Scientific Resources Associated
1328 Kaimalino Lane
San Diego, CA 92109

Memorandum

To:	County of San Diego	**From:**	Valorie Thompson
Re:	Construction Crushing and Blasting Emissions Otay Ranch Village 13	**Date:**	September 29, 2015

☐ **Urgent** ☐ **For Review** ☐ **Please Comment** ☐ **Please Reply** ☐ **Please Recycle**

Introduction

This technical memorandum addresses the air emissions associated with the proposed Project's blasting and rock crushing activities. The Draft EIR presented estimates of air emissions associated with these activities based on the best available data at the time of its preparation. Following circulation of the Draft EIR and in response to comments received on the air quality effects of these activities, estimates of the amounts of blasting and rock crushing proposed by the Project have been refined. This technical memorandum, therefore, presents an updated analysis of construction emissions that takes into account the refined information, which is presented as Attachment A to this memorandum.

Rock Crushing

The air quality analysis presented in the Draft EIR accounted for emissions from the crushing of rock at the Project site. (The crushed rock would be used to provide base materials for construction.) The analysis assumed that a diesel-powered portable rock crusher would be used to crush a maximum of approximately 500 tons of rock per day.

As mentioned above, the Draft EIR's air emissions estimates for rock crushing activities were based on the best available data at the time of its preparation. Subsequent to circulation of the Draft EIR, it was determined that the Project will require approximately 225,000 tons of rock crushing and will result in approximately 130 days of crushing. Portable crushers can process up to 4,000 tons of rock per day.[1] Accordingly, the emissions estimates have been updated to reflect a maximum daily production of 4,000 tons of rock.

As compared to the emissions estimates disclosed in the Draft EIR, this revision results in an increase in maximum daily construction PM_{10} emissions of 11.99 lbs/day, and an increase in maximum daily construction $PM_{2.5}$ emissions of 3.99 lbs/day.[2] Air emission calculations are provided in Attachment B to this technical memorandum.

Blasting

Blasting emissions were calculated in the Draft EIR assuming a maximum daily blast amount of approximately 97,652 lbs of explosives for a total of 49 days of blasting. Based on the revised information provided in Attachment A, it is estimated that a maximum daily blast amount of 48,000 lbs of explosives would be used, for a total of 114 to 125 days of blasting.

Based on this refined information, the maximum daily emissions associated with blasting were updated in the air quality calculations. While the number of days of blasting has increased, the maximum daily emissions associated with blasting would decrease due to the smaller amount of explosives to be used. As compared to the emissions estimates disclosed in the Draft EIR, this revision decreases the maximum daily construction emissions as follows: 252.15 fewer lbs/day of NOx; 1,576.78 fewer lbs/day of CO; 2,507.61 fewer lbs/day of PM_{10}; and 190.64 fewer lbs/day of $PM_{2.5}$.[3]

Summary

Table 1 presents a summary of the updated air emissions estimates for the proposed Project's construction phase without dust controls. Table 2 presents a summary of the updated air emissions estimates for the proposed Project's construction phase with dust controls. It should be noted that the CalEEMod model runs were not updated as

[1] Based on a telephone conversation between Stephen Haase of Baldwin & Sons, LLC (one of the Project applicants) and John Atkins of Vulcan Materials Company in August 2015. Vulcan Materials Company is a publicly traded company with operations in San Diego County. Vulcan is the nation's largest producer of construction aggregates—primarily crushed stone, sand and gravel—and a major producer of aggregates-based construction materials, including asphalt and ready-mixed concrete.

[2] The update to the amount of rock crushed in a single day does not affect the emissions of VOCs, CO, NOx, and SOx, because the generator would still be operated for 8 hours per day.

[3] The updated blasting information affects the emission calculations for NOx, CO, PM_{10}, and $PM_{2.5}$. The U.S. EPA does not provide estimates for VOC and SOx emissions from blasting because such emissions would be negligible.

the rock crushing and blasting emissions calculations must be conducted outside of CalEEMod.

