Coalition for Sustainable Aviation

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11567 Airway Blvd
Roanoke, TX 76262
www.CSAviation.org

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Washington, DC 20460

The following comments are offered by the Coalition for Sustainable Aviation (CSA), a non-profit organization focused on safe and continuous operation of general aviation aircraft. CSA is comprised of members who own and or operate aircraft within the United States. Members of CSA will be impacted directly by the actions of EPA as it pertains to the "Proposed Finding That Lead Emissions From Aircraft Engines That Operate on Leaded Fuel Cause or Contribute to Air Pollution That May Reasonably Be Anticipated To Endanger Public Health and Welfare", referred to herein as the "Proposed Rule". Therefore, as stakeholders, CSA requests that our comments and proposed solutions be considered as EPA formulates an action forward with the "Proposed Rule".

CSA presents comments today that are the culmination of input from three members of CSA. Each of these members are pilots as well as chemical engineers, having extensive experience in the transportation fuel industry, environmental regulations, and statistical engineering practices of industry. No less than 75 years of industry related experience is represented in our comments. Our focus will be on the following key areas; legal authority for the "Proposed Rule", critique of lead monitoring studies offered in the "Proposed Rule", a cost effective and ready solution for Environmental Justice (introducing CODALE), history of past EPA fuel regulations, safety of pilots and passengers, logistical and cost considerations.

CSA appreciates the opportunity to offer comments during the public comment period and remains open to work with EPA and FAA going forward on this very important matter. CSA sees leaded Aviation Gasoline (AvGas) as an important element in the safe operation of the approximately 222,600 piston engine aircraft in the United States today, operated by approximately 664,564 certified pilots. General Aviation serves the public daily through a multitude of venues, from training of professional pilots to the support of communities in remote locations, not otherwise served by road systems – such as nearly 80% of the communities in Alaska.

Lead emissions are 425 times less today than when the Clean Air Act came into being. Since the passage of the Clean Air Act (CAA) by Congress in 1970, lead emissions in the United States have been reduced by a remarkable 99+%, or over 200,000 tons/year. The efforts of EPA, along

with those of refiners and automobile engine manufactures are to be commended. In roughly 2 generations, all but a very small amount of lead emissions has been eliminated. The AvGas of today accounts for approximately 470 tons/year of lead emissions, or less than ¼ of 1% of the lead emissions of the 70's. It should be recognized that the biggest endangerment that the public has ever faced from lead emissions has already been eliminated, through the regulation of transportation fuel and the phase out of lead from automobile gasoline. For our current EPA administrator to "find that lead air pollution may reasonably be anticipated to endanger the public health and welfare" is a high bar to clear when viewed in context of past achievements.

Aviation fuel was specifically excluded from regulation under the Clean Air Act. During this same period of time (1973 through the early 90's), there were significant changes made to automobiles that allowed them to run without leaded fuel. No similar modifications were made to aircraft engines. In fact, today's aircraft engines are essentially the same aircraft engines of the 1930's and 1940's, which is why they depend upon the higher octane fuel, achieved through the use of Tetra Ethyl Lead (TEL), for safe and reliable operation. It should also be noted that the dramatic reduction in lead emissions (by over 99%) was accomplished without making regulatory changes to either aviation fuel or aircraft. Absent the lead from gasoline, it only stands to reason that aircraft engine emissions represent a high percentage of today's lead emissions. The question is can it be managed, or must it be eliminated from aviation fuel at any cost.

<u>EPA does not have the legal authority to implement the "Proposed Rule"</u>
Fundamental to this claim is the fact that Congress excluded aircraft from the Clean Air Act of 1970, which is why airplanes do not have catalytic converters, or any other mandated modifications that our modern day automobiles do have. Lead has not been removed from aviation fuel, as it was for gasoline used by the motoring public during that same period, for good reason. The Clean Air Act provides for this important exclusion in the definition of "Transportation Fuel" 40CFR section 80.1401: *"Transportation Fuel means fuel for use in motor vehicles, motor vehicle engines, nonroad vehicles, or nonroad engines (except fuel for use in ocean-going vessels)."*

40CFR section 85.1703 defines Motor Vehicles, and excludes aircraft by way of, *"the vehicle exhibits features which render its use on a street or highway unsafe, impractical, or highly unlikely, such features including, but not being limited to, tracked road contact means, an inordinate size…."*

Congress has taken no action to modify these definitions to include Aircraft or the associated fuel. Neither the amended CAA of 1977 nor the amended CAA of 1990 changed the definitions of Motor Vehicles or Transportation Fuels.

<u>Further to the matter of over-reach.</u> Under the "Proposed Rule" EPA claims authority under section 231(a)(2)(A) of the Clean Air Act to both "find that lead air pollution may reasonably be anticipated to endanger the public health and welfare" and additionally "to find that engine emissions of lead from certain aircraft cause or contribute to the lead air pollution that may

reasonable be anticipated to endanger public health and welfare". Further, EPA points to findings for Green House Gases (GHGs) under section 202(a) supportive of its proposed authority. Section 202(a)(1) states *"The Administrator shall by regulation prescribe (and from time to time revise) in accordance with the provisions of this section, standards applicable to the emission of any air pollutant from any class or classes of* ***new motor vehicles*** *or* ***new motor vehicle engines****, which in his judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare."* (***emphasis added***)

We point first to the fact that none of the existing 222,600+ piston engine aircraft could be defined as a "new motor vehicle" or having "new motor vehicle engines". More importantly, aircraft are excluded from the definition of "motor vehicle" provided for in the CAA 40CFR section 85.1703

A plain reading of the regulations clearly illustrates that Aircraft are not "Motor Vehicles" and that Aviation Gasoline is not "Transportation Fuel". Respectfully, we do not see the necessary legal authority for EPA to proceed with or implement the "Proposed Rule" in an attempt to regulate Aviation Gasoline under either section 231(a) or section 202(a)

Seeking a workable solution with safety in mind

CSA does recognize and shares many of the same concerns brought forth with the "Proposed Rule". Our additional comments today are focused on both a workable solution to the immediate issue, and to emphasis the importance of aviation safety and the lessons to be learned from past regulatory implementation. The solution we propose today can be implemented in short order and under the current authority of the Federal Aviation Administration (FAA), delivering Environmental Justice while assuring the safety of pilots and their passengers.

The Solution is Dilution – Move the Runup Area Away From Surrounding Communities

The current, more stringent lead air standards are already being met at airports across the nation or can be met by relatively simple changes to aircraft operations within the airport property. In the "Proposed Rule" EPA references past lead concentration monitoring efforts, showing results in Table 2 – Lead Concentrations Monitored at 17 Airports in the U.S. as printed in the Federal Register/ Vol. 87 No. 199 page 62763. Found in Table 2 are two airports having lead design values exceeding the Lead NAAQS, revised in 2008 to 0.15 $\mu g / m^3$ of air. It is important to note that 12 of the 17 monitored airports had lead emission levels at less than 50% of today's Lead NAQQS. It is also noteworthy to see that none of the subject airports would come anywhere close to exceeding the Lead NAAQS of 1.5 $\mu g / m^3$ that was in place while lead was being phased out of gasoline in the 70's, 80's, and 90's. Results from the monitoring program would show that cases are rare where today's Lead NAAQS are exceeded, representing 2 of 17, or 12% of those sampled. Although not necessarily delineated in the Table, an important observation is that 13 of the 17 listed airports are staffed with Air Traffic Control (ATC) personnel, while 4 are uncontrolled, see Table A of this report. Of those uncontrolled airports, the highest lead design value is reported for Auburn Municipal Airport at 0.06 $\mu g / m^3$, or only 40% of the maximum lead NAAQS.

TABLE A

Airport, State	Identifier	Lead Design Value, µg /m^3	Controlled	Runway Length (feet)
Auburn Municipal, WA	S50	0.06	N	3,842
Brookhaven Airport, NY	KHWV	0.03	N	4,222
Centennial Airport, CO	KAPA	0.02	Y	10,001
Deer Valley, AZ	KDVT	0.04	Y	8,196
Gillespie Field, CA	KSEE	0.07	Y	5,342
Harvey Field, WA	S43	0.02	N	2,672
McClellan-Palomar Airport, CA	KCRQ	0.17	Y	4,897
Merrill Field, AK	PAMR	0.07	Y	4,000
Nantucket Memorial Airport, MA	KACK	0.01	Y	6,303
Oakland County International, MI	KPTK	0.02	Y	6,521
Palo Alto Airport, CA	KPAO	0.12	Y	2,433
Pryor Field Regional Airport, AL	KDCU	0.01	N	6,107
Reid-Hillview Airport, CA	KRHV	0.10	Y	3,100
Republic Airport, NY	KFRG	0.01	Y	6,833
San Carlos Airport, CA	KSQL	0.33	Y	2,621
Stinson Municipal, TX	KSSF	0.03	Y	5,000
Van Nuys Airport, CA	KVNY	0.06	Y	8,000

Much of EPA's basis for the "Proposed Rule" appears to be by modeling of 13,000 airports in the peer-reviewed report titled, "Model-Extrapolated Estimates of Airborne Lead Concentrations at U.S. Airports". This model was created using a Monte Carlo simulation using data from a single "model airport". Each airport then had scaled corrections applied to it to determine a projected lead concentration. The two main variables corrected for were lead concentration of fuel and quantity of LTOs. It seems problematic, and certainly not realistic, that the subject analysis extrapolated data from a single airport to determine lead emissions near run-up locations for over 13,000 airports. There are many more variables that can't easily be corrected for, including meteorological data, airplane models, airport specific runup behavior, etc. The variability of these factors cannot be captured without collecting data from multiple, geographically diverse airports. Considering the multitude of variables unaccounted for, the statistical significance of the referenced model calls into question the ability to reliably identify exact airports that would potentially exceed Lead NAAQS.

A critique of the previous studies and an attempt to put the scale of findings into context is offered in Appendix A of our comments.

Recognizing that these studies are limited in scope and sampling, there are a few key observations that can be taken from the Lead Monitoring activity

The most relevant observations are:

- Highest lead emissions occur within 15 meters downwind of the high impact site. (Namely, aircraft exhaust in the runup area on the down wind end of the airport)
- Lead concentrations decrease to below the standard within 50 meter from the location of highest concentration. (Lead NAAQS are exceeded within the 50 meters, but not exceeded past the 50 meters)
- Lead concentrations decrease sharply as distance from the runup area increases. (When it comes to lead exposure, the further from the runup area the better)
- Concentrations of lead from piston engine aircraft emissions can be elevated above background levels at distances of 500 meters over a rolling three-month period. (Lead emissions may be detected, but do not exceed the Lead NAAQS at 500 meters)
- On individual days, concentrations of lead from piston-engine aircraft emissions can be elevated above background levels at distances of 1000 meters on individual days downwind of a runway, depending on aircraft activity and prevailing wind direction. (Detection of Lead emissions at this distance would not be on the same basis of the 3 month average utilized for the NAAQS, but possibly distinguishable from background lead in a given air sample.)

Simple changes in airport ground operations provides a ready solution to those airports that do not meet today's Lead NAAQS.

Recognizing the key variables in EPA's referenced studies, we undertook a simplistic evaluation of those airports listed in Table 2 of the "Proposed Rule", considering runup areas, distances, and prevailing winds. In order to better conceptualize the distribution of lead resulting from piston engine aircraft emissions, we set out to define an area that could be potentially affect by any incremental lead emissions resulting from aircraft. Our focus is therefore at the runup area and where lead from aircraft could be measured and distinguished from background lead. Using the observations derived from EPA's work above, and applying a basic assumption that airport runways are aligned with prevailing winds, an area was defined as the Cone of Distinguishable Aviation Lead Emissions (CODALE). Using the observations from the sources referenced in the "Proposed Rule", and applying two basic assumption, the CODALE was established to be an area represented by a cone spanning an arc of 90 degrees at a distance of 500 meters from the run-up area. Typically, prevailing winds would be straight down the runway, varying no more than 45 degrees side to side (what would be referred to by pilots as quartering winds), hence the rationale for a 90 degree arc.

500 meters was chosen as the arc length for CODALE since that distance corresponds with the distances used in Tables 3, 4, 5, and 6 of the "Proposed Rule" to alleviate potential disparities of age, race, and ethnicity as it relates to distances from airport operations. This then would be the area to concentrate on to best address Environmental Justice. It is interesting to note that our evaluation also considered the 1000 meter range, with the same conclusions. The distance of 500 meters is especially important because it is the maximum distance that the study titled, "A

Geospatial Analysis of the Effects of Aviation Gasoline on Childhood Blood Lead Levels" was able to prove had a statistically significant increase in blood lead levels in children

Having established CODALE, we proceeded with an evaluation of the 17 airports listed in Table 2 of the "Proposed Rule". Additional data was collected for the subject airports and is shown in Table A of our comments. The length of the runway is a key variable in our study, ranging from 2,443 feet at Palo Alto Airport in California to the longest of 10,001 feet at Centennial Airport in Colorado. Where multiple runways existed at a particular airport, we chose to only consider and evaluate the longest runway. The average airport runway length was 5,300 ft, or 1616 meters. Cone of Distinguishable Aviation Lead Emissions (CODALE) is 500 meters in length, the average runway length would provide 3.2 times more distance than necessary to fully disperse lead emissions to a concentration indistinguishable from background levels.

