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June 12, 2023

00821.00017.001

Ms. Tracy Zinn  
T&B Planning, Inc.  
3200 El Camino Real, Suite 100  
Irvine, CA 92602

**Subject: Energy Impact Assessment for the Construction and Operation of the Questhaven Project, San Diego County, CA**

Dear Ms. Zinn:

HELIX Environmental Planning, Inc. (HELIX) has assessed energy consumption impacts associated with the construction and operation of the proposed Questhaven Project (project). This letter summarizes the findings of the energy consumption impacts assessment.

## **PROJECT DESCRIPTION**

The project site consists of 89.23 acres in the western portion of unincorporated San Diego County within the San Dieguito Community Plan Area. From a regional perspective, the project site is located immediately south and west of the city of San Marcos and east of the city of Carlsbad. Interstate 5 (I-5) is located approximately 5.3 miles west of the project site. Specifically, the project site is located south of San Elijo Road and east of Denning Drive (see Figure 1, *Regional Location*, and Figure 2, *Aerial Photo*). The project site encompasses Assessor's Parcel Numbers (APNs) 223-080-46-00; 223-070-07-00; and 223-070-08-00.

The project consists of a Tentative Map, Density Bonus Permit, and an Administrative Permit for the 89.23-acre site. The project would provide for development of 76 single-family residential homes on 18.3 acres, recreation/community park uses on 0.3 acre, open space on 63.9 acres, internal streets and external road improvements totaling approximately 4.3 acres, and water quality detention basins on 2.4 acres. The project would cluster development in the northeastern portion of the project site to allow for the development of residential uses while providing 53.1 acres of biological open space in the southern and western portion of the site. A wildlife corridor would connect the biological open space with open space lands south and west of the project site. The project would connect to existing utilities within San Elijo Road and existing facilities that occupy existing easements along the project's easterly boundary. Access to the project would be provided via two full access connections to San Elijo Road (see Figure 3, *Site Plan*).

## **Regulatory Requirements and Project Design Feature that Reduce Energy Consumption**

The project would be designed without natural gas infrastructure, requiring the use of all electric appliances. The project would be required to meet 2022 Title 24 Part 6 energy efficiency standards and Part 11, California Green Building (CALGreen) standards, including the requirement for on-site photovoltaic (solar) energy generation for new residential buildings three or fewer stories high and cool/green roofs (California Energy Commission [CEC] 2022; California Building Standards Commission [CBSC] 2022). In addition, the project would provide 20 percent water indoor reduction in accordance with CALGreen Standards using low flow plumbing fixtures and fittings (CBSC 2022), and the project would comply with the County's Water Conservation in Landscaping Ordinance requirements and would demonstrate a 40 percent reduction in current Maximum Applied Water Allowance (MAWA) for outdoor water use using drought tolerant landscaping and water efficient irrigation (County 2020).

### **REGULATORY FRAMEWORK**

#### **Federal Energy Regulations**

Energy Independence and Security Act of 2007

House of Representatives Bill 6 (HR 6), the federal Energy Independence and Security Act of 2007, established new standards for a few energy-consuming equipment types not already subject to a standard, and updated some existing standards. The most substantial new standard that HR 6 established was for general service lighting that is being deployed in two phases. First, phased in between 2012 through 2014, common light bulbs were required to use about 20 to 30 percent less energy than previous incandescent bulbs. Second, by 2020, light bulbs were required to consume 60 percent less energy than previous incandescent bulbs; this requirement will effectively phase out the incandescent light bulb.

#### **California Energy Regulations and Plans**

Renewable Energy Programs and Mandates (SB 1078, SB 107, SB 2 X1, SB 350, and SB 100)

A series of substantive legislative initiatives have been advanced at the State level in the last two decades. These initiatives focused on increasing the generation of electricity via renewable energy sources and promoting a shift away from fossil- or carbon-based fuels as a key strategy to reduce GHG emissions, air pollution, and water use associated with the energy sector.

In 2002, California established the Renewables Portfolio Standard (RPS) with Senate Bill (SB) 1078, requiring electric utilities in the State to increase procurement of eligible renewable energy resources to achieve a target of 20 percent of their annual retail sales by the year 2010. In 2011, Governor Jerry Brown approved the California Renewable Energy Resources Act, SB 2 X1. SB 2 X1 legislatively broadened the scope of the State RPS to include retail electricity sellers; investor- and publicly owned utilities; municipal utilities; and community choice aggregators under the mandate to obtain 33 percent of their retail electrical energy sales from renewable sources by 2020.

Approved by Governor Brown on October 7, 2015, SB 350 increased California's renewable electricity procurement goal from 33 percent by 2020 to 50 percent by 2030. This will increase the use of Renewables Portfolio Standard eligible resources, including solar, wind, biomass, and geothermal. In addition, large utilities are required to develop and submit Integrated Resource Plans to detail how each entity will meet their customers resource needs, reduce GHG emissions, and increase the use of clean energy.

Approved by Governor Brown on September 10, 2018, SB 100 extended the renewable electricity procurement goals and requirements of SB 350. SB 100 requires that all retail sale of electricity to California end-use customers be procured from 100 percent eligible renewable energy resources and/or zero-carbon resources by the end of 2045.

### California Energy Plan

The CEC is responsible for preparing the State Energy Plan, which identifies emerging trends related to energy supply, demand, conservation, public health and safety, and the maintenance of a healthy economy. The plan calls for the state to assist in the transformation of the transportation system to improve air quality, reduce congestion, and increase the efficient use of fuel supplies with the fewest environmental and energy costs. To further this policy, the plan identifies a number of strategies, including providing assistance to public agencies and fleet operators.

### California Energy Code

California Code of Regulations (CCR) Title 24 Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings were first established in 1978 in response to a legislative mandate to reduce California's energy consumption. Energy-efficient buildings require less electricity, natural gas, and other fuels. Electricity production from fossil fuels and on-site fuel combustion (typically for water heating) results in GHG emissions.

The Title 24 standards are updated approximately every three years to allow consideration and possible incorporation of new energy efficiency technologies and methods. The latest update to the Title 24 standards occurred in 2022 and went into effect on January 1, 2023. The Building Energy Efficiency Standards focus on several key areas to improve the energy efficiency of newly constructed buildings and additions and alterations to existing buildings. The most significant efficiency improvements to the residential standards include improvements for attics, walls, water heating, and lighting, and the requirement for on-site photovoltaic (solar) energy generation for new residential buildings three or fewer stories high. The standards are divided into three basic sets. First, there is a basic set of mandatory requirements that apply to all buildings. Second, there is a set of performance standards—the energy budgets—that vary by climate zone (of which there are 16 in California) and building type; thus, the standards are tailored to local conditions. Finally, the third set constitutes an alternative to the performance standards, which is a set of prescriptive packages that are basically a recipe or a checklist compliance approach (CEC 2022).

### California Green Building Standards Code

The California Green Building Standards Code (CALGreen; CCR Title 24, Part 11) is a code with mandatory requirements for new residential and nonresidential buildings (including industrial buildings) throughout California. The code is Part 11 of the California Building Standards Code in Title 24 of the CCR.

