1989 Airport Master Plan

(Updated 1997- see appendix K)

Marin County Airport
(Gnoss Field)

CORTRIGHT & SEIBOLD
Airport/Aviation Consultants

AIRPORT MASTER PLAN

for

MARIN COUNTY AIRPORT (GNOSS FIELD)

Prepared for

MARIN COUNTY

The preparation of this report was financed in part through an Airport Improvement Program Grant from the Federal Aviation Administration (FAA) under the provisions of Section 505 of the Airport and Airway Improvement Act of 1982. The contents of this report reflect the views of the Cortright & Seibold Project Team, which is responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policy of the FAA. Acceptance of this report by the FAA does not in any way constitute a commitment on the part of the United States to participate in any development depicted therein nor does it indicate that the proposed development is environmentally acceptable in accordance with Public Laws 91-190, 91-258, 94-353, and/or 90-495.

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1.0 - INTRODUCTION

1.0 - INTRODUCTION

This is the final report for the Marin County Airport (Gnoss Field) Master Plan. The Master Plan includes an airport inventory, aviation forecasts, airport planning evaluation, development recommendations, financial evaluation, and an updated Airport Layout Plan (ALP). In addition, a comprehensive Program Environmental Impact Report/Environmental Assessment (EIR/EA) conforming to State and Federal requirements was prepared as a separate companion document.

The Airport Master Plan and EIR/EA were prepared under an Airport Improvement Program (AIP) grant from the Federal Aviation Administration (FAA) issued in September, 1986. The Marin County Board of Supervisors adopted the Master Plan and certified the Program EIR/EA on 27 June, 1989.

Cortright & Seibold, airport and aviation consultants, directed a team of consultants hired by the County to prepare the Airport Master Plan and Program EIR/EA.

1.1 - PURPOSE

This report is intended to provide Marin County with an informational document to be used in making decisions regarding development of facilities at Gnoss Field over the next 20 years.

The Master Plan provides guidelines for future development of the Marin County Airport to satisfy projected short-, medium-, and long-range aviation requirements. The Master Plan is designed to be flexible and responsive to changing conditions with emphasis on developing a plan consistent with the County's aviation needs

and financial capabilities. Therefore, the Airport Master Plan is intended to be updated and/or modified as future conditions warrant, while maintaining consistency with the overall intent of the plan and the goals, policies, and objectives of Marin County.

1.2 - STUDY OBJECTIVES

At the outset, Marin County defined several objectives to be addressed in the study. These are recapped below:

1. The County wishes to develop a Plan for the Airport that satisfies the viewpoints of the following agencies and groups in terms of political acceptability and changing economic factors since the previous (1975) Master Plan was developed:

   - Marin County
   - City of Novato
   - Federal Aviation Administration
   - Other Government Agencies
   - Public Consensus

2. The County wishes to prepare a plan that provides guidance for Airport operations and development regarding the following factors:

   - Crosswind Runway
   - Instrument Approach Procedure
   - Aircraft Basing/Service Facilities
   - Airfield Capacity
   - Enterprise Fund
   - Wastewater Treatment
   - Safety

3. The County wishes to prepare a plan that provides enhanced environmental compatibility in the Airport environs in relationship to the following factors:

- o Bayfront Conservation Zone
- o Flora/Fauna
- o Wetlands
- o Drainage
- o Soils
- o Implementable Mitigation

4. The County wishes to maintain environs land use compatibility at the Airport in regard to:

   - o Marin County Zoning
   - o City of Novato Pre-zoning
   - o Industrial/Commercial Land Use
   - o Agriculture Land Use
   - o Tidelands

5. The County wishes to maintain eligibility for Federal/State grants via completing the following actions as part of the project:

   - o Adopted Airport Master Plan/Airport Layout Plan
   - o Certified Environmental Impact Report/ Environmental Assessment (EIR/EA)
   - o Agency Coordination

1.3 - STUDY FORMAT

The airport master planning and environmental studies were documented in Working Papers as the project progressed. The Working Papers are as follows:

Report	Subject
Working Paper 1	Airport Inventory, Aviation Forecasts, and Environmental Inventory (16 February, 1987)

Report	Subject
Working Paper 2	Airport Planning Alternatives (14 August, 1987)
Working Paper 3	Environmental Impact Assessment (2 October, 1987)
Working Paper 4	Preliminary Airport Development Program (27 January, 1988)
Working Paper 5	Draft Airport Master Plan Report (24 June, 1988)
Working Paper 6	Draft Environmental Impact Report/ Environmental Assessment (24 June, 1988)

This Airport Master Plan report summarizes the aviation technical evaluations and conclusions of the Working Papers regarding the recommended development program for Marin County Airport.

The associated Program EIR/EA summarizes the environmental evaluations for the recommended development program and satisfies FAA and State environmental impact assessment requirements.

Local participation was invited during the planning process. Active participants included officials and staff of Marin County, the County Aviation Commission, local pilots, representatives of airport businesses, and area residents and land owners. Their valuable points of view regarding the future of Marin County Airport have been considered in developing this Master Plan.

In addition, public meetings and hearings were held to present study evaluations, findings, and recommendations. This included

two hearings before the Marin County Planning Commission and one at the Board of Supervisors.

1.4 - RESPONSIBLE ORGANIZATION

This report was prepared under the direction of the Marin County Department of Public Works and General Services Department with the assistance of the Marin County Planning Department. The key individuals are:

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2.0 - AIRPORT INVENTORY

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This Chapter documents the inventory of existing facilities and services at the Marin County Airport (Gnoss Field). The material contained herein served as the basis for physical facility planning for the Airport and was updated to be current as of the spring of 1988, unless indicated otherwise.

To avoid lengthy explanations in the text, definitions of airport and aviation terms are presented in Appendix A. Technical References are listed in Appendix B.

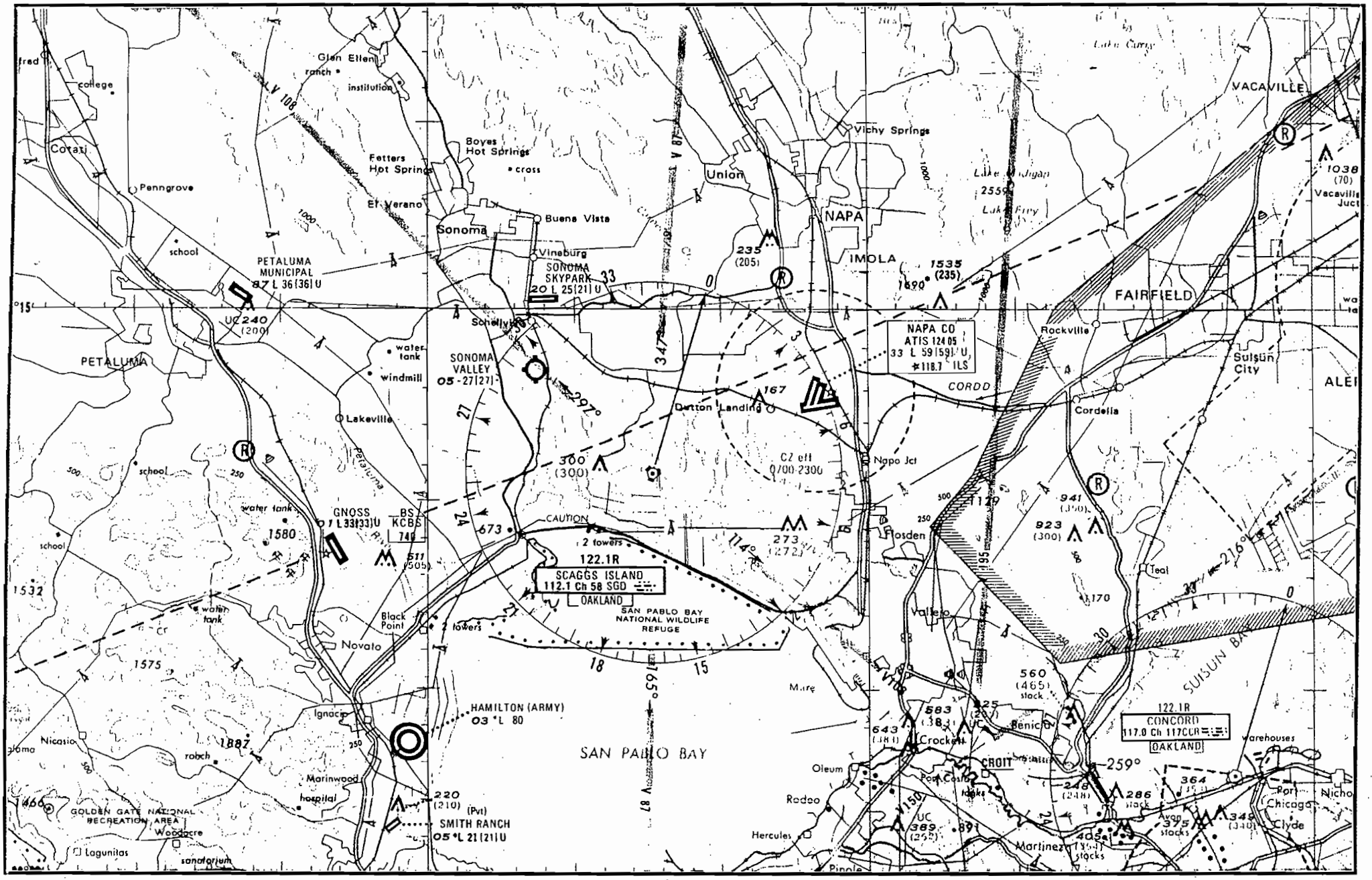
2.1 - LOCATION

The Marin County Airport is located in an unincorporated area of Marin County 3 nautical miles (nm) north of the City of Novato between Highway 101 and the Petaluma River, north of Black John Slough on 91.4 acres at an elevation of approximately 1 foot above mean sea level (msl).

The location of the Airport, as well as other public and private airports in the northern San Francisco Bay region, are illustrated on Figure 2.1, which is a portion of the California Aeronautical Chart published by Caltrans.

2.2 - EXISTING AIRPORT FACILITIES

The Airport is owned by Marin County. It was formerly operated by the Department of Public Works but is currently the responsibility of the General Services Department (July, 1989). The Manager's office is located at the Airport.



CORTRIGHT & SEIBOLD	**AIRPORT LOCATION** **Marin County (Gnoss Field) Airport**	**Figure:** **2.1**

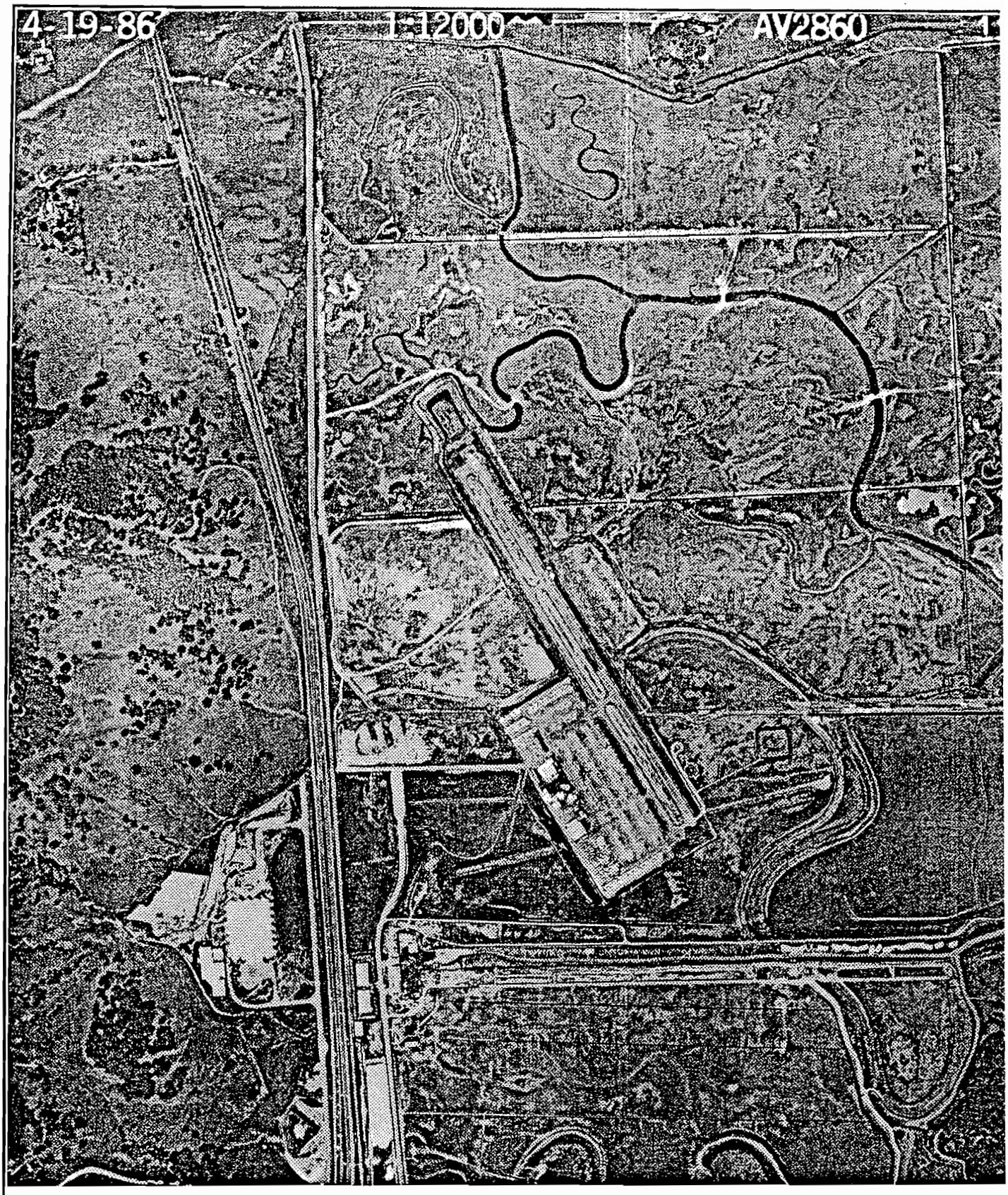
The Airport is a Basic Utility (BU) category facility per the Federal Aviation Administration's (FAA) National Plan of Integrated Airport Systems (NPIAS). The FAA assumes that the Airport will be a General Utility (GU) airport in the next five years. A BU airport can handle 75% to 95% of small general aviation aircraft (12,500 pounds gross weight maximum) and a GU airport can handle virtually 100% of general aviation aircraft.

The FAA also designates the Airport as a "Reliever" for other San Francisco Bay Area commercial service airports. This means that the Marin County Airport is expected to handle some of the general aviation aircraft that would otherwise use San Francisco and/or Oakland International Airports.

Figure 2.2 is an April, 1986 aerial photograph of the Airport and surrounding area which illustrates the existing facilities and vicinity land uses at the time the Master Plan study was initiated. Previous runways, which are now abandoned, were on alignments of 1-19 and 6-24 and are still visible in the photo. (Runway designations are determined by local magnetic compass heading rounded to the nearest 10° as viewed on final approach to landing.)

The existing northwest-southeast runway, Runway 13-31, is 3,300 feet long and 60 feet wide. This runway was constructed by Marin County after purchase of the Airport in 1965. The runway slopes up gradually to the north. The runway surface is asphalt concrete and the gross weight strength is rated at 26,000 pounds for single-wheel landing gear aircraft per the FAA Form 5010-1, "Airport Master Record," (see Appendix C). The pavement condition is good.

The 30-foot wide parallel taxiway is located 150 feet, centerline-to-centerline, from the runway with two exits in addition to the connections at each end.



CORTRIGHT & SEIBOLD	EXISTING FACILITIES Marin County (Gnoss Field) Airport	Figure: 2.2

Medium intensity runway lights (MIRL), threshold lights, and taxiway lights are installed. Runway markings are "basic" and are in good condition. Two box visual approach slope indicators (VASIs) are installed on each end of the runway. The glide angles for the VASIs are 3.5° and 4.0° for Runway 13 and 31, respectively. There are no approach lights.

The obstruction clearance approach surface slope for Runway 31 is 27:1 and for Runway 13 is 40:1. There are no close-in obstructions for either approach. A slope of 20:1 is adequate for the Airport per Federal Aviation Regulations (FAR) Part 77 criteria.

The aircraft parking apron includes 281 tiedowns. Some tiedowns are occupied by 82 individually-owned portable hangars. Two fixed based operator (FBO) maintenance hangars exist (the largest is 100′ x 100′). Approximately 10 more tiedowns and 8 individual hangars are located in the FBO leasehold area. The total parking capacity of Gnoss Field is about 300 aircraft, including both County and FBO tiedowns and portable hangars.

Aviation fuel currently available is 100 octane low-lead avgas (100 LL) and Jet A (for turboprop aircraft). Total tank storage, including all individual tanks, is 46,000 gallons. However, some tanks are not in service.

Other on-airport facilities include a segmented circle, three wind indicators, a tetrahedron, rotating beacon, and unicom radio base station (frequency 123.0).

The airfield is subject to a chronic pavement settlement problem because the facility was constructed over deep deposits of bay mud. It is periodically necessary to repair and/or overlay the existing pavements to correct grade deviations which develop over time. The runway was completely overlayed in 1981 and a portion of the runway was repaired again in 1985. The most recent major runway repair project was completed in April, 1988.

The airfield is surrounded by a system of drainage ditches and dikes to an elevation of approximately 6 feet msl. An evaporation basin on Airport property is approximately 500 feet east of the Runway 31 threshold which takes water from the surface drainage system and the aircraft washrack.

2.3 - FIXED-BASE-OPERATOR (FBO) SERVICES

In 1986, the two independent FBOs were consolidated into a single operation under Marin Air Services (formerly Marin Aviation and Vindair). The FBO provides flight instruction, charter, air taxi, fueling, avionics, and aircraft sales, rental, and maintenance services. American Aircraft of California, distributors for the Falcon Ultralight, are located in the same building as Marin Air Services.

The County Airport Manager's office is located on the second floor of the Piper building, also owned by Marin Air Services.

2.4 - AIRPORT ACCESS

Access is via Airport Road which connects to Binford Road. This is the frontage road on the east side of Highway 101. Binford Road presently dead-ends into Airport Road west of the field. Airport Road connects to the main public auto parking lot adjacent to the Airport Manager's office. Another road continues south along the west side of the Airport property to serve other buildings and auto parking areas. Access to the apron itself is restricted by a 4-foot fence with gates at several locations. Total auto parking spaces provided at the Airport are approximately 180.

2.5 - BASED AIRCRAFT

In 1986, when the Master Plan study began, there were 253 single-engine aircraft, 28 twins, and 2 helicopters based at Marin County Airport for a total of 283 aircraft. The total number of based aircraft has decreased to 260 as of May, 1988.

Annual operations are estimated to range from 135,000 to 160,000 per the FAA Form 5010-1 and estimates provided by the Airport Manager. No actual aircraft operational counts have been recorded. An aircraft operation is defined as either a landing or a takeoff. A touch-and-go counts as two operations.

2.6 - AIR TRAFFIC PROCEDURES

The Airport's traffic pattern is a standard "box" configuration on the east side of the runway. The pattern altitude is 1,000 feet above ground level (AGL). During calm wind conditions, the preferential runway for landing is Runway 13. During westerly crosswinds, the preferential runway for landing is Runway 31. Visual flight rule (VFR) procedures apply at this Airport.

No instrument flight rule (IFR) approach procedures currently exist. It is possible to make an instrument departure (a departure in accordance with an IFR flight plan filed with FAA). All actual landings and takeoffs must be made under VFR conditions.

Distance and bearing from the Skaggs Island VORTAC to the airfield is 240° and 9 nm. The magnetic variation is 17° east in this area. The KCBS radio towers are located 1.2 miles east of the airfield and raise to an elevation of 511 feet msl.

2.7 - AIRCRAFT ACCIDENT HISTORY

The 1985 Draft Environmental Assessment on Gnoss Field evaluated information regarding accidents and safety at the Airport over

the period 1973-1982. This evaluation indicated that virtually all accidents occurred on the Airport (96%) and that 65% occurred during landing. No injuries were sustained in 91% of the accidents and no fatalities occurred at all. Pilot error was sited as a cause or factor in 87% of the accidents and mechanical failure in 13%. Adverse weather and/or crosswind conditions were sited as a factor in 61% of the accidents.

As indicated in the official reports obtained by Cortright & Seibold from the National Transportation Safety Board and the Federal Aviation Administration (NTSB/FAA) for the period January, 1980 through June, 1986, crosswinds were a factor in 26% of the accidents. It is suspected that crosswinds may be a contributing factor (even though not stated) in a larger percentage of the accidents at Gnoss Field based on discussions with the FBO and evaluation of the NTSB/FAA accident reports (see Appendix D).

For example, crosswinds may be a factor in accidents officially classified as "ground loop" and "ran off side of runway." These are classic loss of control on landing accidents in which crosswinds are frequently a contributing factor.

The previous Airport Master Plan prepared in 1975 sited crosswinds as a factor in 25% of the accidents evaluated.

2.8 - WIND STUDY

To collect actual data regarding wind conditions at the Airport (speed, direction, and duration), wind monitoring and recording equipment was installed in January, 1986 by Cortright & Seibold at the direction of the County and maintained until January, 1987. The digital read-out R. M. Young Company equipment gave real time wind speed and direction, as well as recording peak gusts.

To allow development of a "wind rose" and for statistical analysis, a chart recorder was driven by the digital read-out to obtain a permanent hard copy record of the data. One full year's data were collected and evaluated. A report was prepared documenting the results (see Appendix E). In summary, no single runway alignment at Gnoss Field gives 95% or better crosswind coverage. It requires two alignments approximatley at right-angles to each other to provide 95% crosswind coverage at 10 knots. The best combination of runway alignments which did provide more than 95% coverage was the existing Runway 13-31 and a second alignment of approximately 030°-210° magnetic.

2.9 - PREVIOUS MASTER PLAN

The previous Master Plan for Gnoss Field was completed in 1975 but never adopted by the County. This plan projected a growth to 365 based aircraft by 1992 with 348,100 annual operations.

The 1975 Master Plan recommended development of a 3,500-foot crosswind runway on a 020°-200° alignment subject to soil surveys, wind recordings to substantiate runway alignment, and property acquisition. In addition, the Master Plan recommended substantial development of aircraft parking apron and FBO facilities both on the west side of Runway 13-31 and along the proposed new crosswind runway. This development would require the County to purchase about 160 acres of land.

Because the 1975 plan was not adopted, the County has been operating the Airport without official guidelines for the past ten years. The purpose of the present Master Plan is to provide direction for development and operation of the Airport over the next 20-years.

3.0 - AVIATION ACTIVITY FORECASTS

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Aviation activity forecasts were developed in 1986 by Cortright & Seibold (C&S) for 1991, 1996, 2001, and 2006 for Marin County Airport (Gnoss Field). This Chapter summarizes the forecasting results. For purposes of analysis, unconstrained demand was forecast using 1986 as the base year.

It is noted that since the forecasts were prepared, the number of based aircraft at Gnoss Field has decreased. Thus, the forecasts presented here are probably optimistic based on mid-1988 conditions.

3.1 - ASSUMPTIONS

The forecasts were specifically prepared to estimate the number of aircraft based at Gnoss Field if: 1) the Airport is developed to handle the forecast demand and 2) Gnoss Field is the only public-use airport in Marin County by 1991. Smith Ranch Airport is expected to close before 1991 based on the announced plans of the property owner. This forecast does not address the use of Hamilton Army Air Field (HML) for civil aviation or the development of another public airport in the County within the 20-year study timeframe. The forecasts also assume that existing public general aviation airports in Sonoma and Napa Counties will remain open, specifically Petaluma Municipal and Napa County Airports.

3.2 - HISTORICAL DATA

The most important forecast parameter for general aviation activity is based aircraft -- the aircraft that will be based at the Airport and will generate most of the operations. A practical

consideration is that reliable historical data exists only for based aircraft. Therefore, based aircraft serves as the foundation of all general aviation activity forecasts.

Historical aircraft data are available for the United States and for Marin County Airport from the FAA and Airport management records. The historical trend for general aviation aircraft in the nation, California, and Gnoss Field is presented in Table 3.1. The difference between "registered" and "active" aircraft depends on whether the aircraft was flown during the preceding year. Nationally, active aircraft average about 85% of registered aircraft.

3.2.1 - Growth Trends

Reviewing the data in Table 3.1 shows that the national general aviation aircraft fleet increased by 42% from 1975 to 1986 while the number of aircraft based at Gnoss Field increased by 74%. The late 1970's were a high growth period for general aviation in the United States and even more for Marin County which was experiencing rapid population and development growth in this period.

The picture is considerably different if data for 1981 through 1986 are used. During this period, the national fleet grew by only 3% and the number of aircraft at Gnoss Field remained flat after peaking at 303 in 1983 and decreasing to 283 in 1986.

3.2.2 - Economic Factors

The slow growth in the national general aviation aircraft fleet since 1981 results not only from the economic hard times of the early 1980's but more importantly from the rapidly escalating cost of operating and owning general aviation aircraft which has occurred in the last five years, well above the rate of inflation in the economy as a whole.