We collected FAA published airport diagrams for each of the 13 controlled airports in the sample set and are providing them herein. In those instances where runup areas are identified, these were then selected as the high impact point. In those instances where runup areas were not identified, an estimate was made as to where the probable runup locations would be on the field based on the diagram and runway location. Handwritten notes related to scaling and establishing the CODALE are shown freehand on the diagrams. Our approach was that of proof of concept, a more thorough survey and collection of data at subject airports would yield more precise results. In all instances, the CODALE was established upwind, causing the distribution of exhaust gaseous to occur preferential on the airport property.

In the cases of the two California airports having lead concentrations greater than current lead NAAQS, McClellan-Polomar and San Carlos, Diagram 1 and Diagram 2 illustrate that CODALE remains on the airport property. Keeping in mind that lead monitoring outside of the CODALE would show lead levels that are indistinguishable from background concentrations of lead. We suggest that implementing the proposed CODALE solution would yield immediate results, benefiting those potentially impacted by aircraft engine emissions.

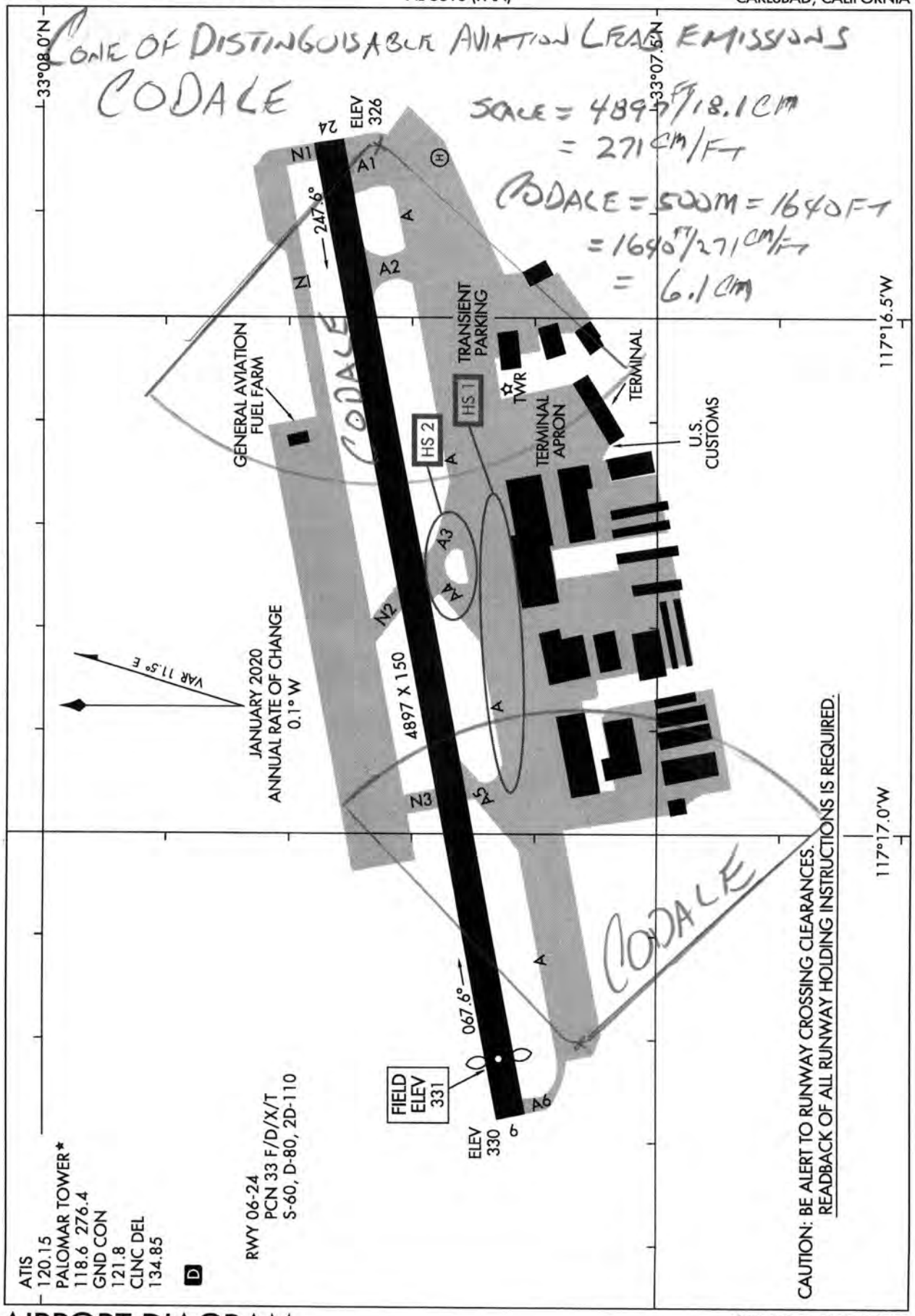
Diagram 1

22083

AIRPORT DIAGRAM

AL-5310 (FAA)

MC CLELLAN-PALOMAR (CRQ)
CARLSBAD, CALIFORNIA

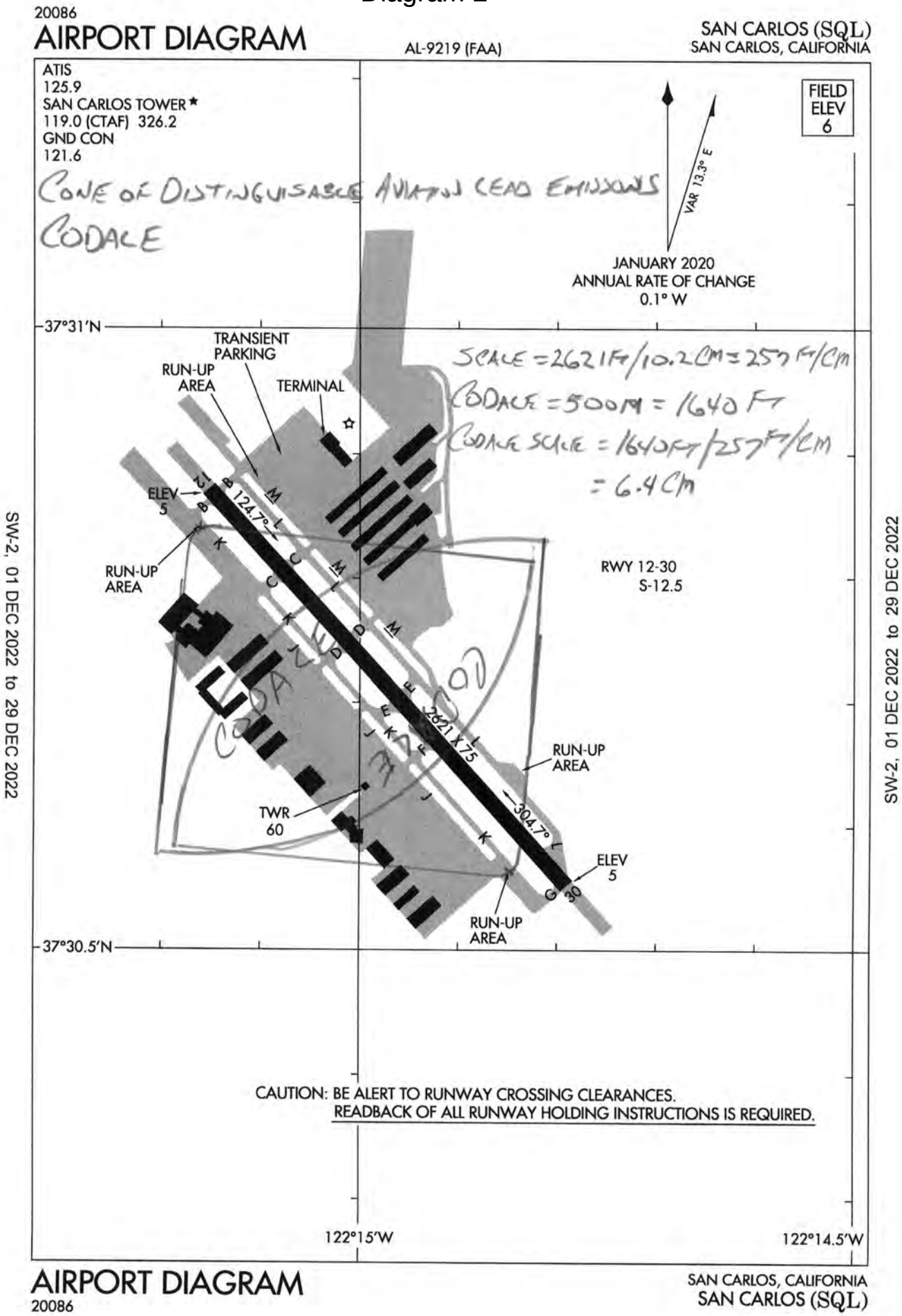


SW-3, 01 DEC 2022 to 29 DEC 2022

SW-3, 01 DEC 2022 to 29 DEC 2022

AIRPORT DIAGRAM
22083
CARLSBAD, CALIFORNIA
MC CLELLAN-PALOMAR (CRQ)

Diagram 2



SW-2, 01 DEC 2022 to 29 DEC 2022

SW-2, 01 DEC 2022 to 29 DEC 2022

Expanded on the concept of CODALE by illustration at additional airports. Even though none of the 15 remaining airports in the study show lead levels to exceed the current lead NAAQS, we expanded our analysis of CODALE to further illustrate its effectiveness as a viable solution for managing aircraft engine lead emissions. We were able to collect additional airport diagrams from FAA sources for the remaining 11 controlled airports, overlaying those with the proposed CODALE methodology. The CODALE modified diagrams are included in Appendix B for your review and consideration.

A solution exist to modify ground operations rather than modify engines or fuel for in-flight operations to meet the stated objective of the Proposed Rule.
In every case evaluated, the CODALE remained on the airport property. The airport schematics provide a pictorial depiction of how lead emission would be reduced to levels indistinguishable from background levels before leaving the airport property, all contained within the CODALE. In other words, the solution to the problem is to relocate runup areas to the upwind end of the runway. The solution is dilution. The significance of this observation is that lead emissions can be immediately addressed, without the need to mandate new fuels or modify the existing aircraft fleet. This solution provides for environmental justice without the burden, costs or safety concerns associated with a mandated fuel approach. The proposed solution would not require the expansion of regulatory authority, but instead FAA could exercise its current authority and implement these procedural changes through existing avenues. Efforts could be focused at those airports that are high risk or in close proximity to sensitive areas, such as McClellan-Palomar CA, San Carlos CA, and Reid-Hillview CA, saving both government and private sector time and resources.

CSA does not advocate the use of a CODALE solution at every controlled airport.
CSA would support the use of the CODALE solution only at those facilities demonstrating higher lead levels than meets the NAAQS, and those airports that seek a ready solution for Environmental Justice. CSA recognizes that the additional ground operations, requiring aircraft to taxi greater distances prior to takeoff, does expose pilots to higher risk of runway or taxiway incursions and must be taken into consideration before implementing the CODALE solution at a particular airport. FAA is keenly focused on runway incursions today and could simply incorporate CODALE into these important safety policies and procedures.

An opportunity exists to optimize the management of Aviation Piston Engine emissions while minimizing the risk to pilots. By utilizing a midfield runup area, Grand Junction Regional Airport (KGRT) in Colorado has already implemented the ideal solution when considering both emissions and pilot safety. Diagram 3 in our comments today illustrates pictorially how lead emissions, distinguishable above background levels, are managed onsite, while minimizing ground operations of pilots prior to take-off. By establishing the runup area midfield, Grand Junction airport has given pilots the ability to performer the important runup phase of flight at a distance far away from the property boundaries and any surrounding communities. Grand Junction proves that there is a workable solution, already in place today.