The current 2022 Standards for new construction of, and additions and alterations to, residential and nonresidential buildings went into effect on January 1, 2023 (CBSC 2022).

The development of CALGreen is intended to (1) cause a reduction in GHG emissions from buildings; (2) promote environmentally responsible, cost-effective, healthier places to live and work; (3) reduce energy and water consumption; and (4) respond to the directives by the Governor. In short, the code is established to reduce construction waste; make buildings more efficient in the use of materials and energy; and reduce environmental impact during and after construction.

CALGreen contains requirements for storm water control during construction; construction waste reduction; indoor water use reduction; material selection; natural resource conservation; site irrigation conservation; and more. The code provides for design options allowing the designer to determine how best to achieve compliance for a given site or building condition. The code also requires building commissioning, which is a process for the verification that all building systems, like heating and cooling equipment and lighting systems, are functioning at their maximum efficiency.

## **Regional Energy Regulations and Plans**

### San Diego Association of Governments Regional Energy Strategy

The San Diego Association of Governments' (SANDAG's) 2009 Regional Energy Strategy (RES) serves as the energy policy blueprint for the San Diego region through 2050. The RES identifies priority early implementation actions, essential to meeting the region's energy goals (SANDAG 2009):

- Pursue a comprehensive building retrofit program to improve efficiency and install renewable energy systems;
- Create financing programs to pay for projects and improvements that save energy;
- Utilize the SANDAG-SDG&E Local Government Partnership to help local governments identify opportunities and implement energy savings at government facilities and throughout their communities;
- Support land use and transportation planning strategies that reduce energy use and GHG emissions;
- Support planning of electric charging and alternative fueling infrastructure; and
- Support use of existing unused reclaimed water to decrease the amount of energy needed to meet the water needs of the San Diego region.

The RES identified the main drivers of the strategy, including the state's preferred loading order for meeting new energy needs and global climate change and its policy implications. The California Public Utilities Commission (CPUC) and CEC adopted a preferred loading order to meet the goals for satisfying the state's growing demand for electricity, which would place top priority on increasing energy efficiency and demand response (i.e., temporary reduction or shift in energy use during peak hours), generating new energy from renewable and distributed generation resources, and improvements to clean fossil-fueled generation and infrastructure.

## County of San Diego General Plan

The Conservation and Open Space Element of the County of San Diego General Plan contains goals and policies for energy conservation and sustainable development. Goals and policies relevant to the proposed project involve air pollutant and/or GHG reduction, which in turn would reduce energy consumption. Such policies include the following (County 2011):

- COS-14.4, Sustainable Technology and Projects: Require technologies and projects that contribute to the conservation of resources in a sustainable manner, which are compatible with community character, and that increase the self-sufficiency of individual communities, residents, and businesses.
- COS-14.10, Low-Emission Construction Vehicles and Equipment: Require County contractors and encourage other developers to use low-emission construction vehicles and equipment to improve air quality and reduce GHG emissions.

## EXISTING CONDITIONS

### State Energy Supply

#### Electricity

California's electricity needs are satisfied by a variety of entities, including investor-owned utilities, publicly owned utilities, and electric service providers. As of 2021, California electricity demand totaled 277,764 gigawatt hours (GWh). In-state generating facilities accounted for about 194,127 GWh, or 70 percent of the total electric power used in the state, with the remaining electricity coming from out-of-state imports (CEC 2023a).

#### Natural Gas

Natural gas continues to play an important and varied role in California. In 2012, nearly 45 percent of the natural gas burned in California was used for electricity generation, and much of the remainder was consumed in the residential (21 percent), industrial (25 percent), and commercial (9 percent) sectors (CEC 2020). Natural gas supplies are currently plentiful and relatively inexpensive as a result of technological advances that allow recovery of natural gas from formations such as shale reservoirs that were previously inaccessible. However, potential environmental concerns are causing decision makers to reexamine the development of shale resources and consider tighter regulations, which could affect future natural gas supplies and prices.

#### Transportation Fuels

Automobiles and trucks consume gasoline and diesel fuel, which are nonrenewable energy products derived from crude oil. In addition to energy consumption associated with on-road vehicle use, energy is consumed in connection with construction and maintenance of transportation infrastructure. Passenger cars and light-duty trucks are by far the largest consumers of transportation fuel. Retail sales of transportation fuel in California totaled 13.8 billion gallons of gasoline and 1.6 billion gallons of diesel in 2021 (CEC 2023b).

## Regional Energy Supply

The primary provider of electricity and natural gas in San Diego county is the San Diego Gas and Electric Company (SDG&E). SDG&E is a regulated public utility that provides energy service to 3.6 million people in San Diego and southern Orange counties. In 2022, SDG&E delivered 6,065 GWh of electricity and 340 million therms of natural gas to residential, commercial, industrial and agricultural customers (SDG&E 2023).

## METHODOLOGY

### Units of Measure

The units of energy used in this section are the British thermal units (Btu), kilowatt hours (kWh), therms, and gallons. A Btu is the quantity of heat required to raise the temperature of one pound of water one °F at sea level. Because the other units of energy can all be converted into equivalent Btu, the Btu is used as the basis for comparing energy consumption associated with different resources and is often expressed in millions of Btus (MMBTU). A kWh is a unit of electrical energy, and one kWh is equivalent to approximately 3,413 Btus, taking into account initial conversion losses (i.e., from one type of energy, such as chemical, to another type of energy, such as mechanical) and transmission losses. Natural gas consumption is described typically in terms of cubic feet or therms; one cubic foot of natural gas is equivalent to approximately 1.05 MMBtu, and one therm represents 0.1 MMBtu. One gallon of gasoline/diesel is equivalent to approximately 0.125/0.139 MMBtu, respectively, taking into account energy consumed in the refining process.

### Modeling and Calculations

The proposed project's direct electricity and natural gas consumption as well as the indirect electricity consumption from water/wastewater sourcing, transport, and treatment were estimated from the air quality and GHG emissions project modeling completed using the California Emissions Estimator Model (CalEEMod), Version 2022.1, as described in the project Air Quality Technical Report (HELIX 2023a) and GHG Emissions Technical Report (HELIX 2023b). Fuel consumption factors in terms of gallons per hour of diesel for off-road equipment were calculated using data from the CARB Mobile Source Emissions Inventory online database—OFFROAD2021 version 1.0.4 (CARB 2023). Fuel consumption factors, in terms of gallon of diesel and gasoline per mile travel, were calculated from the CARB Mobile Source Emissions Inventory online database—EMFAC2021 version 1.0.2 (CARB 2023). The energy calculation sheets are included as Attachment A to this letter.

Energy usage from transportation sources is associated with project-related vehicle trip generation and trip length. Based on the trip generation rate from the Transportation Study prepared for the project, the project would generate 12 average daily trips (ADT) per dwelling unit (DU) and community park would generate 2 ADT. According to the Transportation Study vehicle miles traveled (VMT) analysis, each project resident would travel 24.1 miles per day (Chen Ryan 2023). Total annual VMT for the project was estimated assuming a residential occupation rate of 2.8 persons per household per the County's Climate Action Plan (County 2018).