Table 3.1

HISTORICAL TREND
GENERAL AVIATION AIRCRAFT
National, State, and Airport
1971-1986

Year	United States Registered Aircraft	United States Active Aircraft	California Registered Aircraft	Marin County Airport
1971	151,654	131,743	--	114
1972	164,063	131,148	21,289	135
1973	168,115	145,000	22,117	-
1974	177,086	153,500	23,418	-
1975	185,350	161,400	24,571	163
1976	193,661	168,500	25,735	137
1977	203,332	178,300	26,701	166
1978	212.735	184,300	27,213	207
1979	234,190	198,800	30,298	227
1980	247,847	210,300	32,451	248
1981	255,735	211,000	33,411	284
1982	257,535	213,200	33,529	295
1983	254,745	209,800	32,765	303
1984	260,386	213,300	33,504	293
1985	--	220,900	--	291
1986	264,300*	216,500	--	283

Source: FAA, Census of U.S. Civil Aircraft
FAA, Aviation Forecasts for Fiscal Year 1986-1997
Airport Management Records

* Estimated by Cortright & Seibold

This has had a depressing effect on the production of aircraft as indicated by the data in Table 3.2. This table presents the national totals for production of general aviation aircraft over the period 1969 through 1984. The peak year for aircraft production was 1978 when total domestic shipments of general aviation aircraft was over 14,000 units. Since 1978, the annual production has decreased steadily to the point that 1986 domestic general aviation aircraft deliveries were approximately 1,500 units. The production of most small single-engine and twin-engine aircraft has stopped completely as manufacturers concentrate on delivery of high-value turboprop and turbojet aircraft.

Another strong factor in the decrease in production of new aircraft has been the greatly increased product liability insurance costs for new aircraft which currently are estimated to be about $100,000 per unit. This figure exceeds the purchase price of the typical small single-engine aircraft.

Table 3.3 presents FAA forecasts for aircraft in the national fleet through 1997. The forecasts show only an 18% growth in the total fleet from 1986 to 1997. This is an average annual rate of only 1.5%.

3.3 - AIRCRAFT OWNER DISTRIBUTION

To determine the owner address distribution for the aircraft at Gnoss Field, the Marin County Assessor Office Records were surveyed with the following results:

County	Percent
Marin	85
San Francisco	9
Sonoma	5
All others	1
Total =	100 %

Table 3.2

U.S. AIRCRAFT PRODUCTION - CIVIL
Calendar Years 1969-1984

Year	General* Aviation
1969	9,996
1970	5,246
1971	5,900
1972	7,702
1973	10,482
1974	9,903
1975	10,804
1976	12,232
1977	13,441
1978	14,346
1979	13,177
1980	8,703
1981	6,840
1982	3,326
1983	2,172
1984	2,013

Source: "Aerospace Facts and Figures," Published by Aviation Week and Space Technology, 1985-1986.

* Domestic aircraft shipments.

Table 3.3

HISTORICAL AND FORECASTED ACTIVE GENERAL AVIATION
AIRCRAFT TYPE DISTRIBUTION
National
1980-1997
(thousands)

		Fixed Wing						
		Piston				Rotocraft		
Year*	Total	Single-Engine	Multi-Engine	Turbo-prop	Turbo-jet	Piston	Turbine	Other
Historical								
1980	210.3	168.4	25.1	3.5	2.7	3.1	2.7	4.8
1981	211.0	168.4	24.6	4.1	3.0	2.8	3.2	4.9
1982	213.2	167.9	25.5	4.7	3.2	3.3	3.7	5.0
1983	209.8	164.2	25.0	5.2	4.0	2.4	3.7	5.2
1984	213.3	166.4	25.1	5.5	3.9	2.5	4.0	5.9
1985	220.9	171.9	25.5	5.8	4.3	2.9	4.2	6.3
Forecasted								
1986	216.5	166.4	25.6	6.1	4.6	2.8	4.6	6.4
1987	218.7	166.9	26.0	6.4	4.9	2.8	5.0	6.7
1988	221.1	167.9	26.4	6.6	5.2	2.7	5.3	7.0
1989	224.4	169.6	26.9	6.9	5.5	2.6	5.6	7.3
1990	228.8	172.4	27.3	7.2	5.7	2.6	6.0	7.6
1991	233.6	175.8	27.7	7.5	5.9	2.5	6.3	7.9
1992	238.3	178.7	28.0	7.8	6.2	2.5	6.8	8.3
1993	243.1	182.0	28.3	8.1	6.5	2.5	7.1	8.6
1994	248.0	185.3	28.6	8.4	6.7	2.4	7.7	8.9
1995	253.0	188.9	28.9	8.7	6.9	2.4	8.0	9.2
1996	256.4	191.0	29.2	9.0	7.1	2.3	8.3	9.5
1997	259.8	193.2	29.5	9.3	7.3	2.2	8.6	9.7

Source: FAA, "Aviation Activity Forecasts," Fiscal Years 1986-1997.

* Estimate for 1 January of indicated year.

Review of the data indicates that a number of the San Francisco County addresses were for locations in the downtown area and likely represent the business office location of the aircraft owner, not the actual residence which is probably in Marin County. Airport users at Gnoss Field are estimated to be over 90% Marin County residents. From some locations in Sonoma County, it is just as easy to drive to Gnoss Field as to other public airports in that County. This probably accounts for the 5% of based aircraft owned by Sonoma County residents. Also, it is possible that some of these people actually work in Marin County and base their aircraft at Gnoss Field for business travel reasons.

3.4 - AIRCRAFT TYPE DISTRIBUTION

Table 3.3 presents the historical active general aviation aircraft type distribution for the United States based upon FAA data contained in the annual "Aviation Activity Forecasts." The single-engine (piston) aircraft will continue to be the majority type in the future, but turbine-powered types (turbo-prop, turbo-jet, and turbine-powered rotorcraft) are expected to show the most increase on a percentage basis over the forecast period.

The current national fleet is composed of 77% singles, 12% twins, 5% turboprop/turbojet, 3% rotorcraft, and 3% other (i.e., sailplanes, balloons, etc.). The 1997 national fleet is expected to be 74% singles and 11% twins. Turboprops and turbojets are expected to comprise 6% of the national fleet in 1997 and rotorcraft will be 4%.

The 1986 aircraft type distribution for Gnoss Field is as follows:

Aircraft Type	Number	Percent
Singles	253	89
Twins	28	10
Rotorcraft	2	1
Total =	283	100%

Gnoss Field currently has a disproportionally large share of single-engine aircraft. This is probably due to the limited runway length of 3,300 feet which is marginal for many larger general aviation aircraft.

3.5 - BASED AIRCRAFT FORECAST

Utilizing the historical data, recent forecasts for Marin County population, national and State general aviation forecasts, and other aviation forecasts, including those by the FAA and Metropolitan Transportation Commission (MTC), a series of forecasting exercises were performed. The purpose was to assess the potential for general aviation aircraft activity growth in the County and at Gnoss Field.

3.5.1 - Forecasts by Others

Table 3.4 summarizes forecasts prepared by others for airports in Marin County: Gnoss Field Master Plan (1975), Draft Environmental Assessment (1985), Metropolitan Transportation Commission (MTC) forecasts used in the Hamilton Study (1984), as well as FAA and Division of Aeronautics (DOA) forecasts prepared in 1983 and 1981, respectively.

The 1975 Master Plan forecasts projected a total of 365 based aircraft at Gnoss Field by 1992. The 1985 Environmental Assessment (EA) forecasts projected 470 aircraft by 1990. FAA forecasts for Gnoss Field and Smith Ranch (combined) are for 447 aircraft by 1989. Forecasts prepared for the Hamilton study projected 430 aircraft at HML in 1991 if Gnoss Field were to be closed.

The MTC projected that 510 aircraft will be in Marin County by 2000 and the 1984 EA forecasts are for 600 aircraft (at Gnoss Field) by the same year. The EA projected growth to 675 based aircraft by 2005.

Table 3.4

BASED AIRCRAFT - FORECASTS BY OTHERS
Marin County

Year	1975 1) Master Plan	ESA 2) 1985	MTC 1984 3) (County Total)	DOA 1981 4)*	FAA 1985 5)*	Hamilton 3) 1984
1989					447	
1990		470				
1991						430
1992	365					
1994					533	
1995		535		420		
1996						443
2000		600	510			
2001						785
2004						850
2005		675				

Source: 1) Wilsey and Ham
2) Environmental Science Associates, Inc.
3) Metropolitan Transportation Commission
4) Division of Aeronautics
5) Federal Aviation Administration

* Gnoss Field and Smith Ranch combined total

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The 1975 Gnoss Field Master Plan forecasts did not consider the possible closure of Smith Ranch Airport. However, the 1985 EA forecasts do reflect the demise of Smith Ranch by 1990. The DOA forecasting model restricts the growth of based aircraft to available aircraft parking capacity and shows 300 aircraft at Gnoss Field and 120 at Smith Ranch for a total of 420 in 1995. The corresponding FAA National Plan for Integrated Airport System (NPIAS) forecasts are for 533 aircraft at Gnoss Field and Smith Ranch (or a replacement airport) by 1994. The Hamilton forecasts assume that HML would attract aircraft from outside Marin County due to the size and quality of facilities offered.

3.5.2 - Trial Forecasts

Table 3.5 summarizes trial County-wide and Gnoss Field based aircraft forecasts developed by Cortright & Seibold. The 1985 Association of Bay Area Governments (ABAG) Marin County population forecasts and the MTC San Francisco Bay Area general aviation aircraft forecasts are presented on the left-hand side of the table (columns 1-3).

The center portion of the table (columns 4-6) presents ratio projections of Gnoss Field and Marin County aircraft with and without Smith Ranch Airport. Column 4 presents a ratio projection of based aircraft at Gnoss Field using the ABAG population forecasts and assuming that the number of aircraft per capita remains the same as at present and Smith Ranch remains open. This provides a forecast of only 311 aircraft at Gnoss Field by 2006, as the population growth rate is only 0.5% per annum. If Smith Ranch Airport closes by 1991 and 80 of the 112 aircraft (about 70%) relocate to Gnoss Field, the year 2006 based aircraft will be 391 (column 5). The remainder of the Smith Ranch aircraft are assumed to relocate to other airports (such as the new Petaluma Municipal Airport).

Table 3.5

TRIAL FORECASTS
Marin County (Gnoss Field) Airport
1985-2006

		Bay Area	Ratio Forecast			Percentage Forecast		
Year	County Population	Aircraft (MTC)	Population	+80	Bay Area Aircraft	2% Per Annun	2% +80	3% Per Annun +80
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1985	223,700		291					
1986						283		283
1990	229,600	8,880	298	378	426			
1991						312	392	408
1995	235,400	9,800	306	386	470			
1996						345	425	460
2000	239,700	10,620	311	391	520			
2001						381	461	521
2006						421	502	591

Source: Cortright & Seibold

Column 6 presents projections of Gnoss Field (actually Marin County) based aircraft using the Bay Area distribution percentage developed by MTC for 2000. This results in a forecast of 520 aircraft at Gnoss Field in 2000 if Smith Ranch is closed. This requires an average annual growth rate of 3%.

The right-hand columns (7-9) of Table 3.5 show average annual percentage growth projections at 2%, 2% plus 80 aircraft from Smith Ranch, and 3% plus 80 aircraft over the 20-year forecast period. This results in forecasts of 421, 502, and 591 based aircraft at Gnoss Field by 2006, respectively.

Considering the national forecast of 1.5% average annual growth in the general aviation fleet and the current very low new aircraft production rates, the above forecasts may be optimistic unless the general aviation economic trend is reversed within the next few years.

This is possible over the long-term (10 to 20 years) given: 1) the FAA and aviation industry developing simpler and less-costly primary aircraft; 2) the movement in Congress to restrict exposure of aircraft makers to large product liability claims; and 3) a statute of limitations on when a claim can be filed. Presently, there is no limit on the dollar amount of damages or the time period after manufacturing that the maker can be sued. The FAA development of a Recreational Pilot rating which is less-costly to obtain than the Private Pilot certificate will also help stimulate general aviation growth above current low rates.

3.5.3 - Gnoss Field Aircraft Forecast

Utilizing the forecasting exercises presented in Table 3.4 and assuming that Smith Ranch Airport is closed by 1991, the following forecast of Gnoss Field based aircraft was prepared:

Year	Based Aircraft	Incremental Increase
1986 actual	283	
		102
1991	385	
		35
1996	420	
		40
2001	460	
		50
2006	510	

It is noted that since the forecasts were prepared in 1986, the actual number of based aircraft at Gnoss Field has decreased to 260 by mid-1988. However, if a higher percentage of Smith Ranch aircraft transfer to Gnoss Field than assumed (70%), the above forecasts could still actually be realized, especially the 1991 projection of 385 based aircraft.

3.6 - AIRCRAFT TYPE DISTRIBUTION FORECAST

Utilizing the historical Gnoss Field aircraft type distribution, as well as FAA national forecasts, a projection of aircraft type distribution was prepared. The results are presented in Table 3.6. The predominate type will continue to be single-engine piston aircraft, making up 89% of the total in 1991 and decreasing (but still predominate) to 83% of the total in 2006. Multi-engine aircraft are expected to be 10% by 1991 and increasing to 16% by the year 2006. The number of helicopters is forecast to be 5 by the year 2006.

3.7 - AIRCRAFT OPERATIONS FORECASTS

Historical Marin County aircraft operations data are not available. Estimates of annual operations for Gnoss Field and other non-tower airports are available from airport management or from

Table 3.6

FORECAST AIRCRAFT TYPE DISTRIBUTION
Gnoss Field Airport
1986-2006

Year	Single-engine	Multi-engine	Helicopter	Total
1986	253	28	2	283
1991	342	40	3	385
1996	366	50	4	420
2001	386	70	4	460
2006	425	80	5	510

Source: Cortright & Seibold

FAA Form 5010. Actual operations counts are only available at airports with FAA control towers.

"General aviation" aircraft operations are predominately (but not exclusively) conducted by aircraft under 12,500 pounds gross weight. "Local" operations are conducted by aircraft which take-off and land at the same airport. "Itinerant" operations are conducted by aircraft which takeoff at one airport and land at another airport. "Touch-and-go" operations are considered to be local operations.

A forecast of general aviation aircraft operations was developed using the based aircraft forecast presented earlier and estimates of annual operations per based aircraft.

FAA national estimates prepared in the 1970's indicate that operations per based aircraft should typically range from about 600 to 800. DOA data from the same period indicates an average of 650 operations per based aircraft. Recent downward trends in general aviation aircraft activity and greatly escalating costs of aircraft operations indicate that the present ratio of operation per based aircraft is much lower.

The ultimate selection of a ratio is based upon the assumption that the number of operations being flown by general aviation aircraft is depressed because of economic conditions and rapidly escalating costs. On this basis, a value of 500 operations per based aircraft was selected for estimating 1986 general aviation operations. In addition, FAA national forecasts indicate a downward trend in operations per based aircraft. Thus, a decreasing ratio was selected for computing 1991 through 2006 annual operations forecasts. Results of the operations forecasts are presented in Table 3.7.

Table 3.7 also sets forth a breakdown of forecast general aviation aircraft operations by local and itinerant operations. FAA

Table 3.7

FORECAST GENERAL AVIATION AIRCRAFT OPERATIONS
Gnoss Field Airport
1986-2006

Year	Aircraft	Annual Operations Per Based Aircraft	Annual Operations	Operations Distribution	
				Itinerant	Local
1986	283	500	142,000	64,000	75,000
1991	385	475	183,000	82,000	101,000
1996	420	450	189,000	85,000	104,000
2001	460	425	196,000	88,000	108,000
2006	510	400	204,000	92,000	112,000

Source: Cortright & Seibold

estimates indicate a distribution of 45% itinerant and 55% local operations as typical at non-towered general aviation airports On this basis, itinerant operations are projected to increase from 64,000 in 1986 to 92,000 by 2006, and local operations are forecast to increase from 78,000 to 112,000 over the same period.

3.8 - DEMAND/CAPACITY IMPLICATIONS

Comparing the existing aircraft parking capacity (approximately 300 aircraft) with the forecasts indicates that demand will exceed available aircraft parking capacity by 1991 if: 1) the forecast growth occurs as projected, 2) no new parking spaces are provided at Gnoss Field, and 3) if Smith Ranch Airport closes with most of these aircraft shifting to Gnoss Field.

However, as noted previously, the number of based aircraft at Gnoss Field has decreased from 283 in 1986 to 260 by May, 1988. Several reasons have been suggested for the decrease, including economic factors, continued deterioration of physical plant, lack of hangars, and improved facilities at nearby airports. The exact reason for the drop in based aircraft have not been determined but probably involves a combination of the factors listed above. It remains to be seen if this is a long-term or short-term trend.

4.0 - DEMAND/CAPACITY AND FACILITY REQUIREMENTS

4.0 - DEMAND/CAPACITY AND FACILITY REQUIREMENTS

This Chapter documents the results of aviation demand versus capacity studies and presents a listing of Airport facility requirements. The facility requirements determine the physical sizing and geometrics of the Airport development alternatives described and evaluated later in this report.

4.1 - AIRPORT CATEGORY

Marin County Airport (Gnoss Field) is currently classified as a Basic Utility, Stage II (BU-II) airport using FAA criteria. A BU-II category airport is intended to serve 95% of the general aviation aircraft fleet.

Considering the aviation demand forecasts and the types of aircraft currently using (and forecast to use) the Airport, the dimensional standards for a General Utility, Stage I (GU-I) airport have been adopted for planning evaluations. A GU-I category airport is designed to handle virtually 100% of general aviation aircraft (aircraft with a maximum gross weight of 12,500 pounds or less). General aviation aircraft are also classed as "small aircraft" using FAA criteria. A listing of these aircraft types is presented in Appendix F.

4.2 - AIRPLANE DESIGN GROUP

In addition to defining BU and GU categories for general aviation airports, the FAA defines Airplane Design Groups. The definition of Design Groups is based on the aircraft wingspan. FAA Advisory Circular (AC) 150/5300-4B, "Utility Airports," sets forth the

Design Group concept, as well as other planning and design criteria for general aviation airports. This document was the basic planning guideline used for evaluation of facilities at Gnoss Field.

The Airplane Design Groups appropriate for Gnoss Field are as follows:

Design Group	Aircraft Wingspan
I	less than 49 feet
II	49 feet and larger, but less than 79 feet

As a practical consideration, the largest wingspan of any general aviation aircraft likely to use Gnoss Field is about 55 feet. This would be an aircraft such as a Super King Air B-200. Most general aviation aircraft typically have a wingspan of 45 feet or less.

The existing Airport was developed according to Design Group I criteria. For future facility planning, it is recommended that Design Group I geometric standards be retained. This is reflected in the facility requirements recommendations presented at the end of this Section and used to design the Airport development alternative geometric layouts.

4.3 - AIRFIELD GEOMETRICS

Using the Design Group criteria and other general aviation airport design standards contained in AC 150/5300-4B, it is possible to specify appropriate airfield geometrics for planning (and later design) of facility improvements at Gnoss Field. The recommended airfield geometrics are discussed below.

4.3.1 - Runway Length

One of the most important design factors in planning airport facilities is the runway pavement length. This dimension controls the types of aircraft that can operate from the Airport, as well as the useful payloads that can be carried. Runway length design graphs prepared by the FAA for general aviation aircraft were used to establish recommended runway length requirements. The appropriate runway lengths for planning future facilities using "general utility" criteria are as follows:

Type of Aircraft	Runway Length (feet)
aircraft with 10 seats or less	3,800
aircraft with 10 seats or more	4,400

For comparison, the runway length requirement using "basic utility" standards resulted in a length of 3,200 feet. The existing runway length at Gnoss Field is 3,300 feet.

The runway length values are based on FAA review of the actual flight manuals and operating limitations of various general aviation aircraft. The major parameters used in developing the FAA runway length design graphs were the required landing and/or takeoff distances, and the accelerate-stop distances at maximum certificated takeoff weight.

The airfield elevation and ambient temperature are also considered in determining the necessary runway length. For Gnoss Field, the airfield elevation is sea level and the "worst-case" temperature assumed for calculating runway length was 100°F. (If a temperature of 90°F is used, the runway length requirement

would decrease by 200 feet to 3,600 and 4,200 feet, respectively.)

4.3.2 - Runway Width

The existing Gnoss Field runway width of 60 feet currently satisfies FAA's minimum design criteria for general aviation airports serving Design Group I aircraft.

An additional consideration in determining future runway width is if the Airport will ever be served by a precision (P) or non-precision (NP) instrument approach procedure. For a NP approach, a 60-foot width is adequate, but for a precision approach, the runway width should be 75-100 feet.

Another consideration regarding runway width is crosswinds. If a crosswind runway is not provided in the future at Gnoss Field, it may be desirable to over-widen the existing runway to 75 or 100 feet as an operational safety feature.

4.3.3 - Pavement Strength

The normal maximum pavement strength rating for a general aviation airport is 12,500 pounds for single-wheel landing gear aircraft.

The current runway pavement strength rating at Gnoss Field is 26,000 pounds. This higher strength rating is probably because the original runway pavement has been overlaid with an additional surface course of asphalt concrete to correct the profile. In doing this, the pavement strength rating would automatically be increased due to the increased overall pavement structural section thickness.

The existing runway pavement strength at Gnoss Field is adequate for the 20-year planning period. However, the County should

expect a surface leveling course or localized pavement repairs to be needed every few years due to chronic settlement problems because the airfield was constructed over Bay Mud.

A preliminary inspection of the runway, taxiways, and aircraft parking apron pavements by Cortright & Seibold civil engineering staff indicates that the runway and taxiway pavement is in fair to good condition, but the apron is in fair to poor condition.

4.3.4 - Taxiway Width

The existing parallel taxiway width at Gnoss Field is 30 feet. This exceeds the FAA minimum of 25 feet for Design Group I. However, alternative development evaluations for new facilities have been done using a 30-foot taxiway width.

4.3.5 - Airfield Setbacks

FAA airport design standards specify minimum setbacks from the runway centerline for parallel taxiways, aircraft parking areas, buildings, and property lines.

The existing 150-foot separation between Runway 13-31 and the parallel taxiway meets the FAA minimum, but for planning future facilities the Design Group I setback of 225 feet has been used. (The existing airfield can remain as it presently exists with the 150-foot runway to taxiway separation.)

The FAA standard setback from the runway centerline to aircraft parking areas is 200 feet for Design Group I. The existing facilities at Gnoss Field comply with this criteria. For future facility planning, the Design Group I setback has also been adopted.

For a general aviation airport, the minimum required setbacks from the runway centerline to the building restriction line (BRL)

are the same as for the aircraft parking areas: 200 feet for Design Group I.

An additional consideration in locating buildings on the Airport is the obstruction height limits specified in Federal Aviation Regulation Part 77 (FAR Part 77). These height limits were considered in siting new building locations as part of preparing the recommended Airport development plan.

4.4 - AIRCRAFT PARKING AREAS

Aircraft parking areas at Gnoss Field consist of tiedowns on the apron and portable individual hangars. The majority of based aircraft are stored on tiedowns. Of the 283 aircraft inventoried in 1986, only 67 were housed in private hangars (excluding the FBO hangars). As of Spring 1988, 90 hangars were located on the Airport due to additional construction (82 hangars on County tiedowns and 8 in the FBO area).

Due to limited existing apron area, the County has allowed hangar rows to be established at a minimum face-to-face separation of 50 feet and has placed tiedowns on all available apron areas. This allows a maximum number of aircraft to be based at the Airport but has resulted in a cramped and overcrowded apron layout. The present apron layout makes circulation of aircraft on the apron difficult.

For future hangar area development planning purposes, the face-to-face separation between hangars will be 70-75 feet.

The existing apron area (excluding the FBO lease area) is approximately 18 acres. Using a typical airport facility planning criteria of 12 aircraft per acre, or 400 square yards (sy) per aircraft, the existing apron should be 26 acres just to provide adequate parking and circulation areas for the current number of

based aircraft at Gnoss Field. This includes a 5-10% allowance for transient aircraft parking.

To meet the projected 5-year demand (1991), 35 acres of aircraft parking should be provided. To meet the projected 20-year demand (2006), 47 acres of apron should be provided. This is an overall increase of 29 acres over the existing apron area for the 20-year planning period.

4.5 - APPROACH SURFACES AND CLEAR ZONES

Federal Aviation Regulation Part 77 (FAR Part 77) defines criteria for establishing obstruction free approach surfaces to the runway(s) at Gnoss Field (see Appendix G).

The FAR Part 77 approach surface slope of 20:1 for "visual" and general utility "non-precision instrument" runways is satisfied at the Airport. The existing obstruction-free approach surfaces are 40:1 and 27:1 for Runway 13 and 31, respectively. The approach surface starts 200 feet out from the runway threshold, at the runway end elevation, and extends out and up from the Airport.

In addition to FAR Part 77 approach surfaces, Clear Zones are defined by FAA for the close-in portions of the approach areas. The clear zone areas should be kept free of buildings, concentrations of people, and structures which penetrate the approach surface slopes. For a general aviation runway, the length and width of the clear zone area (on the ground) under the approach surface is as follows for visual, non-precision, and precision runways:

Type of Approach	Clear Zone Dimensions (feet) Width Inner	Outer	Length	Slope (ratio)
Visual	250	450	1,000	20:1
Non-precision	500	800	1,000	20:1/34:1
Precision	1,000	1,750	2,500	34:1/50:1

The Airport development alternatives discussed later in this report use the visual utility runway clear zone standard for initial evaluation purposes. Further evaluation of clear zones was conducted for the selected development alternative in conjunction with studies of instrument approach procedures. (See Appendix H for an illustration of FAA clear zone criteria.)

4.6 - FIXED-BASE-OPERATOR AREAS

The existing fixed-base-operator (FBO) leasehold area at Gnoss Field is about 3.2 acres overall. This leasehold area contains all the FBO buildings, hangars, auto parking, and aircraft parking areas associated with FBO commercial activities at the Airport. The entire area is leased to Marin Air Services.

Considering the number of aircraft presently at the Airport and the forecast aviation demand, a single, full-service FBO is adequate to serve the current demand for aircraft maintenance, flight instruction, charter, aircraft sales, fuel sales, and other normal FBO functions. For long-term planning purposes (and also to satisfy FAA requirements), the Airport Master Plan provides a site for the eventual reestablishment of a second FBO at the Airport.