The emissions presented in Table 1 represent a worst-case scenario in which blasting, rock crushing, and the maximum construction emissions that could occur in any year of construction for each pollutant overlap (i.e., occur on the same day). That is unlikely to occur at the Project site, as it is unlikely that blasting would occur on the same day that rock crushing and other construction activities, such as building construction, would occur. However, for the purpose of presenting a worst-case emissions scenario, this assumption has been made in the analysis.

Table 1 – Maximum Daily Construction Emissions, without dust controls[1]

Construction Year	VOC (lbs/day)	NO_X (lbs/day)	CO (lbs/day)	SO_2 (lbs/day)	PM_{10} (lbs/day)	$PM_{2.5}$ (lbs/day)
Blasting Emissions[2]	-	408.00 ~~660.15~~	1,608.00 ~~3,184.78~~	-	2,208.00 ~~4,715.61~~	244.80 ~~435.44~~
Rock Crushing Emissions[2]	1.45	19.16	5.78	0.03	14.21 ~~2.22~~	4.65 ~~0.66~~
Year 1	51.25	344.97	341.50	0.33	33.25	23.32
Year 2	65.38	335.42	382.71	0.34	31.83	22.29
Year 3	66.19	320.60	412.06	0.36	32.71	21.49
Year 4	62.77	277.82	387.54	0.36	30.18	19.23
Year 5	61.68	260.89	378.73	0.37	29.14	18.18
Year 6	94.70	250.31	439.89	0.44	32.41	18.19
Year 7	61.51	210.34	353.24	0.36	26.84	15.91
Year 8	67.58	192.43	389.35	0.38	27.03	15.09
Year 9	55.88	172.12	329.11	0.36	24.39	14.04
Year 10	27.40	141.37	221.91	0.30	20.59	12.63
Year 11	33.13	67.87	111.44	0.21	6.89	3.89
Maximum Daily Emissions based on Revised Information	96.15	762.58	2,053.67	0.47	2,255.46	272.77
Maximum Daily Emissions in Draft EIR Table 2.2-6	96.15	1,024.28	3,630.45	0.47	4,751.08	459.42
Screening Level Thresholds (SLT)	75	250	550	250	100	55
Significant Impact?	***Yes***	***Yes***	***Yes***	No	***Yes***	***Yes***

Notes:
[1] Maximum daily emissions calculated using the CalEEMod Model. CalEEMod identifies the maximum daily emissions for each pollutant regardless of whether the maximum for each pollutant occurs at the same time. Maximum ROG emissions occur with the overlap of architectural coatings application, building construction, and paving for all construction years. Maximum daily emissions of all other pollutants occur with the overlap of grading, trenching, and building construction.
[2] Based on updated information. Maximum daily emissions conservatively assume that rock crushing, blasting, and other construction occur simultaneously.

All emissions have been modeled assuming compliance with the County's Grading, Clearing and Watercourses Ordinance and SDAPCD Rule 67.

VOC =volatile organic compounds; NO_X = oxides of nitrogen; CO = carbon monoxide; SO_2 = sulfur dioxide; PM_{10} = suspended particulate matter; $PM_{2.5}$ = fine particulate matter

Table 2 – Maximum Daily Construction Emissions, with dust controls[1]