Project building energy consumption was estimated assuming the CalEEMod default for single-family residential and implementation of energy-reducing project design feature related to the elimination of natural gas and full electrification of household appliances.

Indirect energy consumption from water/wastewater sourcing and treatment was estimated based on the CalEEMod indoor and outdoor water use estimates from the Greenhouse Gas Emissions Technical Report (HELIX 2023b), and from CalEEMod default values for water/wastewater electricity use intensity factors for San Diego County (CAPCOA 2022).

## SIGNIFICANCE CRITERIA

According to Appendix G of the CEQA Guidelines, a project would have a significant environmental impact if it would:

1. Result in the wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation.
2. Conflict with or obstruct a state or local plan for renewable energy or energy efficiency.

## IMPACT ANALYSIS

Issue 1: Result in the wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation

### Construction Energy

Energy consumed for project construction would primarily consist of fuels in the form of diesel and gasoline. Fuel consumption would result from: the use of on-road trucks for the transportation of construction materials and water; construction worker vehicles traveling to and from the project site; and from the use of off-road construction equipment. A complete description of the project construction equipment use and vehicle trips is included in Attachment A to this letter. The estimated fuel and total energy consumed during project construction is shown in Table 1, *Construction Energy Use*. The full construction energy consumption calculation sheets are included as Attachment A to this letter.

**Table 1**  
**CONSTRUCTION ENERGY USE**

Source	Gallons Diesel	Gallons Gasoline	MMBtu
Off-Road Construction Equipment	24,155	-	3,357
On-Road Construction Traffic	9,533	6,746	2,162
<b>Total<sup>1</sup></b>	<b>33,688</b>	<b>6,746</b>	<b>5,519</b>

Source: CalEEMod; CARB 2023

<sup>1</sup> Totals may not sum due to rounding.

MMBtu = million British thermal units

While construction activities would consume petroleum-based fuels, consumption of such resources would be temporary and would cease upon the completion of construction. The petroleum consumed during project construction would be typical of similar residential projects and would not require the use of new petroleum resources beyond those typically consumed in California annually for construction activities. Based on these considerations, construction of the project would not result in wasteful, inefficient, or unnecessary consumption of energy resources and the impact would be less than significant.

## Operational Energy

During long-term operation of the project, energy would be consumed in the form of diesel and gasoline used by vehicles traveling to and from the project site; electricity required to source and treat water used by the project; and electricity used directly by the project. The project's estimated annual operational energy use (for the first full year of operation—2029) in gallons of fuel, electricity, and equivalent MMBtu is shown in Table 2, *Operational Energy Use*. The energy calculation sheets are included in Attachment A to this letter.

**Table 2**  
**OPERATIONAL ENERGY USE**

Source	Diesel (gallons)	Gasoline (gallons)	Electricity (kWh)	Total Energy (MMBtu)
Mobile	65,580	12,359	-	10,648
Water/Wastewater	-	-	241,372	824
Direct Electricity Use	-	-	131,943	450
<b>Total<sup>1</sup></b>	<b>65,580</b>	<b>12,359</b>	<b>373,315</b>	<b>11,922</b>

Source: CalEEMod; CARB 2023

<sup>1</sup> Totals may not sum due to rounding.

kWhr = kilowatt-hours; MMBtu = million British thermal units

As shown in Table 2, the project would result in a net increase in annual energy consumption of approximately 11,922 MMBtu. While the proposed project would result in the consumption of gasoline, diesel, and electricity, the increase would be consistent overall with the energy projections for the state and the region to meet the demands of anticipated future residential growth in the state and region. Implementation of the project would not require the construction of new regional facilities and sources of energy. Therefore, operation of the project would not result in wasteful, inefficient, or unnecessary consumption of energy resources and the impact would be less than significant.

Issue 2: Conflict with or obstruct a state or local plan for renewable energy or energy efficiency

The 2022 Title 24 Part 6, Building Energy Efficiency Standards, and 2022 Title 24 Part 11, CALGreen, include provisions applicable to all buildings, which are mandatory requirements for efficiency and design. The project would be consistent with the requirements of Title 24 through implementation of energy-reduction measures, such as energy efficient lighting and appliances, water efficient appliances and plumbing fixtures, water efficient landscaping and irrigation, and the onsite generation of renewable solar energy, as described above. Therefore, the project would not conflict with or obstruct a state or local plan for renewable energy or energy efficiency, and the impact would be less than significant.

## Cumulative Impact Analysis

The geographic scope for energy is the County of San Diego. Short-term and long-term cumulative development is expected to result in an increase in the demand for energy resources throughout the County. Several County programs and policies and SDG&E initiatives would serve to reduce total energy demand among cumulative projects. Additionally, minimum standards for energy efficiency are outlined



in California's Title 24 energy efficiency standards for residential buildings. SDG&E as well as state and federal agencies offer incentive programs to encourage developers to exceed Title 24 standards.

The proposed project's energy usage would not be carried out in a wasteful, inefficient, or unnecessary manner. In addition, the predominant consumer of energy for the project would be on-road vehicle travel. On-road vehicle efficiency is regulated at the State and federal level. Therefore, the proposed project's cumulative impacts related to energy usage would be less than cumulatively considerable.

## CONCLUSION

The project would comply with all applicable requirements of California's 2022 Title 24 Building energy Efficiency Standards and California Green Building Standards (CALGreen), including the requirement for on-site solar electricity generation. Construction and operation of the project would not require the development of new energy resources and distribution infrastructure. The project would not result in wasteful or inefficient consumption of energy resources and the project would not conflict a State or local plan for renewable energy or energy efficient. Impacts related to energy consumption would be less than significant.

Sincerely,



Victor Ortiz  
Senior Air Quality Specialist



Joanne Dramko, AICP  
AICP County-approved Air Quality Specialist

## Enclosures:

- Figure 1: Regional Location
- Figure 2: Aerial Photo
- Figure 3: Site Plan
- Attachment A: Energy Calculation Sheets