Using typical general aviation airport planning criteria, the leasehold area(s) should be sized to contain approximately 3 to 5 acres for full-service FBO development. Smaller lease areas are appropriate to provide sites for specialty aviation services

(i.e., avionics repairs, engine overall, aircraft painting, etc.).

The actual need to develop additional FBO area(s) is subject to future economic conditions and negotiations between the County and prospective airport commercial tenants. In all cases, it is recommended that any new leasehold areas only be provided subject to a written agreement between the County and the prospective tenant.

4.7 - ACCESS AND PARKING

The existing Airport access road, which connects to Binford Road west of the Airport, is a two-lane, two-way asphalt-surfaced facility. Given the modest growth in aviation activity forecast, this road appears adequate for present and projected Airport access requirements over the 20-year planning period.

Internal modifications and/or additions to on-airport roads will be needed to serve new facility development. These roads should be two-lane and have a width of 24 feet.

There are three public auto parking lots on the Airport located at the Marin Air Services and County Airport Administration (Piper) Buildings.

In total, 182 public auto parking spaces are provided at the Airport in a combined total of 2.1 acres of parking lots.

For future facility planning, one public auto parking space should be provided for every 2 based aircraft. This results in a demand for some 210 public auto parking spaces to meet the 5-year (1991) projections and 290 spaces to meet the 20-year (2006) projections. Stated in terms of areas, the requirement is for 2.7 acres by 1991 and 3.5 acres by 2006. These auto parking

areas have been accommodated in the Airport development alternatives.

4.8 - AIRFIELD CAPACITY

Airfield operational capacity is defined by the FAA in terms of "Annual Service Volume" (ASV) and "Hourly Capacity" in Advisory Circular 150/5060-5, "Airport Capacity and Delay."

ASV is an estimate of an airport's annual capacity which accounts for differences in runway use, aircraft type mix, weather conditions, and the number of hours that the airport is used over a year's time.

Hourly capacity is a measure of the maximum number of aircraft operations which can be accommodated on the airport in an hour. An "operation" is a landing or a takeoff. A touch-and-go or stop-and-go counts as two operations.

Hourly capacity values are calculated for both VFR and IFR conditions, as appropriate for the airport. Generally, VFR conditions exist when the ceiling is at least 1,000 feet above ground level and the visibility is at least three statute miles. IFR conditions exist when the ceiling or the visibility is less than the values stated for VFR conditions.

No actual ceiling and visibility weather observations are taken at Gnoss Field, but based on estimates obtained for this study, IFR conditions probably occur less than 10% of the time at this location. This is a typical percentage of the time for instrument meteorological conditions (IMC) to exist over the year based on data from other airports in California.

ASV and hourly VFR and IFR capacity estimates have been prepared for use in this study. Because no IFR procedures are published for Gnoss Field, the present IFR capacity is zero. However,

airspace studies for this study address establishment of IFR procedures for Gnoss Field.

Airfield capacity values for various runway configurations considered in this study are as follows:

Runway Configuration	Airfield Operational Capacity Hourly VFR	Hourly IFR	Annual
Single	90	20	230,000
Open-V	130	20	260,000
Parallel	190	25	350,000

The above capacity values were developed using FAA methodology that assumes ideal operating conditions and air traffic control services at the Airport. In actual practice, these operational levels may not be achieved at "un-controlled" (i.e., no FAA air traffic control tower) airports. However, they are valid long-range facility planning parameters for use in comparative studies of various airfield development alternatives.

Using the aviation activity forecasts, annual demand versus capacity (D/C) ratios were computed for the various airfield configurations. These are as follows:

Year	Annual Operations	Annual Demand/Capacity Ratio Single	Open-V	Parallel
1986	142,000	.62	.53	.40
1991	183,000	.80	.68	.52
1996	189,000	.82	.73	.54
2001	196,000	.85	.75	.56
2006	204,000	.89	.76	.57

Using FAA methodology to convert the above annual operations forecasts to peak-hour operations estimates, the following hourly demand/capacity ratios were derived for Gnoss Field:

Year	Peak-Hour Operations	Hourly Demand/Capacity Ratio		
		Single	Open-V	Parallel
1986	47	.52	.36	.25
1991	61	.68	.47	.32
1996	63	.70	.48	.33
2001	65	.72	.48	.34
2006	68	.76	.52	.36

The annual D/C ratios vary from a low of .40 for a parallel runway configuration for the 1986 activity level to a high of .89 for the 2006 forecast operations using the existing single runway. Presently, Runway 13-31 is being utilized at .62 of its annual capacity.

If a parallel runway were to be constructed, the annual D/C ratio would only reach .57 by the end of the 20-year period.

The annual capacity ratio of an open-V airfield configuration is 0.53 for 1986 activity levels, increasing to 0.76 at the end of the 20-year period (2006).

Based on the above estimates, it is concluded that a single runway airfield configuration could serve the 20-year demand, if necessary, but an open-V configuration would provide more adequate capacity over the entire 20-year period in terms of both annual and hourly airfield capacity. Developing a parallel runway airfield configuration would also provide more capacity than the single runway but actually provides an excess of capacity far beyond the forecast demand. In addition, the parallel runway configuration does not solve the existing crosswind problem and

is no better than the existing Runway 13-31 alignment in this regard. (See Appendix E for discussion of crosswinds.)

Based on this evaluation, an open-V airfield configuration appears to be the optimal airfield layout for both operational capacity and crosswind reasons.

4.9 - AVIGATION

Avigation concerns aircraft operational use and navigation through airspace for arrival and departure from the Airport. The objective is that flight be performed in a routine and safe manner. Air traffic operational procedures are considered in this Section.

4.9.1 - VFR Air Traffic Procedures

Existing VFR arrival and departure procedures for Gnoss Field are to fly a standard "box" pattern on the east side of Runway 13-31 at 1,000 feet agl. It is recommended that the traffic pattern remain on the east side of the Airport because of nearby Mount Burdell on the west side which is a possible obstruction for aircraft flying wide patterns and because of turbulence near the hills.

4.9.2 - IFR Air Traffic Procedures

IFR procedures for the Airport approved by the FAA for use under instrument meteorological conditions (IMC) do not presently exist. Therefore, an evaluation of establishing IFR procedures for Gnoss Field was conducted as part of this project. The evaluation was based on establishing a non-precision instrument approach procedure using existing navaids in the vicinity of the Airport. In the future, it may be possible to develop other

approaches, (e.g., Loran C). Development of a precision instrument landing system (ILS) procedure does not appear feasible due to topographic features and facility siting requirements.

The actual design and implementation of IFR procedures must be done by the FAA. Thus, the County must submit a formal request to FAA for design and publishing of an IFR approach for the Airport.

A non-precision VOR instrument approach procedure is currently published by FAA for the Petaluma Municipal Airport using the 276° radial from Scaggs Island VORTAC. Based on airspace studies conducted for this project, it appears feasible to establish a similar IFR approach procedure for Gnoss Field using the 240° Scaggs Island radial for final approach course guidance.

If the Gnoss Field procedure is developed to the existing airfield (Runway 13-31), it would only be possible to establish "circling" minimums because the alignment of the final approach course from the Scaggs Island VORTAC to the runway would not fall within 30° of the runway alignment which is required by the United States Standard for Terminal Procedures (TERPS) for a straight-in procedure. However, if a northeast-southwest crosswind runway were to be constructed, it may be possible to provide lower straight-in landing minimums, depending on the exact alignment of the runway.

The existence of 1,580-foot Mount Burdell to the west of the Airport would limit circling procedures to the area east of Runway 13-31. Even with this limitation, it would not be possible to establish a minimum decent altitude (MDA) below approximately 900-1,000 feet msl due to the 511-foot KCBS radio towers about 1.2 miles east of the Airport. At least 300 feet of obstacle clearance must be maintained for the protected circling area near the Airport. In addition, it may be necessary to establish

the missed approach point (MAP) before reaching the Airport in order to have adequate terrain clearance for the missed approach.

The Scaggs Island VORTAC could be used as the final approach fix (FAF) and either a timed approach used, or a radial from the Sausalito VORTAC used to establish the MAP. Alternatively, a DME distance from Scaggs Island could establish the MAP. Based on test flying a simulated approach from Scaggs Island VORTAC to Gnoss Field on an outbound radial of 240°, it appears that the Sausalito VORTAC 345° cross-radial could be used to establish the missed approach point. Using this procedure, a missed approach could be executed by making a climbing left turn and proceeding either direct to the Sausalito VORTAC or back to the Scaggs Island VORTAC for holding or vectors from Bay Tracon for another approach.

An additional consideration is obtaining adequate weather reporting at the Airport and a local altimeter setting in order to provide safe, up-to-date information for pilots using the IFR procedure and qualifying the Airport as a landing site for FAR Part 135 charter and air taxi operations.

The solution is to establish weather observations at the Airport, either through manual or automated systems. The most practical system would be to install an Automated Weather Observation System (AWOS) using equipment certified by the FAA for IFR use and transmitting the information to pilots over a unicom, NDB, or VOR frequency. The information can also be transmitted to the Oakland Flight Service Station (FSS) via a computer modem and telephone lines. As an interim procedure, the Napa or Santa Rosa altimeter settings could be used with a higher MDA established for a margin of safety.

4.10 - SUMMARY OF FACILITY REQUIREMENTS

The following Table 4.1 summarizes the recommended facility requirements for Gnoss Field based on the above evaluations. These facility requirements have been used in layout of the planning alternatives presented subsequently.

The airfield geometric standards presented are the recommended requirements for a General Utility airport using FAA's aircraft design Group I criteria. Gnoss Field is currently a Basic Utility II airport.

The runway length recommendation is to initially develop the runway to a "General Utility, Stage I" length of 3,800 feet but to ultimately extend it to 4,400 feet to more adequately satisfy the accelerate-stop distance requirements for aircraft with 10 seats or more used in an FAR Part 135 (air taxi and commercial operation) role. Widening the existing runway from 60 to 75 feet is also recommended, especially if a crosswind runway is not developed.

The establishment of a non-precision instrument approach procedure is assumed within the next five years, based on using the Scaggs Island VORTAC.

The need for a second FBO during the 20-year planning period is assumed but is subject to future economic conditions.

Aircraft parking requirements are stated in terms of both total area in acres and the number of parking positions (tiedowns and/or hangars) to satisfy the based aircraft forecasts, plus an allowance of 5-10% for transient aircraft parking.

Table 4.1

RECOMMENDED FACILITY REQUIREMENTS
Marin County Airport

Component/Factor	Existing	Facility Requirements 5-Years	Facility Requirements 20-Years
Airport Category	BU-II	~~BU~~ B-I	~~BU~~ B-I
Aircraft Design Group	I	I	I
Runway Length (ft)	3,300	3,800	4,400
Runway Width (ft)	60	75	75
Runway Strength (000's lbs)	26.0 S	12.5 S	12.5 S
Taxiway Width (ft)	30	30	30
Runway to Taxiway (ft)	150	150-225	150-225
Runway to Aircraft Parking (ft)	200	200	200
Runway to BRL (ft)	200	200	200
Clear Zones	Visual	Visual	Visual/NPI
Approach Surface (ratio)	20:1	20:1	20:1
IFR Approach Procedure	no	yes	yes
Fixed-Base-Operator (FBO)	1	1-2	2
Aircraft Parking			
- acres	18	35	47
- aircraft:			
based	290	385	510
transient	10	20	40
Total	300	405	550

Source: Cortright & Seibold

5.0 - AIRPORT DEVELOPMENT ALTERNATIVES

5.0 - AIRPORT DEVELOPMENT ALTERNATIVES

This Chapter discusses the Airport development alternatives established to test the feasibility of expanding Marin County Airport. The steps taken to screen and refine the alternatives are described, resulting in the preferred Airport development alternative.

5.1 - PRELIMINARY ALTERNATIVES

The preliminary list of Airport development alternatives for Gnoss Field was prepared based on the previous (1975) Airport Master Plan study, the Gnoss Field Draft Environmental Assessment (1985), suggestions by County staff, the Aviation Commission, and the airport planning experience of Cortright & Seibold.

The preliminary alternatives included the following general types of airfield layouts:

- o Open-V runway alternatives
- o Single runway alternatives
- o Parallel runway alternatives

In addition to various airfield layouts, the consultants evaluated locations for expansion of the aircraft basing and FBO facilities. For the single runway and parallel runway alternatives, these included development to the north of the existing apron and also development of a separate aircraft basing and/or FBO area on the east side of Runway 13-31.

For the open-V alternatives, a new and/or expanded aircraft basing/FBO area could be located in the same areas as for the

single and parallel runway alternatives, as well as inside or outside of the open-V configuration.

The preliminary Airport development alternatives are presented schematically on Figure 5.1 and are listed as follows:

Preliminary Alternative	Runway Configuration	Aircraft Basing Area Location(s)
1	Open-V	West side
2	Open-V	West side and East side North of crosswind runway
3	Open-V	West side and East side South of crosswind runway
4	Single	West side
5	Single	West side
6	Single	West side and East side
7	Parallel	West side
8	Parallel	West side
9	Parallel	West side and East side

5.2 - SCREENING OF PRELIMINARY ALTERNATIVES

The preliminary Airport development alternatives were screened to eliminate the least desirable choices and keep only the most promising alternatives for further evaluation. The screening of preliminary alternatives was based on the consultant's evaluation of realistic airfield and aircraft basing/FBO area development options for Gnoss Field given the available site area and previous airport planning experience.

5.2.1 - Airfield Development Options

Alternatives 1, 2, and 3 are for open-V airfield configurations using existing Runway 13-31 and a new northeast/southwest crosswind runway alignment. Under these alternatives, various

crosswind runway alignments are possible. In addition, aircraft basing areas could be located at three possible sites, as shown on Figure 5.1. These layouts are similar to alternatives addressed in the 1975 Airport Master Plan and the 1985 Environmental Assessment. Extension of existing Runway 13-31 was also considered for Alternatives 1, 2, and 3, as discussed below.

Alternatives 4, 5, and 6 are based on continued use of only the existing airfield. These alternatives include extension of the present 3,300-foot Runway 13-31 on the north, south, or both ends. Lengthening of the existing runway on the south end was dropped early in the analysis because of the very limited possibility of extending in this direction due to: 1) Black John Slough and 2) because this option would restrict access to existing Airport property on the east side of Runway 13-31. Thus, only extension to the north was given serious consideration in later evaluations.

Alternatives 7, 8, and 9 are based on developing a new runway parallel to existing Runway 13-31. A close parallel runway at a 700-foot lateral separation from Runway 13-31 was used for alternative analysis purposes. This is the minimum spacing to provide independent VFR operations and achieve the previously stated annual and hourly capacity values. No practical operational advantage appears to exist for a greater parallel runway separation except under high-capacity IFR operational conditions which are not expected to occur at Gnoss Field. Parallel runway alternatives were previously addressed in the 1975 Gnoss Field Airport Master Plan and in the 1985 Gnoss Field Environmental Assessment. Extensions to existing Runway 13-31 were considered for these alternatives as well.

An ultimate airfield configuration corresponding to Alternative 3 was recommended in the 1975 Gnoss Field Airport Master Plan and is illustrated on the associated Airport Layout Plan (ALP). The

principle reason for recommending an open-V airfield configuration in 1975 appears to be the crosswind problem which affects operations on the present Runway 13-31 alignment under certain wind direction and velocity conditions. Based on the wind study for Gnoss Field conducted by Cortright & Seibold, this configuration still has considerable merit (see Appendix E).

Other possible development alternatives such as relocating the entire airfield farther to the east, closer to the Petaluma River, or developing a crossing runway configuration were also considered early in this study but were dismissed because they provided no apparent operational benefits and/or appeared to result in increased construction and land acquisition costs compared to the other alternatives.

5.2.2 - Aircraft Basing Area Development Options

Five different locations are shown on Figure 5.1 for further development of aircraft basing and/or FBO facilities at Gnoss Field in association with the various airfield development options.

Under Alternatives 1, 2, and 3, some aircraft operations would occur on the existing Runway 13-31 and others would take place on the new northeast-southwest runway. For these Alternatives, locating new aircraft basing areas on the east side of Runway 13-31, either north or south of the crosswind runway, has merit because of the associated new runway.

However, developing new aircraft basing and/or FBO areas as illustrated by Alternatives 2 and 3 appear to be more costly than a consolidated expansion to the north as shown in Alternative 1 because of the need to provide longer access roads and utility extensions.

An offsetting factor might be differences in land acquisition costs on the west side of the Airport versus the east side. However, if construction and land costs are approximately the same on east and west sides of the Airport, Alternative 1 appears the superior choice of the three open-V airport preliminary development alternatives.

The 1975 Gnoss Field Airport Master Plan recommended a development plan similar to Alternative 3 in part because of assumed cheaper land costs on the east side of the Airport, but it was also assumed that no significant environmental differences existed between developing new facilities on the east versus the west side of the existing Airport.

Alternative 1 appears to be the best choice of the open-V airfield alternatives from an anticipated engineering, land acquisition, and cost standpoint.

Alternatives 4, 5, and 6 assume use of only the existing Runway 13-31 alignment over the 20-year planning period. In these cases, new aircraft and/or FBO basing areas can be located on the west side to the north of the existing apron (Alternative 4), across Runway 13-31 on the east side of the Airport (Alternative 5), or a combination of expansion on the west and east sides (Alternative 6).

In the consultant's opinion, expansion of the aircraft and/or FBO areas on the west side is the best area.

Development of a split aircraft basing and FBO area scheme (Alternative 6) appears to be more costly than a consolidated arrangement (as shown in Alternative 4) due to the need to purchase more land and extend utility lines and roads a greater distance than would be necessary for a west side development scheme. Also, from a business standpoint, an FBO located on the east side would be "isolated" and at an economic disadvantage

compared to commercial operators on the west side closer to the Airport access road and the existing aircraft parking apron.

However, it may be desirable to locate private hangars and/or parking areas for based aircraft on property east of Runway 13-31 which is presently owned by the County. This is a particularly attractive short-term option if Smith Ranch Airport should close sooner than assumed and an immediate need is generated to provide parking for 80-100 additional aircraft at Gnoss Field.

Alternatives 7, 8, and 9 are similar to Alternatives 4, 5, and 6 regarding the location of aircraft basing and FBO facilities. Thus, expansion on the west side (Alternatives 7 and 8) is considered by the consultants to be the superior choice among these alternatives as well.

5.3 - "SHORT-LISTED" ALTERNATIVES

Based on the screening of preliminary airport development alternatives for Gnoss Field described above, the following alternatives were selected for further detailed analysis. These are:

- Alternative 1 - Open-V airfield configuration with new aircraft basing area on the west side of Runway 13-31, extension of Runway 13-31 to the north
- Alternative 4 - Extension of Runway 13-31 to the north with new aircraft basing area on the west side
- Alternative 6 - Extension of Runway 13-31 to the north with new aircraft basing area on the west and east sides (using currently-owned County land on the east side)

5.4 - REFINED AIRPORT DEVELOPMENT ALTERNATIVES

Based on the screening of Airport development alternatives and the facility requirements, refined airport development alternatives were prepared to illustrate the physical characteristics of the best development alternatives. These alternatives were subjected to more detailed aviation facility planning and environmental studies resulting in establishment of the preferred Airport development alternative.

5.4.1 - Alternative 1

Alternative 1 assumes that a crosswind runway is constructed. This alternative also assumes that Runway 13-31 is extended to an overall length of at least 3,800 feet but no more than to 4,400 feet and that new aircraft basing areas are developed on the west side of the parallel taxiway for Runway 13-31. This alternative is schematically illustrated on Figure 5.2.

Based on the results of a one-year wind study conducted by Cortright & Seibold from January, 1986 through January, 1987, the runway alignment shown on Figure 5.2 is the preferred alignment for a crosswind runway. Other crosswind runway alignments were evaluated but none proved to be better in terms of overall crosswind coverage.

The wind study results showed that no single runway alignment could provide 95% or higher crosswind coverage at 10 knots when peak-hour gusts were considered in addition to hourly average wind direction and velocity.

The best combination of alignments is the existing Runway 13-31 and a crosswind runway alignment of approximately 030°-210° magnetic. This combination of runways provides 96.7% crosswind coverage, exceeding the FAA criteria of 95%. No other combination of runway alignments equalled or exceeded this percentage of

crosswind coverage. For comparison, the existing Runway 13-31 provides only 84.3% crosswind coverage based on the wind study results.

Under Alternative 1, the construction of the crosswind runway is assumed to occur within the 20-year planning timeframe. The crosswind runway length assumed is 3,000 feet which is 80% of the initial general utility runway length requirement of 3,800 feet per FAA planning criteria.

The crosswind runway would include the construction of a full-length parallel taxiway, exit taxiways along the runway, and connecting taxiways to the existing airfield. The parallel taxiway separation from the crosswind runway is shown at 225 feet and the parallel taxiway width at 30 feet in conformance with FAA recommended Design Group I standards.

For alternative analysis purposes, 20:1 approach surfaces and associated visual clear zones are shown.

Under Alternative 1, the preferred phasing of aircraft basing area facilities is to expand to the north, along the west side of the existing parallel taxiway for Runway 13-31. The Phase 1 expansion illustrated is sized to accommodate the projected first 5 years of development per the facility requirements. This area provides a total of 18.8 acres of new apron and hangar area expansion in Phase 1.

The Phase 2 new apron and hangar expansion area is sized to provide for the full 20-year buildout of aircraft basing facilities per the projected facility requirements. The total additional apron and hangar area provided in Phase 2 is 13.8 acres.

The total apron and hangar expansion area for the full 20-year planning period is 32.6 acres.

The existing consolidated FBO areas on the Airport which are now leased to Marin Air Services total 3.2 acres. This area is designated FBO Site 1 on Figure 5.2. The Alternative 1 layout provides for future development of a second full-service FBO site north of the existing apron in conjunction with expansion of basing area facilities, as illustrated. This area is 5.1 acres but can be sized to specific FBO requirements, as needed.

Under Alternative 1, additional public auto parking areas will be needed in association with aircraft basing area expansion. Figure 5.2 illustrates two possible locations for expansion of auto parking. The areas shown are 2.1 acres and 1.5 acres for Phase 1 and Phase 2, respectively.

New internal Airport roads will be needed to serve new apron and/or hangar development areas and to provide access to the second FBO site, as illustrated. A two-lane, 24-foot wide road will be adequate. At least a 30-foot wide right-of-way should be reserved for this road.

Development of new Airport facilities as illustrated for Alternative 1 will require that the County purchase approximately 142 acres of land. This includes both the land needed for actual siting of physical facilities and to acquire the appropriate clear zone and runway setback areas in conformance with FAA general aviation airport design recommendations.

5.4.2 - Alternative 4

Alternative 4 assumes that a crosswind runway in not constructed. However, this alternative does assume that a northerly extension to Runway 13-31 can be developed, as well as expansion of the aircraft basing area, as illustrated on Figure 5.3.

Assumed Phase 1 (1991) and Phase 2 (2006) expansion is illustrated as an extension of the existing aircraft basing and FBO

area to the north along the west side of the parallel taxiway. The Phase 1 expansion areas shown correspond to the areas needed to develop the facilities needed to handle the first 5-year facility requirements (1986-1991) in response to the aviation forecasts. The Phase 2 expansion area corresponds to the facility development needed for the full 20-year buildout. These areas are the same as for Alternative 1.

Under Alternative 4, the airfield development is assumed to be an expansion of the existing Runway 13-31. Figure 5.3 illustrates extension of Runway 13-31 a total distance of 1,100 feet to the north for a maximum length of 4,400 feet. The parallel taxiway would also be extended. Connecting taxiways would be needed from the runway to the parallel taxiway and from the parallel taxiway to the expanded aircraft parking apron.

Under Alternative 4, the phasing of aircraft parking apron and hangar area expansion is very flexible. The area can be constructed via a series of extensions as actual aircraft parking demand warrants. The areas schematically shown are sized to satisfy the projected facility requirements. The Phase 1 (first 5 years) new apron and hangar area is 18.8 acres and the Phase 2 (20-year buildout) area is 13.8 acres. A total of 32.6 acres of new aircraft parking apron and hangar area is needed over the 20-year planning period.

The existing consolidated FBO areas on the Airport which are now leased to Marin Air Services total 3.2 acres. This area is designated FBO Site 1 on Figure 5.3. The Alternative 4 layout provides for future development of a second full-service FBO site north of the existing apron in conjunction with expansion of basing area facilities as illustrated. This area is illustrated at 5.1 acres but can be sized to specific FBO requirements, as needed.

Under Alternative 4, additional public auto parking areas will be needed in association with aircraft basing area expansion. Two possible locations for expansion of auto parking are illustrated on Figure 5.3. The areas shown are 2.1 acres and 1.5 acres for Phase 1 and Phase 2, respectively.

New internal Airport roads will be needed to serve apron and/or hangar development and to provide access to the second FBO site as illustrated. A two-lane, 24-foot wide road will be adequate. However, at least a 30-foot wide right-of-way should be reserved.

Development of new Airport facilities as illustrated for Alternative 4 will require that the County purchase approximately 91 acres of land. This includes both the land needed for actual siting of physical facilities and to acquire the appropriate Clear Zone and runway setback areas in conformance with FAA general aviation airport design recommendations.

5.4.3 - Alternative 6

Under Alternative 6, it is possible to utilize the existing Airport property on the east side of Runway 13-31 for construction of aircraft tiedown apron and/or hangars.

Alternative 6 assumes that a crosswind runway in not constructed. However, this alternative does assume that a northerly extension to Runway 13-31 can be developed, as well as expansion of the aircraft basing area on the east side of Runway 13-31 and on the west side to the north along the parallel taxiway for Runway 13-31, as illustrated on Figure 5.4.

