selecting the appropriate clear zone design.
- Roadside Barriers: The use of guardrail or other traffic barriers to protect drivers from roadside obstructions is not generally cost-effective for very low-volume local roads and is not recommended for such roads. However, engineering judgment can be used concerning the placement of guardrail at locations where the potential consequences of departure from the roadway are likely to be extremely severe.
- Sight Distances, Horizontal Alignment, and Vertical Alignment: These geometric design features shall be based on the appropriate equations, tables, and figures as presented in *Guidelines for Geometric Design of Very Low-Volume Local Roads.*

We believe that the use of this document for identifying the need and extent of improvements to Paraiso Springs Road and Clark Road is appropriate given the rural nature and low traffic volumes associated with these roadways, under existing conditions and during the early phases

of the project development. However, as shown in Exhibits 9 and 10 of the traffic report, portions of Paraiso Springs would carry more than 400 trips per day under project buildout at 70% occupancy and the entire route would exceed 400 trips per day under project buildout at 100% occupancy. Therefore, at some point during the development of the project, roadway conditions on Paraiso Springs Road and on Clark Road will exceed the thresholds for which the design guidelines apply, as cited in AASHTO's *Guidelines for Low Volume Roads*. When this occurs, a more conservative roadway design standard may be necessary. The appropriate roadway design standard should be determined in consultation with County traffic engineers.

It is recommended that the risk assessment thresholds contained in *Guidelines for Geometric Design of Very Low-Volume Local Roads* and summarized above be considered for use as the thresholds for determining if roadway improvements are warranted as a result of the added traffic volume associated with the project.

Additionally, any roadway improvements made to these two roadways should, at a minimum, meet the design standards for Rural Recreational and Scenic Roads, as documented in the AASHTO publication. The design standards for rural recreational and scenic roads can be applied during conditions when the ADT is at or below 400 vehicles per day. When the roadway volume exceeds this threshold, more conservative design standards may be necessary. Additionally, County traffic engineers should be consulted and engineering judgment should be exercised on a case-by-case basis to determine the extent and timing of necessary roadway improvements.

Conclusions and Recommendations

Hexagon's review of the traffic study identified the following key issues and observations:

- It is recommended that the values or methodology used to derive the 69% cumulative traffic growth factor be documented in the report.
- The various assumptions, methodologies, and calculations used in the trip generation analysis should be verified for accuracy and correctness. It is recommended that additional documentation be added to the traffic study to support the trip generation analysis in order to make the environmental document for this project more defensible and provide additional clarity for the general public.
- It is recommended that the effects of other geometric features on the study route be considered, such as grade, vertical curvature, horizontal curvature, and key intersections. It is recommended that additional documentation be added to the report with respect to the calculated crash modification factors used in the analysis. Consideration should be given to weighting the accident analysis results with actual observed crash data for the study route. Additionally, the various assumptions used in the safety analysis should be documented in the traffic study.
- The traffic analysis compares the projected accident frequencies with the project to accident frequencies associated with "historic" conditions when the site was previously in operation. We recommend using existing conditions for the baseline to which project conditions are compared. This procedure should be combined with engineering judgment and consultation with County traffic engineers to determine if roadway improvements are necessary to remedy a potentially significant increase in accident frequency.
- The traffic study does not identify the thresholds used for determining what magnitude of increase in accident frequency would be considered significant, thereby warranting roadway improvements. It is recommended that the risk assessment thresholds

contained in *Guidelines for Geometric Design of Very Low-Volume Local Roads* be considered as the thresholds for determining if roadway improvements are warranted as a result of the added traffic volume associated with the project.

- Any roadway improvements made should, at a minimum, meet the design standards for Rural Recreational and Scenic Roads. County traffic engineers should be consulted and engineering judgment should be exercised on a case-by-case basis to determine the extent and timing of necessary roadway improvements. The design standards for Rural Recreational and Scenic Roads can be applied during conditions when the ADT is at or below 400 vehicles per day. When the roadway volume exceeds this threshold, more conservative design standards may be necessary. The appropriate roadway design standard should be determined in consultation with County traffic engineers.

This concludes our analysis. If you have any questions or would like to discuss these results, please do not hesitate to call. Thank you.

Sincerely,

Hexagon Transportation Consultants, Inc.

Jeffrey A. Elia, P.E.
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