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CD-0010-22

December 15, 2023

EXHIBITS

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DEPARTMENT OF THE AIR FORCE
UNITED STATES SPACE FORCE
SPACE LAUNCH DELTA 30

28 November 2023

Beatrice L. Kephart
30 CES/CEI
1028 Iceland Avenue
Vandenberg SFB CA 93437-6010

Mr. Cassidy Teufel
California Coastal Commission
455 Market Street, Suite 228
San Francisco CA 94105-2219

Dear Mr. Teufel

On 23 Nov 2022, the Department of the Air Force (DAF) submitted a Consistency Determination (No. CD-0010-22) for Phantom Space Corporation's Daytona-E and Laguna-E Launch Sites and Operations. Since this time, we have been coordinating with your agency on various aspects of this project to ensure that the Proposed Action is consistent to the maximum extent practicable with the California Coastal Management Plan, pursuant to the requirements of the Coastal Zone Management Act. During these discussions there were additional measures that your staff determined prudent. These are outlined below.

Biological Resources

Multiple federally listed species protected under the Endangered Species Act (ESA), potential habitat that supports these listed species, and several state special status species occur within the project vicinity. Pursuant to Section 7 of the ESA, the DAF completed consultation with the United States Fish and Wildlife Service (USFWS) and was issued a Biological Opinion on 24 Apr 2023 (2022-0045260-S7). The DAF has worked with the USFWS to develop the avoidance, minimization, and mitigation measures that are included as part of the Proposed Action to reduce impacts on biological resources. The DAF will implement these measures.

In alignment with the Biological Opinion, the DAF commits to augmenting the existing Western Snowy Plover (SNPL) monitoring program on VSFB, which records habitat use, nesting efforts, nest fates, fledgling survival, and population size through each breeding season, with geospatial analysis of SNPL nesting and the noise environment. Sound meters will be deployed immediately inland of South Surf Beach and a control site to characterize the noise environment during the breeding season within the noise footprint of Phantom launches. Geospatial analysis will be performed annually as Phantom's launch tempo increases to assess whether patterns of nesting activity, nest fates, or fledgling success are negatively impacted by noise from Phantom operations. If the geospatial analysis shows that a statistically significant decline in breeding effort or nest success over two consecutive years, and that this decline cannot confidently be attributed to other natural or human caused catastrophic factors, the DAF will offset this impact by increasing predator removal efforts

on VSFB to include the non-breeding season, particularly focusing on raven removal adjacent to VSFB beaches, with a goal of achieving no net loss of the species.

In alignment with the Biological Opinion, the DAF commits to implement a monitoring program to track California Red-legged Frog (CRLF) habitat occupancy, breeding behaviors (calling), and breeding success (egg mass and tadpole densities) in lower Honda Creek as the frequency of launch and static fire tests under the proposed project gradually increases. Because Phantom intends to slowly ramp up to a full tempo of 48 launches and 48 static fire tests annually over the course of five years, the DAF will be able to assess incremental changes in the acoustic environment and CRLF populations in Honda Creek. The DAF will place passive bioacoustic recorders and conduct CRLF surveys in Honda Creek. The specific threshold criteria for declining CRLF trends would be if surveys detected fewer adult frogs from baseline average two years consecutively, 15% or more decline in egg mass or tadpole densities, or average call-rate changes decrease with increasing disturbance level. The decline will be attributed to the Phantom Project if it cannot confidently be attributed to other natural or human caused factors not related to the Phantom project. The DAF would mitigate for these impacts by creating new CRLF breeding habitat at the San Antonio Creek Oxbow Restoration Area, an established wetland mitigation site that is located outside of areas currently impacted by launch noise and site lighting on VSFB.

Management actions focused on bats are incorporated in Vandenberg's Integrated Natural Resources Management Plan (INRMP). The DAF has been actively monitoring bats on VSFB. In the late 2000's, the DAF worked with regional bat experts Patricia Brown, Dixie Pearson, Drew Stokes and others to assess bat diversity and distribution on VSFB. In 2011, the Central Coast Bat Research Group established acoustic monitoring protocols for studies on VSFB and initial acoustic surveys were completed across VSFB in a variety of habitats. In 2013, in cooperation with Bat Conservation International (BCI) and UC Santa Cruz, the DAF designed and installed an artificial habitat for Townsend's big eared bat, combining suitable roost for a maternity colony as well as overwintering. Recently, DOD has partnered with BCI to fully cooperate in the North American Bat Monitoring Program (NA Bat) at VSFB. This includes deploying many acoustic recording devices each summer (starting 2023). A pilot program was completed in 2022. In 2022 and 2023, VSFB hosted researchers from Humboldt Polytechnic (2022) and BCI/UCLA (2023) investigating bats and communicable diseases, including COVID 19. As part of the Proposed Action, the DAF will augment the current bat monitoring program at VSFB by conducting additional acoustic monitoring within the noise footprint to determine which bat species are present in Honda Canyon and to record and assess their call rates before and after rocket launches. Monitoring will begin during the first calendar year of launch operations and continue annually as Phantom’s program gradually increases over six years to full cadence. The Space Force will discontinue monitoring after concurrence from the Commission if adverse effects attributable to the proposed project are not detected after three years of monitoring once Phantom and all other proposed launch programs impacting Honda Creek reach full or near full tempo.

The DAF would send an annual report to the Commission on all monitoring work conducted for biological resources and outline the data and results collected to date, and any initial conclusions regarding potential effects to the species as a result of the Proposed Action. The report will include annual reports prepared for the USFWS for SNPL and CRLF, and bat monitoring.

Coastal Water Resources

Commercial space companies are independently responsible for compliance to provisions of the Clean Water Act and its requirements for development of site-specific Spill Prevention, Contingency, and Countermeasures (SPCC) plan under 40 CFR 112. Inspection and enforcement of each SPCC and any permitted tanks are delegated to the Santa Barbara County Certified Unified Programs Agency. The SPCC requirements for commercial space companies do not fall under the jurisdiction of SLD 30. Under 40 CFR 112, the SPCC would include elements that the Commission considers critical for these plans, including: an oil spill risk and worst-case scenario spill assessment that includes oil spill trajectories and identification of the coastal resources at risk from oil spill impacts, response capability analysis of the equipment, personnel, and strategies (both on-site and under contract) capable of responding to a worst-case spill, including alternative response technologies, oil spill preparedness training and drills, and evidence of financial responsibility demonstrating capability to pay for costs and damages from a worst-case spill. Phantom's secondary containment would be sized to capture all materials contained within any tanks present and the SPCC would include the necessary specifications on the spill response supplies needed at the site during operations.

Marine Debris

Phantom Space would provide contributions to the California Lost Fishing Gear Recovery Project to offset the impacts from unrecoverable debris into State or Federal waters. For every 3 pounds of unrecoverable debris, Phantom Space would make a compensatory donation of $10.00, which is sufficient to recover 1 pound of lost fishing gear. Phantom Space will provide annual reports to the DAF. These data will be included in the 5-year status update.

Overall Launch Increases

The DAF would report back to the Commission 5 years from now with information on how the Phantom project is, or is not, impacting the surrounding special-status species and their habitats.

The DAF scheduled meetings with the Commission, local governments, state and federal agencies, and stakeholders in 2023 to discuss increased launch activities at multiple sites on Vandenberg and opportunities and priorities for comprehensive and long-range planning that considers the projected future use scenarios that VSFB is considering. It was an open forum where agencies and individuals learned about and discussed the future of space launch development on VSFB.

If you need additional information, or if you have questions, please do not hesitate to call me at (805) 605-7924 or email me at beatrice.kephart@spaceforce.mil. You can also direct your questions or comments to Tiffany Whitsitt-Odell at tiffany.whitsitt-odell@spaceforce.mil.

Sincerely,

11/28/2023

X Beatrice L Kephart

Beatrice L Kephart

Signed by: KEPHART.BEATRICE.LINDA.1166122291

BEATRICE L. KEPHART
Chief, Installation Management Flight

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Exhibit 2: Narrative Description of Launch Programs, Approvals, and Activities

The Commission has previously considered launches from VSFB by launch program, rather than by launch site. The information below is intended to provide a snapshot of current, recent, and proposed activities at VSFB by launch site. Some of the Commission approvals referenced below covered the subject launch program over multiple launch sites. There are currently five Space Launch Complexes (SLCs), one Test Pad (TP-01), and one Launch Facility (LF-576E) at VSFB used by various Space Launch Vehicles to launch satellites into polar orbit, a unique capability based on the geographic orientation of VSFB. Operators use these facilities for small, medium, and heavy launch operations defined by their payload capacity; small vehicles carry less than 4,400 lb., medium vehicles carry between 4,400 and 44,000 lb., and heavy vehicles carry between 44,000 and 110,000 lb.

In addition to space launch activities, VSFB also performs missile launches from underground silos called Launch Facilities (LFs) on the north portion of the base. VSFB is the only location that performs test launches of intercontinental ballistic missiles (ICBMs) to verify their accuracy and reliability. Additionally, the Missile Defense Agency (MDA), one of many tenant units on VSFB, conducts interceptor launches that engage targets over the broad ocean area and tests their missile defense system. The MDA has interceptors on 24-hour alert at VSFB to defend the continental U.S. from incoming missile threats. Missiles are typically launched from LFs, but TP-01 is also used for missile launch. Space Launch Delta (SLD) 30 is currently updating the Minuteman III missile program to the new Ground Based Strategic Deterrent (GBSD) program. SLD 30 has indicated that the western range can support up to 110 space launches and 15 missile launches annually, although the number of actual launches carried out in any one year has only been approximately 10% of these levels.

Many of these space and missile launch programs have common operations. For example, each launch program requires release of a weather balloon with a radiosonde (approximately the size of a shoe box and powered by a 9-volt battery) attached ahead of a launch to gather necessary data about upper atmospheric conditions. The weather balloon rises to approximately 12 to 19 miles and bursts, is not recoverable, and becomes marine debris. Each space launch program typically performs a static fire or vertical fire test a few days to a week prior to launch. The purpose of these tests is to ensure that the rocket engines are functioning correctly. These tests produce noise impacts and exhaust but are of short duration, typically 30 seconds or less, and not as loud as a launch. Additionally, most of the programs at VSFB use expendable rockets/missiles, this means that the first stage of the rocket falls to earth in the ocean, typically in international waters, and is not recovered. Currently, most launches from VSFB are SpaceX rockets that are recovered. Finally, each of these programs produce varying levels of engine noise and sonic booms during launches. Details for the launches conducted at each site are provided below. The launch facilities are generally listed in geographic order from north to south. A map of current and future launch sites is attached.

Current and Recent Launch Programs

TP-01: Department of Defense (DoD) Minotaur Program (Primary Program) and Test Pad location for other programs as needed (temporary)

No records relating to the consideration or approval of the Minotaur launch program have been found in the Commission's files.[1] The Commission has previously approved minor improvements, and launches of missiles and other small space vehicles from TP-01. For example, ND-063-09 allowed for a demonstration launch of one missile from TP-01. Additionally, ND-0004-21, authorized the use of TP-01, as well as other missile launch sites on North VSFB for the Ground-Based Strategic Deterrence program, which is a missile launch program.

The Minotaur is a family of small launch vehicles that have derived from surplus Minuteman II (MM II) and Peacekeeper (PK) missile motors combined with commercially available upper stages/subsystems. The Minotaur is launched from above ground at VSFB and is used to launch small satellites for DoD missions. This vehicle is approximately 63 feet in height, approximately 80,000 pounds (without payload or fuel). The maximum engine noise from a Minotaur launch is unknown and sonic booms from Minotaur launches only occur over the open ocean. The Minotaur is an expendable launch vehicle, meaning that its first stage falls to the ocean and is not recovered. Finally, launches of the Minotaur from TP-01 may cause public access impacts to Surf Beach or Ocean Beach County Park.

SLC-2W: Firefly Alpha Program

The Firefly Alpha Program at SLC-2W was approved at the staff level with a "no effects" letter on April 20, 2020. This letter was sent because the Commission had previously approved the Delta II space launch program at SLC-2W through CC-030-96 on June 12, 1996, which had greater coastal resource impacts than the Firefly Alpha program that replaced it. The Alpha launch vehicle is categorized as a medium lift rocket that produces a total thrust of approximately 165,459 pounds-force (lbf), is 95 feet high, and has a dry mass of 8,386 pounds. The number of launches considered annually for Firefly Alpha was not provided in the materials submitted by DAF in 2020, but DAF included up to 11 launches from SLC-2W in their Environmental Assessment for the launch program. However, Firefly Alpha has launched well below this frequency and has only launched twice since taking over the site in 2020. The Alpha vehicle is significantly smaller and quieter than the Delta II vehicle, its maximum engine noise is 150 dB at the launch pad. Launches from SLC-2W may require temporary closures of Ocean Beach County Park, Surf Beach, and/or Jalama Beach County Park depending on launch trajectory and wind conditions. The Alpha vehicle is expendable and therefore the first stage would be jettisoned as marine debris into international waters.

For comparison, the Delta II program allowed for up to ten launches per year, but limited launch activities to three years to collect environmental monitoring data. The Delta II launch vehicles were 123.4 feet high and weighed approximately 513,000 pounds. The engine noise from Delta II liftoff was predicted to be 198 dB at the launch pad. During launches of the Delta II, a total of nine solid rocket motors, would be spent in getting the payload to orbit, and would be jettisoned

[1] The Minotaur space launch vehicle is a successor to the Taurus C space launch vehicle; the Commission concurred with CC-028-96 for up to three launches annually of the Taurus space launch vehicle from 576C, SLC-3W, or SLC-8 in 1996. The concurrence with CC-028-96 did not contemplate carrying over that approval to subsequent, related programs, and therefore the Minotaur program has not been reviewed under CZMA.

as marine debris in the ocean. Additionally, these launches closed the beaches south of SLC-2W which included Ocean Beach County Park and Surf Beach.