The Phase 1 (1991) expansion is assumed to take place east of existing Runway 13-31 on property that is currently owned by Marin County and is within the present Airport boundary. Under this alternative, development on this property would be for aircraft parking apron and/or hangars. Connecting taxiways,

utilities, and an access road around the south end of Runway 13-31 would be provided.

Phase 2 (2006) expansion is illustrated as an extension of the existing aircraft basing and FBO area to the north along the west side of the parallel taxiway for Runway 13-31. The Phase 2 expansion areas shown correspond to the areas needed to develop the facilities needed to handle the 2006 facility requirements in response to the aviation forecasts. The combined Phase 1 and Phase 2 expansion areas correspond to the total facility development needed for the full 20-year buildout (1986-2006).

Under Alternative 6, the airfield development is assumed to be an expansion of the existing Runway 13-31. Figure 5.4 illustrates extension of Runway 13-31 a total distance of 1,100 feet to the north for a maximum length of 4,400 feet. The parallel taxiway would also be extended. Connecting taxiways would be needed from the runway to the parallel taxiway and from the parallel taxiway and runway to the expanded aircraft parking aprons.

Under Alternative 6, the phasing of aircraft parking apron and hangar area expansion is very flexible. The areas can be constructed via a series of extensions as actual aircraft parking demand warrants. The areas schematically shown are sized to satisfy the projected facility requirements. The Phase 1 (first 5 years) new apron and hangar area is 20.5 acres and the Phase 2 (20-year buildout) area is 13.6 acres. A total of 34.1 acres of new aircraft parking apron and hangar area is provided over the 20-year planning period.

The existing consolidated FBO areas on the Airport which are now leased to Marin Air Services total 3.2 acres. This area is designated FBO Site 1 on Figure 5.4. The Alternative 6 layout provides for future development of a second full-service FBO site north of the existing apron in conjunction with Phase 2 expansion of basing area facilities as illustrated. This area is shown at

5.1 acres but can be sized to specific FBO requirements, as needed.

Under Alternative 6, additional public auto parking areas will be needed in association with aircraft basing area expansion. Figure 5.4 illustrates three possible locations for expansion of auto parking. The areas shown are 1.8 acres, 2.1 acres, and 1.5 acres.

New internal Airport roads will be needed to serve apron and/or hangar development and to provide access to the second FBO site as illustrated. Two-lane, 24-foot wide roads will be adequate. However, at least a 30-foot wide right-of-way should be reserved.

Phase 1 development requires extension of the existing service road at the back of the existing apron around the south end of the apron and the end of Runway 13-31 to reach the Phase 1 apron on the east side of the Airport. Phase 2 expansion requires a road extension to the north from the existing Airport access road to serve this area, as illustrated on Figure 5.4.

Development of new Airport facilities as illustrated for Alternative 6 will require that the County purchase approximately 51 acres of land. This includes both the land needed for actual siting of physical facilities and to acquire the appropriate Clear Zone and runway setback areas in conformance with FAA general aviation airport design recommendations.

5.5 - PREFERRED AIRPORT DEVELOPMENT ALTERNATIVE

Based on the Airport facility requirements and the Airport development alternatives discussed previously, the consultants evaluated the alternatives to establish which was the preferred one from an aviation standpoint. (The environmental consequences of the alternatives were addressed in the associated EIR/EA.) Airport development recommendations were made to the County only

after both the aviation and environmental aspects of the alternatives were determined.

The key questions which were considered in arriving at the preferred alternative from the aviation standpoint are as follows:

1. Does the alternative provide for adequate facilities to satisfy the forecast aviation demand?

2. Does the alternative respond to the aviation-related objectives of the study as defined by the County?

5.5.1 - Adequate Aviation Facilities

All of the alternatives (Alternative 1, Alternative 4, and Alternative 6) discussed previously provide adequate facilities to meet the forecast aviation activity demand in terms of providing sufficient aircraft parking capacity for the 20-year planning period from 1986-2006. The demand for aircraft parking and capacity provided is summarized as follows:

		Estimate of Aircraft Parking Capacity		
Year	Forecast Based Aircraft + Transient	Alt 1	Alt 4	Alt 6
1991	385 + 20 = 405	442	442	432
1996	420 + 30 = 450			
2001	460 + 40 = 500			
2006	510 + 40 = 550	595	595	595

The Phase 1 development assumed under all of the alternatives was sized to provide adequate facilities for the first five years (1986-1991), and the Phase 2 development assumed was sized to satisfy the year 2006 aircraft parking requirements for both based and transient aircraft. It will be necessary to actually construct the Phase 1 facilities before 1991 and the Phase 2

facilities before 2006 if the aircraft parking demand materializes as forecast.

In terms of airfield operational capacity, the comparison is as follows for Alternative 1, Alternative 4, and Alternative 6:

Year	Forecast Annual Operations	Annual Service Volume		
		Alt 1	Alt 4	Alt 6
1991	183,000	260,000	230,000	230,000
1996	189,000			
2001	196,000			
2006	204,000	260,000	230,000	230,000

As indicated, all three of the alternatives can serve throughout the 20-year forecast period in terms of airfield annual operational capacity. However, Alternative 1 has a slight capacity advantage.

It is noted that when annual operations at a general aviation airport equal or exceed 200,000, the airport meets FAA facility establishment criteria for an air traffic control tower. The above annual service volume capacity values are based on the assumption that an FAA air traffic control tower exists when annual aircraft operations exceed this value.

All of the alternatives were designed to satisfy FAA general aviation airport geometric and runway length requirements and were thus equal based on this comparison factor.

An additional consideration is the ability to establish an instrument approach procedure, as none presently exists for Gnoss Field. Assuming that the most likely type of procedure to be developed is a non-precision VOR or VOR/DME approach using the Scaggs Island VORTAC, the preferred alternative is Alternative 1.

Overall, in terms of providing adequate aviation facilities, Alternative 1 is the preferred choice.

5.5.2 - Study Objectives

At the outset of the study, a number of objectives were defined by Marin County to be addressed in this project. (The objectives are stated in Section 1.0.)

The aviation-related objectives were addressed as part of the comparison of the three airport development alternatives in this report. The environmental and other related objectives were addressed in the associated EIR/EA.

All of the alternatives were designed to result in an updated Airport Master Plan for Gnoss Field that satisfies Marin County, Federal Aviation Administration (FAA), and local city and public agency facility development objectives as reflected in various public planning documents. The General Plans of the County and the City of Novato, as well as the National Plan of Integrated Airport Systems (NPIAS) published by the FAA, all call for the continued existence of Gnoss Field as the public-use general aviation airport serving Marin County.

The updating of the Master Plan for Gnoss Field also had as some of its objectives the evaluation of facility development specifically to determine the need for a crosswind runway, instrument approach procedure, expansion of aircraft basing facilities, providing adequate airfield capacity, as well as evaluating the financial operations of the Airport. Infrastructure questions such as wastewater treatment and other support services were also included in the study objectives.

All of the alternatives satisfy the airfield capacity, aircraft basing, service, and infrastructure objectives on an essentially

equal basis. However, differences exist when considering the need for a crosswind runway and instrument approach procedure.

The only alternative that adequately responds to the crosswind runway issue is Alternative 1. Results of the wind study conducted by Cortright & Seibold clearly indicate that a crosswind runway is justified based on the data collected and the FAA airport planning criteria that the airfield should provide 95% or better crosswind coverage.

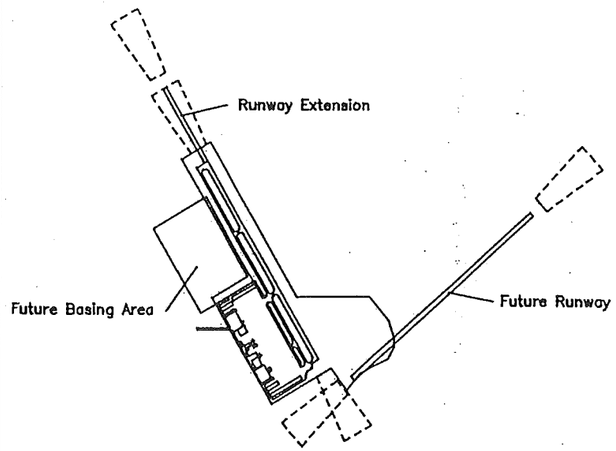
In terms of instrument approach procedures, studies done as part of developing the Master Plan indicate that the most probable method of providing an instrument approach to Gnoss Field involves designing a procedure directly from the Scaggs Island VORTAC to the Airport. Under these circumstances, it appears more feasible to design the approach to a northeast-southwest runway than to the existing Runway 13-31. Thus, this factor favors the development of Alternative 1.

5.5.3 - Preferred Airport Development Alternative

From an aviation facility planning standpoint, the preferred airport development alternative upon which to base the detailed master planning for Gnoss Field was Alternative 1. This is the only alternative that satisfies all of the aviation-related objectives.

Based on the results of the Airport development alternatives evaluation (including associated environmental studies) and with the concurrence of the Aviation Commission, the Marin County Department of Public Works selected Alternative 1 as the basis for preparing the Airport development program.

1



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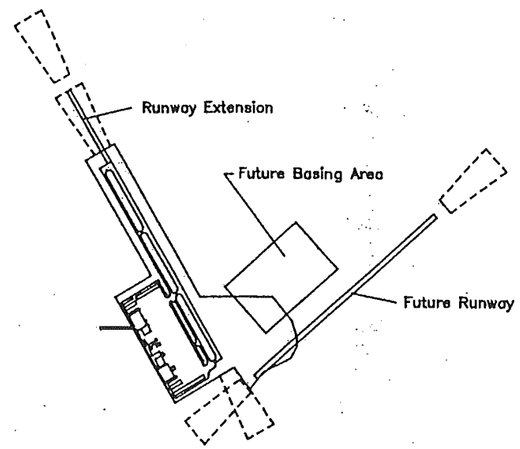

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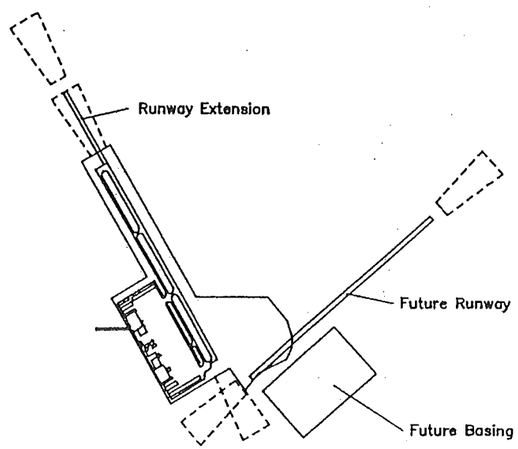

Source: Cortright & Seibold

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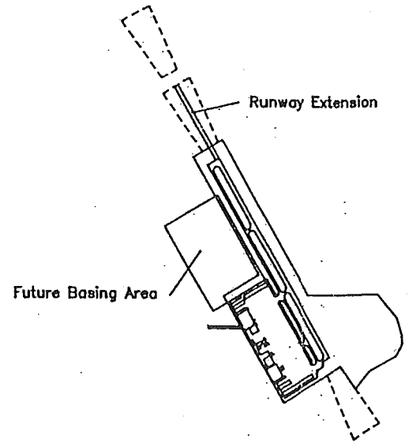

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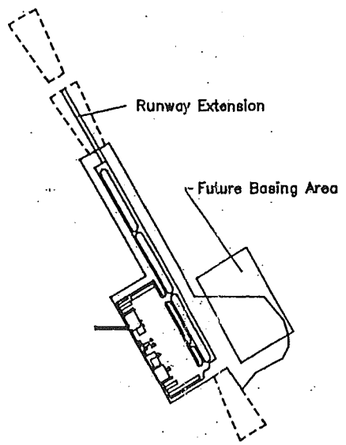

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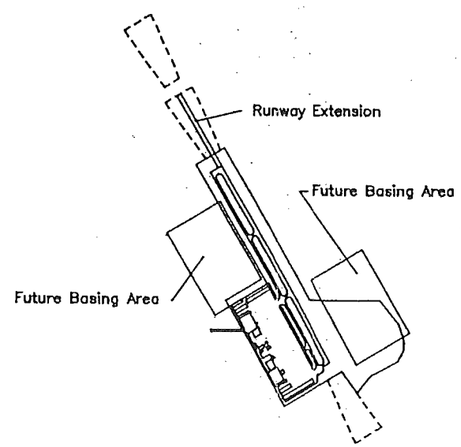

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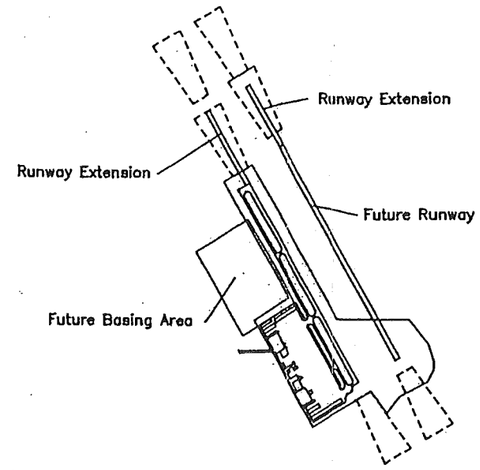

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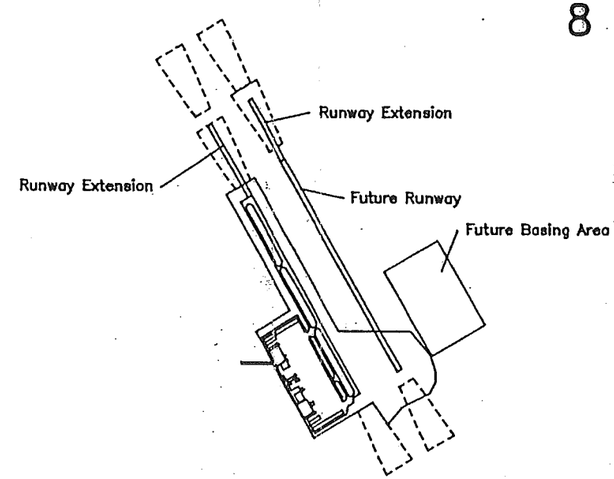

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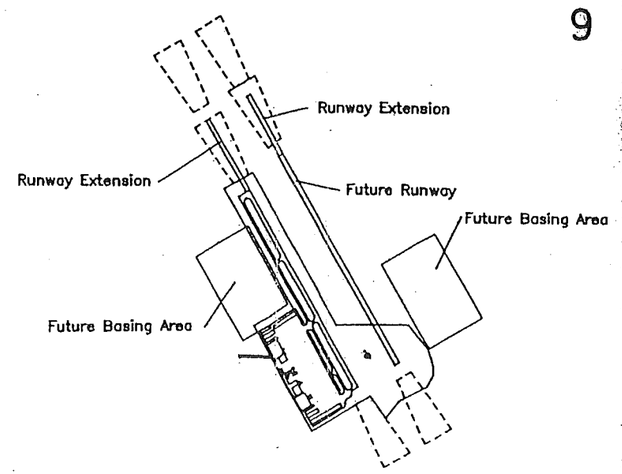
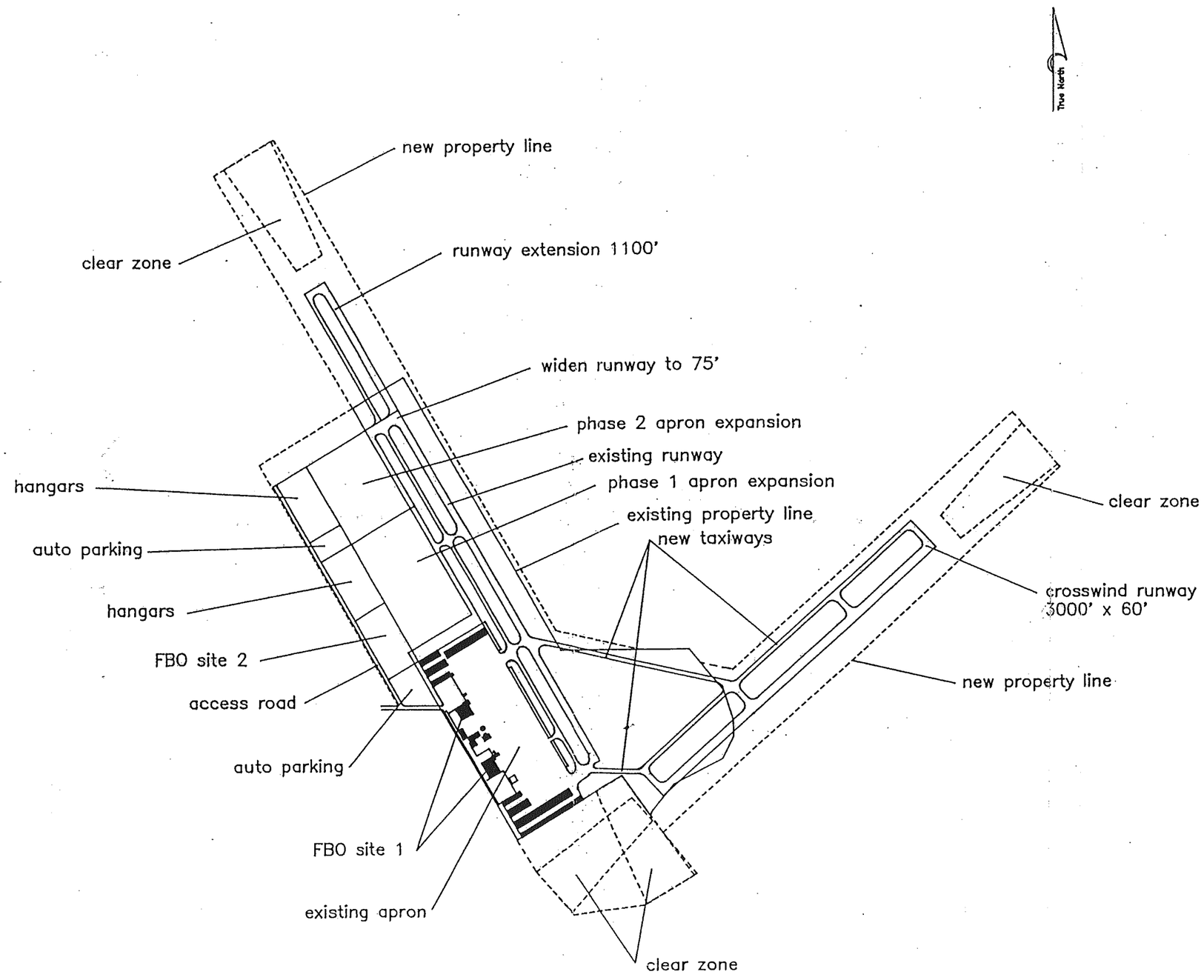


REVISIONS	BY

PRELIMINARY ALTERNATIVES
Gnoss Field Airport
Marin County, California

DRAWN	emr
CHECKED	djo/sls
DATE	11 May, 1987
SCALE	NTS
JOB NO.	CS-111
FIGURE	5.1

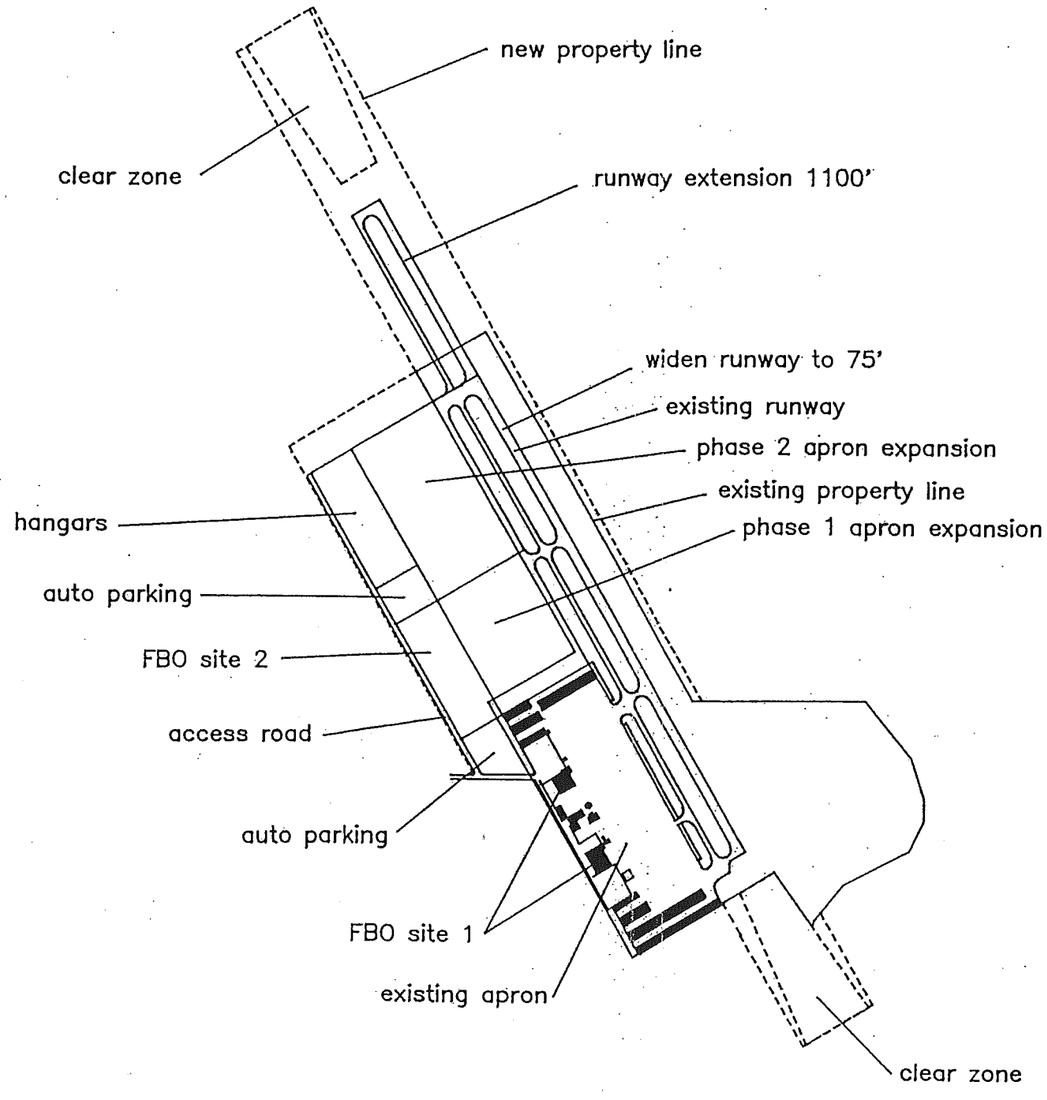


Source: Cortright & Seibold

REVISIONS	BY

DEVELOPMENT ALTERNATIVE 1
Gnoss Field Airport
Marin County, California

DRAWN	
CHECKED	
DATE	11 May, 1987
SCALE	NTS
JOB NO.	03-111
FIGURE	5.2

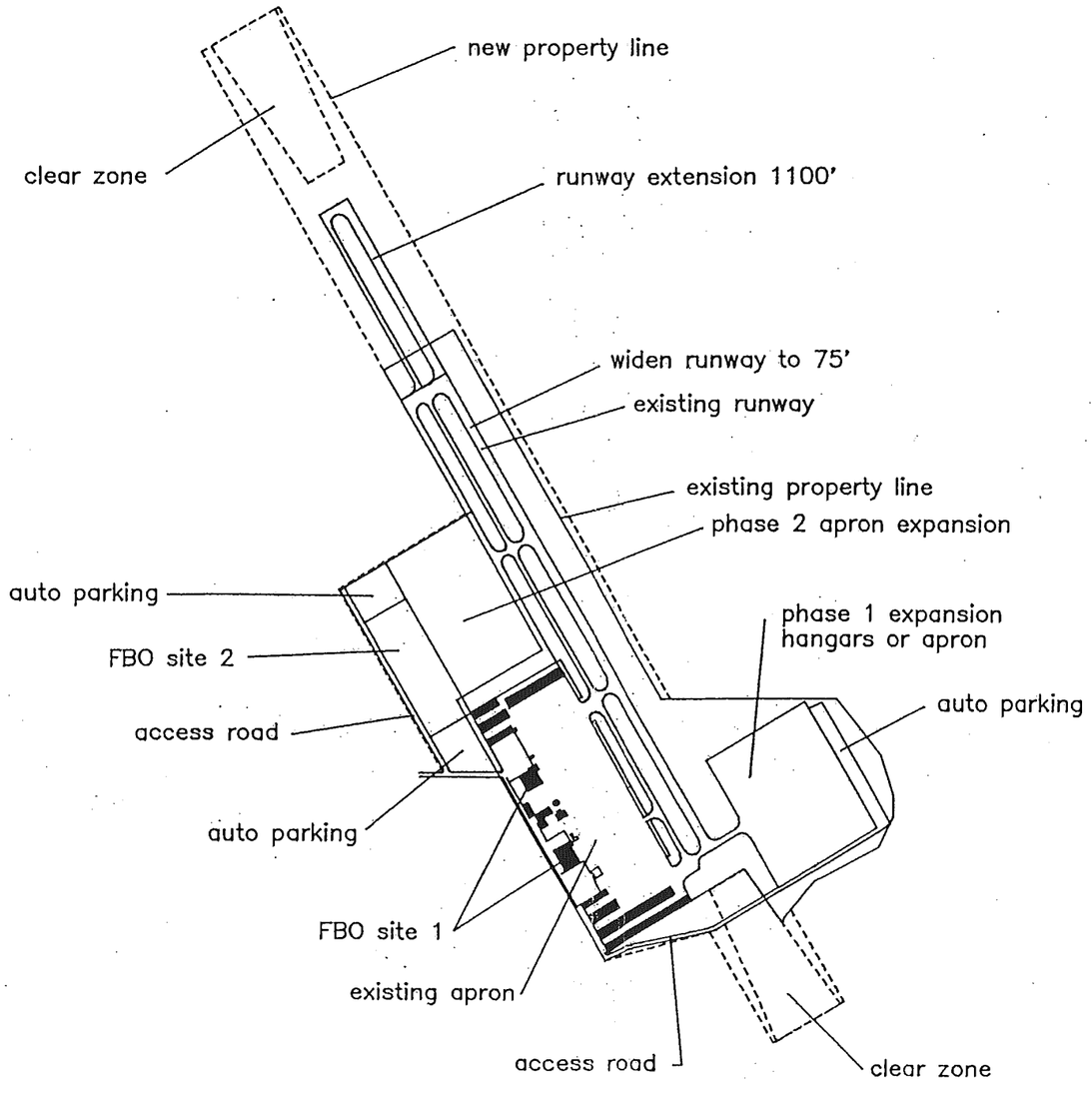


Source: Cortright & Seibold

REVISIONS	BY

DEVELOPMENT ALTERNATIVE 4
Gnoss Field Airport
Marin County, California

DRAWN	
CHECKED	
DATE	11 May, 1997
SCALE	NTS
JOB NO.	03-111
FIGURE	5.3



Source: Cortright & Selbold

REVISIONS	BY

DEVELOPMENT ALTERNATIVE 6
Gnoss Field Airport
Marin County, California

DRAWN	
CHECKED	
DATE	11 May, 1987
SCALE	NTS
JOB NO.	C9-111
FIGURE	5.4

6.0 - AIRPORT DEVELOPMENT PROGRAM

6.0 - AIRPORT DEVELOPMENT PROGRAM

The proposed facility development program for Marin County Airport (Gnoss Field) is outlined in this Chapter based upon the aviation activity forecasts, alternatives evaluation, and environmental impact assessment studies (see associated EIR/EA).