Construction Year	VOC (lbs/day)	NO_X (lbs/day)	CO (lbs/day)	SO_2 (lbs/day)	PM_{10} (lbs/day)	$PM_{2.5}$ (lbs/day)
Blasting Emissions[2]	-	408.00 ~~660.15~~	1,608.00 ~~3,184.78~~	-	2,208.00 ~~4,715.61~~	244.80 ~~435.44~~
Rock Crushing Emissions[2]	1.45	19.16	5.78	0.03	14.21 ~~2.22~~	4.65 ~~0.66~~
Year 1	51.25	344.97	341.50	0.33	25.11	19.17
Year 2	65.38	335.42	382.71	0.34	24.09	18.21
Year 3	66.19	320.60	412.06	0.36	23.86	17.24
Year 4	62.77	277.82	387.54	0.36	21.33	14.98
Year 5	61.68	260.89	378.73	0.37	20.28	13.93
Year 6	94.70	250.31	439.89	0.44	23.12	13.88
Year 7	61.51	210.34	353.24	0.36	17.96	11.65
Year 8	67.58	192.43	389.35	0.38	17.76	10.78
Year 9	55.88	172.12	329.11	0.36	15.56	9.79
Year 10	27.40	141.37	221.91	0.30	12.56	8.49
Year 11	33.13	67.87	111.44	0.21	6.89	3.89
Maximum Daily Emissions based on Revised Information	96.15	762.58	2,053.67	0.47	2,247.32	268.62
Maximum Daily Emissions in Draft EIR Table 2.2-6	96.15	1,024.28	3,630.45	0.47	4,742.94	455.27
Screening Level Thresholds (SLT)	75	250	550	250	100	55
Significant Impact?	***Yes***	***Yes***	***Yes***	No	***Yes***	***Yes***

Notes:

[1] Maximum daily emissions calculated using the CalEEMod Model. CalEEMod identifies the maximum daily emissions for each pollutant regardless of whether the maximum for each pollutant occurs at the same time. Maximum ROG emissions occur with the overlap of architectural coatings application, building construction, and paving for all construction years. Maximum daily emissions of all other pollutants occur with the overlap of grading, trenching, and building construction.

[2] Based on updated information. Maximum daily emissions conservatively assume that rock crushing, blasting, and other construction occur simultaneously.

All emissions have been modeled assuming compliance with the County's Grading, Clearing and Watercourses Ordinance and SDAPCD Rule 67.

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Conclusion

The rock crushing and blasting emissions have been reevaluated based on updated information available from the Project Applicants. Based on the updated evaluation, emissions of VOCs and SOx did not change from the emissions presented in the Draft EIR because emissions of VOCs and SOx from blasting are negligible based on U.S. EPA estimates, and because the source of VOCs and SOx from rock crushing is

solely attributable to the operation of the generator, which would not change. Emissions of NOx, CO, PM_{10}, and $PM_{2.5}$ would decrease from the levels presented in the Draft EIR, but would remain above the significance thresholds for these pollutants. The conclusions in the Draft EIR are unchanged.

Valorie L. Thompson, Ph.D.

Attachment A

Blast Analysis

Table B-1
Rock Crushing Operation
Generator Emissions
Otay Ranch Resort Village

				Emission Factors, lbs/hr								
	Number	Kilowatts	Horsepower	**CO**	**ROC**	**NOx**	**SOx**	**PM10**	**CO2**			
Crusher Generator	1	300	400	7.23E-01	1.82E-01	2.3955	3.30E-03	6.90E-02	3.37E+02			
Total												

Table B-2
Rock Crushing Emissions
Otay Ranch Resort Village

Rock Crushing Emissions

Source: EPA's AP-42 Emission Factors, Section 11.19.2, Crushed Stone Processing
Assumptions - 91,200 cubic yards of material, assume 1.6 tons per cubic yard
Total crushed material = 225,000 tons
Days of Crushing 130

Emission Factors			
Tertiary crushing		0.0024	lbs/ton
Conveyor Transfer		0.001	lbs/ton
Truck unloading, fragmented stone		1.60E-05	lbs/ton
Total Emissions		PM10	PM2.5
Tons/year		3.84E-01	1.15E-01
Max Daily Emissions		13.66	4.10

Assume PM2.5 is 30% of PM10 based on SCAQMD PM2.5 guidance

Table B-3
Blasting Emissions
Otay Ranch Resort Village

Blasting Scenario

Days of Blasting	114 to 125	blasts
Blasts/day	1	blast
Total Pounds per Day	48,000	lbs/day