576-E: ABL Space Systems (ABL) RS1 Program

The ABL RS1 launch program at launch complex 576-E was approved under ND-0020-21 and was reported to the Commission at its hearing on October 15, 2021. The RS1 launch vehicle is categorized as a small lift rocket that produces a total thrust of approximately 133,118 lbf and is 88 feet high. Dry mass for this rocket is unavailable. Under the negative determination, the ABL RS1 program was approved for up to 12 launches and 12 static fire tests annually. Engine noise from the ABL RS1 vehicle is a maximum of 120 dB at the launch pad and the launches would produce sonic booms at a maximum of 5.4 psf over the Pacific Ocean with a maximum sonic boom of up to 2.0 psf on the Northern Channel Islands. The negative determination found that impacts to marine mammals were expected to be limited to startle-responses and impacts from the RS1 launches are less than those that would be expected from launches in closer proximity to haul-out locations. The ABL RS1 program complies with DAF's 2019 LOA which requires mitigation and monitoring for launches. The RS1 vehicle is expendable, and therefore the first stage would be jettisoned as marine debris into international waters. Finally, the ABL RS1 program requires temporary closures of Surf Beach and Ocean Beach Park during launches for public safety. The negative determination was approved with the understanding that closures of Surf Beach and Ocean Beach Park would not exceed 12 annually. Finally, when the Commission heard the negative determination, with the inclusion of the ABL RS1 program, the maximum number of space vehicle launches at VSFB was 65 annually (as of October 15, 2021).

SLC-3E: United Launch Alliance (ULA) Vulcan Centaur Program

The United Launch Alliance (ULA) Vulcan Centaur program at SLC-3E was approved under ND-0027-20 and was reported to the Commission at its hearing on November 6, 2020. The Vulcan Centaur space vehicle is classified as a medium lift vehicle, is 200 feet high, produces 1.1-3.5 million pounds of thrust, and has a gross lift-off mass (fully fueled) of approximately 450-780 tons. The negative determination approved up to six launches annually. The negative determination found that this was comparable to prior launch programs at SLC-3E, which allowed for between two to eight launches annually. Engine noise from the Vulcan Centaur vehicle is up to 120 dB at the launch pad. Launches also result in a sonic boom of up to 8.0 psf in the pacific ocean south of the Northern Channel Islands. No sonic boom contours were found to overlap with the Northern Channel Islands. The Vulcan Centaur space vehicle is expendable, meaning that the first stage lands in the ocean and is not recovered. Public access to Surf Beach, Ocean Beach County Park, and Jalama Beach County Park is restricted up to six times annually during launches under the ULA Vulcan Centaur launch program.

SLC-4E: SpaceX Falcon 9 Launch Program

The Commission has authorized the SpaceX Falcon 9 launch program at SLC-4E through a series of negative determinations: ND-055-10 authorized modifications of SLC-4E to accommodate the Falcon 9 and Falcon 9 Heavy launch programs. ND-0035-14 authorized a single launch of the Falcon 9 space vehicle from SLC-4E, the in-flight abort test of the Dragon spacecraft capsule and recovery operations around 1.5 miles off the coast of VSFB, and the Falcon 9 first stage boost-back and landing at SLC-4W. ND-0027-15 authorized up to six SpaceX Falcon 9 launches annually, including associated first stage boost-back landings. Most

recently ND-0009-23, which was reported to the Commission at its June 7, 2023, hearing, authorized an increased launch cadence of up to 36 launches annually. These negative determinations were made on the basis that the Falcon 9 launch program would not generate new or additional adverse impacts on coastal resources not previously examined by the Commission in its review for CD-049-98 for the Evolved Expendable Vehicle Launch Program, which took place at adjacent SLC-3E.

The Falcon 9 launch vehicle is categorized as a medium lift rocket that produces a total thrust of approximately 1,111,000 lbf, approximately 178 feet high and weighs approximately 693,000 pounds (gross lift off weight of approximately 1,950,000 lbs.). The maximum engine noise from a Falcon 9 launch is 150 dB at the launch pad. First stage boost back activities would produce engine noise of up to 150 dB as well at SLC-4W. Unlike the other launch programs at VSFB, the Falcon 9 rocket is reused, meaning that the first stage booster travels back to either SLC-4W at VSFB or lands on a droneship[2] in international waters for recovery, refurbishment and reuse. This means that the Falcon 9 launch program has lower marine debris impacts than other programs at VSFB, with 177 pounds of unrecoverable debris per launch, including weather balloon. Additional marine debris could occur during an unplanned emergency where the mission fails in some way and the rocket must be jettisoned into the ocean. Each boost back to SLC-4W requires closure of Surf Beach and Ocean Park for safety. Depending on launch azimuth and wind conditions, launches of the Falcon 9 rocket may require evacuation of Jalama Beach County Park. In ND-0009-23, the Commission understood that public access impacts to these parks and beaches would not exceed 12 annually. Subsequent to consideration of ND-0009-23, Commission staff learned that public access impact events had exceeded 12 in the year 2023. The Commission will consider a remedial action letter at its December 2023 hearing to address the public access impacts of the Falcon 9 launch program.

SLC-6: United Launch Alliance (ULA) Delta IV Program (Outgoing)

The Delta IV launch program recently ended operations and has moved out of SLC-6. This program was covered under the Evolved Expendable Launch Vehicle (EELV) Program, under CD-049-98. The EELV program approved launches of two heavy lift and two medium lift rockets at SLC-6 and SLC-3W and anticipated up to 14 launches of these rockets annually. The Delta IV vehicle is classified as a medium lift vehicle, is up to 236 feet high and weighed between 550,100 and 1.6 million pounds at lift off (fully fueled). The Delta IV launch program has NEPA coverage for up to 6 launches annually. Engine noise from Delta IV launches reached a maximum of 85 dBA (A-weighted sound) at the launch pad and sonic booms were modeled to reach a maximum of 7.2 psf over open ocean with a maximum of less than 1 psf over San Miguel Island and Santa Rosa Island. The Delta IV Heavy was classified as a heavy lift vehicle, was 236 feet high, produced approximately 2.1 million pounds of thrust, and weighs 1.6 million pounds at lift off (fully fueled).

The Delta IV launch vehicle was expendable, and the first stage of the rocket would fall to international waters and become marine debris. Finally, launches of the Delta IV and Delta IV heavy rocket required evacuations of Jalama Beach County Park.

The SLC-6 site will likely be used by another space launch company, and Commission staff will continue to coordinate with DAF staff to review future activities at SLC-6.

[2] A droneship is an autonomous vessel that is used as a landing platform for the first stage of rockets.

SLC-8: DoD Minotaur Program and launch pad for other programs as needed (temporary) under California Commercial Spaceport EA

As discussed above, no records relating to the approval of the Minotaur launch program have been found in the Commission's files, and this launch program has not been reviewed under the Coastal Zone Management Act. However, the Commission has conducted extensive review of the SLC-8 site, which is also known as the California Commercial Spaceport under CC-42-94, which was approved at the Commission's October 11, 1994, hearing. Approval of construction of SLC-8 also included approval of a maximum of 24 launches annually from the site. CC-42-94 contemplated engine noise of up to 125 dB near the launch site during launches and anticipated sonic booms estimated up to 1.0 psf on San Miguel Island. Due to the allowable launch azimuths from SLC-8, launches at SLC-8 were not expected to require closures of Jalama Beach County Park. However, launches of the Minotaur from TP-01, as described on page 2, could cause public access impacts to Jalama Beach County Park.

Missile Programs at VSFB

Missiles launched from VSFB are all DoD programs. The MDA has NEPA coverage for 12 launches annually of their Ground Based Interceptor program, the DAF has NEPA coverage for 5 launches annually of their Minuteman III program, and the DAF has NEPA coverage for up to 6 launches annually of their Ground Based Strategic Deterrence (GBSD) program. The GBSD program will replace the Minuteman III program. The GBSD program was concurred with under ND-0004-21; the Commission has not reviewed the other two programs under the Coastal Zone Management Act. Overall, missiles are smaller and quieter to launch than space vehicles and are launched on a western trajectory. The loudest missiles reach a maximum of 125 dB on the launch sites. These launches occur at several sites on north VSFB. Unlike the rockets, missiles typically use solid propellant or fuel.[3] Due to the solid propellants used, exhaust from missile launches may include hydrogen chloride and aluminum oxide, which are components of acid ground cloud. Acid ground cloud, through its contact with nearby vegetation and waterways, may cause acute damage to vegetation and acute reductions surface water pH near the launch location.

Proposed Launch Programs

SLC-9: Blue Origin New Glenn Program

Blue Origin's New Glenn launch program has been proposed for a new space launch complex, SLC-9, under CD-0010-21. Commission staff and DAF staff are continuing to coordinate to accurately quantify potential coastal impacts of this project. The proposed Blue Origin Project, as described in CD-0010-21, would construct a new space launch complex on a greenfield site. The construction of SLC-9 would have a total habitat disturbance area of approximately 324 acres. SLC-9 would support launches of the New Glenn space vehicle. The New Glenn launch vehicle is categorized as a heavy lift rocket that produces a total thrust of approximately 5 million lbf and would be up to 360 feet high. Dry mass is unavailable at this time. The proposed project would include up to eight launches annually. Engine noise during launches would be up

[3] Rockets use liquid propellant, and do not produce hydrogen chloride or aluminum oxide in their exhaust or acid ground cloud impacts.

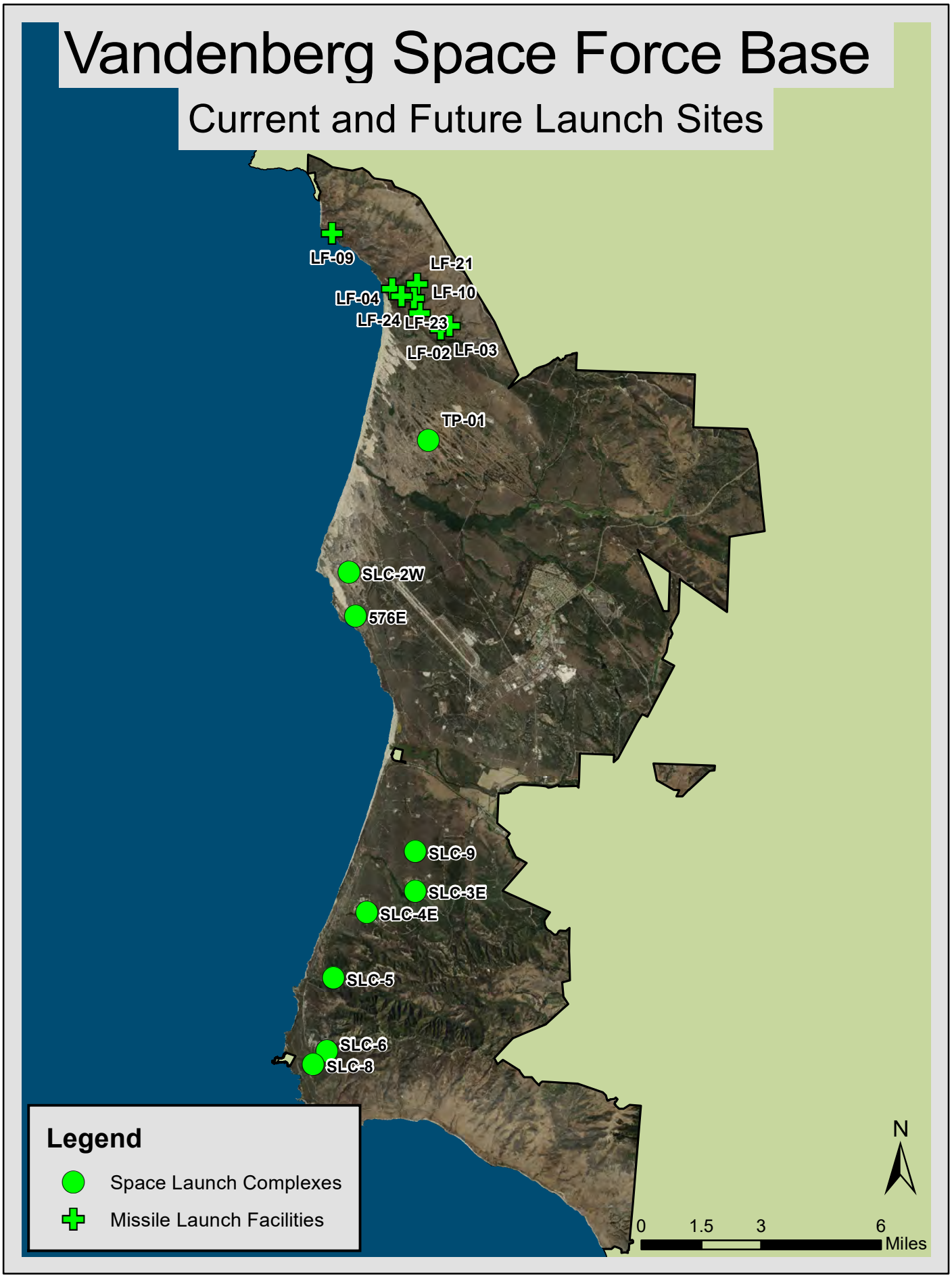
to 115 dB at the launch pad, and expected sonic booms would be up to 8 psf over the Northern Channel Islands. The proposed New Glenn launch program would include a recoverable first stage, lessening the marine debris impacts of launches. The proposed project anticipates that Surf Beach, Ocean Beach, and Jalama Beach County Park would be required to evacuate due to launches from SLC-9.

SLC-5: Phantom Space Daytona-E and Laguna-E Program

Although the main staff report covers Phantom Space Company's Daytona-E and Laguna-E Launch Programs, a brief summary is provided here for consistency and ease of comparison between different launch programs at VSFB.