The airport development program has been divided into Stages as follows:

Stage 1 - 1988 through 1992
Stage 2 - 1993 through 1997
Stage 3 - 1998 through 2007.

Stage 1 corresponds to Phase 1 of the alternatives analysis. Stage 2 and Stage 3 cover Phase 2 of the alternatives analysis (see Section 5.0). The original 20-year study period was from 1986 through 2006. However, the timeframe has been extended since the Master Plan is not being completed until 1989.

The thrust of Stage 1 is to add aircraft parking capacity, especially hangars. The thrust of Stage 2 is to provide a crosswind runway. Stage 3 focuses on providing additional aircraft parking, hangars, and fixed-base-operator (FBO) facilities on an as needed basis.

6.1 - AIRCRAFT PARKING REQUIREMENTS

The future aircraft parking requirements at Gnoss Field are driven by two factors:

1. the expected closure date for Smith Ranch (aka Marin Ranch) Airport which is currently projected to be about 1991; and

2. the actual increase or decrease in the number of aircraft based at Gnoss Field other than the Smith Ranch aircraft.

Both of these factors are discussed in the following paragraphs, as each will have an impact on the need to develop new Airport facilities.

6.1.1 - Smith Ranch Aircraft

The 1986 forecasts of aviation demand projected a modest growth in based aircraft at Gnoss Field except for the first 5-year period when it is expected that Smith Ranch Airport will be closed.

Over 100 aircraft currently located at Smith Ranch will have two alternatives: 1) move to Gnoss Field or 2) go to other airports outside of Marin County. The exact closure date for Smith Ranch is not certain, but it was assumed (based on the announced plans of the property owners) that the aircraft from this airport must relocate by 1991.

A special consideration regarding these aircraft is that each owner already has a portable hangar that would come with the aircraft to Gnoss Field. Thus, Marin County must provide facilities for these hangars in order to absorb the Smith Ranch aircraft.

6.1.2 - Based Aircraft

When the Master Plan study began in 1986, there were 283 aircraft based at Gnoss Field. The forecasts projected a small increase in based aircraft during the first five years, except for the significant transfer of aircraft from Smith Ranch.

Table 6.1 presents a recap of the aircraft forecasts assuming that the majority of Smith Ranch aircraft would relocate to Gnoss Field if aircraft and hangar parking capacity is available in a timely manner. The forecasts have been extended on a straight-line, year-by-year basis through 2007 for purposes of this analysis. As indicated, the projected number of based aircraft for 1988 is 285. However, by the middle of 1988 the actual number of based aircraft had decreased to 260.

Using 260 aircraft as a basis, a projection of aircraft parking requirements was prepared by reducing the forecasts by 25 aircraft in all years. The results are shown on Table 6.1 and indicate a total parking requirement of 280 for 1988, including an allowance of 20 transient positions. (There are currently only 10 transient aircraft parking positions.) The projected 1992 parking requirement is 390 aircraft, increasing to 535 by 2007. Gnoss Field currently has a total aircraft parking capacity of some 300 aircraft counting both County and FBO facilities.

6.1.3 - Hangar Requirements

Based on the desires of aircraft owners currently located at Gnoss Field, as expressed by the Aviation Commission, the primary interest is in developing more hangars to provide protected storage, instead of open tiedowns. This has been reflected in the projections shown on Table 6.1. Only additional hangar capacity as been added during Stage 1 (1988 - 1992).

As of Spring, 1988, 90 portable hangars were located at the Airport, including the hangars owned by the FBO. The proposed development program assumes that 40 new hangars are developed in 1989 and an additional 100 hangars would be installed in 1991 for a total of 230 hangars. Most of the hangars installed in 1991 would actually be transferred from Smith Ranch. This would provide protected storage for over half the based aircraft by the end of Stage 1.

Table 6.1

AIRCRAFT PARKING REQUIREMENTS
Marin County Airport

Year	Forecast Aircraft	Aircraft Parking: Based Aircraft	Aircraft Parking: Transient	Aircraft Parking: Total Parking	Hangars: Add	Hangars: Total	Tiedowns: Add(1)	Tiedowns: Total
Stage 1								
1988	285	260	20	280		90	-16	190
1989	290	265	20	285	40	130	-51	155
1990	295	270	20	290	0	130	-46	160
1991	385	360	20	380	100	230	-56	150
1992	395	370	20	390		230	-46	160
Stage 2								
1993	400	375	30	405		230	-31	175
1994	405	380	30	410		230	-26	180
1995	410	385	30	415		230	-21	185
1996	420	395	30	425		230	-11	195
1997	425	400	30	430		230	-6	200
Stage 3								
1998	430	405	40	445	20	250	-11	195
1999	440	415	40	455	20	270	-21	185
2000	450	425	40	465		270	-11	195
2001	460	435	40	475	20	290	-21	185
2002	470	445	40	485	20	310	-31	175
2003	480	455	40	495	30	340	-51	155
2004	490	465	40	505		340	-41	165
2005	500	475	40	515		340	-31	175
2006	510	485	40	525		340	-21	185
2007	520	495	40	535		340	-11	195

(1) Negative number indicates a surplus of tiedown spaces.
(2) Actual number of based aircraft in 1988.

Based on the modest growth in based aircraft projected during Stage 2, the hangars developed during Stage 1 should also serve the expected demand through the end of Stage 2 (1997).

The development program assumes that 110 additional hangars will be provided during the last 10 years (1998 - 2007) in response to demand for further expansion during Stage 3. This would result in 340 aircraft in hangars on the Airport by the end of Stage 3.

6.1.4 - Tiedown Requirements

Table 6.1 also addresses the need for open tiedowns at Gnoss Field. The total number of tiedowns needed, assuming the hangar development occurs as discussed above, ranges from 190 downward to 150 during Stage 1.

The tiedown requirement then increases to 200 by the end of Stage 2 (1997), as no new hangars are assumed to be constructed during this period.

The tiedown requirement drops to 155 by the middle of Stage 3 and increases to 195 by the end of Stage 3 (2007) if only 110 new hangars are constructed during this timeframe as indicated on Table 6.1.

There are some 206 tiedowns currently available at Gnoss Field which are not already being utilized for portable hangars. If the new hangar development occurs as discussed above, there will be a surplus of tiedowns for the next 20 years. The surplus tiedowns are indicated by the negative numbers in the "Add" column under the "Tiedowns" heading. As indicated, the surplus tiedowns range from a low of 6 to a high of 56.

Given the fact that a significant surplus of tiedowns presently exists at Gnoss Field, and the demand for tiedowns is expected to remain soft for some years in the future, it would be more cost

effective for both Marin County and the FAA to allow some additional portable hangars to be installed on the existing apron rather than to undertake all new construction.

However, current FAA policy prevents this solution unless the County can show that the tiedowns upon which the hangars would be placed are not needed to provide public aircraft parking spaces and certain other administrative requirements are satisfied.

The aircraft parking requirements as shown on Table 6.1 project a significant over-supply of tiedowns and the Airport in fact currently has 47 vacant tiedowns as of mid-1988, as well as a 75-name waiting list for hangars. Thus, the true need is for more hangars, not tiedowns.

6.2 - STAGING PLAN

In response to the Airport facility requirements (see Section 4.0) and the projected need for aircraft parking and hangars discussed above, a staging plan was prepared to illustrate the recommended timing of future development at Gnoss Field.

Tables 6.2, 6.3, and 6.4 present the scheduling assumptions of the staging plan for developing physical facilities and accomplishing administrative actions to achieve development program implementation.

6.2.1 - Stage 1 Development

The Stage 1 (1988-1992) development program assumed that the Airport Master Plan and associated Program Environmental Impact Report/Environmental Assessment (EIR/EA) would be adopted and certified by the County Board of Supervisors during 1988. (In fact, this did not occur until June, 1989.)

Table 6.2

STAGE 1 DEVELOPMENT PROGRAM
Marin County Airport
1988-1992

Project	Description	1988	1989	1990	1991	1992
1.1	Adopt Airport Master Plan	xxxx				
1.2	Certify Eir	xxxx				
1.3	Corps fill permit(s)	xxxx	xxxx	xxxx		
1.4	FAA grant applications	xxxx				xxxx
1.5	runway 13-31 repairs	xxxx				
1.6	extend water lines/hydrants		xxxx			
1.7	existing apron repairs		xxxx			
1.8	land acquistion - - south end		xxxx			
1.9	new hangars - south end		xxxx			
1.10	wash rack modifications		xxxx			
1.11	widen runway 13-31 to 75'			xxxx		
1.12	eastside apron and taxiways			xxxx		
1.13	access road to east side			xxxx		
1.14	install eastside hangars			xxxx		
1.15	existing apron repairs				xxxx	
1.16	land acquistion - - runway extension				xxxx	
1.17	runway 13-31 extension 500'					xxxx
1.18	environmenal mitigation	xxxx	xxxx	xxxx	xxxx	xxxx

Source: Cortright & Seibold

123:gfmpt6-2:
21 December, 1987

Table 6.3

STAGE 2 DEVELOPMENT PROGRAM
Marin County Airport
1993-1997

Project	Description	1993	1994	1995	1996	1997
2.1	review/update master plan	xxxx				
2.2	review/update EIR	xxxx				
2.3	Corps fill permit(s)		xxxx			
2.4	FAA grant applications					xxxx
2.5	runway 13-31 overlay	xxxx				
2.6	land acquistion - - crosswind runway		xxxx			
2.7	crosswind runway construction			xxxx	xxxx	
2.8	environmental mitigation	xxxx	xxxx	xxxx	xxxx	xxxx

Source: Cortright & Seibold

123:gfmpt6-3:
21 December, 1987

Table 6.4

STAGE 3 DEVELOPMENT PROGRAM
Marin County Airport
1998-2007

Project	Description	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
3.1	review/update master plan	xxxx					xxxx				
3.2	review/update EIR	xxxx					xxxx				
3.3	Corps fill permit(s)	xxxx						xxxx			
3.4	FAA grant applications					xxxx					xxxx
3.5	land acquistion - north	xxxx									
3.6	apron expansion - north		xxxx	xxxx							
3.7	access road (new apron)		xxxx								
3.8	FBO site development		xxxx								
3.9	new hangars - north		xxxx	xxxx		xxxx		xxxx		xxxx	
3.10	runway/taxiway 13-31 overlay						xxxx				
3.11	overlay aprons							xxxx			
3.12	land acquistion - - runway extension								xxxx		
3.13	runway 13-31 extension 600'									xxxx	
3.14	environmental mitigation		xxxx	xxxx						xxxx	

Source: Cortright & Seibold

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It also assumes that Corps of Engineers fill permit(s) will be obtained in a timely manner to allow construction of improvements according to the schedule presented. (See the EIR/EA for discussion of the Corps' requirements.)

Federal Aviation Administration (FAA) and/or Caltrans Division of Aeronautics (DOA) construction grant applications (pre-applications) will also need to be submitted in support of funding requests to these agencies. Because it usually takes several years to obtain funding, the grant requests for Stage 1 projects should be submitted during 1988 even if project implementation is several years in the future. Funding applications for Stage 2 projects should be submitted by or before 1992 for similar reasons.

Projects 1.1 through 1.4 on Table 6.2 indicate the timing of the above administrative actions.

Construction projects assumed for Stage 1 include the following items.

Project 1.5. Repair low areas on Runway 13-31, seal coat parallel taxiway, and repaint markings. (This project is in the 1988 STIP program and was completed in April, 1988.)

Project 1.6. Extend the existing water lines and fire hydrant system to provide protection to the existing and new hangars.

Project 1.7. Repair the surface of the older center portion of the existing aircraft parking apron by overlaying the surface with asphalt.

Project 1.8. Acquire 13 acres of land on the south end of the existing apron to provide clear zone protection, as well as space for additional hangars and an access road to the County-owned property on the east side of the Airport.

Project 1.9. Install 40 new portable hangars on a southerly extension of the existing apron on some of the land obtained under Project 1.8.

(Note: An alternative location for some of these portable hangars is on the north end of the existing apron, pending FAA approval of a Marin County request to allow hangars on this area. This would allow some new hangars to be brought onto the Airport as early as 1988.)

Project 1.10. Construct modifications to the existing aircraft washrack and drainage system to bring it into compliance with current environmental regulations.

Project 1.11. Widen Runway 13-31 from 60 feet to 75 feet by adding 15 feet on the east side. This will provide a wider pavement area in response to the crosswind problem. Rewire runway and taxiway lights as part of this project.

Project 1.12. Construct a new aircraft parking apron, connecting taxiways, and hangar area on the County-owned property on the east side of the Airport.

Project 1.13. Construct an asphalt access road around the south end of the Airport between the existing road and the new apron built under Project 1.12.

Project 1.14. Install portable hangars on the new east side apron. This would be a combination of new hangars and relocated hangars from Smith Ranch.

Project 1.15. Repair existing west side apron areas not reconstructed during Project 1.7. This is assumed to be a slurry seal of the north and south areas using Caltrans/DOA grant funds. (This project is in the 1991 STIP program.)

Project 1.16. Acquire 20 acres of land on the north end of Runway 13-31 for an extension.

Project 1.17. Construct a 500-foot extension to Runway 13-31 on the north end.

Project 1.18. This project(s) involves the environmental mitigation(s) to offset the negative impacts of placing fill in "wetlands" areas and any other impacts caused during construction of the projects listed above. The scope and component costs associated with this project(s) are presented in the EIR/EA. A summary of mitigation costs has been included in this report.

Projects 1.1, 1.2, and 1.5 are assumed to be completed in 1988. Projects 1.6 through 1.10 are assumed to be completed in 1989. Projects 1.11 through 1.14 are assumed to be finished in 1990. Projects 1.15 and 1.16 are to be completed in 1991. Project 1.17 is to be accomplished in 1992. Projects 1.3, 1.4, and 1.18 are assumed to be accomplished as indicated on Table 6.2 in order to clear the way for the other projects in a timely manner.

6.2.2 - Stage 2 Development

Table 6.3 presents the proposed projects of the Stage 2 (1993-1997) development program.

As indicated, the administrative projects are a review and/or update of the Airport Master Plan and EIR, and a Corps of Engineers fill permit for the crosswind runway construction project. FAA and/or DOA grant applications must also be filed. These administrative projects are numbers 2.1, 2.2, 2.3, and 2.4.

The construction projects for Stage 2 are described as follows:

Project 2.5. Overlay Runway 13-31 and the parallel and connecting taxiways. Based on past experience at Gnoss Field, reconstruction of the pavements will be needed on a recurring basis due to settlement problems.

Project 2.6. Acquire 68 acres of land northeast of the Airport for development of the crosswind runway (Project 2.7).

Project 2.7. Construct a 3,000-foot long by 75-foot wide crosswind runway on a northeast-southwest alignment as illustrated on the ALP in Section 8.0. Also construct associated parallel and connecting taxiways, as well as dikes and drainage system modifications.

Project 2.8. As with the Stage 1 projects, the environmental mitigation items are discussed in the EIR/EA. A summary of mitigation costs has been included in this report.

Projects 2.1 and 2.2 are assumed to occur in 1993. Project 2.3 should be accomplished in 1994. Project 2.4 is for grant funding after the end of Stage 2 and is assumed to occur by or before 1997. Project 2.5 is assumed to be completed in 1993. Project 2.6 should be completed in 1994 to allow Project 2.7 (crosswind runway) to be constructed in 1995 and 1996. Project 2.8 (environmental mitigation) should be undertaken as indicated on Table 6.3.

6.2.3 - Stage 3 Development

The Stage 3 (1998-2007) development program projects include the following administrative items: review/update the Master Plan and EIR, obtain Corps fill permits, and file FAA/DOA grant applications. These are Projects 3.1 through 3.4 on Table 6.4.

The construction projects of Stage 3 are described as follows:

Project 3.5. Acquire 24 acres of land located northwest of the west side apron for future aircraft parking, FBO, and hangar areas.

Project 3.6. Construct expanded aircraft parking apron, FBO, and hangar areas on land acquired in Project 3.5.

Project 3.7. Concurrently construct a new access road to the areas developed under Project 3.6.

Project 3.8. Allow development of an additional FBO site subject to a lease agreement with the prospective operator.

Project 3.9. Install hangars on the north aircraft basing area. Up to 110 hangars are required based on the forecasts.

Project 3.10. Construct another asphalt overlay of Runway 13-31 to correct anticipated settlement problems.

Project 3.11. Construct an asphalt overlay of the aircraft parking aprons to repair anticipated age and settlement related problems.

Project 3.12. Acquire 6 acres of land and 1 acre of avigation easement on the north end of Runway 13-31 for an additional 600-foot extension.

Project 3.13. Construct a 600-foot extension to Runway 13-31, bringing the total length to 4,400 feet.

Project 3.14. Undertake environmental mitigation project(s) associated with the development of the above Stage 3 airport construction projects. These items are decussed in the EIR/EA.

The possible timing of Stage 3 projects is indicated on Table 6.4. The exact staging is highly speculative and can be adjusted in response to the actual needs determined during the Master Plan reviews/updates throughout the 20-year planning period.

7.0 - FINANCIAL EVALUATION

7.0 - FINANCIAL EVALUATION

The financial evaluation of the Airport development program for Gnoss Field was developed using available records, budget information, and historical expense and revenue data from the Marin County Department of Public Works. Construction and environmental mitigation cost estimates for the Stage 1 (1988-1992) and Stage 2 (1993-1997) development program were incorporated. Estimated costs for associated administrative actions by the County were also included.

7.1 - BACKGROUND

Airport revenue and expense data were available for fiscal years (FY) 1979 through 1987 from County records. Budget information, together with the airport development program cost estimates, form the basis for the financial evaluation. The evaluation was limited to ten years due to the speculative nature of long-term financial projections based on development programs which are subject to future economic events.

The evaluation includes:

- a discussion of funding sources used for airport maintenance, operations, and development;
- a review of the past budget information;
- an analysis of operating revenues;
- an analysis of operating expenses;

- a recommended capital improvement program (CIP) that includes a detailed Stage 1 and Stage 2 implementation schedule for 1988-1997;

- a financial feasibility projection for the first 10 years which includes projected revenues, expenses, construction costs, environmental mitigation costs, and requirements for County funding; and

- recommendations to assist Marin County in moving towards a financially stronger airport operation.

7.2 - AIRPORT FUNDING SOURCES

Traditionally, aviation and non-aviation revenues have been used to off-set operating expenses at publicly-owned airports. Major capital improvements have been funded by matching State or Federal grants with local funds. In the past, smaller publicly-owned airports have augmented locally derived revenues with money from the General Fund.

7.2.1 - Trends in Airport Finance

Since the 1970's, there has been a movement on the national, State, and local level towards user-generated funds as a major source of airport revenues. There is pressure at the national level to have user-generated revenues support the cost of the airport and airway system.

For some time, State policy has dictated that a user-based fuel tax should support the aviation program. Recent changes in the State airport funding program broaden the definition of eligible items.

At the local level, Proposition 13 (1978) created an emphasis on user supported programs and projects -- use of the "enterprise fund," reimbursement for services provided by local government, and pricing services for full recovery of costs.

7.2.2 - Local Airport Revenues

A study by the Southern California Association of Governments (SCAG) indicated that large urban general aviation airports have positive net revenues with a ratio of operating revenues to operating expenses of more than one. For the period 1975-1982, the ratio averaged 1.15. It grew from 0.99 in 1976 to 1.34 in 1982.

In contrast, during the same period, the average revenue/expense ratio at smaller general aviation airports was 0.65.

Non-aviation revenues help. Frequently, urban areas have an advantage because of hotel, retail, and industrial revenue sources that are located on airport property. However, these kinds of opportunities do not exist at Marin County Airport because of the limited land area.

7.2.3 - California Aid to Airports Program

Funding for the California Aid to Airports Program (CAAP) is derived from a tax on general aviation fuel and tax monies are deposited in the Aeronautics Account. There are three separate programs in operation:

- Annual Grant Program. $5,000.00 per year is given to every eligible, publicly-owned airport in the State.

- Acquisition and Development Program. This program funds grants, prioritized by the State Transportation Commission through the State Transportation Improvement Program (STIP).

These grants are matched by local funds on a 90%-10% basis subject to a $500,000 maximum State grant.

- State Loan Program. Public airport owners are eligible for low-interest, long-term loans from the Division of Aeronautics (DOA) provided they can demonstrate the ability to repay. Terms generally run from 10 to 25 years at interest rates of 6% to 8%. Matching FAA grants and revenue-generating projects have the highest priorities for DOA loans.

7.2.4 - Federal Airport Improvement Program (AIP)

The Airport and Airways Improvement Act of 1982 provided about $4.8 billion through FY 1986/1987.

Legislation signed by the President in December, 1987 extends the AIP funding at $1.3 to $1.7 billion annually on a national basis for the next five years (FY 1988 - FY 1992).

7.3 - HISTORICAL AIRPORT REVENUES AND EXPENSES

A record of revenues and expenses for Marin County Airport by source was available for FY 1979-FY 1987. Revenues and expenses are summarized on Table 7.1. Revenues are principally generated by monthly tiedown fees and one FBO lease. As an indicator of the financial status of the County Airport, the annual expenses have been subtracted from revenues and the overall net revenue (loss) shown. The Airport has been operating at a loss for the past 4 years, ranging from $5,800 to $33,300 annually.