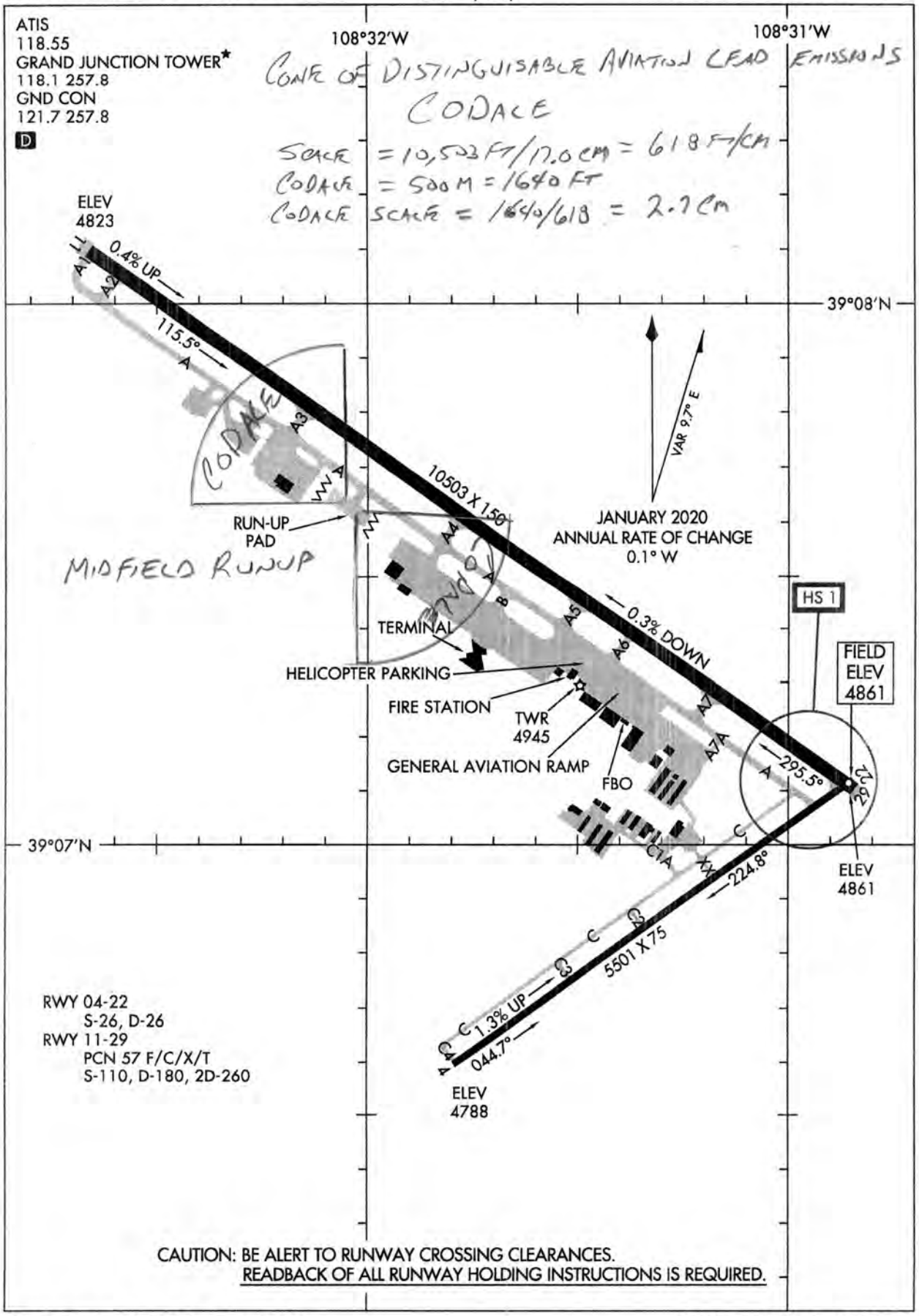
Diagram 3

22251

AIRPORT DIAGRAM

AL-634 (FAA)

GRAND JUNCTION RGNL (GJT)
GRAND JUNCTION, COLORADO



SW-1, 29 DEC 2022 to 26 JAN 2023

SW-1, 29 DEC 2022 to 26 JAN 2023

AIRPORT DIAGRAM

GRAND JUNCTION, COLORADO
GRAND JUNCTION RGNL (GJT)

22251

CSA encourages FAA and EPA to take this real-world example and expand on its application. FAA and EPA, along with the appropriate airport managers, could work together, considering risk, balanced with the need for Environmental Justice, as they determine the best airports and methods to implement CODALE. Effectiveness could be measured directly through the appropriate monitoring studies. We would expect the total number of airports to be a very small percentage of the 13,000 US airports considered in the "Proposed Rule". CSA would expect less than 100 airports nationwide.

Additional Comments

CSA recognizes that EPA may choose to not agree with our claim of regulatory overreach, and may instead elect to move forward with an attempt to regulate aircraft and mandate the use of new fuels in all aircraft AvGas piston engines. CSA further recognizes that the opportunity to comment is limited to the 90 days and will therefore offer the balance of our comments in that context.

Safety of aircraft engine operations is of paramount importance and has not been (adequately) addressed in the Proposed Rule. Should EPA proceed with the endangerment finding under section 231(a)(2)(A) and further move to regulate "Covered Aircraft" under the same authority, it is imperative that risk to the safety of pilots and their passengers be weighed against the benefits of controlling lead emissions by modifications limited to only AvGas or aircraft engines. A thorough review of the "Proposed Rule" results in finding no discussion about the potential for adversely affecting the safety of aircraft operation. The "Proposed Rule" fails to address section 231(a)(B)(ii) which states "The Administrator shall not change the aircraft emission standards if such change would significantly increase noise and adversely affect safety". Aircraft safety is of paramount importance to CSA, the Federal Aviation Administration (FAA), to that of the public welfare, as well as to EPA.

Piston-powered aviation serves all aspects of life in the USA and would create undue hardship if aviation was interrupted by mandating lead-free aviation fuel. Less than 0.2% of the U.S. population are licensed to operate aircraft. Much of this can be attributed to the fact that extensive training is required in order to receive a license from FAA to operate an aircraft, training that focuses on safe operation and the rules associated with operating aircraft in the Air Traffic Control (ATC) system. The FAA establishes and enforces rules and regulations as they pertain to pilots and aircraft operations. Even though there are very few licensed pilots, general aviation impacts virtually every walk of life in our society. This would include training, from military to commercial airline operations, to law enforcement, disaster relief efforts, and support of remote communities throughout the world.

Aviation safety is an important element that needs to be addressed in the Proposed Rule. CSA requests that the "Proposed Rule" consider safety as it would pertain to both long term effects as well as the risk of failures with the implementation of any mandated changes to AvGas. The practical aspect of implementation and its effect on safety should be considered and addressed before EPA proceeds with the "Proposed Rule". Fortunately, there is ample history to draw

upon in order to better ascertain the safety issues GA would certainly be faced with, should EPA move to mandate the complete and immediate removal of lead from AvGas.

Case History – Automotive Gasoline Lead Phaseout

The removal of lead from automotive gasoline provides for a good case study and should not be ignored when considering the possibility of eliminating TEL from AvGas. Over the course of approximately 40 years, beginning in 1973 EPA worked with industry stakeholders to successfully reduce lead emission by over 99%, a monumental effort that people from every walk of life have benefitted. This feat was accomplished by working with both gasoline producers and automobile manufactures, and utilizing an approach that phased lead out over a period of time. Integral to the phase-out was a lead credit program where refiners of gasoline were able to undertake the multi-billion dollar capital expenditures necessary to reconfigure production facilities for the new gasoline formulations.

New gasoline formulations need to go hand-in-hand with engine technology changes in order to maintain aircraft safety. Reflecting on that period of time, beginning in 1973, when the process for lead phase out began, it should be recognized that there were two key elements to achieving the goal of a lead-free fuel formulation that had lower octane value. The need for new engine technology went hand-in-hand with new gasoline formulations. By developing advanced technology, the center of which was fuel injected engines with computer controlled electronic ignition systems, a lower octane fuel could be utilized without causing internal damage to the new model automobile engines.

An accelerated implementation of lead-free aviation fuel could adversely affect aviation safety.

When it comes to the proposed lead removal from AvGas, many commenters appear to be in favor of a much more aggressive schedule, where by lead would be completely removed from AvGas no later than the year 2030, less than 7 years from even the most accelerated rule making process that EPA could undertake.

Case History – Low Sulfur Diesel Implementation

One of the most applicable and enlightening experience with implementation of a new fuel regulation would be that of Low Sulfur Diesel (LSD). In 1993 EPA began regulating sulfur in diesel, starting first with on-road diesel fuel and a new maximum allowed level of 500 ppm, down from previously acceptable levels as high as 5000 ppm. To address the growing concern over acid rain and to further reduce particulate matter, EPA promulgated the LSD rule. As a result the refining industry undertook an extensive and costly effort to remove sulfur from refinery intermediate streams through a technology known as hydrotreating. Following years of capital expenditures and the resulting plant modifications, refiners were prepared and brought these units up and online, displacing the higher sulfur diesel in the pipeline and terminals with the new LSD by the effective date of this new regulation. All in all the delivery of the new LSD to the consumer was performed as mandated and done on schedule. This was because the refiners had the time to make the costly modifications to their processes well ahead of the deadline.

Unlike the phase out of lead in gasoline over time, the sulfur specifications for on-road diesel were essentially changed overnight. What was not anticipated was the massive number of engine failures that would occur as a direct result of this newly mandated low-sulfur diesel fuel. Thousands of diesel-powered automobiles and trucks, including ambulances and service vehicles, along with diesel driven construction equipment as well as farming equipment were shutting down across the United States. Within days it was determined that the failures were directly related to the new Low Sulfur Diesel specification. A loss in lubricity resulting from the lower sulfur content in the new diesel fuel was the root cause of these failures. The point of failure was within the fuel delivery system, at the fuel pumps of the failed diesel-powered vehicle. Once the fuel pumps began failing, diesel engines abruptly stopped operating and the diesel-powered vehicle came to rest where it was. Because of the nature of land vehicles, an engine failure does not necessary result in extensive vehicular damage and is not necessarily a life-threatening event. However, in the case of an aircraft engine failure, extensive damage to the aircraft itself, to the pilot and passengers, and to persons and property on the ground is very likely to occur, and there exists an unacceptable chance of fatalities.

CSA opposes a mandatory fuel change that would be essentially overnight. Such an impact would go far beyond the unacceptable safety risk, such an implementation would almost certainly ground the entire GA fleet. If a similar event to that experienced with low sulfur diesel implementation were to occur with aviation fuel, FAA would have no choice but to issue an Airman's Directive (AD) and ground all "Covered Aircraft" until a safe solution could be developed and implemented. Such an AD would come at a tremendous cost to the general aviation community, both in the way of capital expenditures for hastened engine modifications, and in the way of lost revenue for those operating piston engine aircraft for air taxi, freight, flight schools, or other business endeavors. Such engine modifications to accommodate an unanticipated chemical property (such as lubricity with LSD) resulting from lead-free aviation fuel would be unproven and carry their own safety risk.

<u>Implementation of lead-free aviation fuel requires technology changes to aviation engines, which takes time.</u> Reflecting again on the phase out of lead from automobile gasoline, the second critical component to its success was the development of advanced engine technology. Due to the lower octane value of the resulting unleaded fuel, new engines had to be developed. Only through the advancement of computer controlled timing and electronic fuel injection was it possible to reformulate gasoline and remove TEL from the blends.

Aircraft engines today are, for all intents and purposes, operating with technology that was developed nearly 100 years ago. In fact, many of the aircraft that would fall under the proposed "Covered Aircraft" definition in the Proposed Rule have no electrical systems at all. These airplanes are literally started by hand, similar to how one would start a lawn mower with a pull rope. It is important to understand that virtually every "Covered Aircraft" operates with two self-contained ignition systems known as magnetos. The use of dual magnetos, and the accompanying dual spark plugs in each cylinder, provide pilots with the necessary redundancy that should one ignition system fail in flight, that the second will keep the airplane running and airborne until it can safely land at an airport. Once safely on the ground the necessary repairs to the failed ignition system can then be made. Similar scenarios exist, where for example an

alternator fails in flight and causes the battery to completely discharge. In the case of magnetos, the aircraft engine continues to run and the airplane can be flown safely to an airport for diagnosis and repairs. The computer-based ignition systems of today's automobiles require a functioning electrical system to continue uninterrupted operations.

Unlike drivers of automobiles, pilots cannot simply pull their plane to the side of the road and check under the hood should their engine quit running. As many flight instructors are fond of saying "Takeoffs are Optional, Landings are Mandatory". In-flight safety emphasizes the need for rigorous pre-flight procedures.

Safety is paramount to aircraft operations, which is why pilots go through such an extensive pre-flight check prior to taking off. Pilots do not just jump in the plane and go, unlike many of us might do in an automobile. As part of pre-flight safety procedures pilots conduct an operations check (Ops Check) for each of the aircraft's ignition systems (Mag Checks) during the run-up phase of flight. EPA references past studies in the "Proposed Rule" which identify the "run-up" to be the biggest single contributor to AvGas lead emissions. This is an important observation, and one that has been addressed directly through the proposed solution offered with our comments today. Pilots cannot compromise safety by eliminating their run-up, but they can conduct the run-up, with CODALE in mind, at a more appropriate location,

Only through the development of new engines and associated technology can those aircraft utilizing high compression engines be expected to transition to a lower octane, lead free AvGas. Based on the experience from the automotive industry, and considering the very low attrition rate of aircraft, undertaking such and effort of this magnitude would be extremely costly and take far more than 8 years to accomplish.