Phantom Space Company's proposed Daytona-E and Laguna-E launch programs at SLC-5 are being considered by the Commission under CD-0010-22. Both launch vehicles are categorized as small lift rockets. The Daytona-E rocket would be approximately 54.4 feet high and has an estimated dry mass of 2,656 pounds. The Laguna-E rocket would be approximately 78.7 feet high and has an estimated dry mass of 7,900 pounds. Phantom proposes to build up to a launch cadence of 48 launches and 48 static fire tests annually. The maximum engine noise produced would be up to 140 dB at the launch pad for a Laguna-E launch. The maximum sonic boom would be up to 1.5 psf from a Daytona-E launch over the ocean south and west of the Northern Channel Islands. The Daytona-E and Laguna-E launch vehicles would be expendable, and the first stage would fall to the ocean in international waters off Baja California, and would not be recovered. Finally, the proposed Daytona-E and Laguna-E launch programs would very rarely cause public access impacts at Jalama Beach County Park, due to the use of an offshore launch azimuth. DAF estimates a maximum of two public access impact events at Jalama Beach County Park annually.

Exhibit 2: Current and Future Launch Sites



Note: SLC-5 and SLC-9 are proposed and not yet constructed, all other space launch and missile launch facilities are constructed and operational.

Exhibit 3: Vandenberg Map

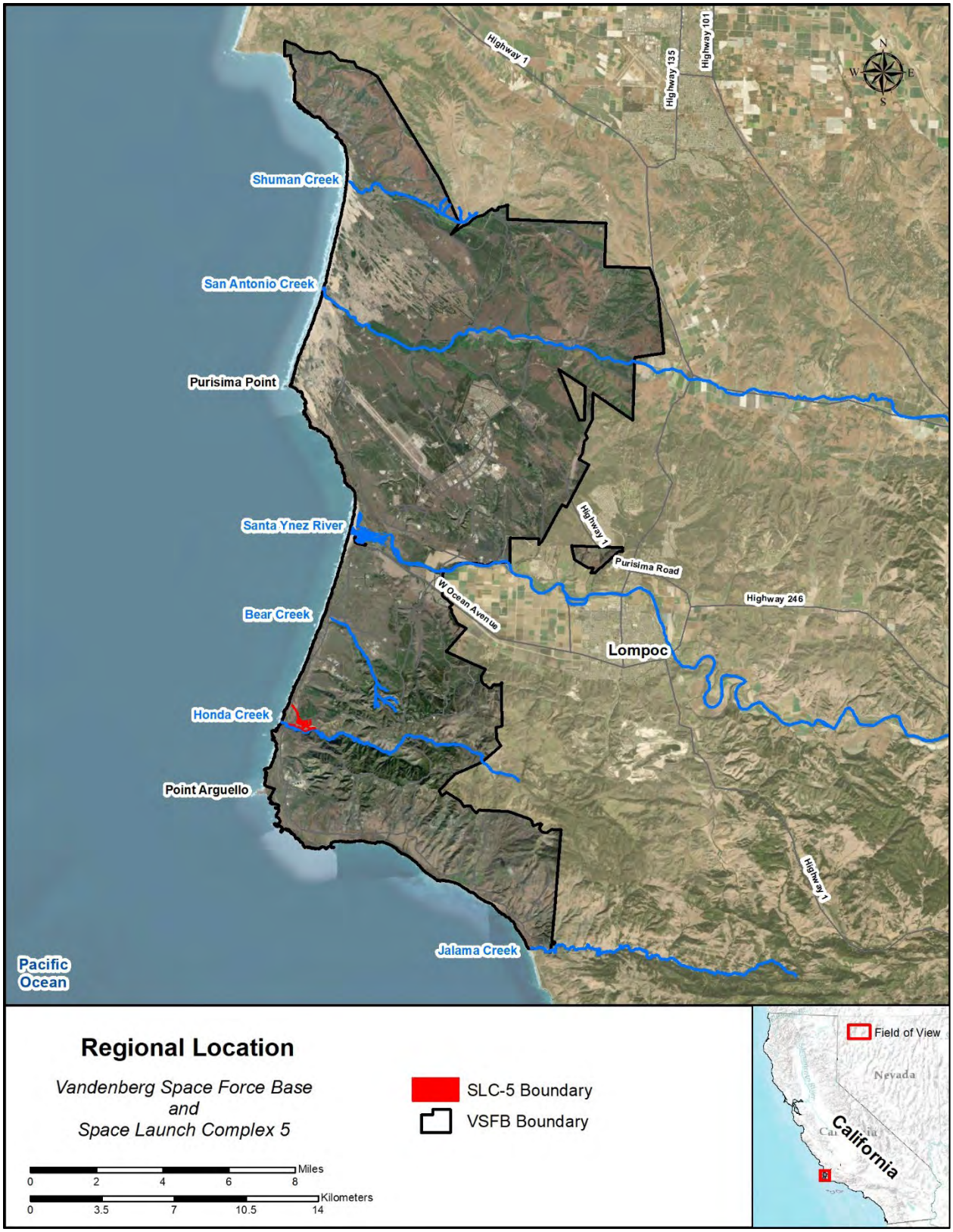


Figure 1-1: Regional location of Proposed Action Area

Exhibit 4: Site Plans

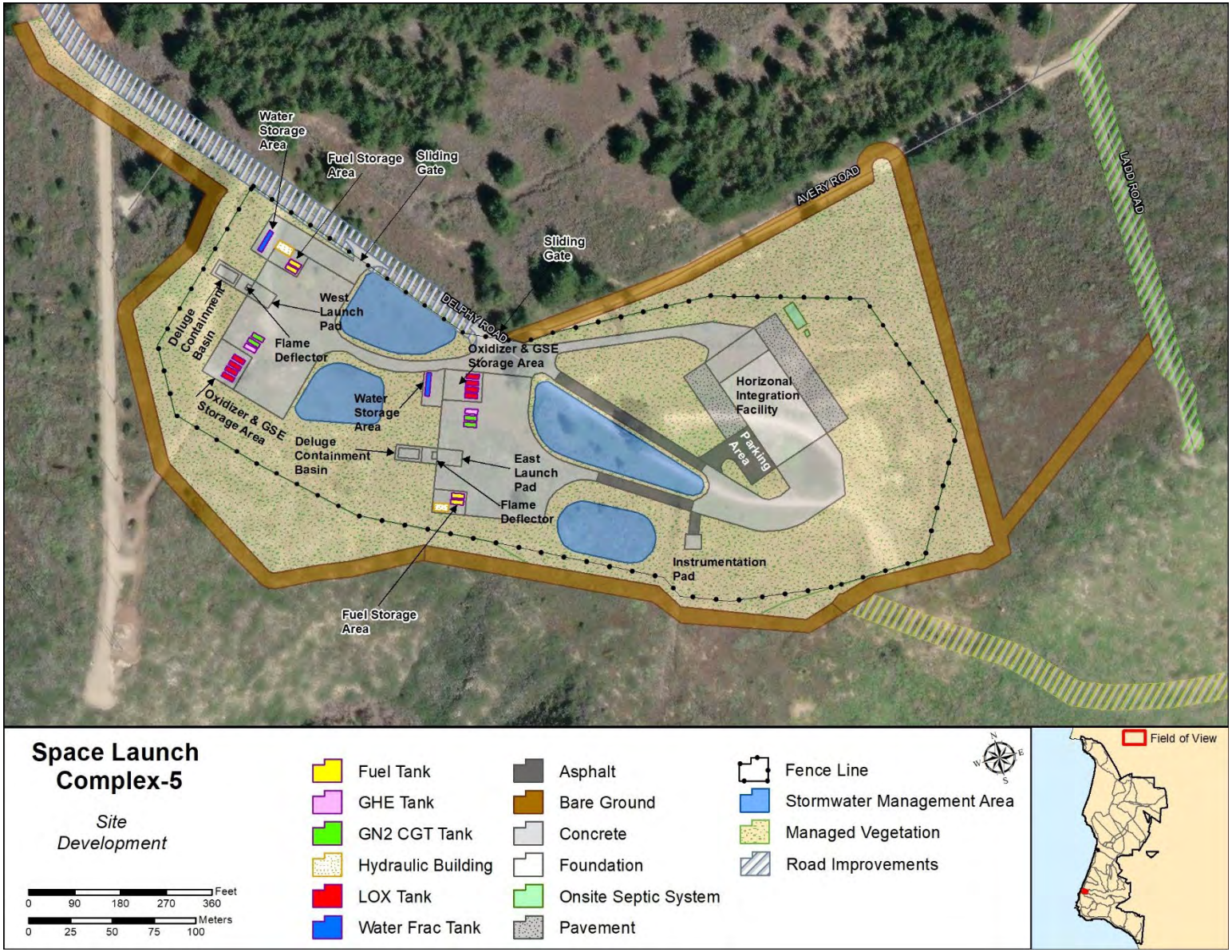


Figure 2-5: Conceptual Site Plan

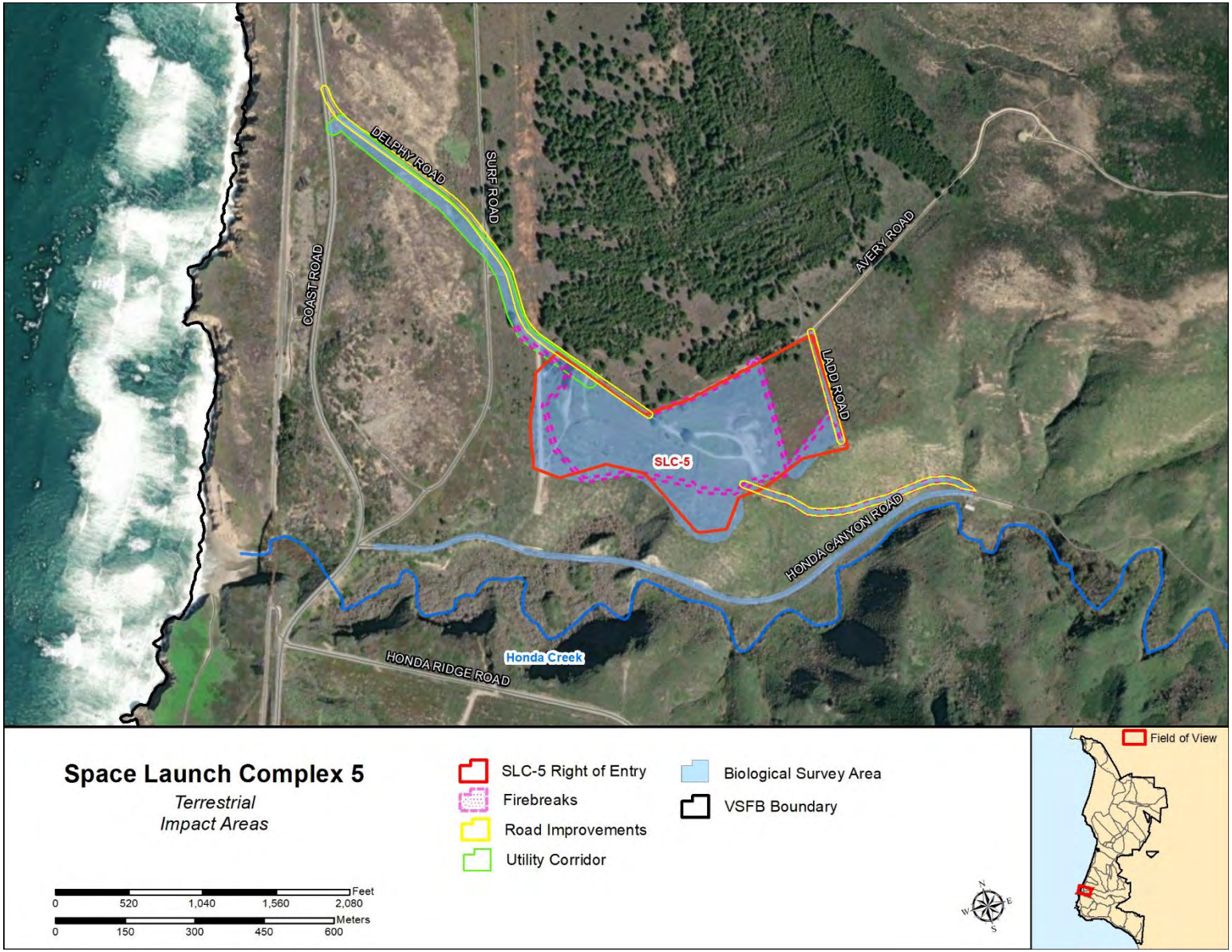


Figure 2-11: SLC-5 Construction and Ground Disturbance Areas (Note: "Right of Entry" does not define the Proposed Action Area)