Table 7.1

COUNTY OF MARIN AIRPORT BUDGET
Fiscal Years 1979-1987

	Actual								
	1979	1980	1981	1982	1983	1984	1985	1986	1987
SALARIES/EMPLOYEE BENEFITS									
Regular Staff Salaries	30,086.93	34,051.60	34,873.62	39,788.00	42,847.44	42,273.41	44,642.45	46,110.41	50,145.60
Extra Hire	216.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dispatcher	64.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Retirement County	3,714.60	6,714.48	6,716.26	7,567.60	5,733.92	5,639.58	5,318.15	5,311.24	5,751.62
Additional Retirement/Benefits	1,572.70	2,326.60	1,549.80	2,029.98	1,786.60	3,722.35	4,600.61	6,055.54	6,205.09
Salaries/Benefits Received	4,854.43	2,497.72	38,392.42	10,146.18	1,700.00	9,900.00	4,950.00	10,800.00	10,500.00
Compensation Insurance	451.78	530.13	513.79	644.93	984.65	974.45	699.07	863.36	1,446.35
	40,960.74	46,120.53	82,045.89	60,176.69	53,052.61	62,509.79	60,210.28	69,140.55	74,048.66
SERVICES AND SUPPLIES									
General Insurance	10,223.00	10,299.96	11,300.00	10,200.00	9,520.00	10,509.00	9,153.00	24,864.00	24,864.00
Office Equipment Repair/Maintenance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	356.52	405.75
Building/Plant Maintenance	1,171.87	2,184.33	6,996.53	4,685.51	9,775.51	58,320.96	22,698.23	15,707.62	14,458.79
Office Supplies and Expense	197.09	162.72	131.40	336.39	284.33	278.01	969.09	322.90	453.24
Document Reproduction	76.33	29.34	87.88	38.35	0.00	113.12	126.30	78.71	53.29
Radio Rental	0.00	0.00	200.00	200.00	220.00	200.00	220.00	233.00	964.00
Rent	2,369.00	2,675.00	2,375.00	3,525.00	3,300.00	3,300.00	3,300.00	3,300.00	2,900.00
Small Tools and Instruments	98.76	0.00	285.16	149.30	95.39	0.00	180.71	915.71	1,208.90
Special Projects	0.00	0.00	0.00	0.00	0.00	7,030.98	0.00	0.00	0.00
Material/Equipment Rental	0.00	0.00	0.00	0.00	19.26	0.00	0.00	0.00	0.00
Conferences	563.42	543.36	546.30	645.56	245.00	682.80	75.00	532.50	1,215.80
Mileage/Routine Travel	435.37	526.68	912.57	534.24	665.49	859.65	891.50	161.75	225.98
Vehicle Rental	2,535.84	2,535.00	3,036.06	2,905.90	3,079.06	2,840.45	3,944.50	7,514.19	4,995.70
Contract Services, Miscellaneous	2,696.10	2,742.93	11,308.14	18,658.78	20,552.43	17,809.41	36,018.89	50,181.94	115,340.06
Contract Services, Telephone	500.90	488.62	480.06	548.93	743.96	1,025.87	1,037.94	1,376.23	1,537.89
Contract Services, Power	0.00	0.00	0.00	0.00	0.00	0.00	4,755.39	5,236.96	4,768.90
	20,867.68	22,187.94	37,659.10	42,427.96	48,500.43	102,970.25	83,370.55	110,782.03	173,392.30
OTHER CHARGES									
Principal	0.00	0.00	0.00	0.00	22,173.00	0.00	0.00	0.00	0.00

Table 7.1

COUNTY OF MARIN AIRPORT BUDGET
Fiscal Years 1979-1987

	Actual								
	1979	1980	1981	1982	1983	1984	1985	1986	1987
FIXED ASSESTS									
Land Improvements	0.00	7,672.78	253,742.40	145,474.10	0.00	0.00	0.00	0.00	0.00
Miscellaneous Equipment/Machinery	1,807.30	0.00	0.00	0.00	392.19	0.00	12,383.58	0.00	0.00
Communications Equipment	0.00	0.00	0.00	0.00	0.00	991.59	0.00	0.00	0.00
Data Processing Equipment	0.00	0.00	0.00	0.00	0.00	3,737.93	0.00	0.00	0.00
Data Processing Software	0.00	0.00	0.00	0.00	772.50	0.00	0.00	0.00	0.00
	1,807.30	7,672.78	253,742.40	145,474.10	1,164.69	4,729.52	12,383.58	0.00	0.00
DIRECT CHARGES/APPROPRIATION	63,635.72	75,981.25	373,447.39	248,078.75	124,890.73	170,209.56	155,964.41	179,922.58	247,440.96
INTERDEPARTMENTAL CHARGES/CREDITS									
Vehicle/Equipment Rental	0.00	0.00	29.28	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	29.28	0.00	0.00	0.00	0.00	0.00	0.00
GENERAL FUND TOTAL	63,635.72	75,981.25	373,476.67	248,078.75	124,890.73	170,209.56	155,964.41	179,922.58	247,440.96
Rents/Concessions, Tiedowns	45,098.33	49,579.50	51,764.50	76,552.50	80,896.42	81,691.55	79,572.00	77,354.00	75,096.59
Tiedown Security	0.00	0.00	8,299.00	14,417.16	16,478.40	15,354.50	21,961.00	35,357.00	29,665.53
Fixed Base Operator Fees	22,165.53	26,808.20	36,137.15	34,464.38	32,537.57	34,658.30	36,143.65	30,923.00	26,561.94
Aviation Fuel Tax, State	5,000.00	5,000.00	5,000.00	5,000.00	5,000.00	5,000.00	5,000.00	5,000.00	5,000.00
Other State Aid	0.00	0.00	0.00	115,200.86	0.00	0.00	0.00	0.00	0.00
Federal Aid	0.00	0.00	267,953.99	7,659.09	0.00	0.00	0.00	0.00	105,000.00
Other Misc. Refunds/Reimbursements	1,253.66	38.38	96.62	545.80	104.14	224.86	737.85	7,017.65	282.62
	73,517.52	81,426.08	369,251.26	253,839.79	135,016.53	136,929.21	143,414.50	155,651.65	241,606.68
OVERALL NET =	9,881.80	5,444.83	(4,196.13)	5,761.04	10,125.80	(33,280.35)	(12,549.91)	(24,270.93)	(5,834.28)

7.4 - CAPITAL IMPROVEMENT PROGRAM COST ESTIMATES

Stage 1 and Stage 2 development program project costs and cost distribution by source are summarized on Tables 7.2 and 7.3. The construction cost estimates were prepared by Cortright & Seibold and include a 25% markup to account for design/administration services, contingencies, and cost escalation over the ten-year timeframe. Environmental mitigation costs, estimated by QUAD Consultants, are detailed in the associated EIR/EA and summarized on the tables.

The use of FAA or Caltrans 90% construction grant funds (10% County share) was assumed as much as possible for all eligible construction projects. Private funding is assumed for some hangar construction, as this has been a viable source in the past. The specific cost allocation assumptions for each individual project are documented in Appendix I. Only the aggregate total cost distribution appears on Tables 7.2 and 7.3.

Environmental mitigation costs were assumed to be 100% paid for by the County for purposes of this analysis. However, some on-site mitigation costs may prove to be eligible for FAA grants if they are shown to be directly related to a specific construction project. This would have to be negotiated between the County and FAA at the time the grant(s) is approved.

Most FAA grant-eligible projects require the County to provide 10% of the total costs. However, a higher percentage (45%) of the development costs for the east side apron/hangars (Stage 1, Project 1.12) must be covered by the County because nearly half of the construction will not be eligible for FAA funding. This is because the hangars are a "revenue-generating" item for "exclusive use" of individuals. FAA would most likely fund the common use apron areas and taxiways. (If tiedowns were installed instead of hangars, the entire project would probably be eligible for 90% Federal grants under AIP.)

Table 7.2

STAGE 1 DEVELOPMENT PROGRAM COSTS
Marin County Airport

PROJECT	DESCRIPTION	1988	1989	1990	1991	1992	Total
1.1	Adopt Airport Master Plan	10,000	0	0	0	0	10,000
1.2	Certify EIR	10,000	0	0	0	0	10,000
1.3	Corps fill permit(s)	5,000	5,000	5,000	0	0	15,000
1.4	FAA grant applications	1,000	0	0	0	1,000	2,000
1.5	runway 13-31 repairs	125,000	0	0	0	0	125,000
1.6	extend water lines/hydrants	0	250,000	0	0	0	250,000
1.7	existing apron repairs	0	315,625	0	0	0	315,625
1.8	land acquisition-south end	0	167,500	0	0	0	167,500
1.9	apron and hangars-south end	0	1,181,250	0	0	0	1,181,250
1.10	wash rack modifications	0	37,500	0	0	0	37,500
1.11	widen runway 13-31 to 75'	0	0	331,875	0	0	331,875
1.12	east side apron and taxiway	0	0	2,248,750	0	0	2,248,750
1.13	access road to east side	0	0	300,000	0	0	300,000
1.14	install east side hangars	0	0	62,500	0	0	62,500
1.15	existing apron repairs	0	0	0	57,500	0	57,500
1.16	land acquisition-north end	0	0	0	250,000	0	250,000
1.17	runway 13-31 extension 500'	0	0	0	0	571,875	571,875
1.18	environmenal mitigation	37,400	50,000	50,000	50,000	50,000	237,400
	TOTAL =	188,400	2,006,875	2,998,125	357,500	622,875	6,173,775
	COST DISTRIBUTION *						
	Marin County	55,900	206,810	1,350,781	80,750	108,187	1,802,428
	FAA -- AIP	20,000	1,028,785	1,584,844	225,000	514,688	3,373,317
	CALTRANS -- STIP	112,500	0	0	51,750	0	164,250
	FBO/PRIVATE	0	771,280	62,500	0	0	833,780
	TOTAL =	188,400	2,006,875	2,998,125	357,500	622,875	6,173,775

Source: Cortright & Seibold

* = See Appendix I for individual project cost distribution.

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Table 7.3

STAGE 2 DEVELOPMENT PROGRAM COSTS
Marin County Airport

PROJECT	DESCRIPTION	1993	1994	1995	1996	1997	Total
2.1	review/update master plan	25,000	0	0	0	0	25,000
2.2	review/update EIR	25,000	0	0	0	0	25,000
2.3	Corps fill permit(s)	0	5,000	0	0	0	5,000
2.4	FAA grant applications	0	0	0	0	1,000	1,000
2.5	runway 13-31 overlay	481,250	0	0	0	0	481,250
2.6	land acquisition crosswind	0	850,000	0	0	0	850,000
2.7	crosswind runway	0	0	2,081,875	2,081,875	0	4,163,750
2.8	environmental mitigation	21,000	100,000	100,000	100,000	100,000	421,000
	TOTAL =	552,250	955,000	2,181,875	2,181,875	101,000	5,972,000
	COST DISTRIBUTION *						
	Marin County	69,125	190,000	308,187	308,188	101,000	976,500
	FAA -- AIP	483,125	765,000	1,873,688	1,873,687	0	4,995,500
	CALTRANS -- STIP	0	0	0	0	0	0
	FBO/PRIVATE	0	0	0	0	0	0
	TOTAL =	552,250	955,000	2,181,875	2,181,875	101,000	5,971,999

Source: Cortright & Seibold

* = See Appendix I for individual project cost distribution.

A similar situation applies for the south end expansion of apron/hangars (Stage 1, Project 1.9).

The main financial difference between the "east side" and "south end" apron/hangar projects is that most of the hangars to be placed on the east side will probably be relocated from Smith Ranch Airport. The south end hangars are assumed to be new purchases by private individuals, similar to the addition of 14 port-a-ports in 1987. The 1987 hangar project allocated site improvement costs as part of the financial package accepted by the hangar owners. The County did not incur any significant costs in implementing this project. Thus, private sources will pay for much of the south end project development costs, as indicated in Table 7.2.

A possible way for the County to minimize costs for the east side apron/hangars would be to prorate some or all of the development costs of the hangar sites to the individuals allowed to place hangars on the project site. Alternatively, the County may decide to absorb the costs in order to retain the Smith Ranch aircraft and hangars in Marin County.

The total cost of the Airport improvements (including administrative actions and environmental mitigation) during the first 10 years is estimated to be $12.1 million. About $2.8 million of County funds are required. The majority of County funds ($1.8 million) are required for Stage 1 (1988-1992) projects.

In addition, the County will need to obtain about $3.4 million in FAA grants for Stage 1 (1988-1992) projects and $5.0 million additional in FAA funds for Stage 2 (1993-1997) projects. Private sources are expected to provide over $800,000 for hangar projects. Only $165,000 in STIP funds from the DOA are included, most of which is for the runway repairs already completed in 1988.

7.5 - FINANCIAL PROJECTIONS

The financial analysis of the Marin County Airport development program was projected for the 10-year period 1988 through 1997 from the County's perspective. From the County's financial perspective, specific assumptions about revenue increases were made. Operating expenses were generally increased 5% annually, and the County's share of the capital improvement program and environmental mitigation costs (from Tables 7.2 and 7.3) was included.

The financial projections appear on Tables 7.4 and 7.5 and are discussed below. Table 7.4 projections assume implementation of all Stage 1 and Stage 2 projects. Table 7.5 projections assume implementation of only Stage 1 projects for comparison purposes.

7.5.1 - Capital Improvement Program Expenses

The County share of the capital improvement program (CIP) costs and environmental mitigation costs were brought forward into the financial feasibility projection. The County costs are based on the proposed Airport development program and funding sources discussed in Section 7.4. All projects are assumed to be paid for as they are implemented, except the east side apron/hangar project which is assumed to be financed in part with a DOA loan.

Principal and interest payments for the DOA loan ($996,300) appear as County costs in the financial analysis (see Tables 7.4 and 7.5). A 25-year term and 8% interest rate are assumed, but it may be possible to obtain a lower interest rate depending on economic conditions at the time the loan is actually approved by the Division of Aeronautics. (It is assumed that DOA will have the financial resources to loan Marin County nearly $1.0 million in 1990.)

Table 7.4

FINANCIAL PROJECTIONS
Stage 1 and 2 Projects
Marin County Airport

CIP EXPENSE	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
CIP projects	18,500	156,810	304,438	30,750	58,187	48,125	90,000	208,187	208,187	1,000
mitigation	37,400	50,000	50,000	50,000	50,000	21,000	100,000	100,000	100,000	100,000
principal	0	0	0	39,854	39,854	39,854	39,854	39,854	39,854	39,854
interest	0	0	0	79,708	76,519	73,331	70,143	66,954	63,766	60,578
TOTAL CIP =	55,900	206,810	354,438	200,312	224,560	182,310	299,997	414,995	411,807	201,432
INCOME										
FBO	30,000	31,000	32,000	40,000	41,000	50,000	51,000	52,000	53,000	54,000
hangars	72,900	108,000	198,000	198,000	198,000	217,800	217,800	217,800	217,800	217,800
tiedowns	122,500	102,500	102,500	100,000	105,000	118,200	125,000	125,000	146,400	134,700
Subtotal =	225,400	241,500	332,500	338,000	344,000	386,000	393,800	394,800	417,200	406,500
DOA GRANT	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
TOTAL INCOME =	230,400	246,500	337,500	343,000	349,000	391,000	398,800	399,800	422,200	411,500
OPERATING EXPENSES										
salaries/benefits	80,000	84,000	88,200	92,610	97,241	102,103	107,208	112,568	118,196	124,106
insurance	25,000	27,500	30,250	33,275	36,603	40,263	44,289	48,718	53,590	58,949
maintenance	20,000	21,000	22,050	23,153	24,310	25,526	26,802	28,142	29,549	31,027
office rent	4,000	4,000	4,000	4,000	4,000	4,500	4,500	4,500	4,500	4,500
service/supply	15,000	15,750	16,538	17,364	18,233	19,144	20,101	21,107	22,162	23,270
vehicle rent	7,000	7,350	7,718	8,103	8,509	8,934	9,381	9,850	10,342	10,859
power	7,000	7,350	7,718	8,103	8,509	8,934	9,381	9,850	10,342	10,859
contract/misc.	45,000	47,250	49,613	52,093	54,698	57,433	60,304	63,320	66,485	69,810
fixed assets	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
TOTAL M&O =	205,000	216,200	228,085	240,702	254,101	268,836	283,966	300,053	317,167	335,380
OPERATING NET =	25,400	30,300	109,415	102,298	94,899	122,164	114,834	99,747	105,033	76,120
OVERALL NET =	(30,500)	(176,510)	(245,023)	(98,014)	(129,661)	(60,146)	(185,163)	(315,248)	(306,774)	(125,312)

Source: Cortright & Seibold

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Table 7.5

FINANCIAL PROJECTIONS
Stage 1 Projects
Marin County Airport

CIP EXPENSE	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
CIP projects	18,500	156,810	304,438	30,750	58,187	0	0	0	0	0
mitigation	37,400	50,000	50,000	50,000	50,000	0	0	0	0	0
principal	0	0	0	39,854	39,854	39,854	39,854	39,854	39,854	39,854
interest	0	0	0	79,708	76,519	73,331	70,143	66,954	63,766	60,578
TOTAL CIP =	55,900	206,810	354,438	200,312	224,560	113,185	109,997	106,808	103,620	100,432
INCOME										
FBO	30,000	31,000	32,000	40,000	41,000	50,000	51,000	52,000	53,000	54,000
hangars	72,900	108,000	198,000	198,000	198,000	217,800	217,800	217,800	217,800	217,800
tiedowns	122,500	102,500	102,500	100,000	105,000	118,200	125,000	125,000	146,400	134,700
Subtotal =	225,400	241,500	332,500	338,000	344,000	386,000	393,800	394,800	417,200	406,500
DOA GRANT	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
TOTAL INCOME =	230,400	246,500	337,500	343,000	349,000	391,000	398,800	399,800	422,200	411,500
OPERATING EXPENSES										
salaries/benefits	80,000	84,000	88,200	92,610	97,241	102,103	107,208	112,568	118,196	124,106
insurance	25,000	27,500	30,250	33,275	36,603	40,263	44,289	48,718	53,590	58,949
maintenance	20,000	21,000	22,050	23,153	24,310	25,526	26,802	28,142	29,549	31,027
office rent	4,000	4,000	4,000	4,000	4,000	4,500	4,500	4,500	4,500	4,500
service/supply	15,000	15,750	16,538	17,364	18,233	19,144	20,101	21,107	22,162	23,270
vehicle rent	7,000	7,350	7,718	8,103	8,509	8,934	9,381	9,850	10,342	10,859
power	7,000	7,350	7,718	8,103	8,509	8,934	9,381	9,850	10,342	10,859
contract/misc.	45,000	47,250	49,613	52,093	54,698	57,433	60,304	63,320	66,485	69,810
fixed assets	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
TOTAL M&O =	205,000	216,200	228,085	240,702	254,101	268,836	283,966	300,053	317,167	335,380
OPERATING NET =	25,400	30,300	109,415	102,298	94,899	122,164	114,834	99,747	105,033	76,120
OVERALL NET =	(30,500)	(176,510)	(245,023)	(98,014)	(129,661)	8,979	4,837	(7,061)	1,413	(24,312)

Source: Cortright & Seibold

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The Stage 1 CIP and environmental mitigation annual costs to the County vary from a low of $55,900 in 1988 to a high of $354,438 in 1990. This corresponds to an average annual cost to the County of $212,404 for 1988-1992.

For Stage 2 CIP projects, the extreme spread is $182,310 in 1993 to $414,995 in 1995. This corresponds to an average annual cost to the County of $302,108 for 1992-1997.

Under the financial assumptions presented, the total County negative CIP cash flow during Stage 1 is $1,042,000. The negative cash flow for Stage 2 is $1,510,541. The total Stage 1 and Stage 2 negative cash flow is $2,552,561.

The financial support for the CIP and associated mitigation projects from the General Fund can be varied depending on the projects actually implemented and the method of funding selected. In addition, it may be possible to accomplish certain development items as combined public/private projects; thus, reducing County costs.

7.5.2 - Operating Income

This financial feasibility analysis is based on an assumed policy of intentionally increasing revenue from all sources as the conditions of the FBO lease and month-to-month rental agreements permit. The assumptions used are noted below.

The FBO lease with Marin Air Services allows only limited potential for revenue increases to the County. The agreement has a term of 40 years and does not expire until 2008. The agreement provides for payment to the County from three components:

1. land area lease;

2. a percentage of gross sales (less fuel, tax, and aircraft sales); and

3. a percentage of the difference between the wholesale and retail price of avgas.

The land lease component allows for rent increases every five years based on a consumer price index (CPI) escalator. The County gets 1% of gross sales and 20% of the difference between wholesale and retail fuel prices. The total annual income from the FBO is estimated by the County at about $30,000 in 1988.

The financial projections assume a modest increase in FBO payments to the County based on assumed increases in FBO gross income and fuel sales due to a larger number of aircraft based at Gnoss Field in the future. The County income from the FBO has been increased from $30,000 in 1988 to $54,000 in 1997 on this basis, assuming a land lease increase of about 25% starting in 1993.

No County-owned hangars exist at Gnoss Field and the County charges standard monthly tiedown fees to individuals who place their own portable hangars on the aircraft parking apron. The 1988 rate is $40 per month per tiedown space used and does not include any specific charge for the hangar.

In order for the County to generate a reasonable return from the hangar sites, the monthly fee should be increased to include a charge for the hangar, as well as the tiedown. The financial projections assume an increase in 1988 to $75 per month and a flat 10% increase every five years starting in 1993. This increase was incorporated because, in the consultants opinion, the hangar sites are under valued.

The FBO charges a reported $55 per month for tiedowns they rent from the County at a reduced rate. The County should charge the

same rate for all similar tiedowns -- either to individuals or the FBO.

The financial projections assume the County will raise the tie-down rate for all tenants to $50 per month in 1988 and apply a flat 10% increase every five years starting in 1993.

On the basis of the above assumptions (as well as the proposed development program), the annual County income from hangar sites and tiedowns has been projected to increase from $195,400 in 1988 to $352,500 in 1997.

Total annual County income from the Airport (including the DOA $5,000 annual grant) has been projected to increase from $230,400 in 1988 to $411,500 in 1997.

7.5.3 - Operating Expenses

Historical operating expenses indicated on Table 7.1 were used as the basis for estimating future expenses. The expenses were increased 5% annually during the 10-year period from assumed 1988 values to reflect operating an upgraded airport and general cost escalation. Expense items not increased at 5% annually were: 1) insurance which was increased 10% per year, 2) office rent for the Airport Manager, and 3) fixed assets. Office rent was increased marginally every five years corresponding to increases in the FBO land lease because the office is in an FBO-owned building. Fixed assets were held flat at $2,000 per year to reflect small cost items.

Total annual operating expenses were projected to increase from $205,000 in 1988 to $335,380 in 1997, as indicated on Tables 7.4 and 7.5.

7.5.4 - Operating Net

Using the above cost estimates and financial assumptions gives the County a projected annual net operating profit on the Airport ranging from $25,400 in 1988 to $122,164 in 1993.

7.5.5 - Overall Net

The financial analysis assumes increases in rates and charges at Marin County Airport. However, the Airport requires continuing support from the General Fund if all the projects listed in the proposed development program are implemented.

The projected overall annual net negative cash flow varies from $30,500 in 1988 to $315,248 in 1995 if all Stage 1 and Stage 2 projects are implemented. The average yearly cash outlay is $167,235 from 1988 through 1997 (see Table 7.4).

If only Stage 1 projects are implemented, the annual net negative cash flow range is $30,500 in 1998 to $245,023 in 1990. The average yearly cash outlay is $69,585 from 1988 through 1997. However, a small positive annual net cash flow occurs in 1993, 1994, and 1996 (see Table 7.5).

It is noted that a portion of the above amounts will actually be offset by sales tax receipts and by County taxes collected in the form of property taxes and possessory interest taxes on aircraft based at Gnoss Field. For example, based on the County Auditors 6 October, 1987 financial report regarding FY 86-87 fiscal activity relating to Marin County Airport, the Airport actually generated a net gain of nearly $55,000 to the County General Fund when both direct and indirect revenues are considered. An additional $46,000 of indirect revenue was generated for other taxing entities (e.g., Novato Schools and Special Districts) because of the Airport and associated activity. A combined total of $101,000 of

indirect revenue was generated in FY 86-87 for all taxing entities benefitting from the Airport's existence in Marin County.

7.5.6 - Financial Feasibility

Given the magnitude of the CIP and environmental mitigation costs and the limited revenue-generating potential of the Airport, the only ways the County could achieve an overall net positive cash flow at the Airport would be to: 1) defer some development projects and/or 2) obtain more private and non-County funds than has been assumed in this financial analysis to help with implementation.

7.6 - FINANCIAL RECOMMENDATIONS

The following general recommendations provide a series of actions for consideration by Marin County in working toward a stronger financial position for Gnoss Field.

7.6.1 - Enterprise Account

The ability to identify revenues and costs on a continuing basis is important. Establishing an Enterprise Account provides assistance in this area. It can also provide the basis for establishing rates and charges that will recover the cost of providing airport services and facilities. Therefore, putting Gnoss Field on an Enterprise Account system is recommended.

7.6.2 - State Loan Program

For projects determined by the County to be desirable enough to carry the financing charges, the Division of Aeronautics (DOA) airport loan program is a potential funding source if the County can demonstrate the ability to repay the debt via revenues and/or other funds.

7.6.3 - Grant-in-Aid Programs

Maximum effort should be made to secure State or Federal grants to finance up to 90% of the costs of major capital construction projects at Gnoss Field. FAA "pre-applications" should be submitted for all eligible projects, as well as funding requests through the State Transportation Improvement Program (STIP). Some of the environmental mitigation costs that may be required to obtain Corps of Engineers fill permits and any other environmental approvals (see EIR/EA) may also be FAA fundable. This should be discussed with the FAA based on the adopted Airport Master Plan.

7.6.4 - Payment by Airport Users

Where an improvement is made (or allowed) for an individual, commercial operator, or other customer, it is recommended that the user either pay for the required improvement or return the County's share of the investment in the form of rent, lease, or operating fees.

7.6.5 - Tiedown and Hangar Fees

The Department of Public Works should establish an updated schedule of monthly rates and charges to be paid by aircraft and hangar owners using Marin County Airport. The fee schedule should set forth monthly (and/or annual) amounts to be paid for use of open tiedowns and storage of aircraft within privately-owned hangars. The rates and charges should be revised on a periodic basis to reflect fair market value for the facilities provided by the County. An immediate increase in monthly rates to $50 for tiedowns and $75 for private hangar sites is recommended. Individual airport users and the FBO should pay the same rates for similar spaces.

7.6.6 - Computer System

In order to properly administer the Enterprise Account and to keep up-to-date financial records on airport income and expenses, hangars, and based aircraft, it is recommended that the Airport Manager obtain a micro-computer system with appropriate hardware and software to carry out the assigned function under the Enterprise Account procedures. This computer system should be compatible with the systems currently in use by the County.

8.0 - AIRPORT MASTER PLAN

Based on the recommended capital improvement program (CIP) and Marin County decisions, the Master Plan and development program staging drawings for Marin County Airport were prepared by Cortright & Seibold.

8.1 - MASTER PLAN

The Master Plan for Gnoss Field is a long-range conceptual plan which provides guidelines and sets priorities for future Airport development. Because specific projects are phased to occur over a 20-year period, the Airport Master Plan does not present a detailed set of plans and engineering studies for development at the Airport. Actual engineering and design work is yet to be conducted and the Master Plan is designed to be flexible and responsive to changing conditions that may occur in the design, engineering, and financing phases.

The Master Plan includes the following drawings:

- o Airport Layout Plan (ALP)
  - Airport Data
  - Stage 1 Development
  - Stage 2 Development
  - Stage 3 Development
- o Terminal Area Plan (TAP)
- o Approach and Clear Zone Plan (ACZP)

Reduced versions of the drawings are presented at the end of this Chapter and are briefly described below:

8.2 - AIRPORT LAYOUT PLAN

Marin County adopted the complete Master Plan and Airport Layout Plan, as well as certified the associated Program EIR/EA. However, the actual implementation of individual construction projects will be based on the financial and environmental feasibility of each, as determined by the Board of Supervisors. Adoption of the Master Plan by the County and acceptance of the ALP by the FAA does not commit either the County or FAA to the actual development of the projects illustrated.