Reformulation of AvGas – There is no Silver Bullet

Efforts have been underway for over a decade to find the drop-in replacement for a lead-free high-octane AvGas. Both FAA, through the Piston Engine Aviation Fuels Initiative (PAFI), and the private sector have labored to find a fuel that will meet the specifications of ASTM D910, but to no avail. In 2022 FAA appears to have made some concessions for an alternative approach for a replacement fuel, namely through the issuance of a Supplemental Type Certificate (STC). General Aviation Modifications, Inc. (GAMI) was issued a STC for their patented fuel formulation trade marked as G100UL™. \

Three significant concerns are raised when considering an STC approach as a replacement for the 100LL AvGas in the market today.

The first concern is the fact that aircraft engine manufacturers warranty the performance of their engines based on operating that engine with the ASTM specified fuel that is currently in use. An aircraft owner that uses an STC fuel has no recourse to the engine manufacturer should the STC fuel use damage the engine, or worse, contribute to an aircraft accident. The STC fuel is a "buyer beware, use at your own risk." Long term use statistics are not and will not be available for the STC fuels for many years to come. Each pilot that will use the STC fuel is, in essence, transforming their aircraft into an experiment.

Second concern is that of sustainability. For instances, consider the recently issued STC for G100UL™. According to the patent application, the G100UL™ fuel maintains the 100 Octane value through the replacement of TEL with substantial quantities of Aromatics and Aromatic Amines. Aromatics are regulated and controlled substances in transportation fuel today and would almost certainly be regulated further in AvGas, should EPA be charged with it's oversight. Aromatics are known to be carcinogenic, aromatic amines are toxic, and these compounds are under careful scrutiny today by many concerned citizens and government agencies. It is entirely conceivable that in the near future, should the agency adopt regulatory authority over aviation gasoline, that EPA would move to further regulate those fuel blend stocks just as they do today with automobile gasoline.

The STC approach creates a market of boutique fuels. The current direction of some in the industry appears to be that of developing drop-in replacements of various formulation of lead free high octane fuels. Unfortunately, since these fuels would not meet an industry accepted standard, none of these would meet the definition of fungible and would instead create a market of boutique fuels. A fungible commodity, like today's 100LL or automobile gasoline, is indistinguishable from its manufacture and essentially identical in its formulation. There is an inherent safety concern when mixing fuels of various composition and formulation in the tank of an operating aircraft.

A market of boutique fuels is especially problematic when considering illiquid and inefficient AvGas market and distribution system that exists today. To further fragment this market will lead to higher costs, and the likelihood of outages. Fuel supply outages could conceivably lead to fuel exhaustion, while a pilot seeks to acquire fuel at an alternate airport, another safety concern that must be taken into consideration.

One final observation as it pertains to fungibility and mandating a fuel that can only be met with an STC is that of the experience gained from the implementation of Reformulated Gasoline (RFG) in California. Similar to the approach here, where fuel blenders are seeking and receiving patents, Unocal patented a formulation to meet (California Air Resource Board) CARB RFG that was infringed upon by virtually every refiner in the United States as they blended fuel to meet the new regulations for CARB summertime RFG. Supply chains were disrupted, costs were increased, and after millions of dollars in litigation, FTC eventually stepped in with charges of anticompetitive conduct in order to resolve the matter (FTC Charges Unocal with Anticompetitive Conduct Related to Reformulated Gasoline. – press release dated March 4, 2003). There simply is no way that general aviation industry could absorb such a setback as the transportation fuel industry did during the CARB RFG implementation. CSA encourages EPA and FAA to take this important time from history under consideration when developing plans for implementation of any proposed changes to the AvGas fuel system.

<u>The AvGas market is much different than the automobile gasoline market</u>.

Regarding bringing a new fuel to the market, it is worth noting that the AvGas market is quite small and illiquid, especially when compared to gasoline and diesel fuel markets. The fact is that numerous airports throughout the U.S. have no fuel at all. Of those that do offer leaded AvGas, only 100LL grade is offered. A very small number of airports also offer ethanol-free motor gasoline (MoGas), perhaps no more than 5% of the airports. From a practical standpoint, the supply of AvGas today is limited to the single grade and almost always a single tank at the airport facility. This fact would point to the need for new tankage and infrastructure throughout the entire airport system in order to offer any additional grades of AvGas. The capital associated with building duplicate tankage and associated delivery equipment would prove to be expensive, a cost that would either drive GA business out or cause those that remain to incur greater operating cost. Not only would the capital cost to transition to a new lead-free aviation fuel be prohibitive, but the staffing and logistics to maintain duplicate systems would be challenging.

<u>Misfuelling of aircraft engines can have major safety consequences.</u>
A particularly concerning observation to be made from the phase out of lead from automobile fuel was the failure of engines due to misfuelling. During that period of time when both leaded and UL fuel were available at gas stations throughout the U.S. some drivers mistakenly placed leaded fuel in automobiles that now had catalytic converters installed. Over the course of time those catalytic converters would begin to plug, and in some instances automobile engines would fail. A very high risk of misfuelling exists today at those airports like Reid-Hillview and San Martin airports which have hastened to control lead emissions by banning 100LL AvGas from being supplied on the field. As an alternative, these airports do offer an unleaded grade of fuel, however the octane value is inadequate for high compression engines. Given no other option, it is conceivable that an uninformed pilot will make the mistake of placing the low-octane fuel in their aircraft. This presents a major safety concern due to the high likelihood of detonation when burning low octane fuel in a high compression aircraft engine. FAA recognizes and defines detonation in the FAA Airplane Flying Handbook (FAA-H-803-3A) as *"The sudden release of heat energy from fuel in an aircraft engine caused by the fuel-air mixture reaching its critical pressure and temperature. Detonation occurs as a violent explosion rather than a smooth burning process."* Detonation is a very real concern and a safety matter that must be taken seriously when considering alternatives to 100LL AvGas. As stressed earlier in our comments, misfuelling an airplane has the potential for far more dire consequences than misfuelling a car.

CONCLUSIONS

As stakeholders in the process, CSA is thankful that we have had the opportunity to comment on the Proposed Rule. Our comments highlight numerous areas of concern, all which ultimately center around the safety of pilots and their passengers while addressing the possibility of endangering the public with aircraft engine emissions. CSA opposes a mandate over a common sense solution to aviation lead emissions. A plain reading of the CAA illustrates that Aircraft are not Motor Vehicles and EPA would not have the authority to regulate Aircraft or the fuel used in Aircraft. Even though we do not support EPA mandating fuel by regulations, we do share similar concerns of lead emissions from aircraft. We are convinced that there is a common-sense

solution that can be immediately implemented in those areas where excessive lead emissions exist. We contend that if lead emissions from aircraft are undetectable from background levels of lead, then it stands to reason that there can be no potential for endangerment outside of the Cone of Distinguishable Aviation Lead Emissions (CODALE). Provided that this premise is sound, then it simply is not necessary for EPA to regulate the entire fleet of piston engine aircraft in order to meet its objective of safeguarding the public where it can be "reasonably anticipated that leaded aircraft fuel contributes to air pollution that would endanger public health and welfare". We request that EPA instead focus its resources and energy along with FAA to assure Environmental Justice expeditiously by considering and implementing the CODALE approach at sensitive airports.

Bottom line – there is no need to wait until 2030 to implement a solution. The solution does not require new fuel or new regulations. It simply is not necessary to expose communities that surround airports to aviation gasoline emissions. When it comes to the issue of lead emissions and safeguarding public health – Dilution is the Solution.

CSA looks forward to having the concerns that we have presented in our comments addressed and welcome the opportunity to work further with both EPA and FAA on an acceptable solution to this important matter.

Appendix A

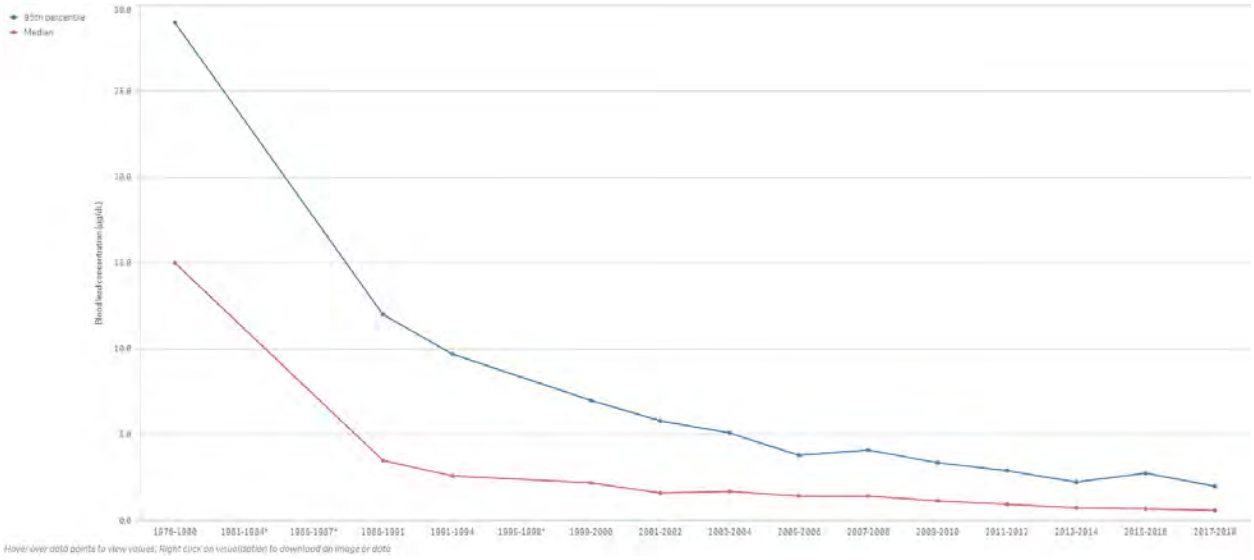
Critiques of Previous Studies and Putting Scale of Findings Into Context

The purpose of "A Geospatial Analysis of the Effects of Aviation Gasoline on Childhood Blood Lead Levels" was to find any correlation between geographical proximity to airports and an increase in Blood Lead Levels (BLLs). The conclusion of the survey was: "We estimated a significant association between potential exposure to lead emissions from avgas and blood lead levels in children. Although the estimated increase was not especially large, the results of this study are nonetheless directly relevant to the policy debate surrounding the regulation of leaded avgas." Put into other terms, the increase of BLL was "statistically significant" using the assumptions put forward, however the study mentioned that the likely practical significance was low.

The average lead levels for the sampled children from 9 months to 7 years was 3.88 µg/dL +/- 2.94 Stdev. Using correctly adjusted data and using the middle of the calculated distribution, the study found that there was only a 0.034 µg/dL increase when the subjects lived within 500 meters of the airport. As mentioned in the study, although there was a statistically significant positive correlation between subjects living within 500m of the airports selected in the study, the increase was 86 times smaller than the StdDev that is already present in the general population in the counties studied. This should not be considered a reasonable factor in endangering the health of the public.

It is important to note that, even after using a lower level of scrutiny (p=0.10), the study was unable to statistically prove, after adjustment, that there was any increase of lead levels in blood samples for individuals living 501-1,000 m of the airport. This furthers the potential efficacy of the solution put forth by the comment put forth by CSA, which involves the relocation of the CODALE.

Using data gathered from the EPA, we can see that the national median BLL is less than a third since the start date of this study in 1976, from 2.2 µg/dL -> 0.6 µg/dL. See chart below provided by the EPA. With this lower level of lead in the general population, and the practically insignificant increase in lead levels due to geospatial relation to airports, the likelihood that lead introduced by AvGas would be a significant source that would push any individual above the actionable threshold of 10 µg/dL is beyond improbable. It would similarly be improbable using the CDC recommendation of 5 µg/dL. This needs to be taken into account when balancing the potential risk of aircraft operation and economic impact that regulating the lead content in AvGas might cause.



Due to the fact that the surrounding properties around airports are commercial zoned, there is a high likelihood of additional lead sources beyond that of aircraft emissions. In the study, "The Effect of Leaded Aviation Gasoline on Blood Lead in Children" it was found that 41% of airports had lead sources other than aircraft. Although this was accounted for in this study, it was not accounted for in "A Geospatial Analysis of the Effects of Aviation Gasoline on Childhood Blood Lead Levels", which puts those results into question. In all likelihood 41% is a low estimate, since accounting for all sources would be difficult. The "shock" method used in the study that did account for other potential sources, utilizing the air traffic lapse after the events of 9/11, wouldn't be able to account for the fact that contaminants often take months or years to enter the surrounding populace's blood.