Exhibit 5: Historical and Proposed Development

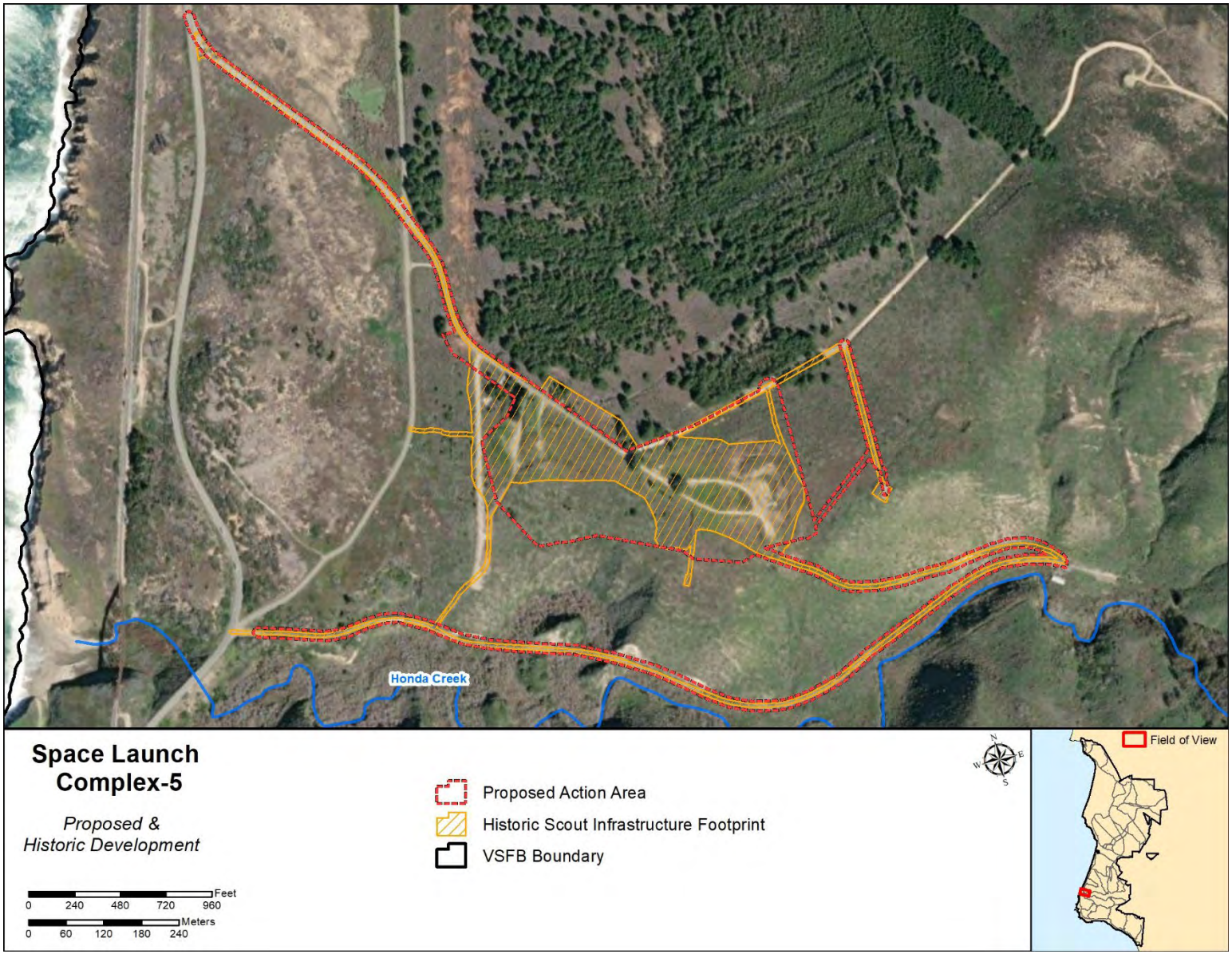


Figure 2-3: Overlay of historic infrastructure footprint and Proposed Action Area

Exhibit 6: Vegetation Alliances at the Project Site

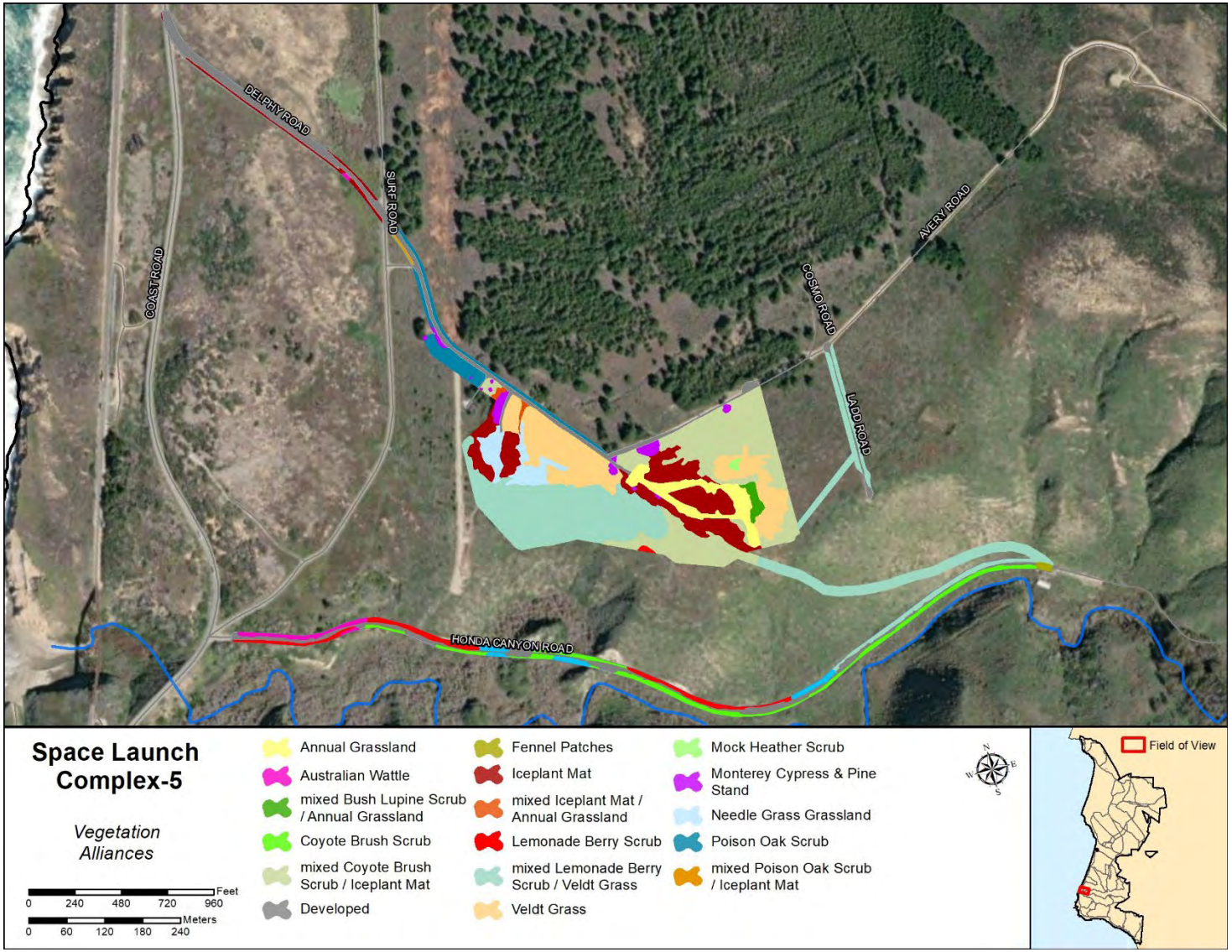


Figure 3-5: Vegetation alliances within the vicinity of the Proposed Action

Table 3-8: Absolute cover of main component species per vegetation alliance

Common Name	Alliance Name	Absolute Cover of Main Component Species*
Annual Grassland	*Avena* spp. - *Bromus* spp. Herbaceous Semi-Natural Alliance	20% *Medicago polymorpha* ; 10% *Plantago coronopus* ; 10% *Carpobrotus* sp.
Arroyo Willow Thicket	*Salix lasiolepis* Shrubland Alliance	95% *Salix lasiolepis* ; 10% *Rhubus ursinus* ; 5% *Foeniculum vulgare*
Australian Wattle Patch	*Acacia* spp. - *Grevillea* spp. - *Leptospermum laevigatum* Shrubland Semi-natural Alliance	90-100% *Acacia longifolia*
Mixed Bush Lupine Scrub / Annual Grassland	mixed *Lupinus arboreus* Shrubland Alliance and *Avena* spp. - *Bromus* spp. Herbaceous Semi-Natural Alliance	70% *Lupinus arboreus* ; 20% *Carpobrotus* sp.; 10% *Ericameria ericoides* ; 10% *Ehrharta calycina*
Coyote Brush Scrub	*Baccharis pilularis* Alliance	50% *Baccharis pilularis* ; 30% *Artemisia californica* ; 20% *Toxicodendron diversilobum*
Mixed Coyote Brush Scrub / Iceplant Mat	mixed *Baccharis pilularis* Alliance and *Mesembryanthemum* spp. - *Carpobrotus* spp. Herbaceous Semi-Natural Alliance	40% *Carpobrotus* sp.; 20% *Ehrharta calycina* ; 20% *Ericameria ericoides* ; 5% *Baccharis pilularis* ; 5% *Frangula californica*
Developed	Developed - Unvegetated	None
Fennel Patches	*Conium maculatum* - *Foeniculum vulgare* Herbaceous Semi-Natural Alliance	40% *Foeniculum vulgare*
Iceplant Mat	*Mesembryanthemum* spp. - *Carpobrotus* spp. Herbaceous Semi-Natural Alliance	70-95% *Carpobrotus* sp.; 0-15% *Ehrharta calycina* ; 0-15% *Bromus* sp.; 0-1% *Acmispon glaber* ; 0-1% *Ericameria ericoides* ; 0-1% *Leptosyne gigantea*
Mixed Iceplant Mat / Annual Grassland	Mixed *Mesembryanthemum* spp. - *Carpobrotus* spp. Herbaceous Semi-Natural Alliance and *Avena* spp. - *Bromus* spp. Herbaceous Semi-Natural Alliance	50% *Bromus* sp.; 50% *Carpobrotus* sp.
Lemonade Berry Scrub	*Rhus integrifolia* Shrubland Alliance	30% *Rhus integrifolia* ; 0-45% *Salvia melifera* ; 0-30% *Toxicodendron diversilobum* ; 0-15% *Carpobrotus* sp.; 10% *Artemisia californica* ; 0-10% *Baccharis pilularis* ; 10-15% *Encelia californica*
Mixed Lemonade Berry Scrub / Veldt Grass	mixed *Rhus integrifolia* Shrubland Alliance and *Ehrharta calycina*	25% *Rhus integrifolia* ; 20% *Ehrharta calycina* ; 15% *Ericameria ericoides* ; 10% *Carpobrotus* sp.; 10% Salvia melifera
Monterey Cypress & Pine Stand	*Hesperocyparis macrocarpa* - *Pinus radiata* Forest & Woodland Semi-Natural Alliance	85% *Hesperocyparis macrocarpa* ; 0-75% *Carpobrotus* sp.
Mock Heather Scrub	*Lupinus chamissonis* - *Ericameria ericoides* alliance	30% *Ericameria ericoides* ; 30% *Carpobrotus* sp.; 20% *Ehrharta calycina*
Needle Grass Grassland	*Nassella* spp. - *Melica* spp. Herbaceous Alliance	30% *Stipa pulchra* ; 25% *Bromus* sp.; 15% *Medicago polymorpha* ; 10% *Plantago coronopus* ; 5% *Carpobrotus* sp.
Poison Oak Scrub	*Toxicodendron diversilobum* Shrubland Alliance	40% *Artemisia californica* ; 20% *Toxicodendron diversilobum* ; 15% *Ericameria ericoides* ; 10% *Carpobrotus* sp.; 3% *Baccharis pilularis*
Mixed Poison Oak Scrub / Iceplant Mat	mixed *Toxicodendron diversilobum* Shrubland Alliance and *Mesembryanthemum* spp. - *Carpobrotus* spp. Herbaceous Semi-Natural Alliance	50% *Carpobrotus* sp.; 30% *Ericameria ericoides* ; 20% *Toxicodendron diversilobum* ; 10% *Artemisia californica* ; 5% *Baccharis pilularis* ; 2% *Frangula californica*
Veldt Grass	*Ehrharta calycina* Undescribed Alliance	50-80% *Ehrharta calycina* ; 10-15% *Bromus* sp.; 7-25% *Carpobrotus* sp.; 0-7% *Artemisia californica* ; 0-5% *Baccharis pilularis* ; 0-5% *Ericameria ericoides* ; 0-5% *Rhus integrifolia*

*Species cover and composition varied by location; alliance assignments represent the best fit among described alliances (J. Sawyer et al 2009); cover of non-dominant species was ony noted where doing so helped clarify alliance assignments