Emission Factors

CO emission factor	67	lbs/ton explosive
NOx emission factor	17	lbs/ton explosive
PM10 emission factor	46	kg/tonne explosive
PM2.5 emission factor	5.1	kg/tonne explosive

Emissions

CO emissions	1608.00	lbs/day
NOx emissions	408.00	lbs/day
PM10 emissions	2208.00	lbs/day
PM2.5 emissions	244.80	lbs/day

Source:
CO and Nox Emission factors: U.S. EPA. 1995. AP-42, Volume I, Fifth Edition, Compilatino of Air Pollutant Emission Factors: Chapter 13.3 Explosives Detonation. October 2009
http://www3.epa.gov/ttn/chief/ap42/ch13/final/c13s03.pdf
Accessed September 18, 2015
PM10 and PM2.5 Emission Factors: Australian Government Department of Environment. 2012. National Pollutant Inventory Emission Estimation Technique Manual for Explosive Detonation and Firing Ranges Version 2.0.
http://www.npi.gov.au/system/files/resources/e635847a-22ef-9f74-71ba-c10705d09e59/files/fexplos.pdf
Accessed September 18, 2015

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M. J. BAXTER DRILLING COMPANY

Project:

Otay Ranch Resort Village 13
San Diego County, California

September 29, 2015

Blasting Analysis

Per your request, our firm performed a blasting analysis using the geotechnical information provided by Geocon Incorporated along with their geologic map with the locations of the air track borings, excavator trenches and seismic lines.

After reviewing this information, it is our opinion that blasting will be required mostly in the Metavolcanic formations and expect some in the Fanglomerate deposits where highly cemented.

This analysis will address three points concerning the blasting at the Otay Ranch Resort Village 13 Project. These three points are as follows:

- **Estimated amount of material and schedule to complete blasting of each phase area.**
- **Mitigation measures to address noise, dust and ground vibration.**
- **The total estimated amount of blasting materials required for development and the total estimated number of days required for blasting.**

In order to start addressing the above mentioned points, we need an estimated volume for the drilling and blasting for this project. Based on the data we have, along with our experience in the area with drilling and blasting in similar geology, we believe that 5.2 million cubic yards of drilling and blasting may be required. This estimated volume may vary depending on equipment size and methods used by the grading contractor.

Estimated amount of material and schedule to complete blasting of each phase area:

The following projections are based on two drills working 50 hours per week.

- Copper Phase: 292,000 yards- 7 weeks= 6 Blasts
- Gold Phase: 665,000 yards- 14 weeks= 14 Blasts
- Green Phase: 521,000 yards-11 weeks= 11 Blasts
- Orange Phase: 2,709,000 yards- 57 weeks= 56 Blasts
- Yellow Phase: 635,100 yards- 14 weeks= 13 Blasts
- Silver Phase: 127,059 yards- 3 weeks= 4 Blasts
- Tan Phase: 104,389 yards- 3 weeks= 4 Blasts
- Reservoir: 36,928 yards= 1 week= 1 Blast
- Otay Rd. (Back): 84,643 yards= 3 weeks= 4 Blasts
- Otay Road: 16,694 yards= ½ week= 1 Blast

Totals: 10 Phases: 5,191,813 yards= 113 ½ weeks= 114 Blasts

Note: The above are estimates only and can vary depending on conditions dealing with subsurface projects. The above estimates are based on current conditions with new homes constructed and occupied within the village. Building in phases can vary the shot sizes depending on the distances to new structures.

Best practices to address noise, dust and ground vibration:

The advantage here is the location of this project and the distances to the existing homes. Based on our analysis the closest homes are to the west at approximately 1,436 feet. To the northwest the closest is approximately 2,440 feet. With these distances and based on our experience blasting within 150 feet of existing homes, the effects of noise, dust and vibration will be minimal. However, the following methods can be applied to help reduce further any concerns if they arise.

For addressing any noise complaints we can design the shots so they are facing to the east exposing any free faces away from the existing homes. Also, leaving overburden above the rock zones will help minimize the noise of the blast and any fly-rock.