In the study "Model-extrapolated Estimates of Airborne Lead Concentrations at U.S. Airport", there was a significant effort to account for a number of known factors that would add variation in lead quantity in the air, like lead concentrations in the AvGas and runup time. However, the sources of data that were used to estimate that variation often used a small number of airports. The runup time study only used 5 airports. The study states that runup time was considered the largest factor that was attributed to lead concentrations. A few particularly inefficient engines in the model airport could cause a massive shift in final analysis. One thing that wasn't accounted for is the model of airplanes and condition of the airplanes that are used on the field. These known factors would be extremely challenging to track. But there are plenty of unknown factors that could cause additional shifts in the population that could only be accounted for if a significantly larger and diverse sample was used.

If the EPA plans on using this type of analysis to make decisions, it is imperative that more data points are collected from more than one or two model airports and that those airports not be

located in similar geologic locations. Although we were unable to find an industry standard for minimum sample locations for Monte Carlo simulations, it would be hard to find many practicing statisticians that believe that taking samples from one airport and extrapolating those findings out to 13,000 airports could reasonably create an accurate and robust model.

Appendix B

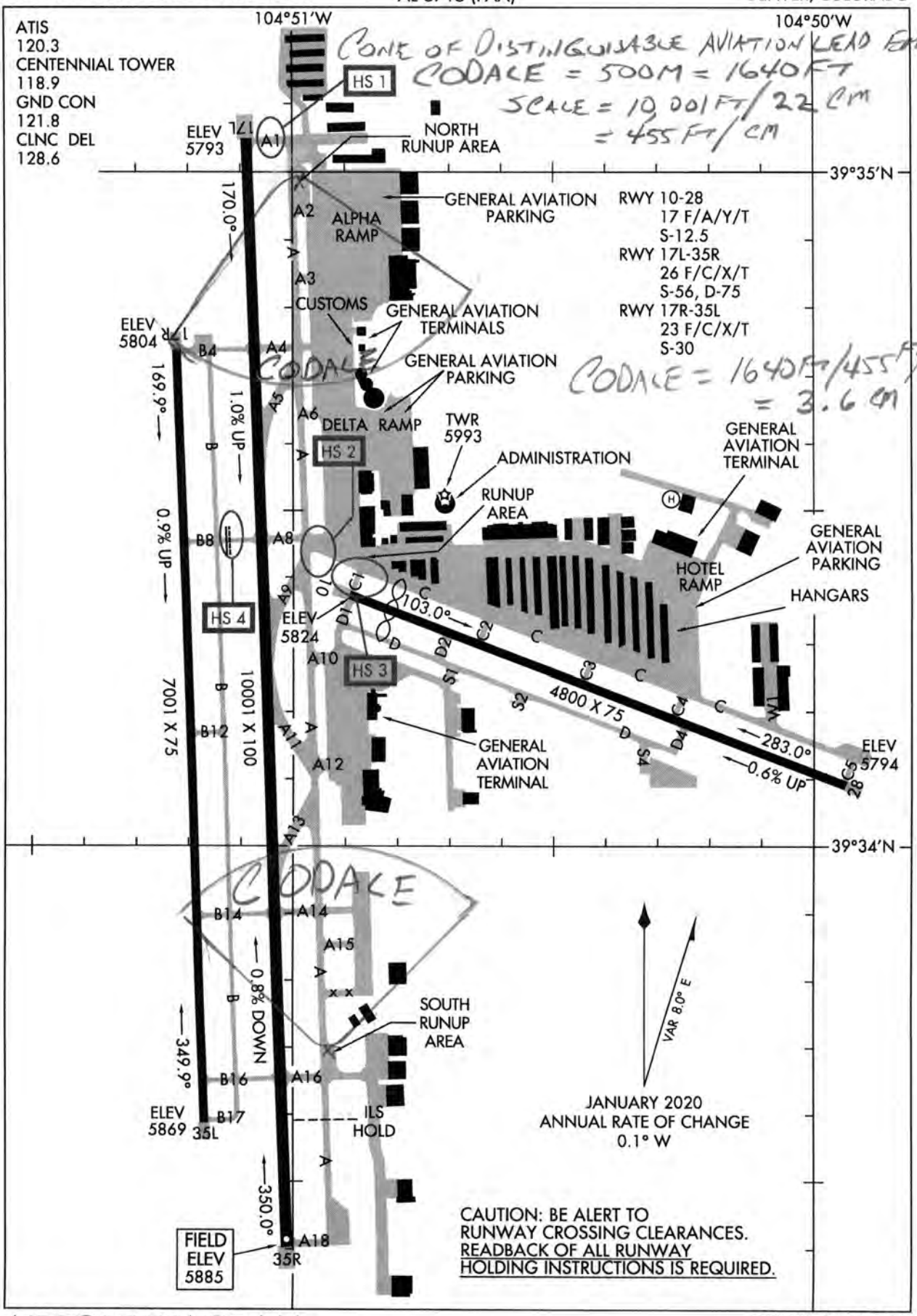
Controlled Airports and Associated Airport Diagrams with CODALE Applied

The airport diagrams shown in this appendix are to further illustrate the application of CODALE in managing aircraft engine emissions. These airports were chosen because they existed in the original study of 17 airports where lead concentrations were monitored. Each of the 11 airports shown in this appendix are controlled airports, none of which demonstrated lead values in excess of the current lead NAAQS.

The Cone of Distinguishable Aviation Lead Emissions (CODALE) represents an area where lead emissions could be detected – at levels greater than background levels. Areas outside of the CODALE would have lead levels indistinguishable from background levels. When it comes to exposure to lead emissions – Dilution offers an immediate is the Solution

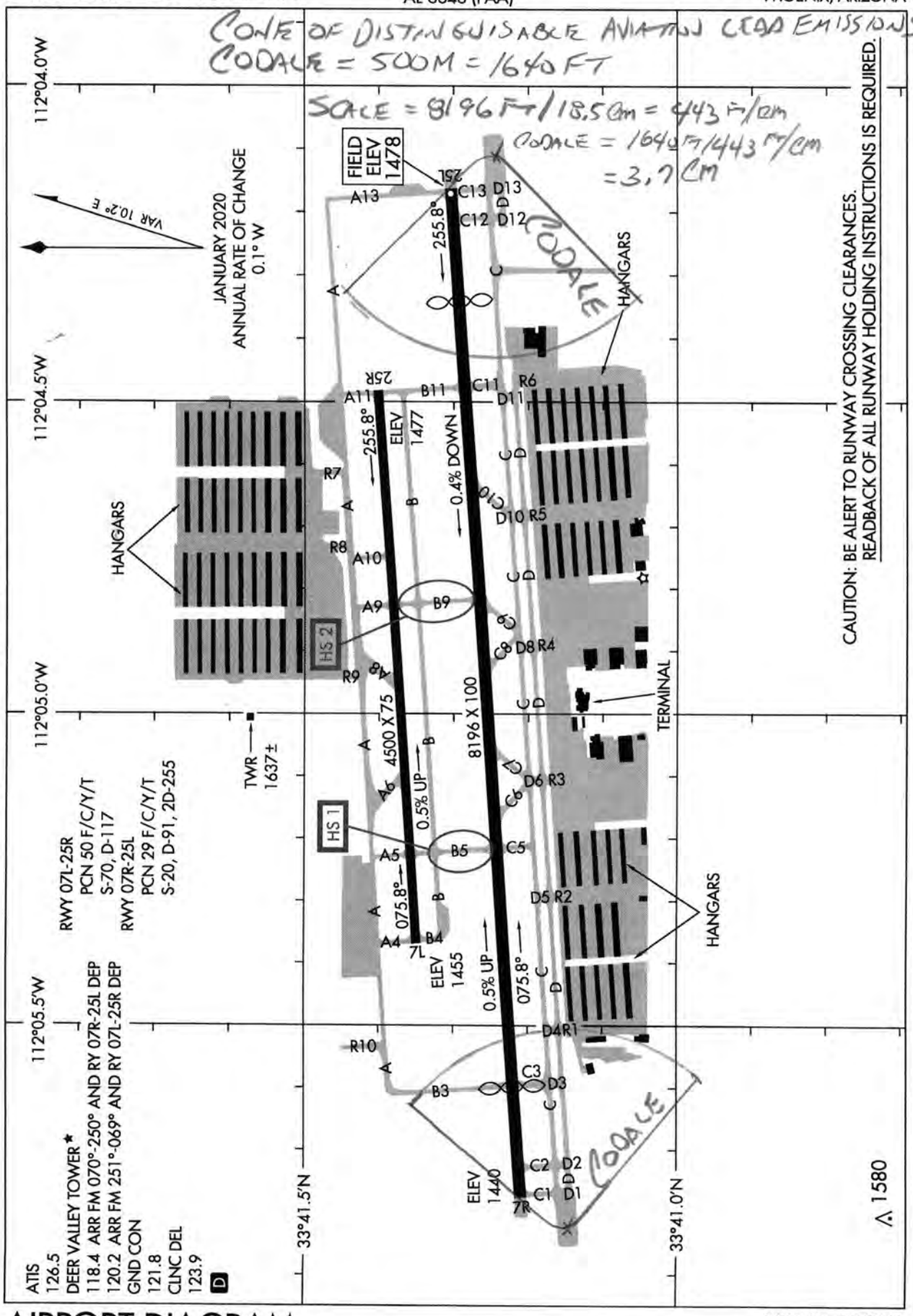
Airport Diagrams Include in Appendix B

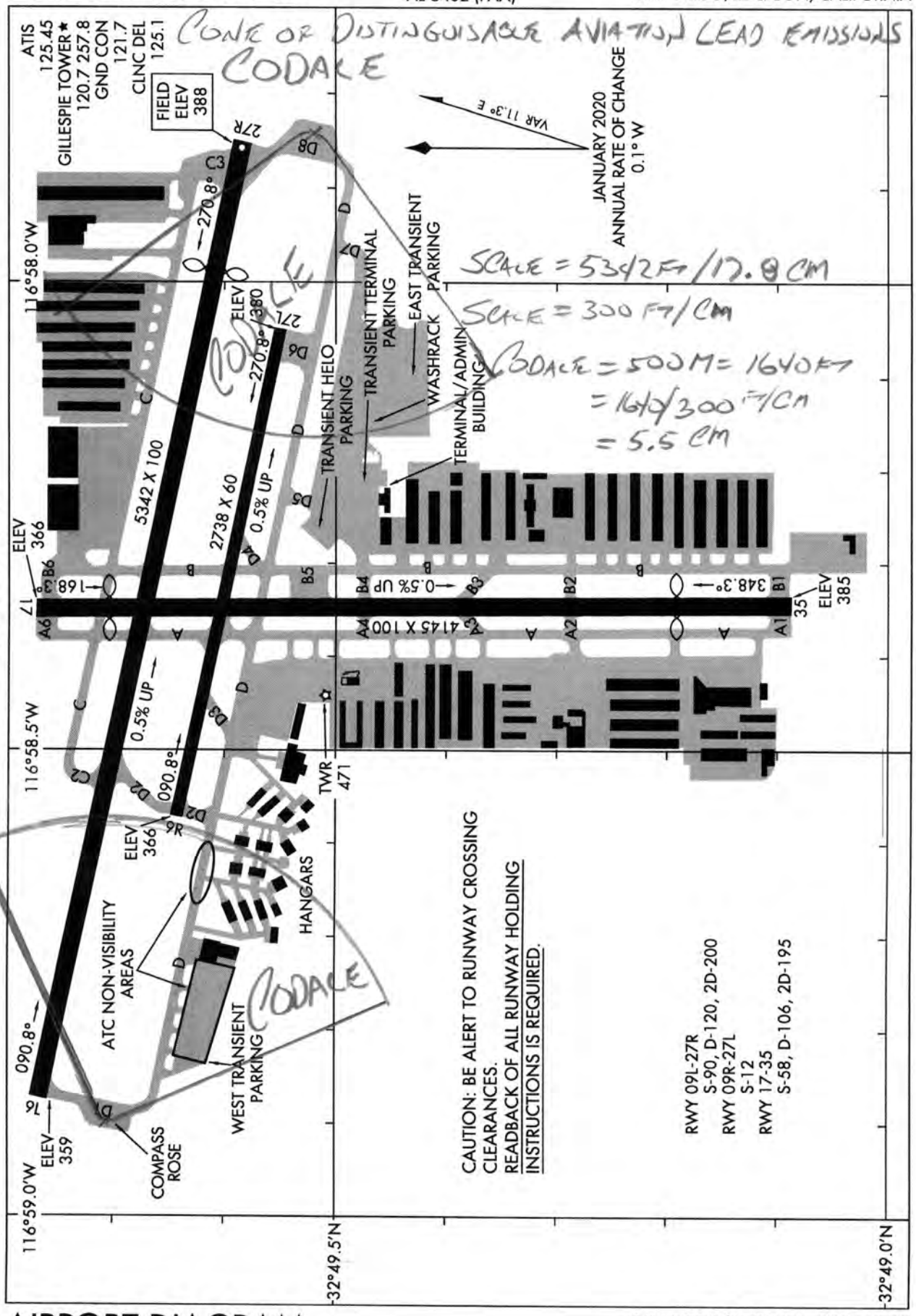
Centennial Airport, CO
Deer Valley, AZ
Gillespie Field, CA
Merrill Field, AK
Nantucket Memorial Airport, MA
Oakland County International, MI
Palo Alto Airport, CA
Reid-Hillview Airport, CA
Republic Airport, NY
Stinson Municipal, TX
Van Nuys Airport, CA