Exhibit 7: Wildlife Species and Engine Noise Maps

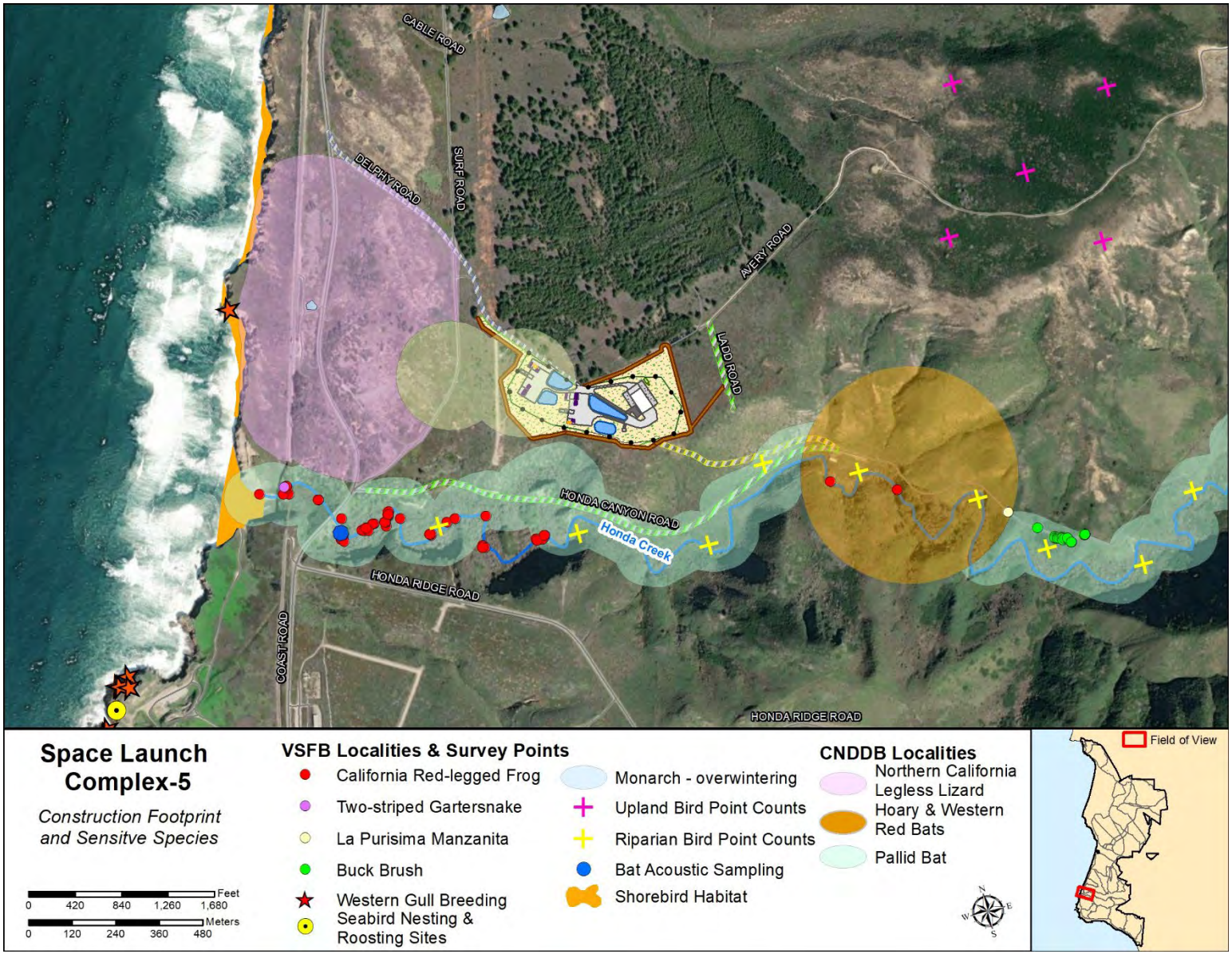


Figure B-1: Special status species localities and survey points in the vicinity of the SLC-5 construction footprint

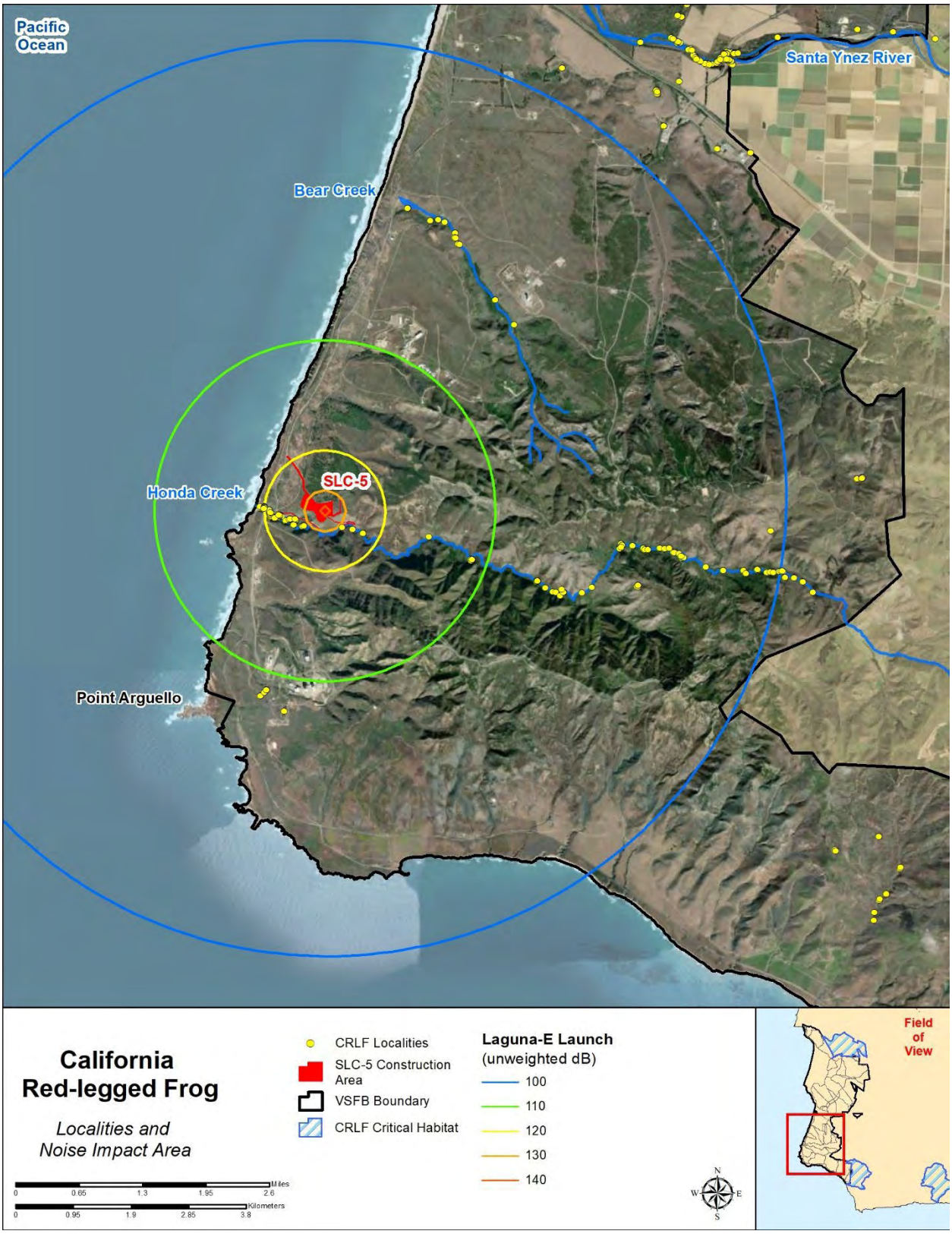


Figure B-2: California red-legged frog localities within the Laguna-E noise footprint (Source: USSF long term annual surveys and monitoring)

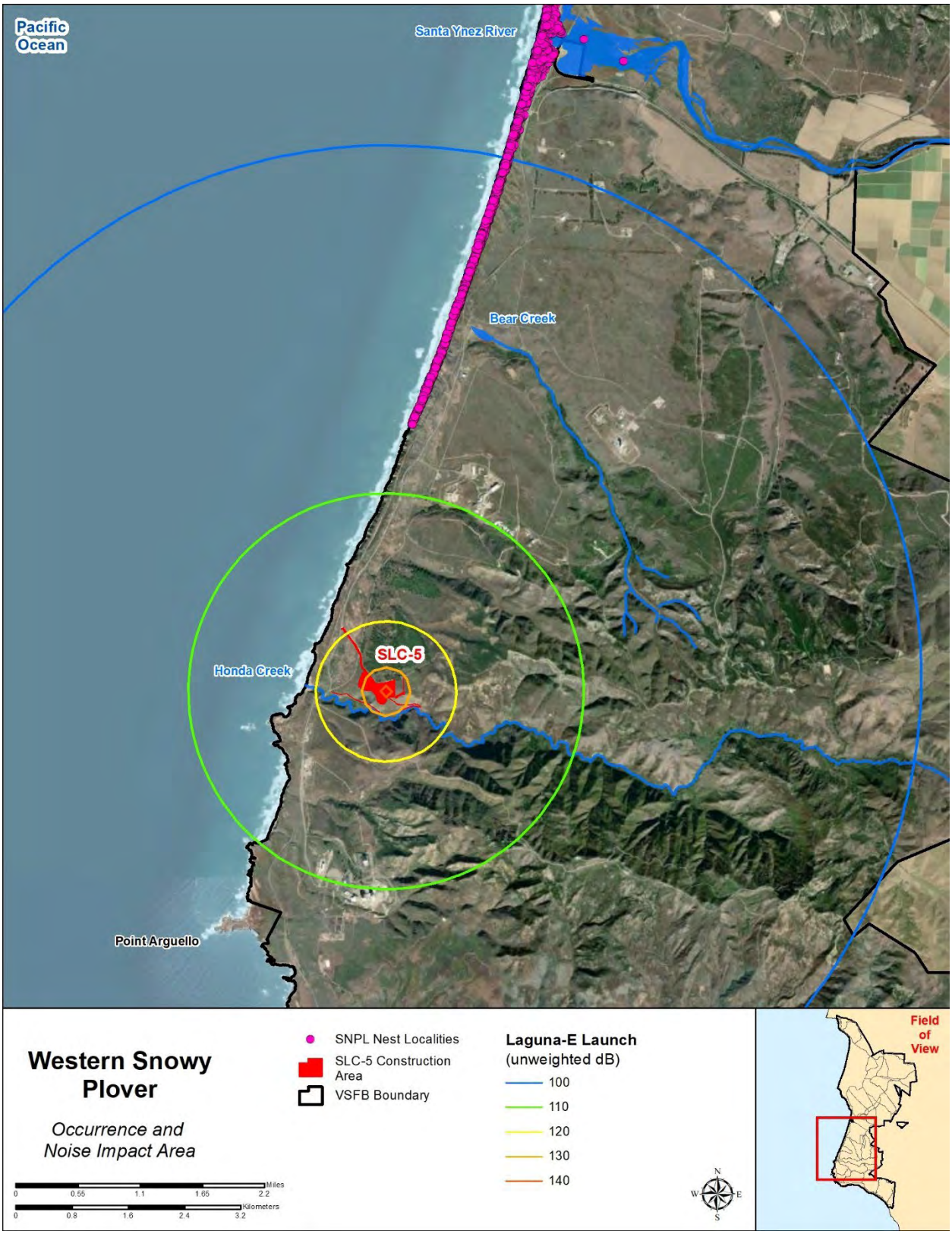


Figure B-3: Western snowy plover nest localities within the Laguna-E noise footprint (Source: USSF long term annual surveys and monitoring)

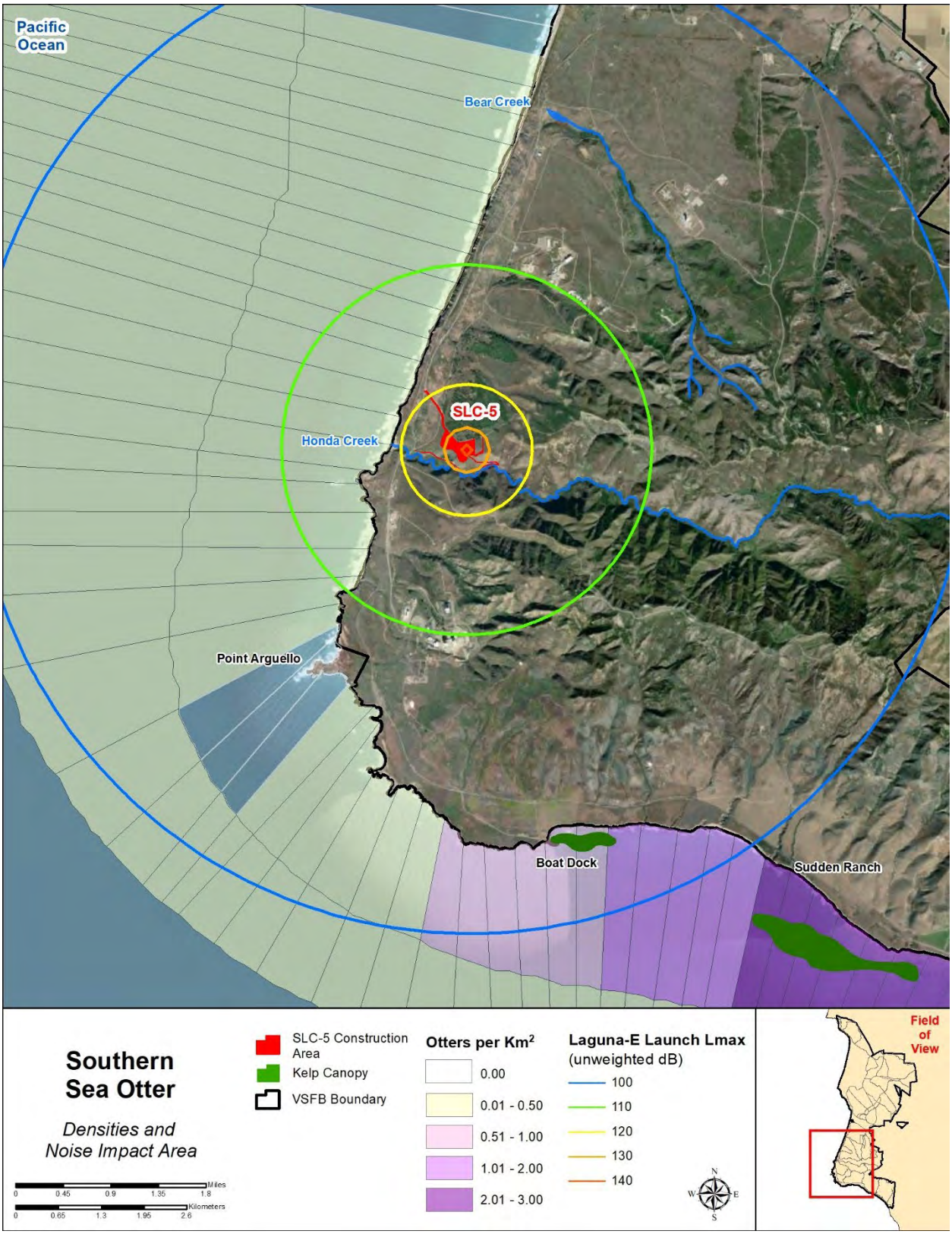


Figure B-5: Southern sea otter densities offshore within the Laguna-E noise footprint (Source: USGS 2019)