## REFERENCES

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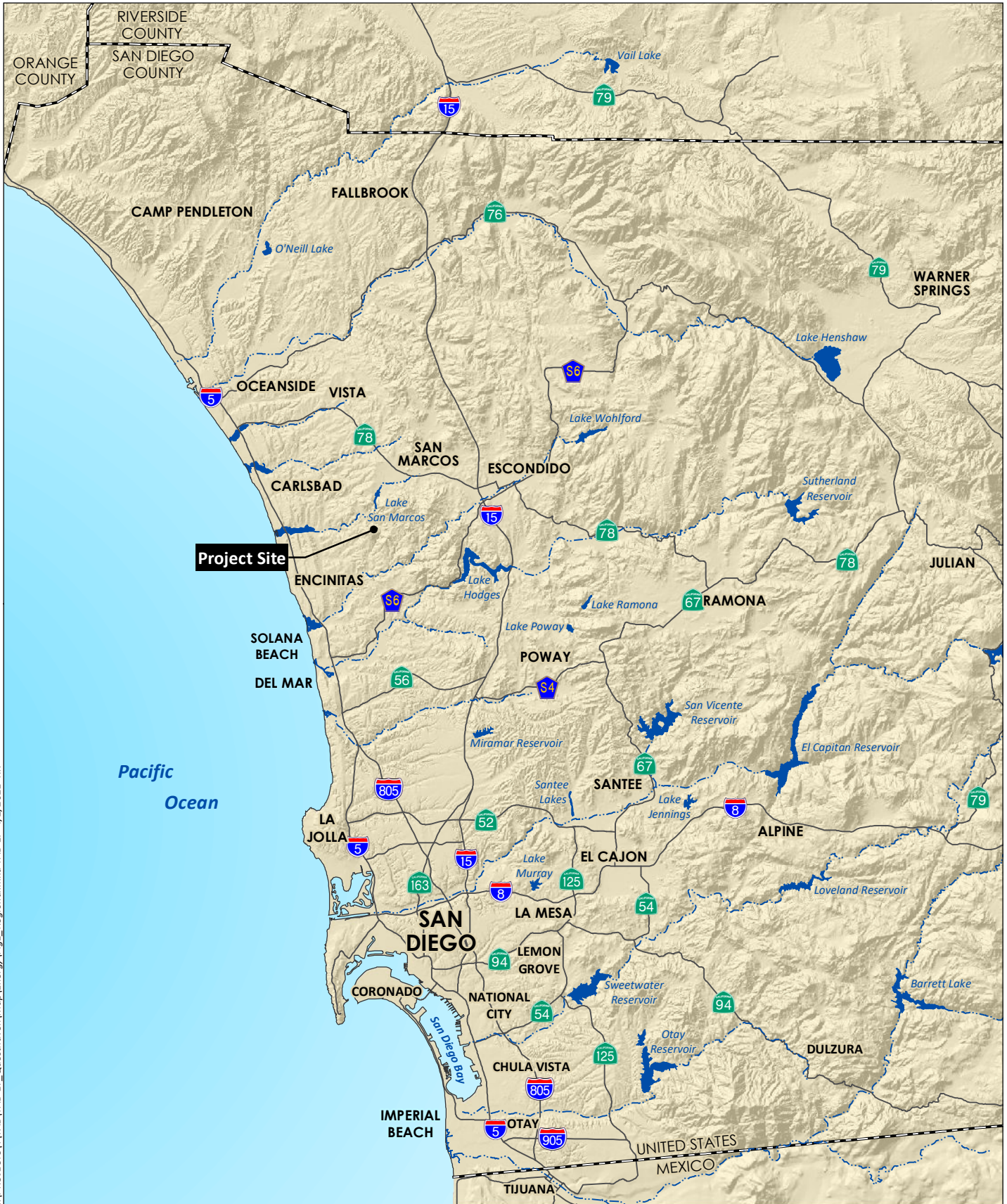
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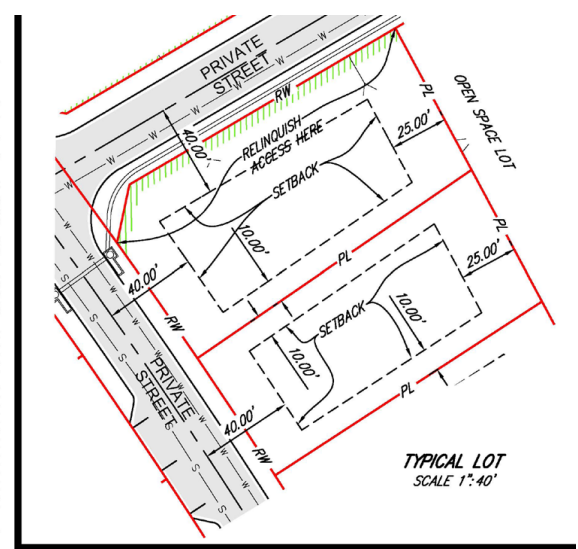
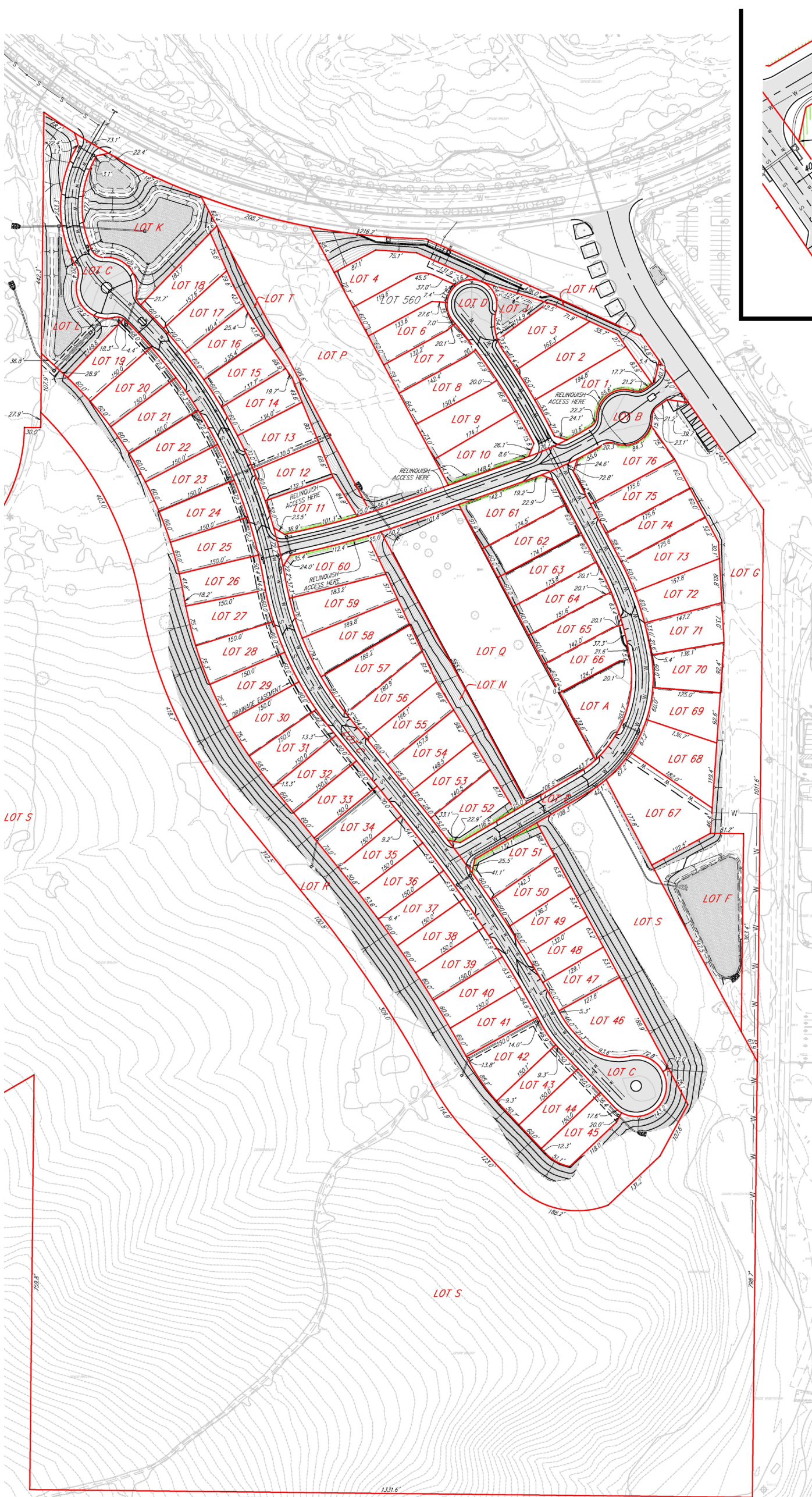