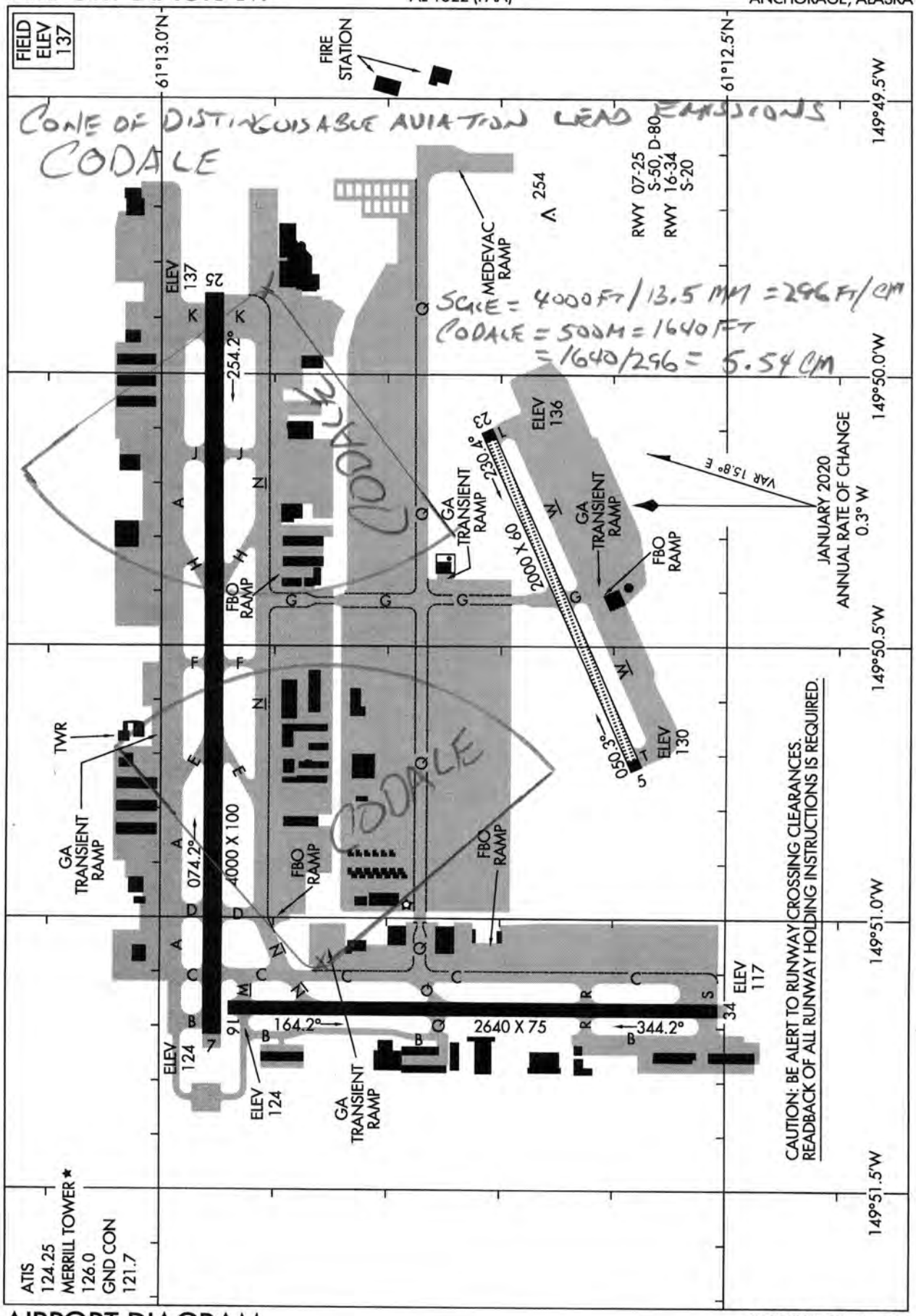


SW-1, 01 DEC 2022 to 29 DEC 2022

SW-1, 01 DEC 2022 to 29 DEC 2022

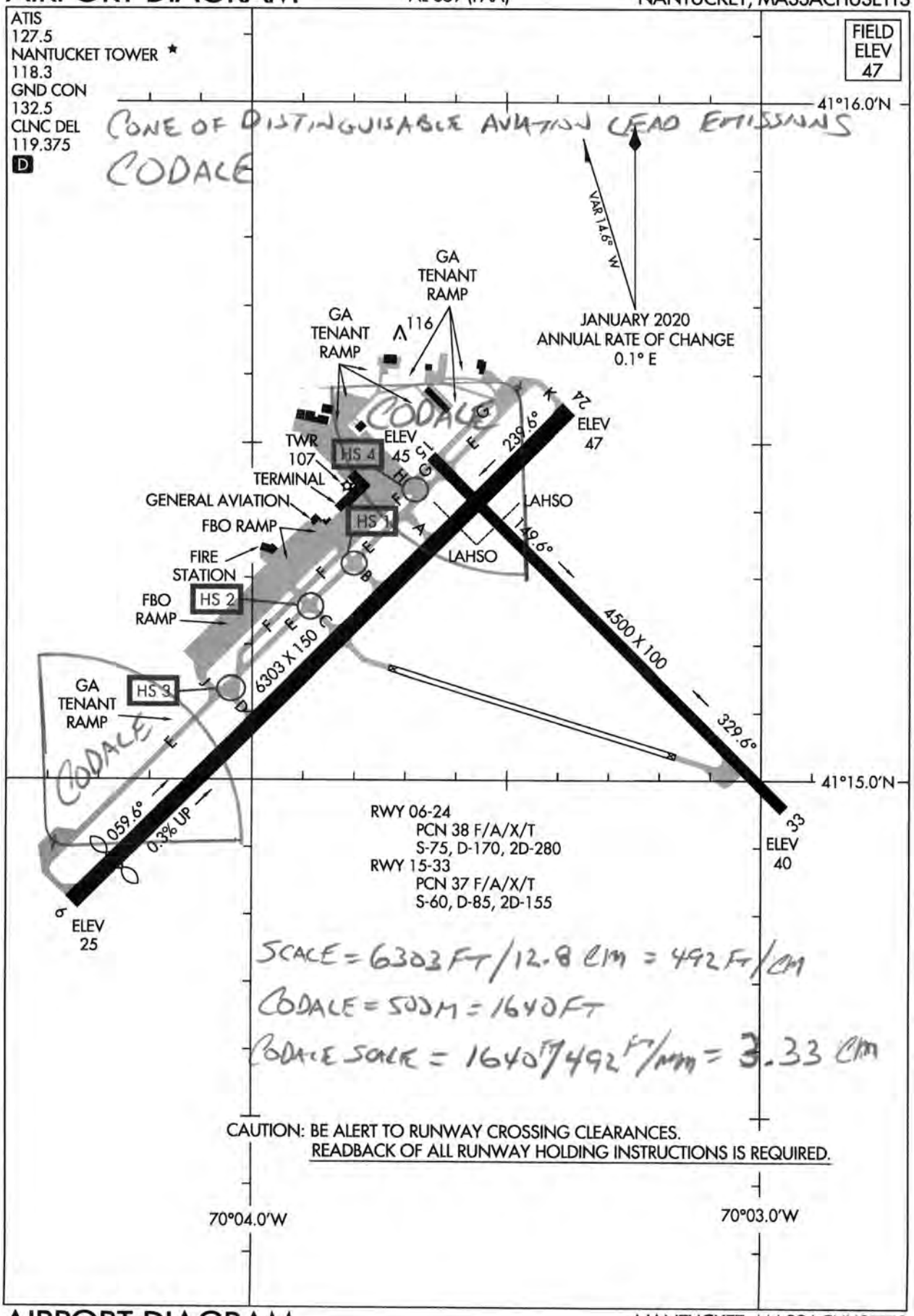

CONE OF DISTINGUISABLE AVIATION LEAD EMISSIONS
CODALE = 500M = 1640 FT
SCALE = 8196 FT / 18.5 CM = 443 FT/CM
CODALE = 1640 FT / 443 FT/CM
= 3.7 CM
CODALE
CODALE
FIELD ELEV 1478
25L
25R
7L
7R
255.8°
075.8°
ELEV 1477
ELEV 1455
ELEV 1440
0.4% DOWN
0.5% UP
0.5% UP
8196 X 100
4500 X 75
HS 1
HS 2
HANGARS
HANGARS
HANGARS
TERMINAL
TWR 1637±
JANUARY 2020
ANNUAL RATE OF CHANGE
0.1° W
VAR 10.2° E
112°04.0'W
112°04.5'W
112°05.0'W
112°05.5'W
33°41.5'N
33°41.0'N
RWY 07L-25R
PCN 50 F/C/Y/T
S-70, D-117
RWY 07R-25L
PCN 29 F/C/Y/T
S-20, D-91, 2D-255
ATIS
126.5
DEER VALLEY TOWER★
118.4 ARR FM 070°-250° AND RY 07R-25L DEP
120.2 ARR FM 251°-069° AND RY 07L-25R DEP
GND CON
121.8
CLNC DEL
123.9
D
CAUTION: BE ALERT TO RUNWAY CROSSING CLEARANCES.
READBACK OF ALL RUNWAY HOLDING INSTRUCTIONS IS REQUIRED.
1580


ATIS 125.45
GILLESPIE TOWER★ 120.7 257.8
GND CON 121.7
CLNC DEL 125.1
FIELD ELEV 388
JANUARY 2020 ANNUAL RATE OF CHANGE 0.1° W
VAR 11.3° E
EAST TRANSIENT PARKING
WASHRACK
TERMINAL/ADMIN BUILDING
TRANSIENT TERMINAL PARKING
TRANSIENT HELO PARKING
5342 X 100
2738 X 60
0.5% UP
270.8°
090.8°
348.3°
168°
ELEV 366
ELEV 380
ELEV 385
ELEV 359
ELEV 366
4145 X 100
TWR 471
HANGARS
ATC NON-VISIBILITY AREAS
WEST TRANSIENT PARKING
COMPASS ROSE
CAUTION: BE ALERT TO RUNWAY CROSSING CLEARANCES.
READBACK OF ALL RUNWAY HOLDING INSTRUCTIONS IS REQUIRED.
RWY 09L-27R S-90, D-120, 2D-200
RWY 09R-27L S-12
RWY 17-35 S-58, D-106, 2D-195
116°58.0'W
116°58.5'W
116°59.0'W
32°49.5'N
32°49.0'N
CONE OF DISTINGUISABLE AVIATION LEAD EMISSIONS
CODALE
SCALE = 5342 FT / 17.8 CM
SCALE = 300 FT/CM
CODALE = 500 M = 1640 FT
= 1640/300 FT/CM
= 5.5 CM