The primary noise generation results from drilling to create the boreholes for explosives. As discussed in the noise analysis for the project, an 800 foot buffer from the blast areas is recommended to reduce noise levels to the nearest residential property line to below a level of significance. The attached exhibit "Otay Ranch Village 12 Drilling/Blasting Areas- Noise Buffer" demarks the limits of the buffer area to be implemented for the drilling operation.

For addressing any dust complaints we can pre-water the ground prior to drilling and also wet the shots prior to initiation. This helps some but will not eliminate the dust. However, due to the distances from the existing houses the dust will dissipate before reaching the homes. It will be more of a visual effect that a dust problem.

For addressing the ground vibration, we feel based on the distances from the existing homes the vibration effects will be null or under .05 inches per second or five hundreds of an inch. We would recommend due to the estimated volume of blasting that three or four existing homes on the western side be inspected to provide documentation of any existing damage or cosmetic cracks prior to the blasting. Also, portable seismographs will be used to accurately measure ground vibration and air blast levels. This tool not only gives irrefutable evidence to actual possibilities of damage, but gives the blaster immediate indicators for blasting design confirmation.

Estimated amount of blasting material and number of days required for blasting:

Based on our estimated 5.2 million cubic yards of blasting and the standard one pound per cubic yard we would estimate 5.2 million pounds of materials. The blasting material will consist of Ammonium Nitrate/Fuel Oil (ANFO) and/or emulsion slurry explosives which with best industry standards of care and adequately primed charges reduce losses of ammonium and nitrates in the ground or in ground water to immeasurable levels due to the burn rate and consumption in the borehole.

I want to point out with the modern technology in today's blasting systems we can use a larger amount of explosives per blast due to the delay timing between holes. If we have for example; a 300 hole shot we can delay the holes so they are firing independently minimizing the vibration effect to the surrounding area. We are also able to direct the shot to move in a predetermined direction to minimize air blast where existing homes are present. Based on a similar project of 1.7 million cubic yards of blasting with a commercial site within 200 feet at the closest point we averaged approximately 24,000 pound shots which equaled 70 total shots. With this project and the distances at 1,436 feet to the closest homes we estimate shot sizes can double to maximum of 48,000 pounds which would be approximately 114-125 shots.

Additional Observations and Conclusions:

Based on our 69 years of experience in the drilling and blasting industry, this project does not present any unusual circumstances and we anticipate a safe and expedient blasting operation where blasting is required. We would recommend having a homeowner's pre-construction meeting to discuss the project and the blasting that will be required. These meetings have been extremely important in educating existing homeowner's who might have concerns about blasting in their area.

Blasting is used daily in construction throughout the world; it is the most cost-effective method for breaking rock. Rock excavation by blasting takes a fraction of the time required by conventional ripping and hydraulic breakers.

Strict government limits are based on extensive research conducted by many agencies throughout the world. Federal, State, and local government agencies impose restrictions and laws pertaining to vibration and air-blast limits. The leading, and one of the most conservative sources used for these limits, is the United States Bureau of Mines (USBM). The USBM has conducted over 100 years of blast testing with relation to various types of structures.

In conclusion, this project has a benefit of having open space as a buffer between the cut areas and the existing homes. While blasting will be required, the effects on the surrounding homeowners will be minimal using the most modern technology available in the blasting industry.

M.J. Baxter Drilling Company has been involved over the years in very highly sensitive blasting projects in the middle of towns, next to existing dams, middle of streets, and next to high pressure gas lines. In all these projects we were successful using our experience, quality workmanship and commitment to safety.

Thank you for the opportunity to provide our services. If we can be of further service or you should have questions regarding this report, please contact our office at your convenience.