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Source: Aerial (SanGIS, 2019)



QUESTHAVEN SUBD 76 LOT CONCEPT WITH 10 FT SIDE YARD SETBACKS			
PARCEL NAME	LOT TYPE	AREA (SF)	AREA (AC)
Lot 1	RESIDENTIAL	15,915.24	0.37
Lot 2	RESIDENTIAL	12,776.89	0.29
Lot 3	RESIDENTIAL	9,559.46	0.22
Lot 4	RESIDENTIAL	11,993.44	0.28
Lot 5	RESIDENTIAL	10,085.48	0.23
Lot 6	RESIDENTIAL	8,955.98	0.21
Lot 7	RESIDENTIAL	9,377.69	0.22
Lot 8	RESIDENTIAL	10,949.04	0.25
Lot 9	RESIDENTIAL	11,911.06	0.27
Lot 10	RESIDENTIAL	12,220.86	0.28
Lot 11	RESIDENTIAL	10,704.52	0.25
Lot 12	RESIDENTIAL	8,423.35	0.19
Lot 13	RESIDENTIAL	9,885.56	0.23
Lot 14	RESIDENTIAL	8,835.26	0.20
Lot 15	RESIDENTIAL	8,777.50	0.20
Lot 16	RESIDENTIAL	8,804.98	0.20
Lot 17	RESIDENTIAL	9,586.40	0.22
Lot 18	RESIDENTIAL	11,158.05	0.26
Lot 19	RESIDENTIAL	9,923.90	0.23
Lot 20	RESIDENTIAL	9,924.50	0.23
Lot 21	RESIDENTIAL	9,924.50	0.23
Lot 22	RESIDENTIAL	9,924.50	0.23
Lot 23	RESIDENTIAL	9,924.50	0.23
Lot 24	RESIDENTIAL	9,924.50	0.23
Lot 25	RESIDENTIAL	9,927.29	0.23
Lot 26	RESIDENTIAL	9,367.98	0.22
Lot 27	RESIDENTIAL	10,144.31	0.23
Lot 28	RESIDENTIAL	10,144.31	0.23
Lot 29	RESIDENTIAL	10,144.31	0.23
Lot 30	RESIDENTIAL	10,144.31	0.23
Lot 31	RESIDENTIAL	9,894.54	0.23
Lot 32	RESIDENTIAL	9,000.00	0.21
Lot 33	RESIDENTIAL	9,000.00	0.21
Lot 34	RESIDENTIAL	10,500.00	0.24
Lot 35	RESIDENTIAL	9,247.99	0.21
Lot 36	RESIDENTIAL	9,292.83	0.21
Lot 37	RESIDENTIAL	9,292.83	0.21
Lot 38	RESIDENTIAL	9,292.83	0.21
Lot 39	RESIDENTIAL	9,292.83	0.21
Lot 40	RESIDENTIAL	9,292.83	0.21
Lot 41	RESIDENTIAL	9,341.83	0.21
Lot 42	RESIDENTIAL	11,984.56	0.28
Lot 43	RESIDENTIAL	9,000.25	0.21
Lot 44	RESIDENTIAL	9,000.00	0.21
Lot 45	RESIDENTIAL	8,734.08	0.20
Lot 46	RESIDENTIAL	16,229.65	0.37
Lot 47	RESIDENTIAL	7,899.13	0.18
Lot 48	RESIDENTIAL	8,030.43	0.18
Lot 49	RESIDENTIAL	8,258.23	0.19
Lot 50	RESIDENTIAL	8,583.58	0.20
Lot 51	RESIDENTIAL	10,608.53	0.24
Lot 52	RESIDENTIAL	10,331.46	0.24
Lot 53	RESIDENTIAL	8,666.22	0.20
Lot 54	RESIDENTIAL	10,231.98	0.23
Lot 55	RESIDENTIAL	9,715.97	0.22
Lot 56	RESIDENTIAL	10,409.99	0.24
Lot 57	RESIDENTIAL	12,507.91	0.29
Lot 58	RESIDENTIAL	12,460.00	0.29
Lot 59	RESIDENTIAL	11,917.52	0.27
Lot 60	RESIDENTIAL	12,940.49	0.30
Lot 61	RESIDENTIAL	13,666.51	0.31
Lot 62	RESIDENTIAL	10,459.30	0.24
Lot 63	RESIDENTIAL	10,438.12	0.24
Lot 64	RESIDENTIAL	10,412.48	0.24
Lot 65	RESIDENTIAL	10,096.71	0.23
Lot 66	RESIDENTIAL	9,304.64	0.21
Lot 67	RESIDENTIAL	21,440.61	0.49
Lot 68	RESIDENTIAL	13,845.75	0.32
Lot 69	RESIDENTIAL	9,770.10	0.22
Lot 70	RESIDENTIAL	9,742.03	0.22
Lot 71	RESIDENTIAL	9,321.80	0.21
Lot 72	RESIDENTIAL	10,814.98	0.25
Lot 73	RESIDENTIAL	12,302.60	0.28
Lot 74	RESIDENTIAL	10,536.89	0.24
Lot 75	RESIDENTIAL	10,536.89	0.24
Lot 76	RESIDENTIAL	12,770.09	0.29
Lot A	PARK	13,699.68	0.31
Lot B	PRIVATE STREET	37,018.42	0.85
Lot C	PRIVATE STREET	97,488.19	2.24
Lot D	PRIVATE STREET	17,789.53	0.41
Lot E	PRIVATE STREET	36,897.43	0.85
Lot F	WATER QUALITY	32,407.16	0.74
Lot G	OPEN SPACE	79,211.65	1.82
Lot H	OPEN SPACE	19,798.48	0.45
Lot J	WATER QUALITY	5,005.10	0.11
Lot K	WATER QUALITY	38,685.71	0.89
Lot L	WATER QUALITY	28,458.07	0.65
Lot N	OPEN SPACE	18,423.90	0.42
Lot P	OPEN SPACE	89,273.76	2.05
Lot Q	OPEN SPACE	82,517.05	1.89
Lot R	OPEN SPACE	167,599.45	3.85
Lot S	OPEN SPACE	2,314,336.49	53.13
Lot T	OPEN SPACE	12,550.26	0.29