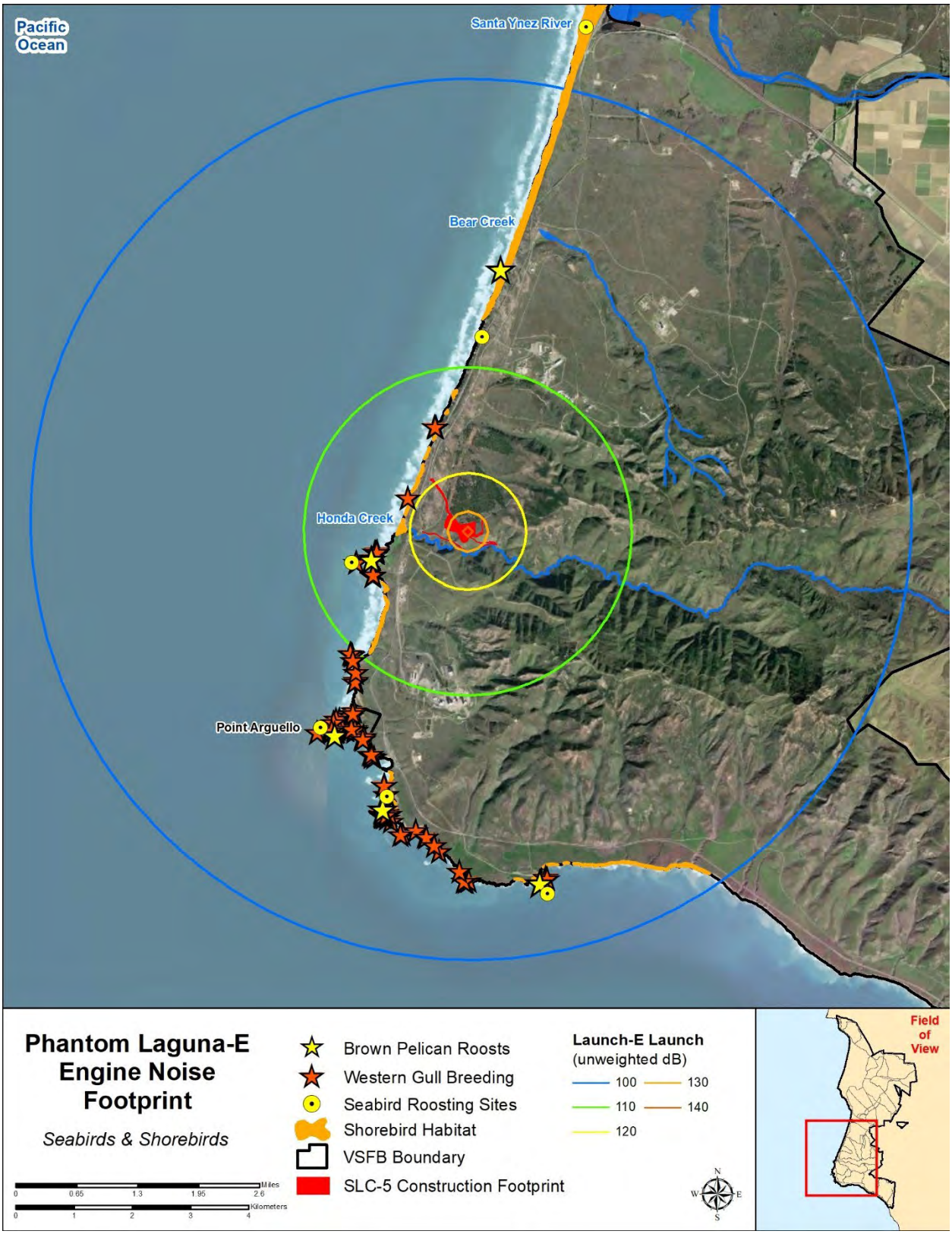


Figure B-6: Seabird roosting and breeding areas and shorebird habitat within the Laguna-E noise footprint (Source: USSF long term annual surveys and monitoring)

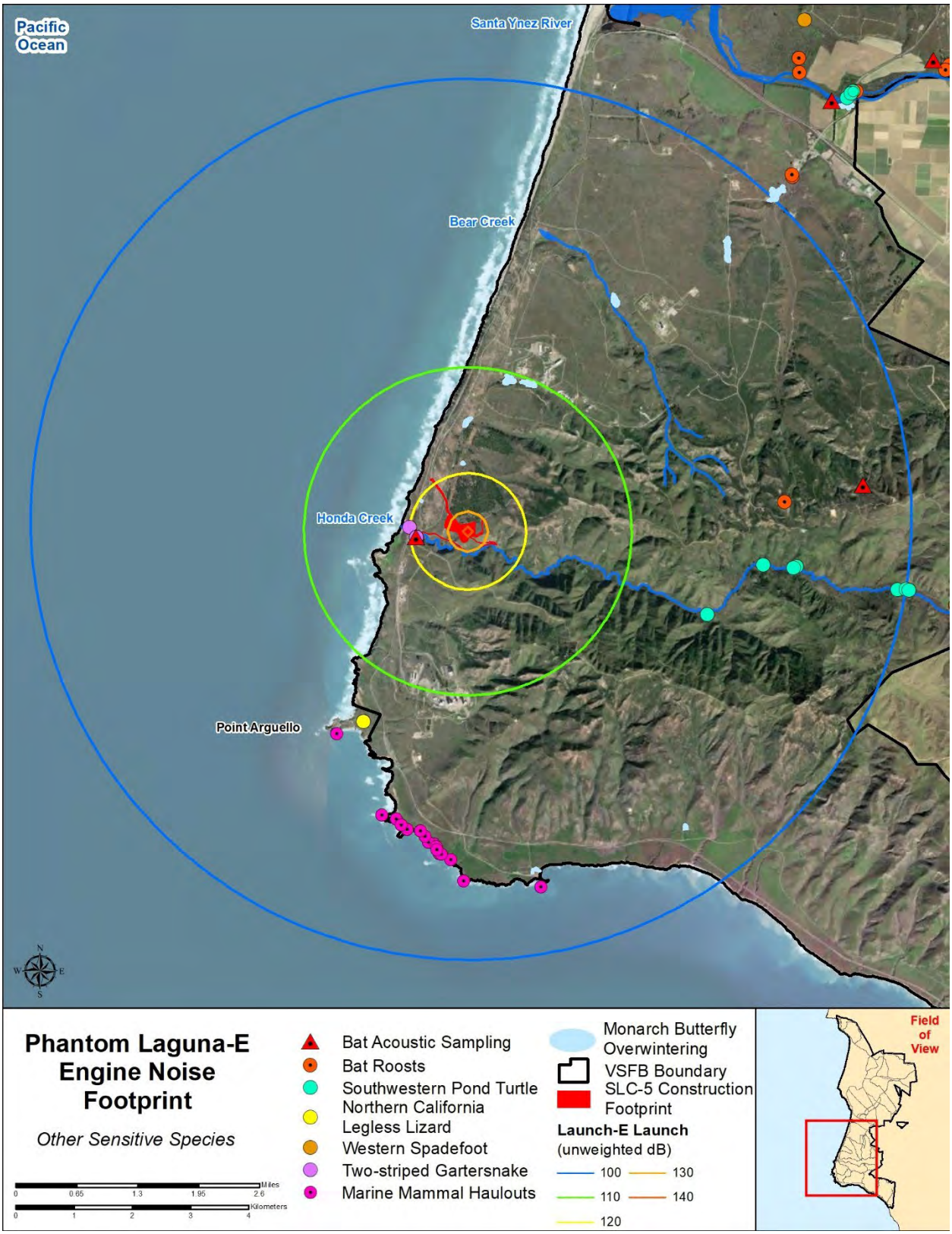


Figure B-7: Other special status species within the Laguna-E noise footprint (Source: USSF long term annual surveys and monitoring)

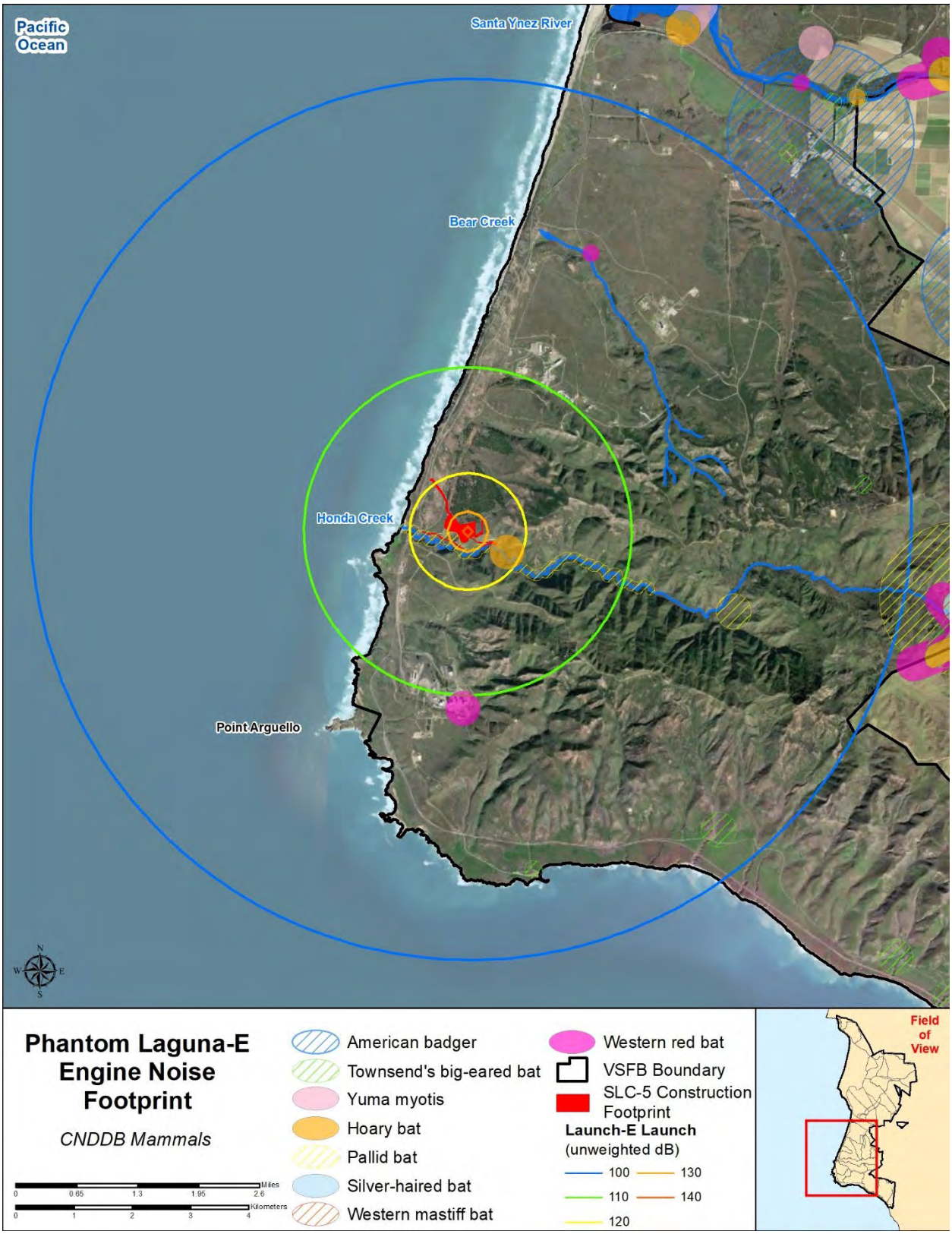


Figure B-8: Special status mammal CNDDB localities within the Laguna-E noise footprint

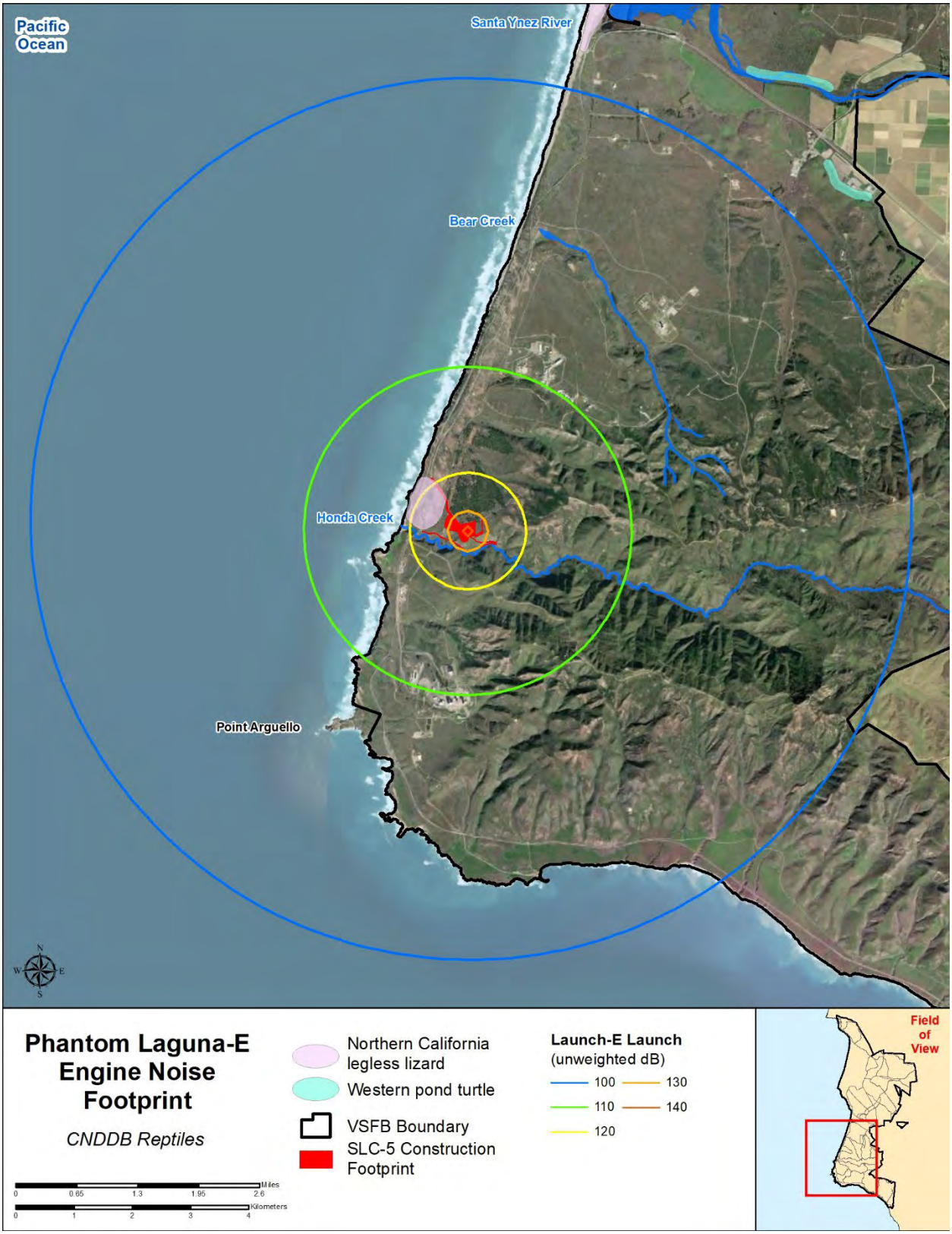


Figure B-9: Special status reptile CNDDB localities within the Laguna-E noise footprint