The updated Airport Layout Plan (ALP) for Marin County Airport is a graphic presentation of existing and proposed facilities and their location on the Airport in conformance with the recommended development program. The pertinent clearance and dimensional information required to show compliance with the applicable standards established by the FAA is also indicated on the ALP. The ALP has been prepared in a multi-drawing format which illustrates each of the three Stages of the development program independently.

8.3 - TERMINAL AREA PLAN

The Terminal Area Plan (TAP) for Marin County Airport provides a more detailed layout for proposed aircraft basing, apron, hangar, and FBO facilities than shown on the ALP to give specific facility planning guidelines for this area of the Airport.

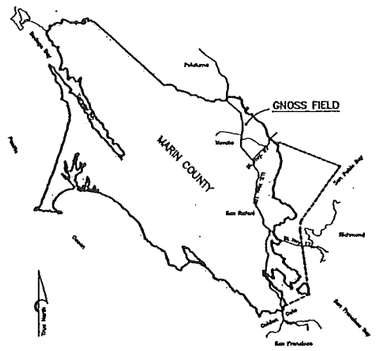
8.4 - APPROACH AND CLEAR ZONE PLAN

An updated Approach and Clear Zone Plan (ACZP) for Marin County Airport was also prepared. The ACZP supplements the ALP and provides plan and profile view information for the runway approach areas. A key function of the ACZP is to identify obstructions in the vicinity of the Airport which may have an impact on the use of the runway(s) and adjacent airspace. The

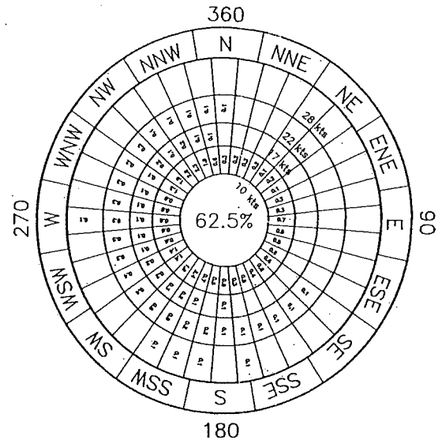
ACZP was prepared using criteria contained in Federal Aviation Regulation Part 77 (FAR Part 77), "Objects Affecting Navigable Airspace" (see Appendix G).

The parameters of the FAR Part 77 imaginary surfaces are determined by the runway classification and type of approach (visual and/or instrument) available or planned for each runway. The ACZP for Marin County Airport was based on general aviation category runway criteria with a non-precision circling instrument approach.

AIRPORT LOCATION MAP



WIND ROSE



Surface wind velocity measured
19 January, 1986 to 31 January, 1987

Runway 13–31 and 3–21 combined
crosswind coverage at 10 knots = 96.7%

AIRPORT DATA

	EXISTING	Stage 1 (5-year)	Stage 2 (10-year)	Stage 3 (20-year)
Category	BU-II	GU-I	GU-I	GU-I
Elevation (msl)	1.5'	1.5'	2.0' +/-	2.0' +/-
Airport Reference Point: Latitude	38° 08' 40" N	38° 08' 40" N	38° 08' 41" N	38° 08' 41" N
Longitude	122° 33' 25" W	122° 33' 25" W	122° 33' 12" W	122° 33' 12" W
Mean Maximum Temperature Hottest Month	81°F	81°F	81°F	81°F
Acreage	91.4	124	192	222
Aircraft Parking	300	390	430	535
Runway to Building Restriction Line	200'	200'	200'	200'
Navaids	none	VORTAC/Loran C	VORTAC/Loran C	VORTAC/Loran C

RUNWAY DATA

	EXISTING	Stage 1 (5-year)	Stage 2 (10-year)		Stage 3 (20-year)	
Identification	Runway 13–31	Runway 13–31	Runway 13–31	Runway 3–21	Runway 13–31	Runway 3–21
Length/Width	3,300'/60'	3,800'/75'	3,800'/75'	3,000'/75'	4,400'/75'	3,000'/75'
Effective Gradient (%)	0%	0%	0%	0%	0%	0%
Lighting	MIRL	MIRL	MIRL	MIRL	MIRL	MIRL
Marking	Basic	Basic	Basic	Basic	Basic	Basic
True Bearing	N 30° 20' 30" W	N 30° 20' 30" W	N 30° 20' 30" W	N 47° E	N 30° 20' 30" W	N 47° E
Approach Surface: FAR 77	20:1	20:1	20:1	20:1	20:1	20:1
Actual	40:1/27:1	– –	– –	– –	– –	– –
Clear Zone Dimensions: Inner	250'	250'	250'	250'	250'	250'
Outer	450'	450'	450'	450'	450'	450'
Length	1,000'	1,000'	1,000'	1,000'	1,000'	1,000'
Wind Coverage (%) (10 knots)	84.3%	84.3%	84.3%	80.9%	84.3%	80.9%
Instrument Runway	no	Circling	Circling	Circling	Circling	Circling
Visual Approach Aids	VASI	VASI	VASI	PAPI	VASI	PAPI
Pavement Type	AC	AC	AC	AC	AC	AC
Pavement Strength (000 lbs.)	26.0 S	26.0 S	26.0 S	12.5 S	26.0 S	12.5 S
Taxiway: Length/Width	3,300'/30'	3,800'/30'	3,800'/30'	3,000'/30'	4,400'/30'	3,000'/30'
Distance from Runway	150'	150'	150'	225'	150'	225'
Lighting	MITL	MITL	MITL	MITL	MITL	MITL

Marin County, California
General Services Department
Jeffrey Rawles, Assistant Director

Approved _____ Date _____

Federal Aviation Administration
Airports District Office, Burlingame, California
John Pfeifer, Chief

Approved _____ Date _____

The preparation of this Airport Layout Plan (ALP) was financed in part through an Airport Improvement Program Grant from the Federal Aviation Administration (FAA) under the provisions of Section 505 of the Airport and Airway Improvement Act of 1982. The contents of this ALP reflect the views of Cortright & Seibold who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policy of the FAA. Acceptance of this ALP by the FAA does not in any way constitute a commitment on the part of the United States to participate in any development depicted therein nor does it indicate that the proposed development is environmentally acceptable in accordance with Public Laws 90–190, 91–258, 94–353, and/or 90–495.

Prepared by:

Cortright & Seibold
Airport / Aviation Consultants

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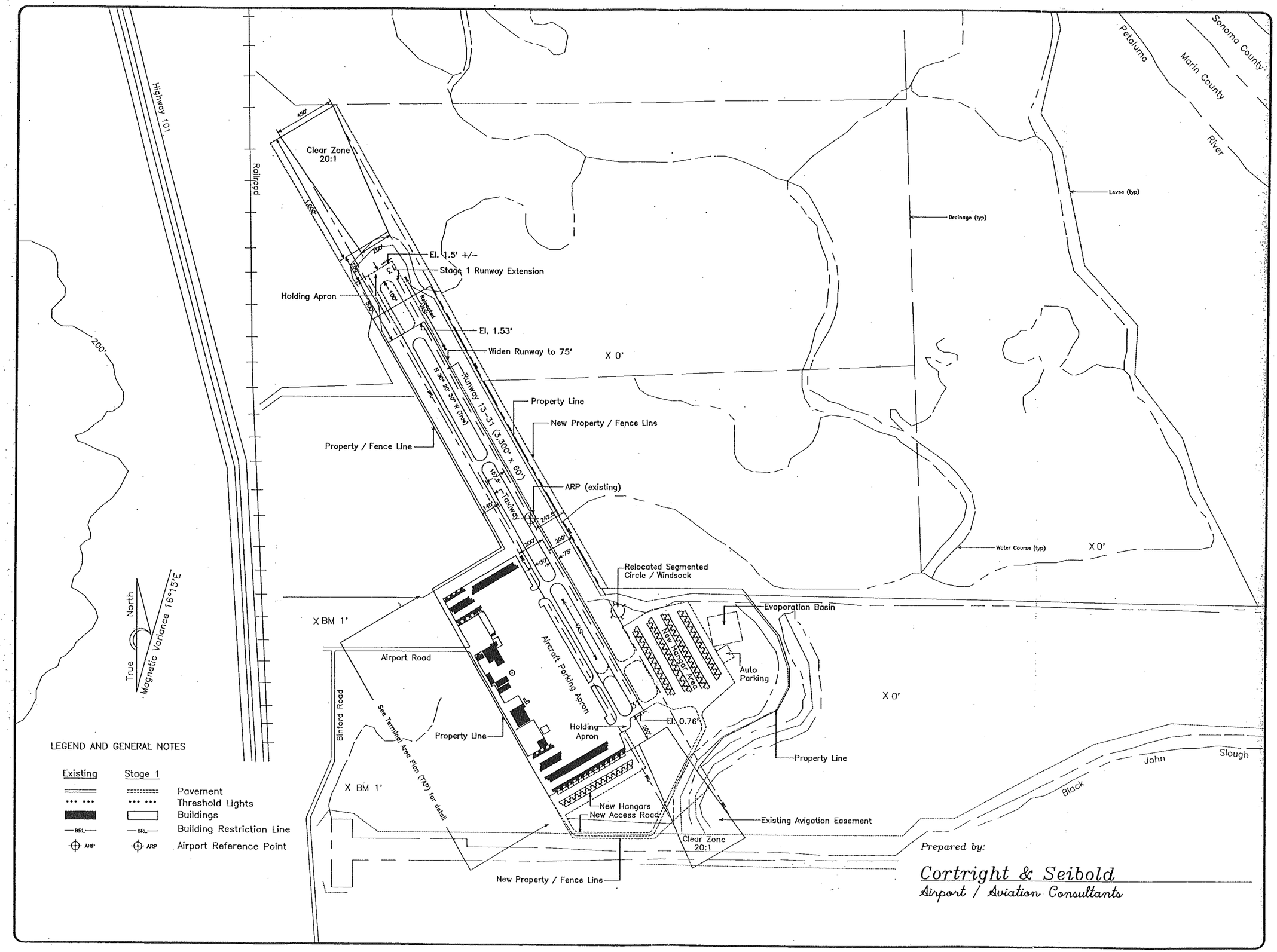
Antioch, California 94509 *415:754–6965*

REVISIONS	BY
CAD:GFDATA:2,513	

AIRPORT LAYOUT PLAN
Gnoss Field
Marin County, California

DRAWN	emr
CHECKED	djc/sls
DATE	31 July, 1989
SCALE	na
JOB NO.	CS-111
SHEET	1
OF	6 SHEETS



REVISIONS	BY
CAD:GFALPA:11,542	

AIRPORT LAYOUT PLAN – STAGE 1

Gnoss Field

Marin County, California

Prepared by:

Cortright & Seibold

Airport / Aviation Consultants

DRAWN emr
CHECKED djc/ele
DATE 31 July, 1989
SCALE 1" = 300'
JOB NO. CS-111
SHEET 2 OF 6 SHEETS

REVISIONS	BY
CAD:GFALP11:11,542	

AIRPORT LAYOUT PLAN – STAGE 2

Gnoss Field

Marin County, California

Highway 101

Railroad

Clear Zone 20:1

1,000'

450'

250'

Holding Apron

El. 1.5' +/–

100'

Runway 13-31 (3,800' x 75')

N 30° 20' 30" W (true)

BRL

Property / Fence Line

X 0'

Property / Fence Line

150'

Taxiway

140'

ARP (existing)

ARP (ultimote)

240.5'

885.5'

200'

75'

30'

Segmented Circle / Windsock

New Taxiway

X BM 1'

Airport Road

Binford Road

See Terminal Area Plan (TAP) for detail

Aircraft Parking Apron

YBR

New Hangar Area

Evaporation Basin

Auto Parking

PAPI

Runway 3-21 (3,000' x 75')

New Property / Fence Line

X 0'

31

El. 0.76'

Holding Apron

Property Line

Clear Zone 20:1

Access Road

Existing Avigation Easement

Clear Zone 20:1

Water Course (typ)

Drainage (typ)

Levee (typ)

Petaluma

Sonoma County

Marin County

River

Holding Apron

Clear Zone 20:1

El. 2.0' +/–

225'

N 47° E (true)

X 0'

John

Slough

Black

200'

North

True

Magnetic Variance 16°15'E

LEGEND AND GENERAL NOTES

Existing*	Stage 2	
		Pavement
		Threshold Lights
		Buildings
BRL	BRL	Building Restriction Line
ARP	ARP	Airport Reference Point

* = Existing – after Stage 1 development

Prepared by:

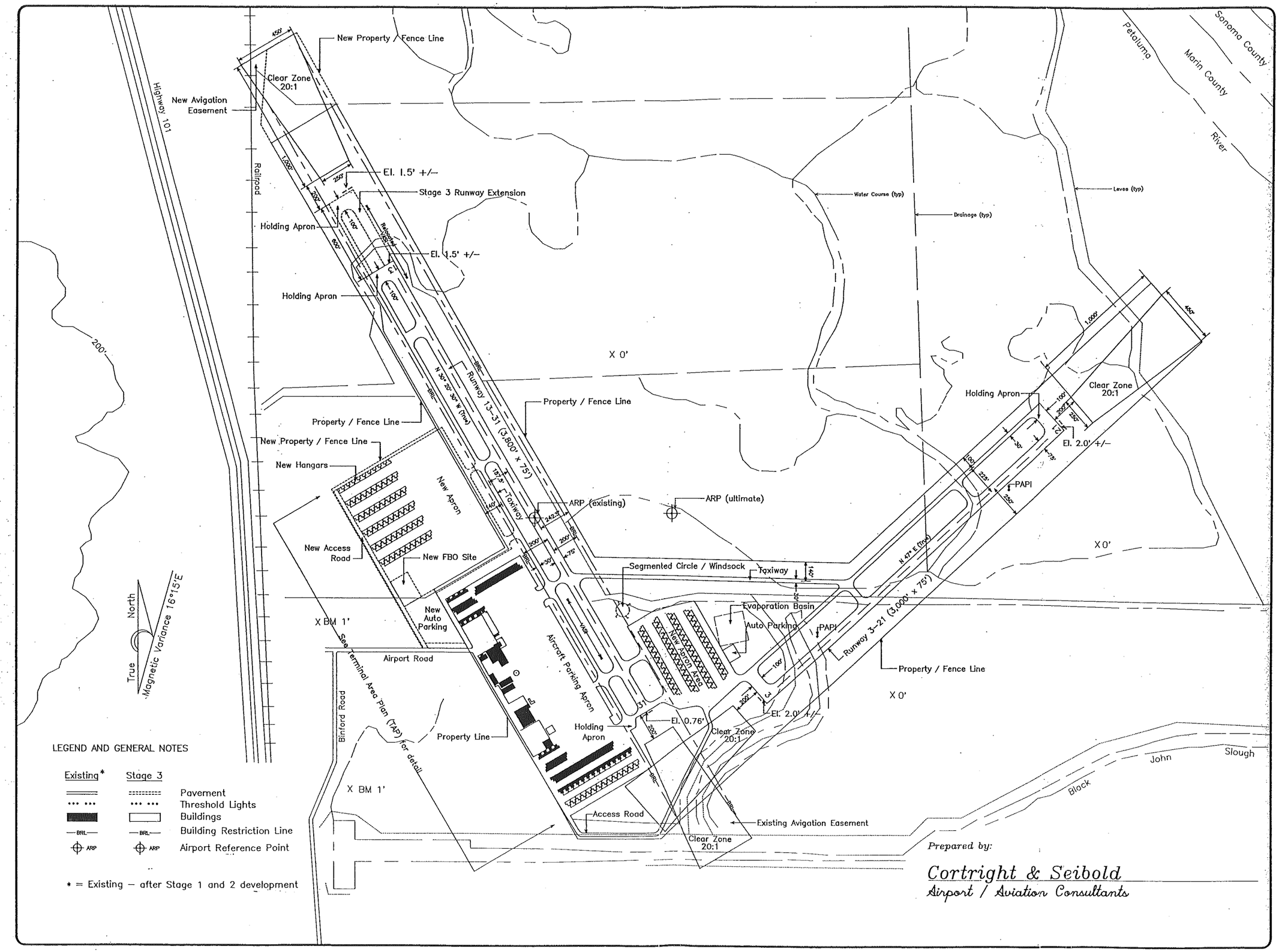
Cortright & Seibold

Airport / Aviation Consultants

DRAWN	emr
CHECKED	djc/ale
DATE	31 July, 1989
SCALE	1" = 300'
JOB NO.	CS-111
SHEET	3
OF	6 SHEETS

REVISIONS	BY
CAD:GFALPC:11,542	

AIRPORT LAYOUT PLAN – STAGE 3
Gnoss Field
Marin County, California



Prepared by:

Cortright & Seibold
Airport / Aviation Consultants

DRAWN	emr
CHECKED	djc/ele
DATE	31 July, 1989
SCALE	1" = 300'
JOB NO.	CS-111
SHEET	4
OF	6 SHEETS

LEGEND AND GENERAL NOTES

Existing	Ultimate	
———	- - - -	Pavement
▨	□	Buildings
— BRL —	— BRL —	Building Restriction Line
—x—	—x x—	Fence

Magnetic Variance 16°15'E.
True North

New Property Line
New Taxiway (Stage 2)
New Segmented Circle / Windsock
Evaporation Basin
Auto Parking
New Taxiway (Stage 2)
New Hangars (100) (Stage 1)
70' (typ)
Clear Zone 20:1
New Access Road (Stage 1)
30'
Property Line
BRL
242.5'
60'
200'
75'
15'
Relocated MIRL (Stage 1) this side
40' (typ)
Widened Runway 13–31 (Stage 1)
New Taxiways
Relocated Threshold Lights
Clear Zone 20:1
200'
157.5'
200'
30'
VASI
Taxiway
New Taxiway (typ)
75'
BRL
40' (typ)
140'
New Hangars (20) (optional site)
Widened Taxiway
Existing Aircraft Parking Area
New Aircraft Parking Apron (Stage 3)
Drainage Channel
Property Line
Proposed New Fuel Tanks
Fuel
Marin Air Services
Washrack
New Hangars (110)
Picnic/Park Area
Gate
Airport Manager's Office
Crosswinds Cafe
Beacon
Gate
50' (typ)
Auto Parking
Auto Parking
Auto Parking
50' (typ)
New Hangars (40) (Stage 1)
70'
70' (typ)
120'
New FBO Site
New Auto Parking
Access Road
Gate
Property Line
Gate
New Access Road
Landscape Area
Airport Road
New Property Line (Stage 3)
New Access Road (30' R/W)

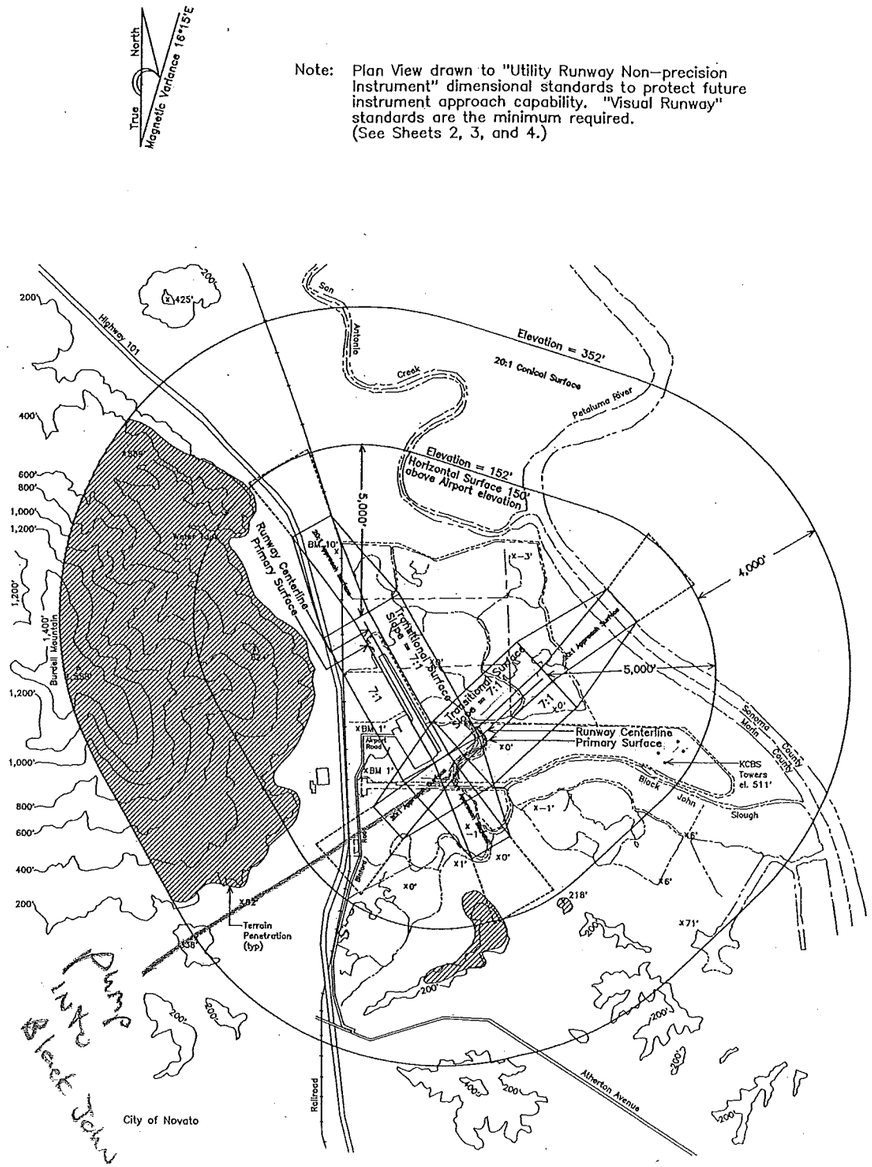
Prepared by:

Cortright & Seibold
Airport / Aviation Consultants

REVISIONS	BY
CAD:GFTAP:2,685.5	

TERMINAL AREA PLAN
Gnoss Field
Marin County, California

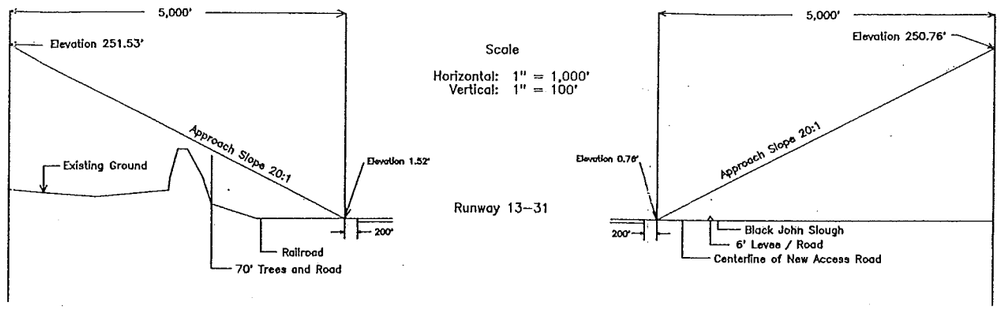
DRAWN	emr
CHECKED	djc/ele
DATE	31 July, 1989
SCALE	1" = 100'
JOB NO.	CS-111
SHEET	5
OF	6 SHEETS



PLAN VIEW
FAR PART 77 SURFACES

Scale: 1" = 2,000'

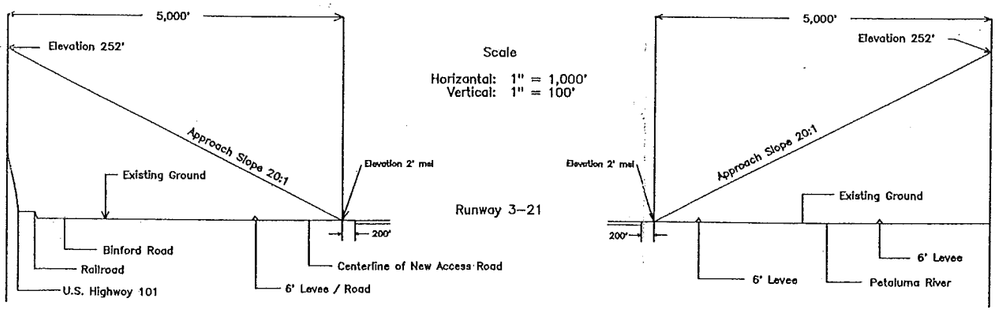
APPROACH PROFILES



Scale
Horizontal: 1" = 1,000'
Vertical: 1" = 100'

Runway 13–31

APPROACH PROFILES



Scale
Horizontal: 1" = 1,000'
Vertical: 1" = 100'

Runway 3–21

Prepared by:

Cortright & Seibold
Airport / Aviation Consultants

REVISIONS	BY
CAD:GFACZP:12,000	

APPROACH AND CLEAR ZONE PLAN
Gnoss Field
Marin County, California

DRAWN	emr
CHECKED	djc/sla
DATE	31 July, 1989
SCALE	as shown
JOB NO.	CS-111
SHEET	6
OF	6 SHEETS

APPENDIX A

Glossary of Aviation Terms

Appendix A

GLOSSARY OF AVIATION TERMS

AGL. Above Ground Level.

AIM. Airman's Information Manual.

AIP (Airport Improvement Program). Federal Aviation Administration (FAA) airport planning and construction grant program.

Aircraft Approach Category. Aircraft approach category is based on 1.3 Vso (Vso is the aircraft stall speed at the maximum certificated landing weight in the landing configuration). The aircraft approach speed categories are:

Category A: less than 91 knots;
Category B: 91 knots to 121 knots;
Category C: 121 knots to 141 knots;
Category D: 141 knots to 166 knots; and
Category E: 166 knots or more.

Aircraft Delay. The difference between the actual time an aircraft takes to perform a given operation and the time it would take without interference from other sources.

Aircraft Parking Line Limit. An aircraft parking line limit is a line beyond which no part of a parked aircraft should protrude.