I:\PROJECTS\TAB\_AD161\_0001\TAB-17\_QUESTHAVEN\Map\Energy\Fig3\_SitePlan.mxd TAB-17 01/20/2022 -DY

Source: County of San Diego 2022

# Attachment A

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## Energy Calculation Sheets

## Construction Energy Use

Off-Road Construction Equipment Energy Use												
Phase	Equipment	Fuel	HP	Load Factor	Equipment Count	Hours/Day	Work Days	Gallons /HP-Hr	Gallons /Hour	Gallons /Day	Total Gallons	Total kBtu
Site Preparation	Rubber Tired Dozers	Diesel	367	0.4	2	8.0	20	0.0206268	3.02801	48.448	969.0	134,686
	Tractors/Loaders/Backhoes	Diesel	83	0.37	4	8.0	20	0.0191257	0.58735	18.795	375.9	52,251
Grading/Underground Utilities	Bore/Drill Rigs	Diesel	83	0.5	1	8.0	45	0.0258528	1.07289	8.583	386.2	53,687
	Excavators	Diesel	36	0.38	2	8.0	45	0.0219661	0.30050	4.808	216.4	30,074
	Graders	Diesel	148	0.41	1	8.0	45	0.0212565	1.28985	10.319	464.3	64,544
	Off-Road Trucks	Diesel	376	0.38	1	4.0	45	0.0198010	2.82917	11.317	509.3	70,786
	Rubber Tired Dozers	Diesel	367	0.4	1	8.0	45	0.0206268	3.02801	24.224	1,090.1	151,522
	Rubber Tired Loaders	Diesel	150	0.36	1	8.0	45	0.0186613	1.00771	8.062	362.8	50,426
	Scrapers	Diesel	423	0.48	2	8.0	45	0.0249970	5.07539	81.206	3,654.3	507,945
	Tractors/Loaders/Backhoes	Diesel	84	0.37	2	8.0	45	0.0191257	0.59443	9.511	428.0	59,490
	Paving	Pavers	Diesel	81	0.42	2	8.0	35	0.0214010	0.72806	11.649	407.7
Paving	Paving Equipment	Diesel	89	0.36	2	8.0	35	0.0183606	0.58827	9.412	329.4	45,791
	Rollers	Diesel	36	0.38	2	8.0	35	0.0215765	0.29517	4.723	165.3	22,976
	Cranes	Diesel	367	0.29	1	7.0	440	0.0148894	1.58468	11.093	4,880.8	678,433
Building Construction	Forklifts	Diesel	82	0.2	3	8.0	440	0.0103808	0.17025	4.086	1,797.8	249,893
	Generator Sets	Diesel	14	0.74	1	8.0	440	0.0179704	0.18617	1.489	655.3	91,091
	Tractors/Loaders/Backhoes	Diesel	84	0.37	3	7.0	440	0.0191257	0.59443	12.483	5,492.5	763,458
	Welders	Diesel	46	0.45	1	8.0	440	0.0258047	0.53416	4.273	1,880.2	261,352
Architectural Coating	Air Compressors	Diesel	37	0.48	1	8.0	35	0.0179704	0.31916	2.553	89.4	12,422
<b>Project Construction Off-Road Total</b>											<b>24,154.7</b>	<b>3,357,499</b>

On-Road Construction Energy Use												
Phase	Trip Type (Fleet Mix)	Trips	Distance (miles)	Work Days	Total VMT	gallons diesel/VMT	Total diesel gallons	gallons gas/VMT	Total gasoline gallons	Total kBtu		
Site Preparation	Worker (LDA, LDT1, LDT2)	17.5	12	20	4200.0	8.55822E-05	0.36	0.036797711	154.55	19,214		
	Hauling (HHDT)	18.3	20	20	7320.0	0.165180624	1209.12	0.000000067	0.00	168,068		
Grading/Underground Utilities	Worker (LDA, LDT1, LDT2)	27.5	12	45	14850.0	8.55822E-05	1.27	0.036797711	546.45	67,936		
	Hauling (HHDT)	20	20	45	18000.0	0.165180624	2973.25	0.000000067	0.00	413,282		
Paving	Worker (LDA, LDT1, LDT2)	15	12	35	6300.0	8.55822E-05	0.54	0.036797711	231.83	28,821		
	Hauling (HHDT)	13	20	35	9100.0	0.165180624	1503.14	0.000000067	0.00	208,937		
Building Construction	Worker (LDA, LDT1, LDT2)	27.4	12	440	144672.0	8.55822E-05	12.38	0.036797711	5,323.60	661,847		
	Vendor (HHDT, MHDT)	8.12	7.63	440	27260.5	0.140604164	3832.93	0.014863852	405.20	583,022		
Architectural Coating	Worker (LDA, LDT1, LDT2)	5.47	12	35	2297.4	8.55822E-05	0.20	0.036797711	84.54	10,510		
<b>Project Construction On-Road Total</b>					<b>233999.9</b>		<b>9533.2</b>		<b>6746.2</b>	<b>2161638.2</b>		

### Notes:

- Off-road equipment types and horsepower from CalEEMod defaults.
- Off-road equipment count and hours from CalEEMod for the AQ/GHG report.
- Off-road fuel consumption factors from CARB OFFROAD2021, for San Diego County, aggregate model years. <https://arb.ca.gov/emfac/emissions-inventory/>.
- On-road fleet mix and trip distances from CalEEMod for the AQ/GHG report.
- On-road fuel consumption factors weighted average for fleet mix from CARB EMFAC2021, for San Diego County, aggregate model years, aggregate speeds. <https://arb.ca.gov/emfac/emissions-inventory/>
- 1 Gallon of diesel = 139 kBtu; 1 gallon of gasoline = 124 kBtu

Construction Energy Summary			
Source	Gallons Diesel	Gallons Gas	kBtu
Off-Road Construction Equipment	24,155	-	3,357,499
On-Road Construction Traffic	9,533	6,746	2,161,638
<b>Project Construction Total</b>	<b>33,688</b>	<b>6,746</b>	<b>5,519,137</b>

## Annual Operational Energy Use

<b>Project VMT</b>
1,871,903

Project On-Road Project Operational Energy Use						
Category	Mix	Diesel Gallons/VMT	Diesel Gallons	Gasoline Gallons/VMT	Gasoline Gallons	kBtu
LDA	60.9162%	0.032033	36,526.5	0.0000486	55.5	5,084,058
LDT1	3.8894%	0.039825	2,899.5	0.0000486	3.5	403,463
LDT2	17.8600%	0.039461	13,192.8	0.0001189	39.8	1,838,725
MDV	10.1308%	0.047335	8,976.5	0.0006090	115.5	1,262,054
LHDT1	1.3823%	0.055533	1,436.9	0.0258464	668.8	282,663
LHDT2	0.5356%	0.033170	332.6	0.0505438	506.7	109,063
MHDT	1.6956%	0.042272	1,341.7	0.0907825	2,881.4	543,796
HHDT	2.4628%	0.000062	2.9	0.1563262	7,206.8	894,043
OBUS	0.1928%	0.100209	361.7	0.0694918	250.8	81,369
UBUS	0.1823%	0.027556	94.0	0.0855154	291.8	49,256
MCY	0.5807%	-	0.0	0.0252973	275.0	34,098
SBUS	0.0764%	0.102960	147.2	-	0.0	20,467
MH	0.0950%	0.150796	268.2	0.0356544	63.4	45,137
<b>Annual Total</b>			<b>65,580.4</b>		<b>12,359.0</b>	<b>10,648,193</b>