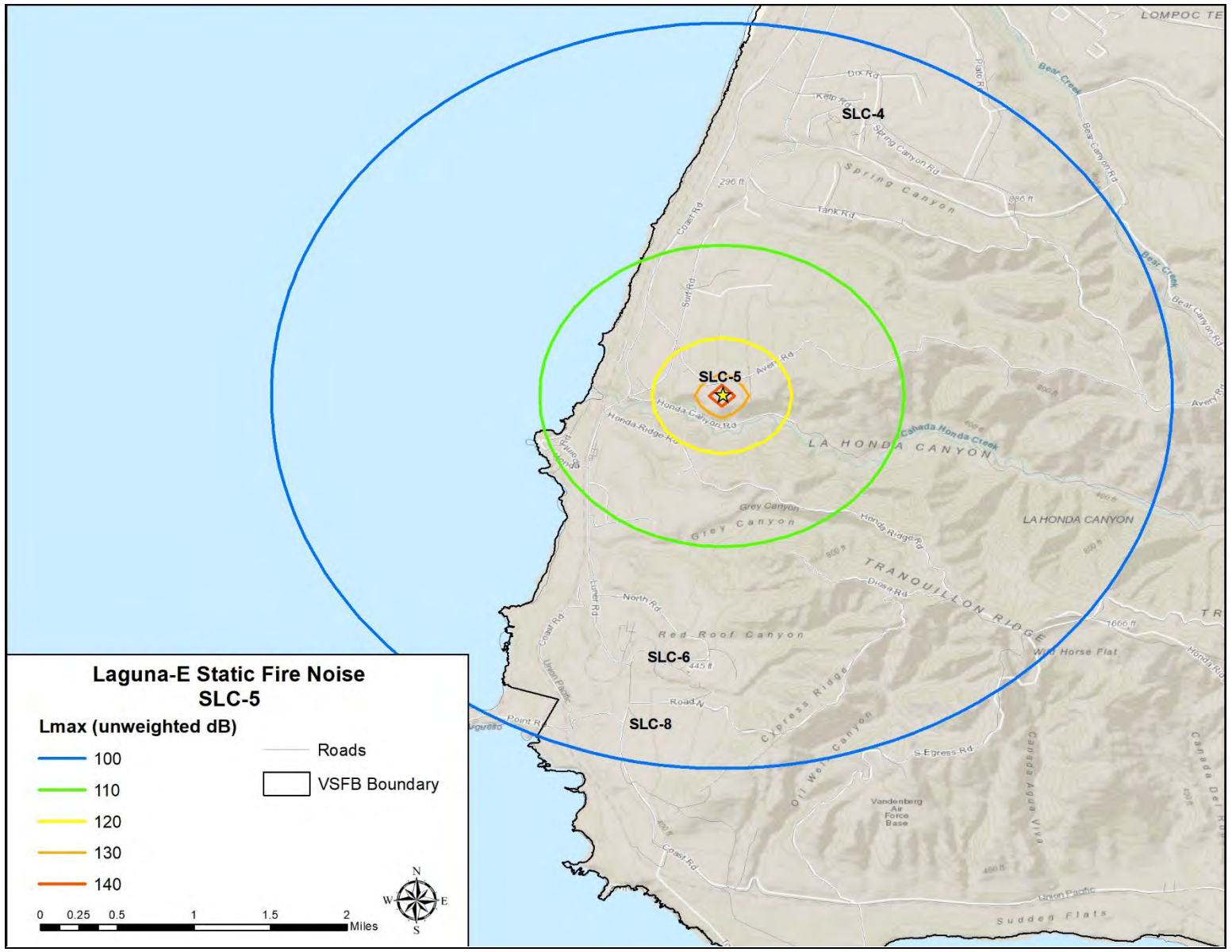


Figure 2-17: Maximum Engine Noise Distribution During Laguna-E Static Fire

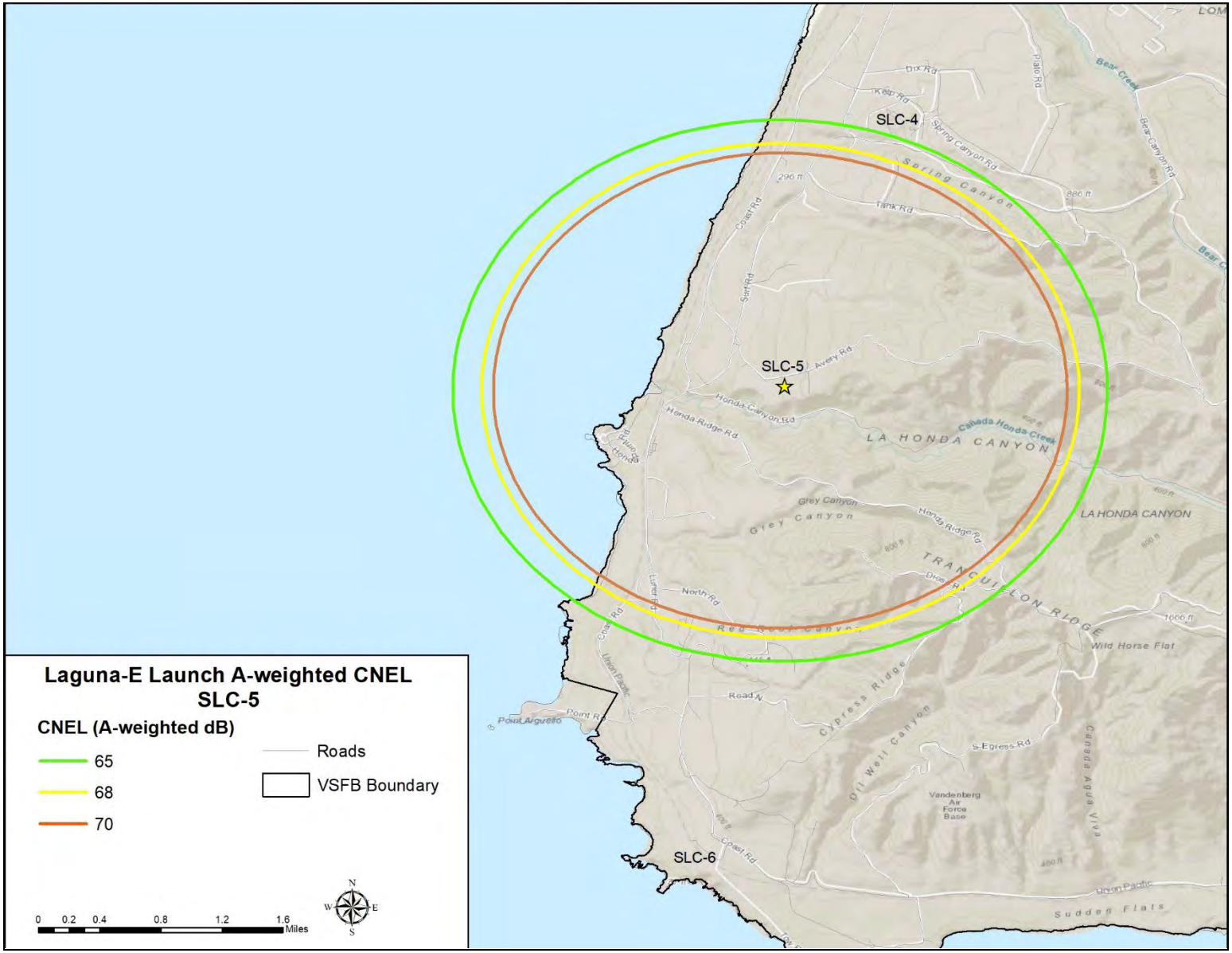


Figure 2-19: A-weighted Community Noise Equivalent Level during Laguna-E Launch

Exhibit 8: Preliminary Site Lighting Plan

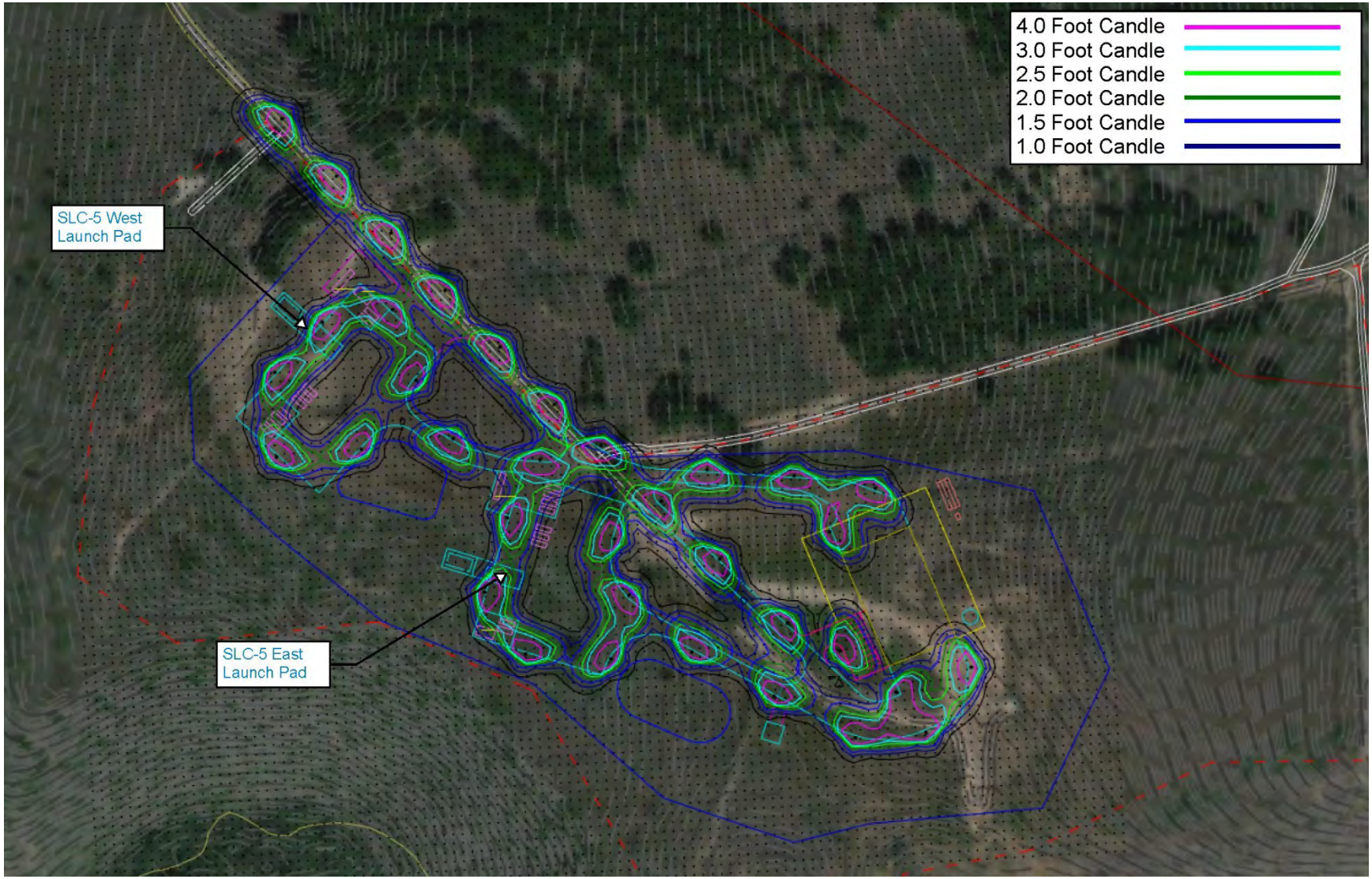


Figure 2-10: Preliminary Lighting Plan

Exhibit 9: Predicted First Stage Splashdown Map

Figure 2-20: Daytona-E and Laguna-E First Stage Splashdown Zone in Broad Ocean Area