AK, 03 NOV 2022 to 29 DEC 2022

AK, 03 NOV 2022 to 29 DEC 2022

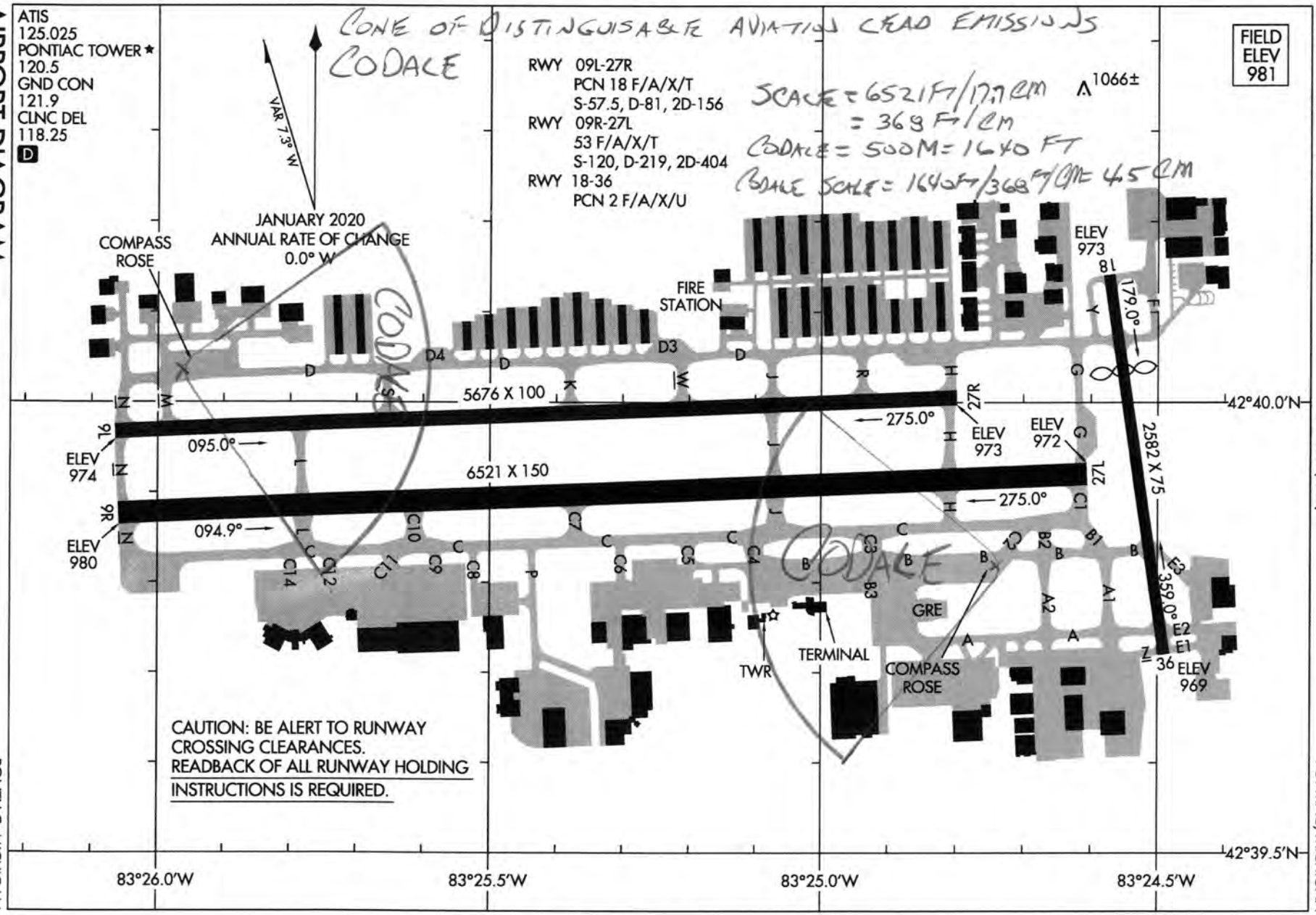

ATIS
127.5
NANTUCKET TOWER ★
118.3
GND CON
132.5
CLNC DEL
119.375
D
FIELD ELEV 47
41°16.0'N
CONE OF DISTINGUISABLE AVIATION LEAD EMISSIONS
CODALE
VAR 14.6° W
JANUARY 2020
ANNUAL RATE OF CHANGE
0.1° E
GA TENANT RAMP
116
GA TENANT RAMP
TWR 107
ELEV 45
HS 4
TERMINAL
GENERAL AVIATION
FBO RAMP
HS 1
FIRE STATION
FBO RAMP
HS 2
GA TENANT RAMP
HS 3
CODALE
239.6°
24
ELEV 47
LAHSO
149.6°
LAHSO
4500 X 100
329.6°
6303 X 150
059.6°
0.3% UP
6
ELEV 25
33
ELEV 40
41°15.0'N
RWY 06-24
PCN 38 F/A/X/T
S-75, D-170, 2D-280
RWY 15-33
PCN 37 F/A/X/T
S-60, D-85, 2D-155
SCALE = 6303 FT / 12.8 CM = 492 FT/CM
CODALE = 500M = 1640 FT
CODALE SCALE = 1640 FT / 492 FT/MM = 3.33 CM
CAUTION: BE ALERT TO RUNWAY CROSSING CLEARANCES.
READBACK OF ALL RUNWAY HOLDING INSTRUCTIONS IS REQUIRED.
70°04.0'W
70°03.0'W

22139 AIRPORT DIAGRAM

OAKLAND COUNTY INTL (PTK)

PONTIAC, MICHIGAN

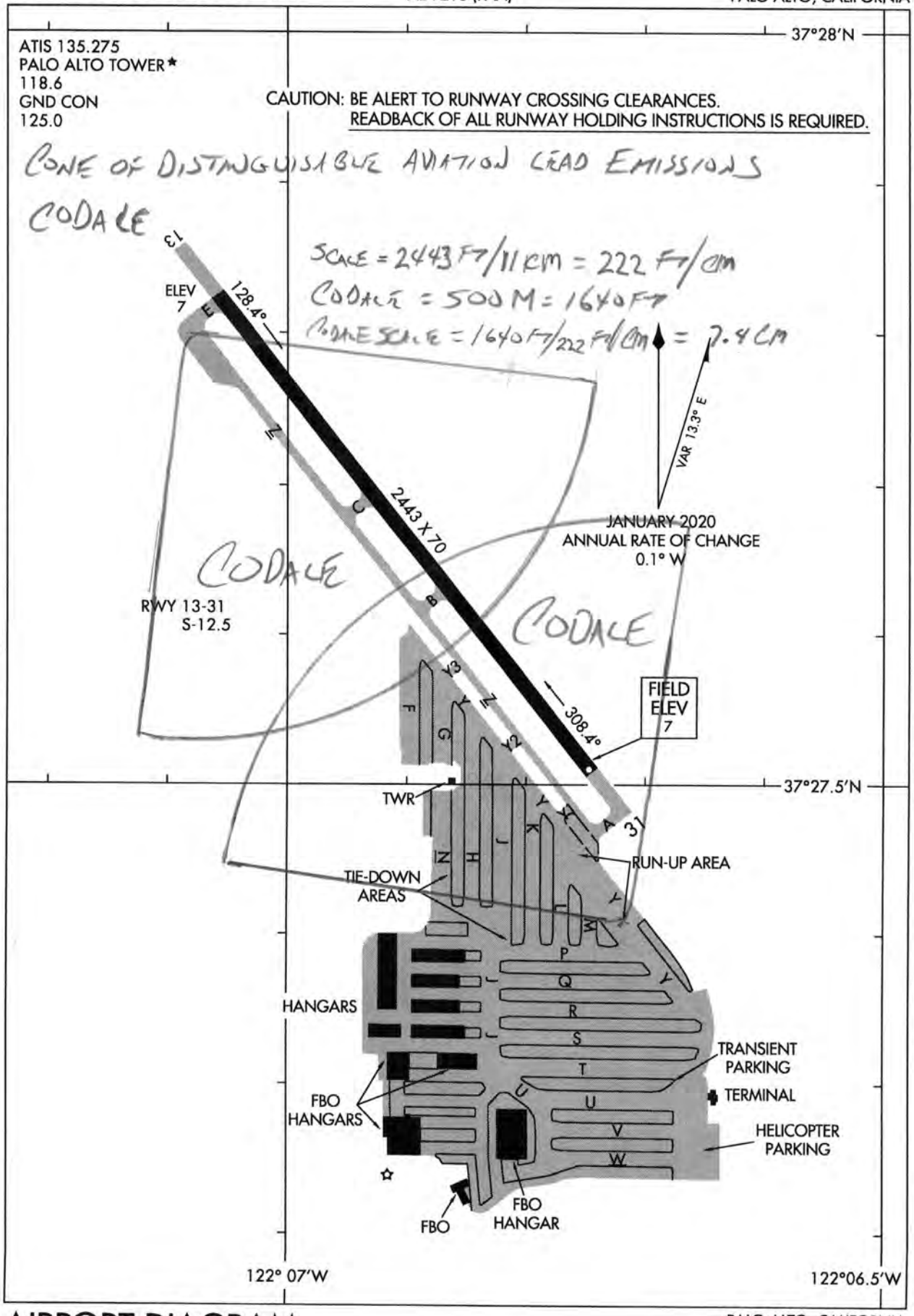
AL-5052 (FAA)



22139 AIRPORT DIAGRAM

OAKLAND COUNTY INTL (PTK)