Project Electricity and Natural Gas			
Type	Source	kWhr	kBtu
Natural Gas	Hot Water, Heating	-	0
Electricity	Buildings, Lighting	131,943	450,209
<b>Total</b>		<b>131,943</b>	<b>450,209</b>

Project Water and Wastewater Energy Use							
Indoor (Mgal)	Outdoor (Mgal)	Supply (kWhr/Mgal)	Treat Water (kWhr/Mgal)	Distribute (kWhr/Mgal)	Treat Wastewater (kWhr/Mgal)	kWhr	kBtu
2.67	16.259	9,727	111	1,272	1,911	241,372	823,596

Project Total		
Energy Type	Quantity	kBtu
Gasoline (Gallons)	12,359	1,532,522
Diesel (Gallons)	65,580	9,115,671
Natural Gas (kBtu)	0	0
Electricity (kWhr)	373,315	1,273,805
<b>Total</b>		<b>11,921,998</b>

**Notes:**

- VMT, electricity, natural gas, and water use from project CalEEMod annual output.
- Fleet mix from CalEEMod default for San Diego County
- Fuel consumption factors weighted average for fleet mix from CARB EMFAC2021, for San Diego County, aggregate model years for 2029, aggregate speeds.
- Water electricity intensity factors from CalEEMod default for San Diego County.
- 1 Gallon of diesel = 139 kBtu; 1 gallon of gasoline = 124 kBtu; 1 kWhr = 3.412142 kBtu.
- Electricity use includes reduction from on-site photovoltaic generation.



## 2022 Title 24 Solar Calculation

Residential DU	76
Residential CFA (SF)	136,800
A (zone 10)	0.627
B (zone 10)	1.41
kWPV Required	192.93
kWhr/year	338,019.67

### Notes:

1. Residential CFA assumes average CalEEMod default of 1,800 square feet per single family residence.

2. Solar requirement calculation methodology from the 2019 Title 24 Part 6 Residential Compliance Manual, Chapter 7 (CEC 2019; [https://www.energy.ca.gov/sites/default/files/2020-06/07-PV\\_BatteryStorage\\_and\\_SolarReady\\_ada.pdf](https://www.energy.ca.gov/sites/default/files/2020-06/07-PV_BatteryStorage_and_SolarReady_ada.pdf)):

$$\text{kW required} = (\text{CFA} \times \text{A}) / 1000 + (\text{NDwell} \times \text{B})$$

WHERE:

kW = kWdc size of the PV system

CFA = Conditioned floor area

NDwell = Number of dwelling units A = Adjustment factor (from Table 7-1 of the Residential Compliance Manual)

B = Dwelling adjustment factor (from Table 7-1 of the Residential Compliance Manual)

3. Climate zone 10 for the project site from the CEC EX Building Climate Zone Search tool (<https://caenergy.maps.arcgis.com/apps/webappviewer/index.html?id=4831772c00eb4f729924167244bbca22>)

4. Solar kWhr per year can be calculated by: kWhr/year = Power Output (kW) x 24 hours/day x 365 days/year x CF, where CF is a capacity factor which accounts for climate, daylight hours, roof pitch and orientation, and transmission loss. For typical California residential systems, the CF can range between 17% and 22.5%. A CF of 20% was used in the project calculations.

Model Output: OFFROAD2021 (v1.0.4) Emissions Inventory

Region Type: County

Region: San Diego

Calendar Year: 2026

Scenario: All Adopted Rules - Exhaust

Vehicle Classification: OFFROAD2021 Equipment Types

Units: tons/day for Emissions, gallons/year for Fuel, hours/year for Activity, Horsepower-hours/year for Horsepower-hours

Region	CalYr	VehClass	MdlYr	HP_Bin	Fuel	Fuel_gpy	Total_Activity_hpy	Total_Population	Horsepower_Hours_hhpy	Gallons/hp-hour
San Diego	2026	Construction and Mining - Rubber Tired Dozers	Aggregate	600	Diesel	208572.93	27587.28	36.71	10111753.65	0.02062678
San Diego	2026	Construction and Mining - Tractors/Loaders/Backhoes	Aggregate	100	Diesel	2256605.39	1413549.97	2184.86	117988103.87	0.01912570
San Diego	2026	Construction and Mining - Bore/Drill Rigs	Aggregate	100	Diesel	23952.84	11324.81	26.95	926508.82	0.02585279
San Diego	2026	Construction and Mining - Excavators	Aggregate	50	Diesel	167740.14	213251.80	282.58	7636309.25	0.02196613
San Diego	2026	Construction and Mining - Graders	Aggregate	175	Diesel	280413.79	89047.07	186.25	13191896.42	0.02125652
San Diego	2026	Construction and Mining - Off-Highway Trucks	Aggregate	600	Diesel	1390086.06	186935.68	133.32	70202763.38	0.01980102
San Diego	2026	Construction and Mining - Rubber Tired Loaders	Aggregate	175	Diesel	757054.94	270622.82	279.10	40568282.47	0.01866125
San Diego	2026	Construction and Mining - Scrapers	Aggregate	600	Diesel	2076104.59	197145.30	399.47	83054224.08	0.02499698
San Diego	2026	Construction and Mining - Pavers	Aggregate	100	Diesel	37537.19	21648.01	54.00	1753989.43	0.02140103
San Diego	2026	Construction and Mining - Paving Equipment	Aggregate	100	Diesel	23670.01	14468.87	30.00	1289172.66	0.01836062
San Diego	2026	Construction and Mining - Rollers	Aggregate	50	Diesel	94403.64	122398.56	342.69	4375295.02	0.02157652
San Diego	2026	Construction and Mining - Cranes	Aggregate	600	Diesel	272603.22	50031.99	98.15	18308522.71	0.01488942
San Diego	2026	Industrial - Forklifts	Aggregate	100	Diesel	595194.65	695792.57	885.53	57336076.44	0.01038081
San Diego	2026	Portable Equipment - Non-Rental Generator	Aggregate	50	Diesel	3668.88	5059.90	3.61	204161.96	0.01797044
San Diego	2026	Light Commercial - Misc - Welders	Aggregate	50	Diesel	344169.45	289945.05	451.46	13337472.3	0.02580470
San Diego	2026	Portable Equipment - Non-Rental Compressor	Aggregate	50	Diesel	1072.65731	1516.638641	3.60932178	59690.08827	0.01797044