Exhibit 10: Sonic Boom Map

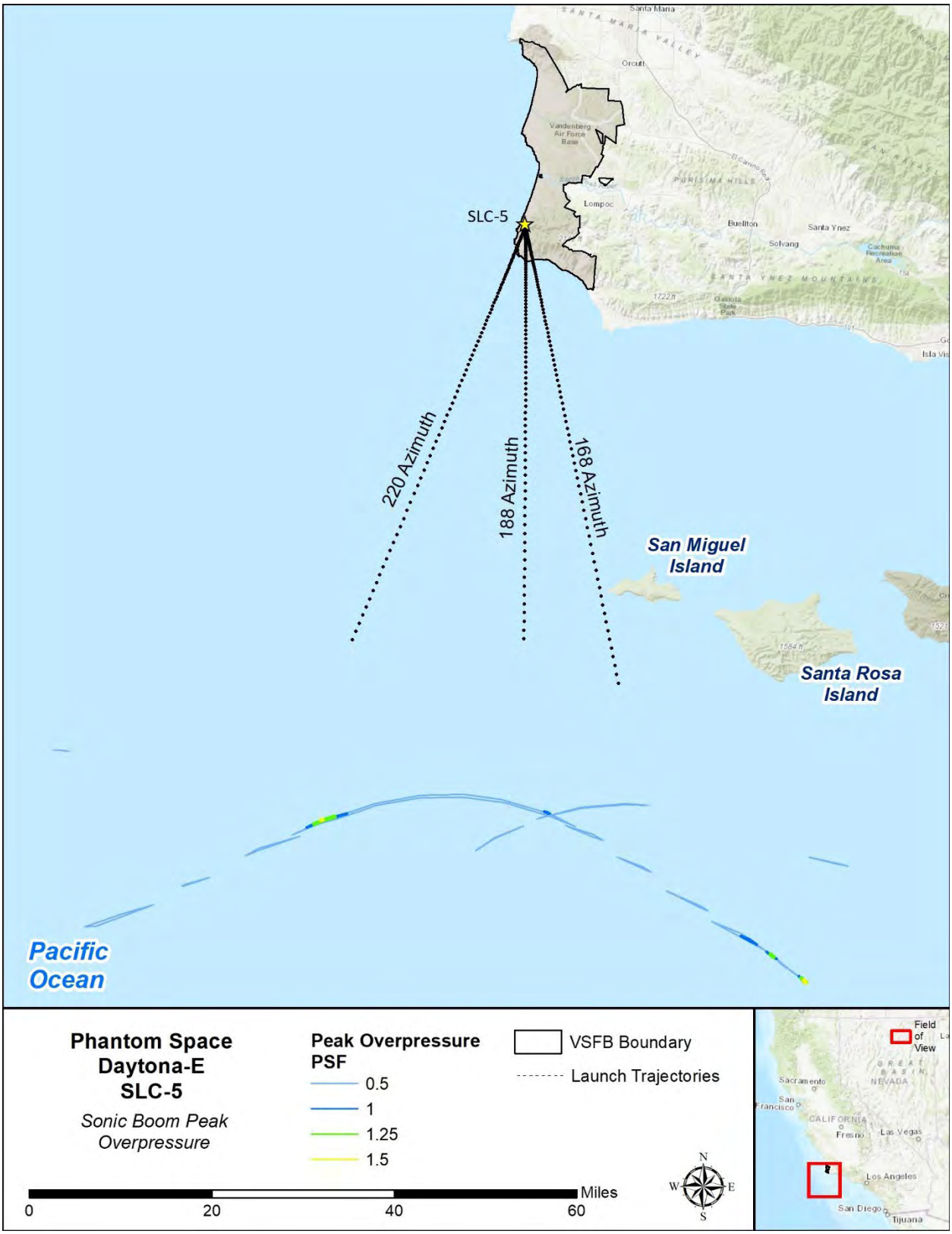


Figure 2-12: Predicted Sonic Boom Footprint for Daytona-E

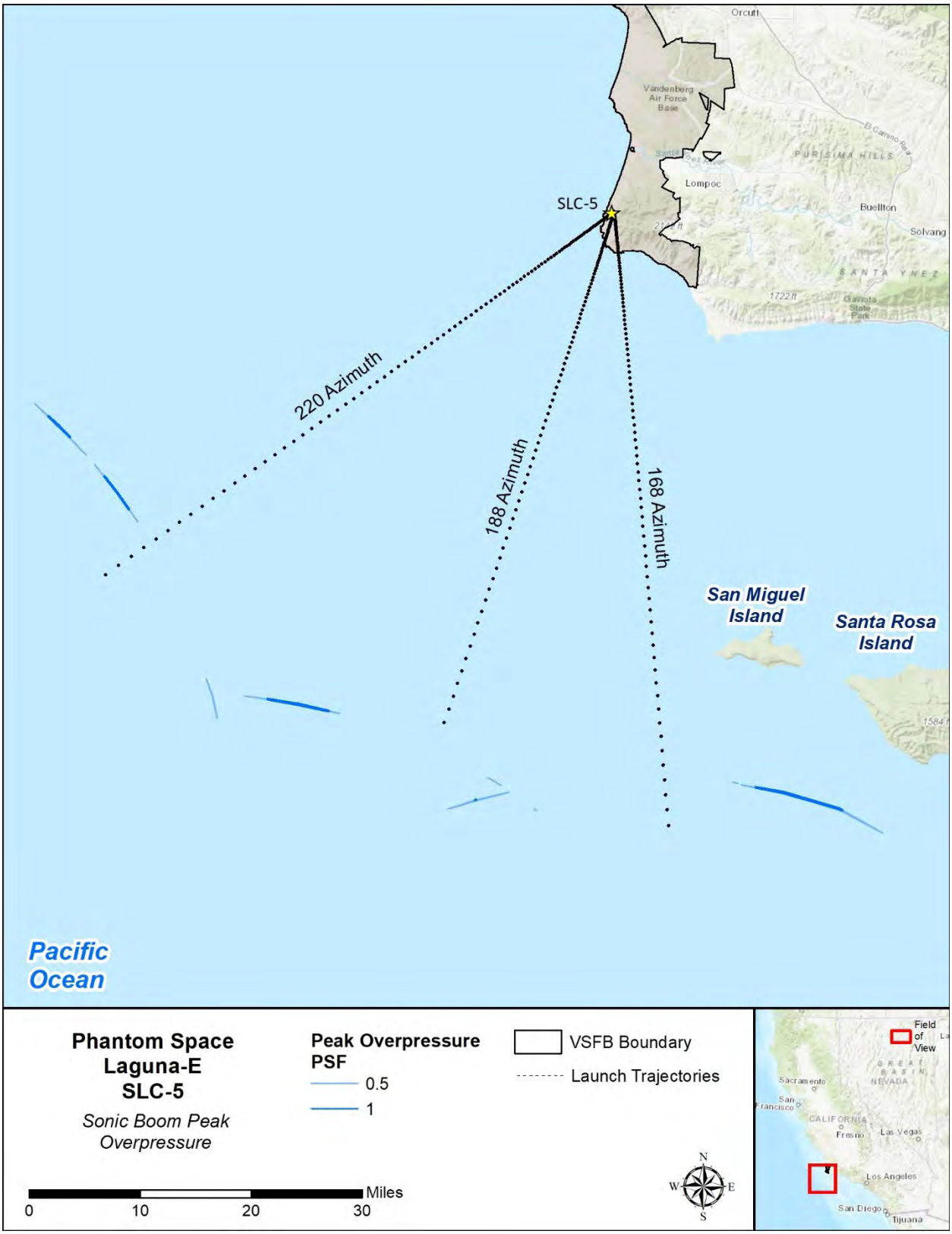


Figure 2-13: Predicted Sonic Boom Footprint for Laguna-E

Exhibit 11: Fishing Blocks and Range of Launch Angles

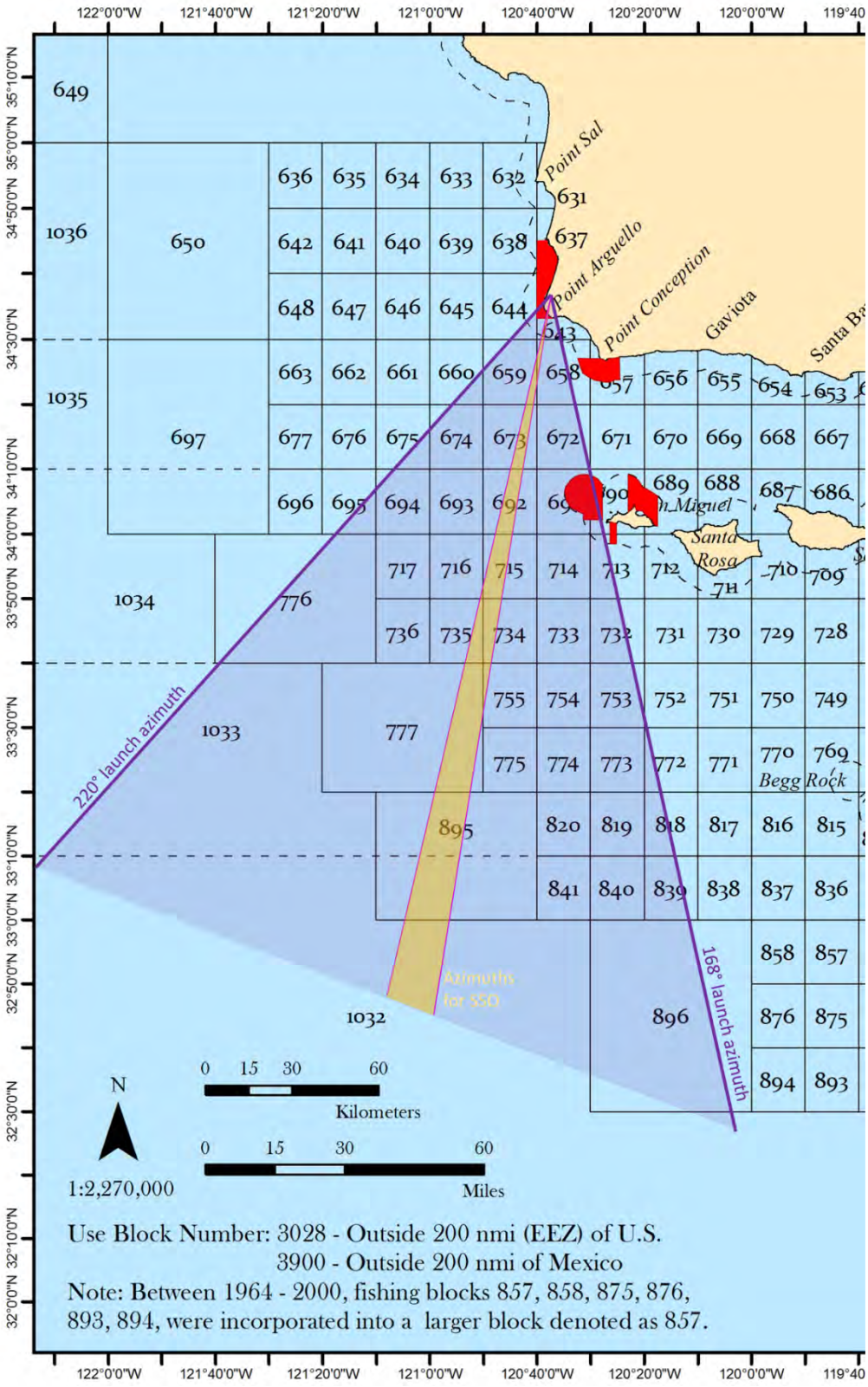
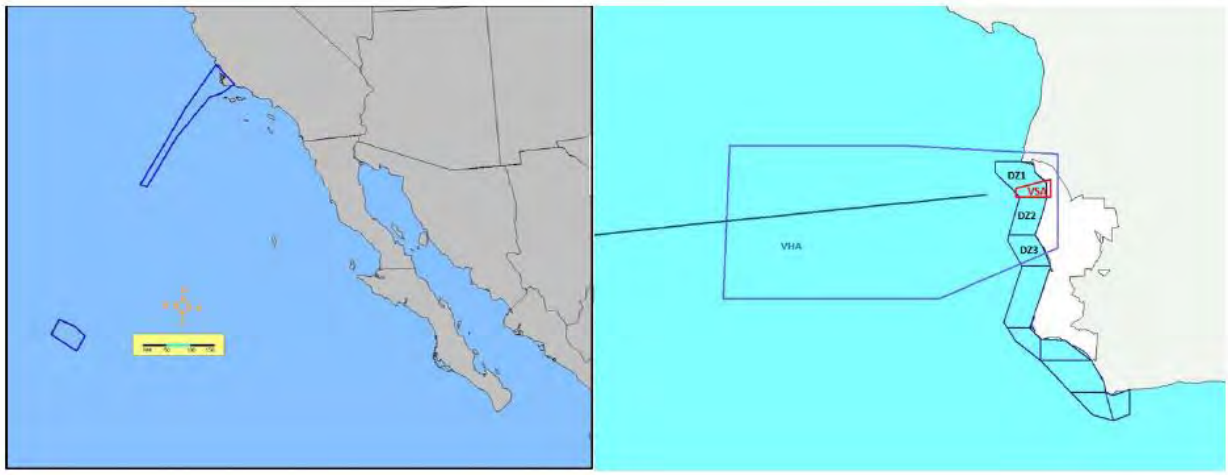


Figure 3-2: Phantom's Potential Launch Azimuth Range (purple), Most Frequent SSO Azimuths (orange), State Marine Reserves (red), and CDFW Fishing Blocks

Example Vehicle Hazard Areas for representative VSFB Launches

This information is excerpted and lightly edited from DAF's Consistency Determination



The maps above show two examples identified in recent Notice To Mariners (NOTMARs) for VSFB launches. The map on the left depicts a vehicle hazard area (VHA) of a relatively new launch vehicle approximately 10-15% larger than Phantom's Laguna launch vehicle. Because Phantom's vehicles are smaller, these are likely much larger than the VHAs that would be determined for Phantom's initial launches. The map on the right depicts the VHA of a highly reliable rocket approximately the same size as Phantom's Daytona. A similar sized VHA would be expected for Phantom's Daytona once reliability is established. The Laguna would be expected to have a slightly larger VHA. Note that in both examples, the vehicle launch azimuths are west from VSFB; Phantom's flight paths would be southerly, thus the VHA would also be aligned in a southern direction.