PONTIAC, MICHIGAN

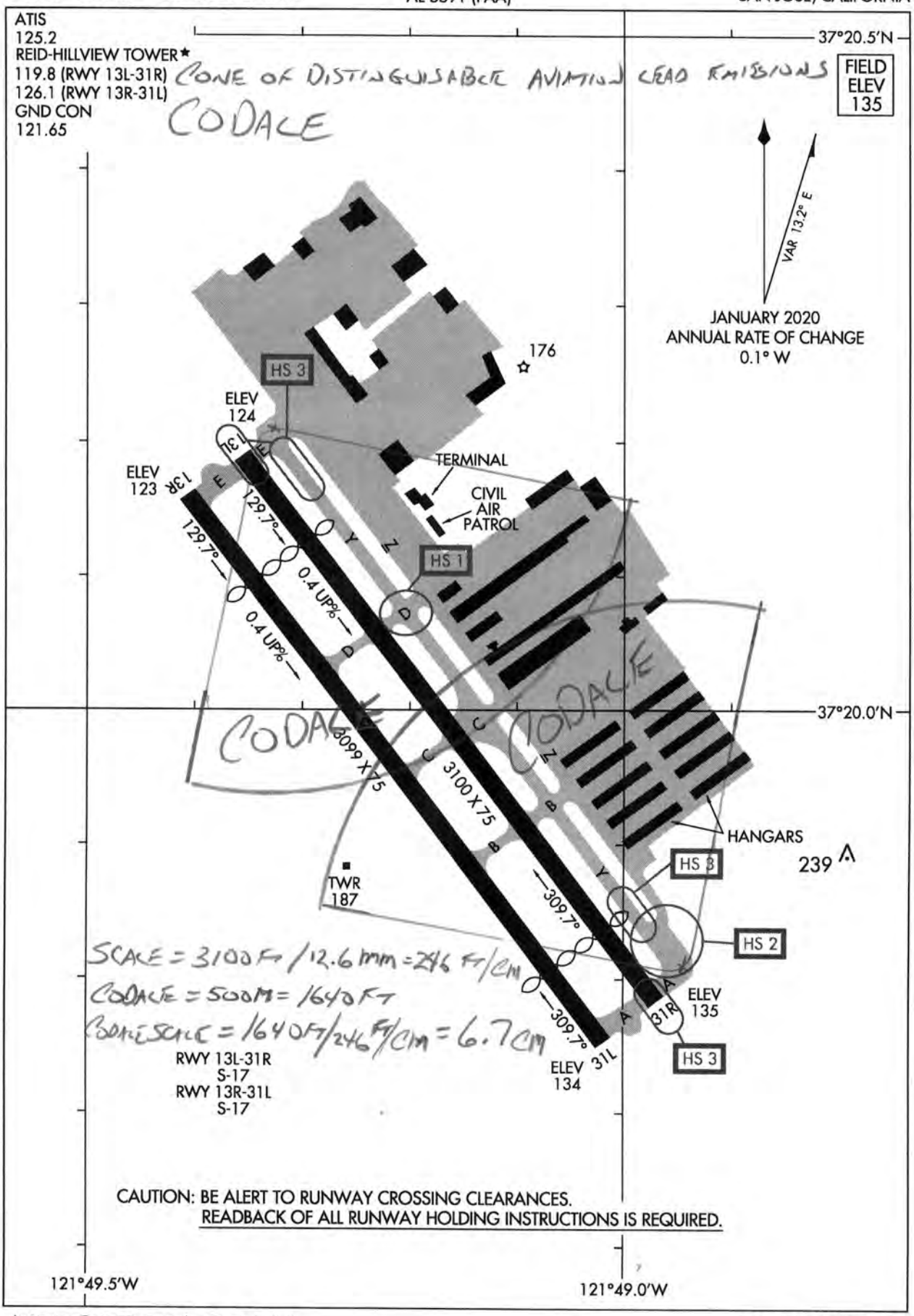


SW-2, 01 DEC 2022 to 29 DEC 2022

SW-2, 01 DEC 2022 to 29 DEC 2022

AIRPORT DIAGRAM

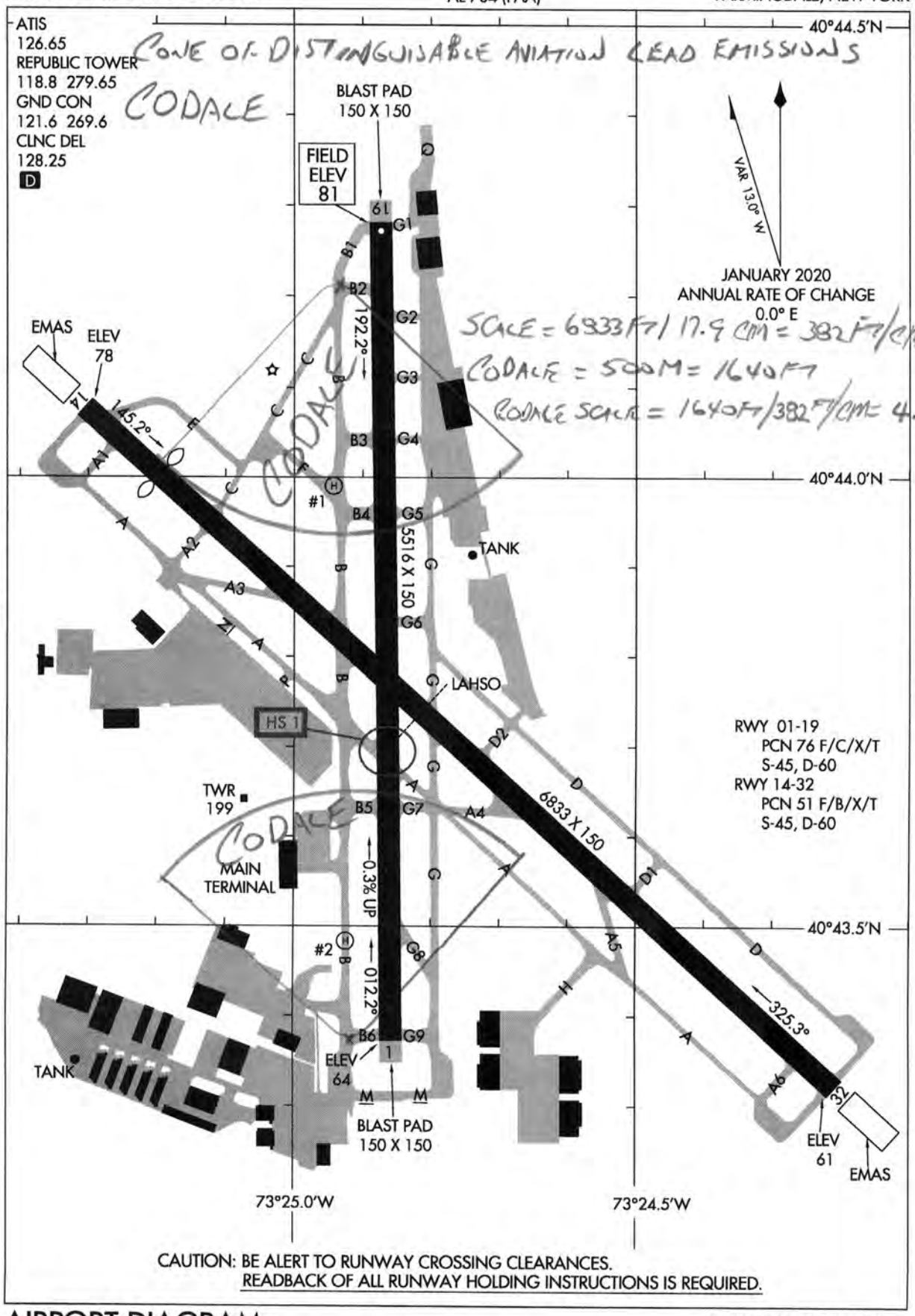
REID-HILLVIEW OF SANTA CLARA COUNTY (RHV)
AL-5591 (FAA)
SAN JOSE, CALIFORNIA



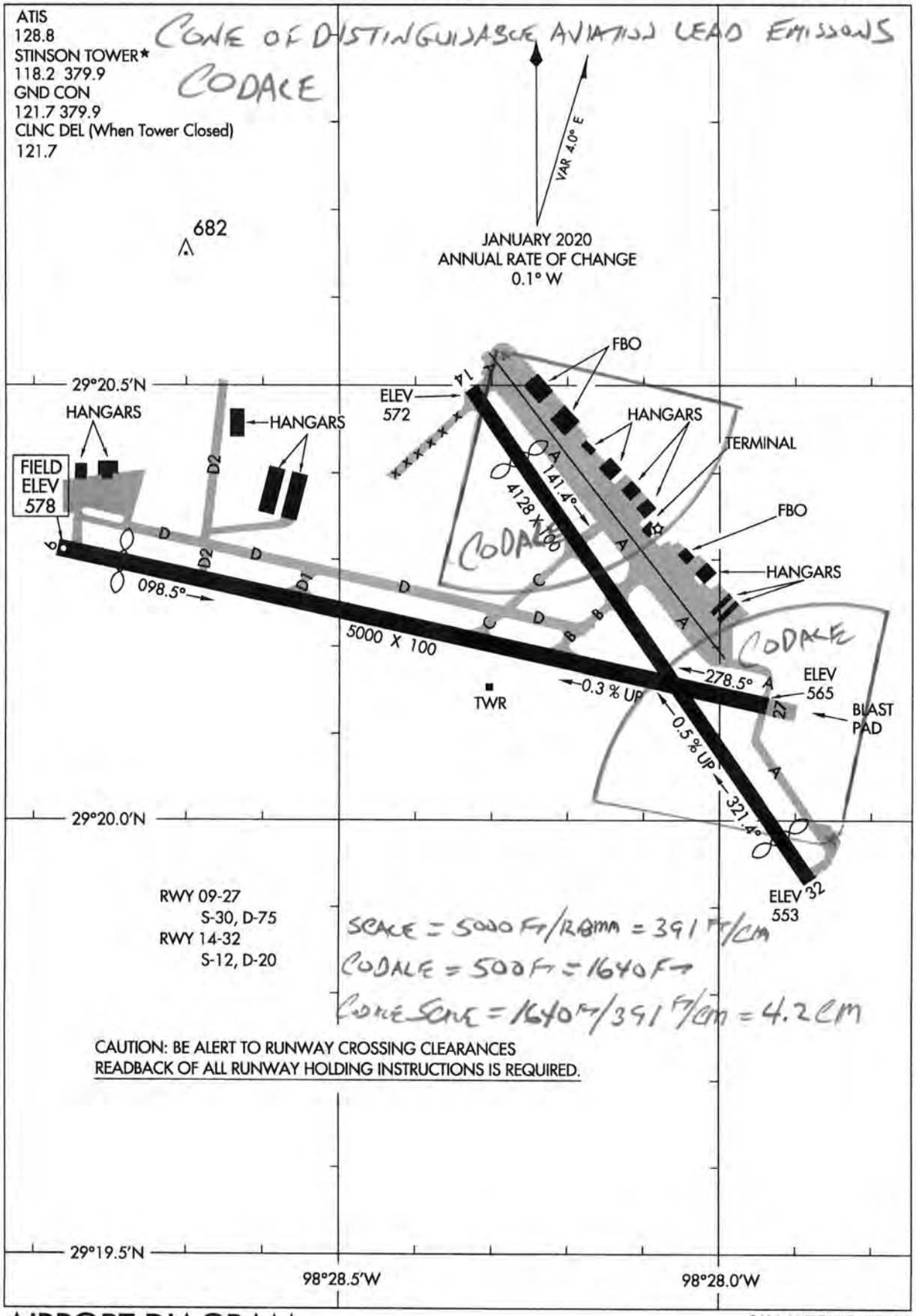
SW-2, 01 DEC 2022 to 29 DEC 2022

SW-2, 01 DEC 2022 to 29 DEC 2022

AIRPORT DIAGRAM
22139
SAN JOSE, CALIFORNIA
REID-HILLVIEW OF SANTA CLARA COUNTY (RHV)



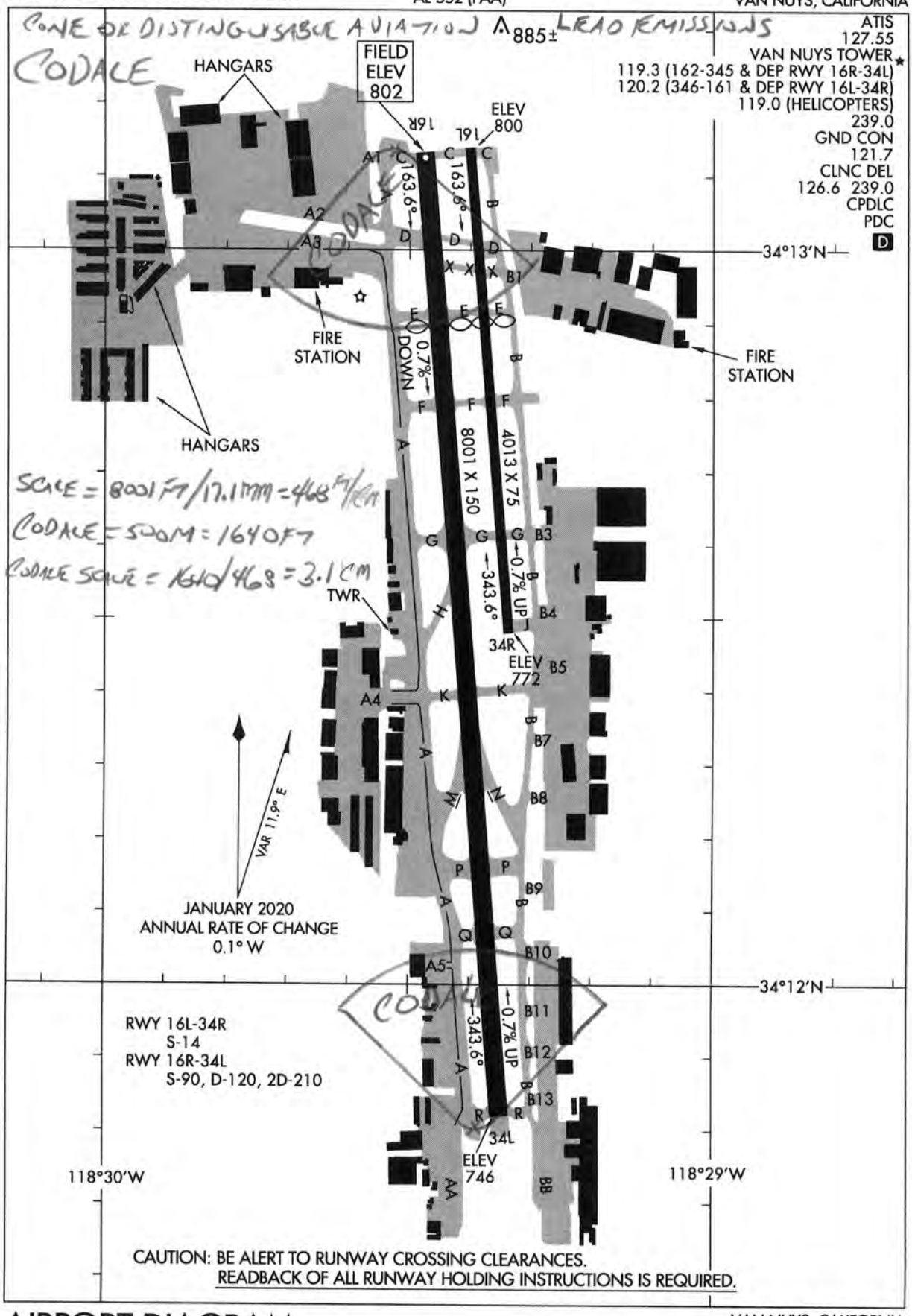
CAUTION: BE ALERT TO RUNWAY CROSSING CLEARANCES.
READBACK OF ALL RUNWAY HOLDING INSTRUCTIONS IS REQUIRED.


ATIS
128.8
STINSON TOWER*
118.2 379.9
GND CON
121.7 379.9
CLNC DEL (When Tower Closed)
121.7
CONE OF DISTINGUISHABLE AVIATION LEAD EMISSIONS
CODALE
682
VAR 4.0° E
JANUARY 2020
ANNUAL RATE OF CHANGE
0.1° W
29°20.5'N
29°20.0'N
29°19.5'N
98°28.5'W
98°28.0'W
FBO
HANGARS
TERMINAL
ELEV 572
FIELD ELEV 578
4128 X 100
141.4°
CODALE
098.5°
5000 X 100
0.3 % UP
278.5°
ELEV 565
BLAST PAD
TWR
0.5 % UP
321.4°
ELEV 553
RWY 09-27
S-30, D-75
RWY 14-32
S-12, D-20
SCALE = 5000 FT/128mm = 391 FT/CM
CODALE = 500 FT = 1640 FT
CONE SCALE = 1640 FT/391 FT/CM = 4.2 CM
CAUTION: BE ALERT TO RUNWAY CROSSING CLEARANCES
READBACK OF ALL RUNWAY HOLDING INSTRUCTIONS IS REQUIRED.

AIRPORT DIAGRAM

AL-552 (FAA)

VAN NUYS (VNY)
VAN NUYS, CALIFORNIA



ATIS
127.55
VAN NUYS TOWER★
119.3 (162-345 & DEP RWY 16R-34L)
120.2 (346-161 & DEP RWY 16L-34R)
119.0 (HELICOPTERS)
239.0
GND CON
121.7
CLNC DEL
126.6 239.0
CPDLC
PDC
D

RWY 16L-34R
S-14
RWY 16R-34L
S-90, D-120, 2D-210

CAUTION: BE ALERT TO RUNWAY CROSSING CLEARANCES.
READBACK OF ALL RUNWAY HOLDING INSTRUCTIONS IS REQUIRED.

SW-3, 01 DEC 2022 to 29 DEC 2022

SW-3, 01 DEC 2022 to 29 DEC 2022