Source: EMFAC2021 (v1.0.2) Emissions Inventory

Region Type: County

Region: San Diego

Calendar Year: 2026, 2029

Season: Annual

Vehicle Classification: EMFAC2007 Categories

Units: miles/year for CVMT and EVMT, trips/year for Trips, kWh/year for Energy Consumption, tons/year for Emissions, 1000 gallons/year for Fuel Consumption

2026 Construction Fleet Fuel Consumption								
Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	VMT	Fuel Consumption (1000 Gal.)	Gallons/VMT
<b>Worker (LDA, LDT1, LDT2)</b>								
San Diego	2026	LDA	Aggregate	Aggregate	Diesel	47783453	1177.104526	
San Diego	2026	LDT1	Aggregate	Aggregate	Diesel	229653.87	10.14606334	
San Diego	2026	LDT2	Aggregate	Aggregate	Diesel	30987925	994.9867972	
					<b>Diesel Total</b>	<b>79001032</b>	<b>2182.237386</b>	<b>8.55822E-05</b>
San Diego	2026	LDA	Aggregate	Aggregate	Gasoline	1.61E+10	546928.2606	
San Diego	2026	LDT1	Aggregate	Aggregate	Gasoline	1.445E+09	60381.09448	
San Diego	2026	LDT2	Aggregate	Aggregate	Gasoline	7.872E+09	330985.2524	
					<b>Gas Total</b>	<b>2.542E+10</b>	<b>938294.6075</b>	<b>0.036797711</b>
					<b>Total VMT</b>	<b>2.55E+10</b>		
<b>Vendor (HHDT, MHDT)</b>								
San Diego	2026	HHDT	Aggregate	Aggregate	Diesel	592931221	97966.23267	
San Diego	2026	MHDT	Aggregate	Aggregate	Diesel	235665704	27593.71523	
					<b>Diesel total</b>	<b>828596925</b>	<b>125559.9479</b>	<b>0.140604164</b>
San Diego	2026	HHDT	Aggregate	Aggregate	Gasoline	154277.92	39.62714087	
San Diego	2026	MHDT	Aggregate	Aggregate	Gasoline	64251852	13233.83854	
					<b>Gas Total</b>	<b>64406130</b>	<b>13273.46568</b>	<b>0.014863852</b>
					<b>Total VMT</b>	<b>893003055</b>		
<b>Hauling (HHDT)</b>								
San Diego	2026	HHDT	Aggregate	Aggregate	Diesel	592931221	97966.23267	<b>0.165180624</b>
San Diego	2026	HHDT	Aggregate	Aggregate	Gasoline	154277.92	39.62714087	<b>6.68152E-08</b>
					<b>Total VMT</b>	<b>593085499</b>		

2029 Operational Fleet Fuel Consumption								
Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	VMT	Consumption (1000 Gal.)	Gallons/VMT
<b>LDA</b>								
San Diego	2029	LDA	Aggregate	Aggregate	Diesel	32705226	781.541	<b>4.86365E-05</b>
San Diego	2029	LDA	Aggregate	Aggregate	Gasoline	1.6E+10	514731.5	<b>0.032032562</b>
					<b>Total VMT</b>	<b>1.61E+10</b>		
<b>LDT1</b>								
San Diego	2029	LDT1	Aggregate	Aggregate	Diesel	48034.63	1.964969	<b>1.47349E-06</b>
San Diego	2029	LDT1	Aggregate	Aggregate	Gasoline	1.33E+09	53108.01	<b>0.039824500</b>
					<b>Total VMT</b>	<b>1.33E+09</b>		
<b>LDT2</b>								
San Diego	2029	LDT2	Aggregate	Aggregate	Diesel	31251936	954.3392	<b>0.000118899</b>
San Diego	2029	LDT2	Aggregate	Aggregate	Gasoline	8E+09	316736	<b>0.039461305</b>
					<b>Total VMT</b>	<b>8.03E+09</b>		
<b>MDV</b>								
San Diego	2029	MDV	Aggregate	Aggregate	Diesel	69391601	2852.036	<b>0.000608987</b>
San Diego	2029	MDV	Aggregate	Aggregate	Gasoline	4.61E+09	221680.1	<b>0.047334725</b>
					<b>Total VMT</b>	<b>4.68E+09</b>		
<b>LHDT1</b>								
San Diego	2029	LHDT1	Aggregate	Aggregate	Diesel	3.89E+08	23775.34	<b>0.025846424</b>
San Diego	2029	LHDT1	Aggregate	Aggregate	Gasoline	5.31E+08	51083.19	<b>0.055533072</b>
					<b>Total VMT</b>	<b>9.2E+08</b>		
<b>LHDT2</b>								
San Diego	2029	LHDT2	Aggregate	Aggregate	Diesel	1.68E+08	12164.57	<b>0.050543835</b>
San Diego	2029	LHDT2	Aggregate	Aggregate	Gasoline	73049535	7983.258	<b>0.033170473</b>
					<b>Total VMT</b>	<b>2.41E+08</b>		
<b>MHDT</b>								
San Diego	2029	MHDT	Aggregate	Aggregate	Diesel	2.32E+08	26712.55	<b>0.090782548</b>
San Diego	2029	MHDT	Aggregate	Aggregate	Gasoline	62266677	12438.4	<b>0.042271878</b>
					<b>Total VMT</b>	<b>2.94E+08</b>		
<b>HHDT</b>								
San Diego	2029	HHDT	Aggregate	Aggregate	Diesel	6.06E+08	94701.92	<b>0.156326206</b>
San Diego	2029	HHDT	Aggregate	Aggregate	Gasoline	158289	37.46643	<b>6.18465E-05</b>
					<b>Total VMT</b>	<b>6.06E+08</b>		
<b>OBUS</b>								
San Diego	2029	OBUS	Aggregate	Aggregate	Diesel	14340310	2002.854	<b>0.069491762</b>
San Diego	2029	OBUS	Aggregate	Aggregate	Gasoline	14481146	2888.179	<b>0.100209334</b>
					<b>Total VMT</b>	<b>28821456</b>		
<b>SBUS</b>								
San Diego	2029	UBUS	Aggregate	Aggregate	Diesel	14042033	1679.366	<b>0.085515443</b>
San Diego	2029	UBUS	Aggregate	Aggregate	Gasoline	5596130	541.1423	<b>0.027555649</b>
					<b>Total VMT</b>	<b>19638163</b>		
<b>MCY</b>								
San Diego	2029	MCY	Aggregate	Aggregate	Gasoline	1.43E+08	3611.692	<b>0.025297276</b>
<b>UBUS</b>								
San Diego	2029	SBUS	Aggregate	Aggregate	Gasoline	5193427	534.7156	<b>0.102960073</b>
<b>MH</b>								
San Diego	2029	MH	Aggregate	Aggregate	Diesel	11943363	1273.942	<b>0.035654372</b>
San Diego	2029	MH	Aggregate	Aggregate	Gasoline	23786962	5387.996	<b>0.150796163</b>
					<b>Total VMT</b>	<b>35730325</b>		