Sincerely,

Glenn Inverso
President

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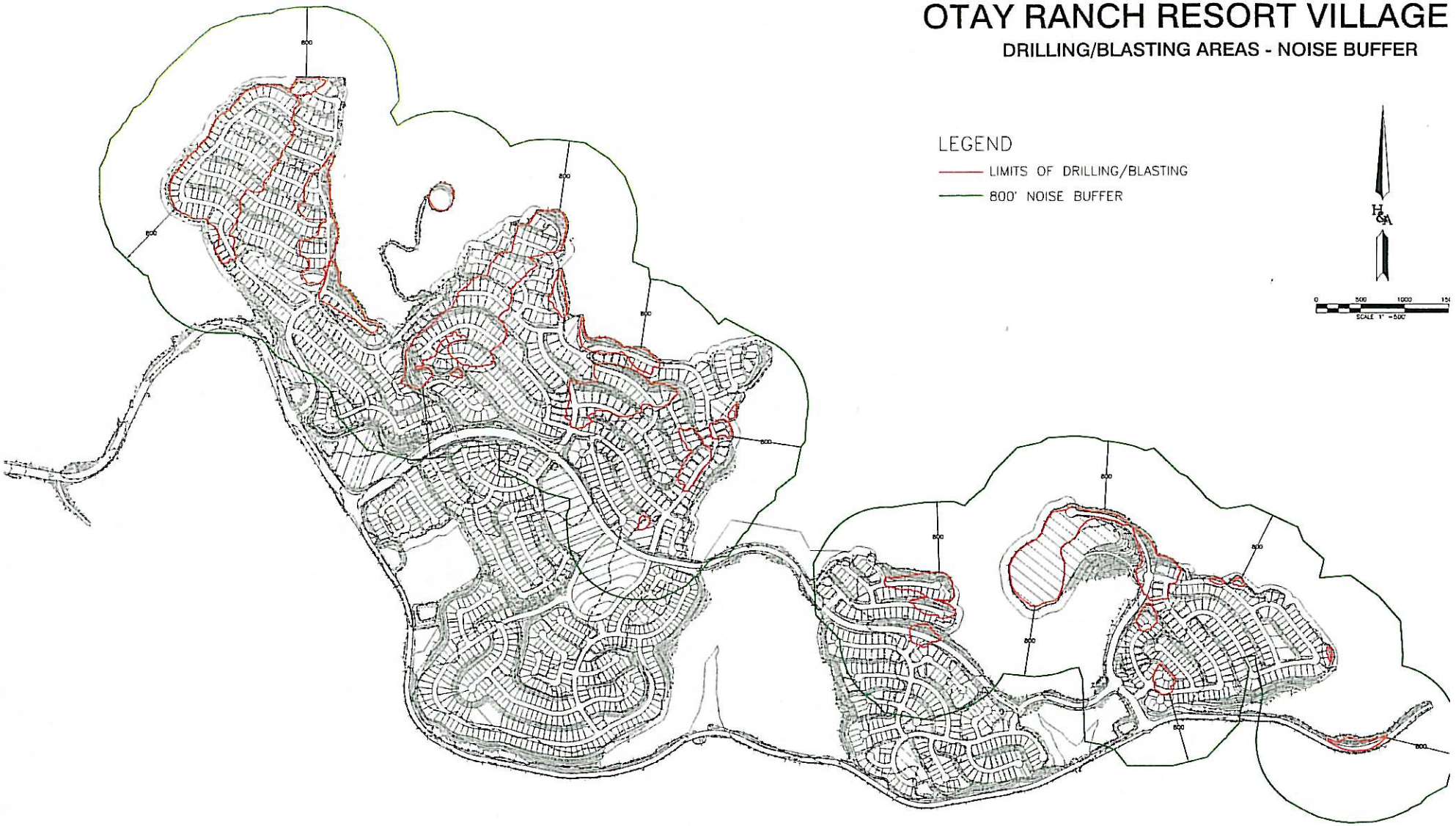
Serving Southern California for over 69 years! ***God Bless America.***

OTAY RANCH RESORT VILLAGE

DRILLING/BLASTING AREAS - NOISE BUFFER



HUNSAKER & ASSOCIATES SAN DIEGO