Airfield Capacity. The maximum number of aircraft operations that can take place in a given time under specific conditions of airspace, ceiling and visibility, runway layout and use, aircraft mix, and proportion of arrivals and departures.

Airplane Design Group. The airplane design group subdivides airplanes by wingspan. The Airplane Design Groups are:

Group I - Wingspan up to 49 feet (15 m);
Group II - Wingspan 49 feet (15 m) to 79 feet (24 m);
Group III - Wingspan 79 feet (24 m) to 118 feet (36 m);
Group IV - Wingspan 118 (36 m) to 171 feet (52 m);
Group V - Wingspan 171 feet (52 m) to 197 feet (60 m); and
Group VI - Wingspan 197 feet (60 m) to 262 feet (80 m).

Airport Hazard. An airport hazard is any structure, object, or any use of land on or near an airport that obstructs the airspace required for an aircraft flight in landing or taking off at the airport or is otherwise hazardous to aircraft landing, taking off, or taxiing at the airport.

Airport Type (general aviation). Runway length separates utility (general aviation) airports into basic and general utility types.

ALP (Airport Layout Plan). An airport layout plan is a scale drawing of the airport showing:

1. The boundaries of the airport and all its proposed additions, together with the boundaries of off-site areas owned or controlled by the airport authorities for airport purposes, including proposed additions;

2. The exact location, type, and dimensions of all existing and proposed airport facilities and structures such as runways, taxiways, aprons, terminal buildings, and roads, as well as all proposed extensions and reductions of existing airport facilities; and

3. The location of all existing and proposed non-aviation areas and all their existing improvements.

ALS. Approach Light System.

Annual Service Volume. A level of annual aircraft operations that may be used as a reference in preliminary planning. It is not a capacity figure. Rather, it is the annual volume of aircraft operations beyond which the average delay to each aircraft increases rapidly with relatively small increases in aircraft operations (and beyond which the levels of service on the airfield deteriorate).

Approach End of Runway. The approach end of runway is the near end of the runway as viewed from the cockpit of a landing airplane.

Approach Surface. An imaginary surface longitudinally centered on the extended centerline of the runway, beginning at the end of the primary surface and rising outward and upward to a specified height above the established airport elevation.

ARP (Airport Reference Point). An ARP is a point having equal relationship to all existing and proposed landing and takeoff areas which is used to locate the airport geographically.

ARSA. Airport Radar Service Area.

ARTCC (Air Route Traffic Control Center). An FAA facility providing air traffic control service to aircraft operating on an IFR flight plan within controlled airspace and principally during the en route phase of flight.

ASR (Airport Surveillance Radar). Approach control radar used to detect and display an aircraft's position in the terminal area. ASR provides range and azimuth information but does not provide elevation data. Coverage of the ASR can extend up to 60 miles.

ATA (Airport Traffic Area). Airspace within five statute miles of an airport up to an altitude of 3,000 feet.

ATC. Air Traffic Control.

ATCT (Air Traffic Control Tower). A terminal facility that uses air/ground communications, visual signaling, and other devices to provide ATC services to aircraft operating in the vicinity of an airport or on the airfield area. Authorizes aircraft to land or takeoff at the airport controlled by the tower or to transit the airport traffic area.

AWOS. Automated Weather Observation System.

Based Aircraft. General aviation, air carrier, and other aircraft which use an airport as a "residence" or home base.

Basic Utility - Stage I. This type of airport serves about 75% of the single-engine and small twin-engine airplanes used for personal and business purposes. Precision approach operations are not usually anticipated. This airport is designed for small airplanes in Airplane Design Group I.

Basic Utility - Stage II. This type of airport serves all the airplanes of Stage I, plus some small business and air taxi type twin-engine airplanes. Precision approach operations are not usually anticipated. This airport is also designed for small airplanes in Airplane Design Group I.

BRL. Building restriction line.

Circling Approach. A maneuver to align the aircraft with a runway for landing when a straight-in landing from an instrument approach is not possible after the pilot has established visual reference to the airport.

Clear Zone. An area at ground level that provides for the unobstructed passage of landing aircraft through the above airspace. The dimensions of a clear zone are determined by the approach surface dimensions of FAR Part 77 for the runway concerned. The clear zone always begins at the end of the runway primary surface.

Conical Surface. A surface extending from the periphery of the horizontal surface outward and upward at a slope of 20 to 1 for the horizontal distances and to the elevations above the airport elevation as prescribed by FAR Part 77.

Crosswind. The wind component at 90° to the runway.

Crosswind Runway. A runway additional to the primary runway to provide for wind coverage. A crosswind runway may be required if the orientation of the primary runway results in crosswinds exceeding 12 miles per hour (or 10 knots) more than 5% of the time, (i.e., less than 95% wind coverage).

DH. Decision Height.

Displaced Threshold. The runway threshold is the designated beginning of the runway that is available and suitable for the landing of aircraft. A displaced threshold is located other than at the physical beginning of the runway pavement. The displaced threshold indicates that the beginning of the runway is not to be used for landing, usually due to some obstruction in the approach path.

DME (Distance Measuring Equipment). Equipment used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigational aid (see Tacan and Vortac).

FAA. Federal Aviation Administration.

FAF. Final Approach Fix.

FAR. Federal Aviation Regulation.

FAR Part 36. Federal Aviation Regulation Part 36 "Noise Standards: Aircraft Types and Airworthiness Certification."

FAR Part 77. Federal Aviation Regulation Part 77 "Objects Effecting Navigable Airspace."

FAR Part 91. Federal Aviation Regulation Part 91 "General Operating and Flight Rules."

FAR Part 103. Federal Aviation Regulation Part 103 "Ultralight Vehicles."

FAR Part 135. Federal Aviation Regulation Part 135 "Air Taxi Operators and Commercial Operators."

FAR Part 150. Federal Aviation Regulation Part 150 "Airport Noise Compatibility Plan."

FAR Part 152. Federal Aviation Regulation Part 152 "Airport Aid Program."

FAR Part 155. Federal Aviation Regulation Part 155 "Surplus Property."

FBO (Fixed Base Operator). An airport service operation, normally consisting of fuel sales, aircraft rentals, charter aircraft, aircraft sales, and maintenance with a fixed base of operation at the airport.

FSS (Flight Service Station). An FAA facility in the national flight advisory system for the collection and dissemination of NOTAMS, weather, administrative data; providing preflight and in-flight advisory service to pilots via air/ground communications facilities, processing IFR and VFR flight plans, and providing emergency assistance to pilots.

General Utility - Stage I. This type of airport serves all small airplanes. Precision approach operations are not usually anticipated. This airport is designed for small airplanes in Airplane Design Group I.

General Utility - Stage II. This type of airport serves large airplanes in Aircraft Approach Categories A and B and usually has the capability for precision approach operations. This airport is normally designed for aircraft in Airplane Design Groups I and II. It may also be designed to serve Aircraft Approach Category A large airplanes in Airplane Design Group II. While runways serving or expected to serve large airplanes may be built to utility airport standards, they are considered as other than utility runways in aeronautical studies.

GS (Glide Slope). Provides vertical guidance for aircraft during approach and landing. The glide slope consists of: 1) electronic components emitting signals which provide vertical guidance by reference to airborne instruments during instrument approaches such as ILS, or 2) ground aids, such as VASI, which provide visual vertical guidance for VFR approach or for the visual portion of an instrument approach and landing.

HAA (Height Above Airport). The height of the MDA above airport elevation.

HAT (Height Above Touchdown). The height of the DH or MDA above the elevation of the runway touchdown zone.

Hazard to Air Navigation. Any object which has a substantial adverse effect upon the safe and efficient use of navigable airspace by aircraft or on the operation of air navigation facilities is a hazard to air navigation.

Heavy Aircraft. Aircraft with maximum takeoff weight of 300,000 pounds or more.

High Altitude (Jet) Airways. Those airways established from 18,000 feed above mean sea level (msl) to Flight Level (FL) 450, inclusive, used by jet aircraft and other IFR traffic en route between various terminal areas.

HIRL. High Intensity Runway Lights.

Horizontal Surface. A specified portion of a horizontal plane located 150 feet above the established airport elevation which establishes the height above which an object is determined to be an obstruction to air navigation. (See FAR Part 77.)

ICAO. International Civil Aviation Organization.

IFR (Instrument Flight Rule). FAR rules that govern the procedures for conducting instrument flight (FAR Part 91).

ILS (Instrument Landing System). (See Precision Instrument Approach System.)

IMC (Instrument Meteorological Conditions). Meteorological conditions expressed in terms of visibility, distance from clouds and ceiling less than the minimums specified for visual meteorological conditions.

Instrument Approach. An aircraft approach to an airport solely by reference to instruments.

Instrument Operation. A takeoff or landing of an aircraft while on an instrument flight clearance.

Large Aircraft. A large aircraft is an aircraft of more than 12,500 pounds (5,700 mg) maximum certificated takeoff weight.

LDA. Localizer-type Directional Aid.

LIRL. Low Intensity Runway Lights.

LOC. ILS localizer which provides lateral course guidance for an instrument approach.

LOC Backcourse. The ILS localizer signals extending outward from the airport in the direction opposite from the direction of an ILS approach. In some cases a nonprecision approach may be approved based on these signals.

Loran C (Long-range Navigational). Long-range navigation electronic equipment which gets its position information by analyzing signals from a chain of three or more low frequency stations. The receiver notes the difference in time of arrival of the signals from each station and translates them into lines of position (LOPs). When two LOPs intersect, a fix can be established and the receiver's computer translates this fix into the latitude and longitude coordinates of the aircraft's present position.

MAP (Missed Approach Point). A point in an instrument approach procedure at which a missed approach shall be executed if the required visual reference does not exist.

MDA (Minimum Descent Altitude). The lowest MSL altitude to which descent is authorized on final approach in a standard instrument approach procedure with no electronic glide slope information.

MEA. Minimum en route altitude.

MIRL. Medium Intensity Runway Lights.

MLS (Microwave Landing System). An advanced form of precision approach equipment with improved accuracy, and fewer siting problems than current ILS. MLS also has the useful potential to permit curved path approaches to the runway instead of the straight path limitations of ILS and PAR.

MOA (Military Operations Areas). MOA airspace is defined by vertical and lateral limits established for the purpose of separating certain military training activities from IFR traffic. Whenever a MOA is being used, nonparticipating IFR traffic may be cleared through a MOA if IFR separation can be provided by ATC. Otherwise, ATC will reroute or restrict nonparticipating IFR traffic. VFR aircraft can transit the MOA.

MSL. Mean sea level.

Navaid. Visual or electronic devise that provides point-to-point guidance information or position data to aircraft in flight.

NM (Nautical Mile). A nautical mile (nm) is 6,076 feet.

Nondirectional Beacon (NDB). A low- or medium-frequency radio beacon which transmits nondirectional signals whereby the pilot of an aircraft equipped with a loop antenna can determine his bearing and "home" on the station. (See Nonprecision Instrument Approach.)

Nonprecision Instrument Approach. An instrument approach procedure based on an electronic aid designed to provide an approach path for alignment of an aircraft on final approach to a runway. It generally lacks the high accuracy qualities of the precision approach equipment and does not provide vertical guidance. the VHF Omnirange (VOR) and the Nondirectional Homing Beacon (NDB) are two examples of the type of equipment used.

Nonprecision Instrument Runway. A nonprecision instrument runway is one with an instrument approach procedure utilizing air navigation facilities, with only horizontal guidance, or area-type navigation equipment for which a straight-in nonprecision instrument approach procedure has been approved or planned, and no precision approach facility or procedures is planned or indicated on an FAA or DOD approved airport layout plan, or on other FAA or DOD planning documents.

NOTAM (Notice to Airmen). A notice containing information concerning the establishment, condition, or change in any component (facility, service, or procedure) of, or hazard in the National Airspace System the timely knowledge of which is essential to personnel concerned with flight operations.

Obstruction to Air Navigation. An existing object, including a mobile object, is, and a future object would be, an obstruction to air navigation if it is of greater height than any of the heights or surfaces defined in FAR Part 77.

Overrun. (See Stopway.)

PAPI (Precision Approach Path Indicator). A visual approach aid light system providing glide slope information to the pilot on landing approach to the runway.

PAR. Precision Approach Radar.

PIC. Pilot in Command.

PLASI (Pulse Light Approach Slope Indicator). A visual approach aid light system providing glide slope information to the pilot on landing approach to the runway using a pulse light signal.

Precision Instrument Approach System. An instrument procedure based on electronic aids or voice communications designed to provide an approach path for exact alignment and descent of an aircraft on final approach to a runway. Instrument landing system (ILS), precision approach radar (PAR), and microwave landing system (MLS) are examples.

Precision Instrument Runway. A precision instrument runway is one with an instrument approach procedure utilizing an instrument landing system (ILS), microwave landing system (MLS), or precision approach radar (PAR). A planned precision instrument runway is one for which a precision approach system or procedure is indicated on an FAA or DOD approved airport layout plan or on other FAA or DOD planning documents.

Primary Surface. A rectangular area surrounding the runway at the same elevation as the runway which must be free of obstructions. (See FAR Part 77 for dimensions.)

RAIL. Runway Alignment Indicator Lights.

RCO. Remote Communications Outlet.

REILS. Runway End Identifier Lights.

Relocated Threshold. A relocated threshold is a permanent threshold located at the relocated runway end.

RNAV (Area Navigation). A method of navigation that permits aircraft operations on any desired course within the coverage of station referenced navigation signals or within the limits of self-contained system capability.

ROC. Required Obstacles Clearance.

Rotating Beacon. Visual navaid consisting of alternating white and green light flashes indicating the location of the airport.

Runway. A runway is a defined rectangular area on an airport prepared for the landing or takeoff of airplanes.

Runway Safety Area. A runway safety area is a rectangular area, centered on the runway centerline, which includes the runway (and stopway, if present) and the runway shoulders. The portion abutting the edge of the runway shoulders, runway ends, and stopways is cleared, drained, graded, and usually turfed.

RVR. Runway Visual Range.

Segmented Circle. A visual indicator providing traffic pattern information.

SID. Standard Instrument Departure.

Small Aircraft. A small aircraft is an aircraft of 12,500 pounds (5,700 kg) or less maximum certificated takeoff weight.

SSALR. Simplified, Short Approach Light System with Runway Indicator Lights.

STAR. Standard Terminal Arrival Route.

Stop End of Runway. The stop end of runway is the far runway end as viewed from the cockpit of a landing airplane.

Stopway. A stopway (or overrun) is an area beyond the stop end of the takeoff runway which is no less wide than the runway and is centered on the extended centerline of the runway. It is able to support an airplane during an aborted takeoff without causing structural damage to the airplane, and designated by the airport authorities for use in decelerating the airplane during an aborted takeoff.

Straight-in Landing. A landing made on a runway aligned within 30° of the final approach course.

Taxilane. A taxilane is the portion of the aircraft parking area used for access between taxiways, aircraft parking positions, hangars, storage facilities, etc. A taxilane is outside the movement area.

Taxiway. A taxiway is a defined path, from one part of an airport to another, selected or prepared for the taxiing of aircraft.

TCA (Terminal Control Area). Controlled airspace extending upward from the surface or higher to specified altitudes, within which all aircraft are subject to operating rules and pilot and equipment requirements specified in FAR Part 91. Generally, this requires two-way radio communication and VOR navigation equipment and a private pilot license or better.

TERPS (Terminal Instrument Procedures). Federal Aviation Administration (FAA) handbook for designing instrument approach procedures.

Threshold. The threshold is the beginning of that portion of the runway available and suitable for the landing of airplanes.

Touch-and-Go Operations. An operation by an aircraft that lands and takes off on a runway without stopping or exiting the runway.

Traffic Pattern. The aircraft traffic flow that is prescribed for landing and taking off from an airport. The components of a typical traffic pattern are upwind let (a flight path parallel to the landing runway in the direction of landing); crosswind leg (a flight path at right angles to the landing runway off its upwind end); downwind leg (a flight path parallel to the landing runway in the direction opposite to landing); base leg (a flight path at right angles to the landing runway off its approach end); and final approach (a flight path in the direction of landing along the extended runway centerline). The final approach normally extends from the base leg to the runway. An aircraft making a straight-in approach is also considered to be on final approach.

Transport Airport. A transport airport is an airport designed, constructed, and maintained to serve airplanes in Aircraft Approach Categories C and D.

TRSA. Terminal Radar Service Area.

TVOR (Terminal Very High Frequency Omnidirectional Range). A VOR located on or near an airport and used as an approach aid. (See VOR.)

Unicom. A private communication facility used to provide advisory-only airport information.

Utility Airport. A utility airport is an airport designed, constructed, and maintained to serve airplanes in Aircraft Approach Categories A and B.

VASI (Visual Approach Slope Indicator). Runway lighting system which provides visual glide slope information on final approach and used primarily under VFR conditions. VASI consists of at least two sets of lights alongside the approach end of a runway, one upwind of the other. If the pilot is too high, he sees all white lights. If too low, he will see all red lights. When on the proper glide slope, he will see red lights over white lights.

VDP. Visual Descent Point.

VFR (Visual Flight Rules). Rules that govern the procedures for conducting flight under visual conditions (FAR Part 91).

Victor Airway (Low Altitude Airways). Those airways designated from 1,200 feet above the surface (or in some instances higher) up to, but not including, 18,000 feet msl. The VOR airways are predicted solely on VOR or VORTAC navigation aids.

Visual Runway. A visual runway is a runway intended solely for the operation of aircraft using visual approach procedures, with no straight-in instrument approach procedure and no instrument designation indicated on an FAA or DOD approved airport layout plan or on other FAA or DOD planning documents.

VMC (Visual Meteorological Conditions). Meteorological conditions expressed in terms of visibility, distance from clouds and ceiling equal to or better than specified minimum. In VMC, aircraft can be flown by visual reference to the ground.

VOR (Very High Frequency Omnidirectional Range). A navigation ground station transmitting signals containing directional information in the very high frequency portion of the radio frequency.

VOR/DME. Co-located VOR and DME.

VORTAC. Very High Frequency Omnidirectional Range (VOR/Tactical Air Navigation (TACAN))). A navigation aid providing VOR azimuth, TACAN azimuth, and TACAN distance measuring equipment (DME) at one site.

Wind Coverage. Wind coverage is the percent of time for which aeronautical operations are considered safe due to acceptable crosswind components.

Wind Indicator. A devise which visually indicates the wind direction.

APPENDIX B

Technical References

Appendix B

TECHNICAL REFERENCES

- Federal Aviation Administration (FAA) Advisory Circular (AC) No. 150/5300-4B, "Utility Airports Air Access to National Transportation," 24 June, 1975.
- Federal Aviation Administration (FAA) Advisory Circular (AC) No. 150/5300-12, "Airport Design Standards-Transport Airports," 28 February, 1983.
- Federal Aviation Administration (FAA) Advisory Circular (AC) No. 150/5360-7, "Planning and Design Considerations for Airport Terminal Building Development," 5 October, 1976.
- Federal Aviation Administration (FAA) Advisory Circular (AC) No. 150/5360-9, "Planning and Design of Airport Terminal Facilities at Nonhub Locations," 4 April, 1980.
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- State of California, "State CEQA Guidelines," January, 1986.

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- National Oceanic and Atmospheric Administration, "Airport/ Facility Directory, Southwest United States," 6 August, 1986.

- National Oceanic and Atmospheric Administration, "Instrument Approach Procedures," July, 1986.

- Optima Publications, "Pilots Guide to California Airports," 1986.

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APPENDIX C

Airport Master Record (FAA Form 5010)

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

AIRPORT MASTER RECORD

PRINT DATE 04/02/86
FORM APPROVED. OMB No. 04-R0051

>1 ASSOC CITY: NOVATO 4 STATE: CA FAA SITE NR: 01967.A
>2 AIRPORT NAME: GNOSS FLD 5 COUNTY: MARIN CA
3 CBD TO AIRPORT(NM): 03 N 6 REG/ADO: AWP/SFO 7 SECT AERO CHT: SAN FRANCISCO

GENERAL

10 OWNERSHIP: PUBLIC
>11 OWNER: MARIN COUNTY
>12 ADDRESS: PO BOX 4186, CIVIC CENTER
SAN RAFAEL, CA 94903
>13 PHONE NR: 415-897-1754
>14 MANAGER: J. STANFILL
>15 ADDRESS: P O BOX 4186
SAN RAFAEL, CA 94903
>16 PHONE NR: 415-897-1754
>17 ATTENDANCE SCHEDULE:

MONTHS	DAYS	HOURS
ALL	ALL	0800-1800

18 AIRPORT USE: PUBLIC
19 ARPT LAT: 38-00-48N ESTIMATED
20 ARPT LONG: 122-33-25W
21 ARPT-ELEV: 00001 ESTIMATED
22 ACREAGE: 90
>23 RIGHT TRAFFIC: 31
>24 NON-COMM LANDING FEE: NO
25 NASP/FEDERAL AGREEMENT: NGY
26 FAR 139 INDEX: N

SERVICES

>70 FUEL: 100LL
>71 AIRFRAME RPRS: MAJOR
>72 PWR PLANT RPRS: MAJOR
>73 BOTTLE OXYGEN: HIGH/LOW
>74 BULK OXYGEN: HIGH/LOW
75 TSNT STORAGE: TIE
76 OTHER SERVICES: AVNCS CHTR INSTR RNTL SALES

BASED AIRCRAFT

90 SINGLE ENG: 269
91 MULTI ENG: 35
92 JET: 1
TOTAL 305
93 HELICOPTERS: 2
94 GLIDERS:
95 MILITARY:
96 ULTRA-LIGHT:

FACILITIES

>80 ARPT BCN: CG
>81 APT LGT SKED: DUSK-DAWN
>82 UNICOM: 123.000
>83 WIND INDICATOR: YES-L
84 SEGMENTED CIRCLE: YES
85 CONTROL TWR: NO
86 FSS: OAKLAND
87 FSS ON ARPT: NO
88 FSS PHONE NR: 415-273-0284
89 TOLL FREE NR: 800-345-4546

OPERATIONS

100 AIR CARRIER:
101 COMMUTER:
102 AIR TAXI: 500
103 G A LOCAL: 124500
104 G A ITNRNT: 35000
105 MILITARY:
TOTAL: 160000

OPERATIONS FOR 12 MOS ENDING 25SEP85

RUNWAY DATA

	13/31				
>30 RUNWAY IDENT	13/31	/	/	/	/
>31 LENGTH:	3300				
>32 WIDTH:	60				
>33 SURF TYPE-COND	ASPH-G				
>34 SURF TREATMENT	NONE				
35 GROSS WT: SW	26				
36 (IN THSDS) DW	NONE				
37 DTW	NONE				
38 DDTW	NONE				
LIGHTING/APCH AIDS					
	13/31				
>40 EDGE INTENSITY	MED				
41 NOW ELEMENT 81					
>42 RWY MARK TYPE-COND	BSC-G /BSC-G	/	/	/	/
>43 VASI	V2L /V2L	/	/	/	/
44 THR CROSSING HGT	25 /50	/	/	/	/
45 VISUAL GLIDE ANGLE	3.50 /4.00	/	/	/	/
>46 CNTRLN-TDZ	N-N /N-N	/	/	/	/
>47 RVR-RVV	N-N /N-N	/	/	/	/
>48 REIL	N /N	/	/	/	/
>49 APCH LIGHTS	NONE /NONE	/	/	/	/
OBSTRUCTION DATA					
	13/31				
50 FAR 77 CATEGORY	A(V) /A(V)	/	/	/	/
>51 DISPLACED THR	NONE /NONE	/	/	/	/
>52 CTLG OBSTN	TREE /POLE	/	/	/	/
>53 OBSTN MARKED/LGTD	NONE /NONE	/	/	/	/
>54 HGT ABOVE RWY END	70 /30	/	/	/	/
>55 DIST FROM RWY END	3000 /1000	/	/	/	/
>56 CNTRLN OFFSET	NONE /350L	/	/	/	/
57 OBSTN CLNC SLOPE	40:1 /27:1	/	/	/	/
58 CLOSE-IN OBSTN	N /N	/	/	/	/
20:1 LANDING LENGTH					
	13/31				
60 LANDING RWY-LENGTH	/	/	/	/	/
61 CTLG OBSTACLE	/	/	/	/	/
62 HGT-ABOVE THR	/	/	/	/	/
63 DIST FROM THR	/	/	/	/	/
64 CNTRLN OFFSET	/	/	/	/	/

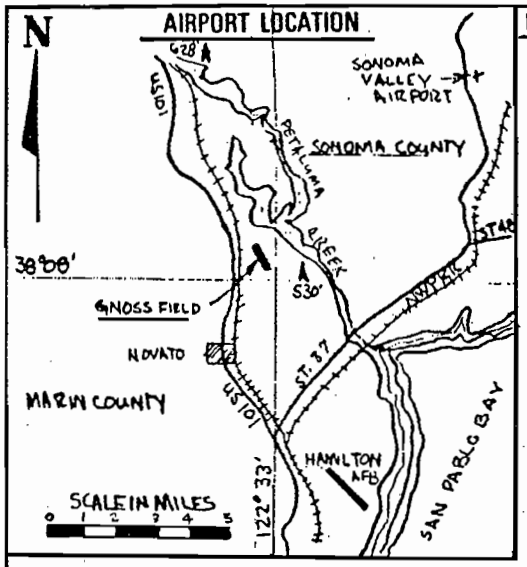
(>) ARPT MGR PLEASE ADVISE FSS IN ITEM 86 WHEN CHANGES OCCUR TO ITEMS PRECEDED BY >

>110 REMARKS:
A110 -01 DITCHES SURROUND RWY.
A110 -02 DURG PERIODS CALM WIND LAND RWY 13. WHEN CROSSWIND FM W LAND RWY 31.
A110 -03 MOUNTAINS W, HILLS S.

SITE NO. 1967.A

ACRES- 90

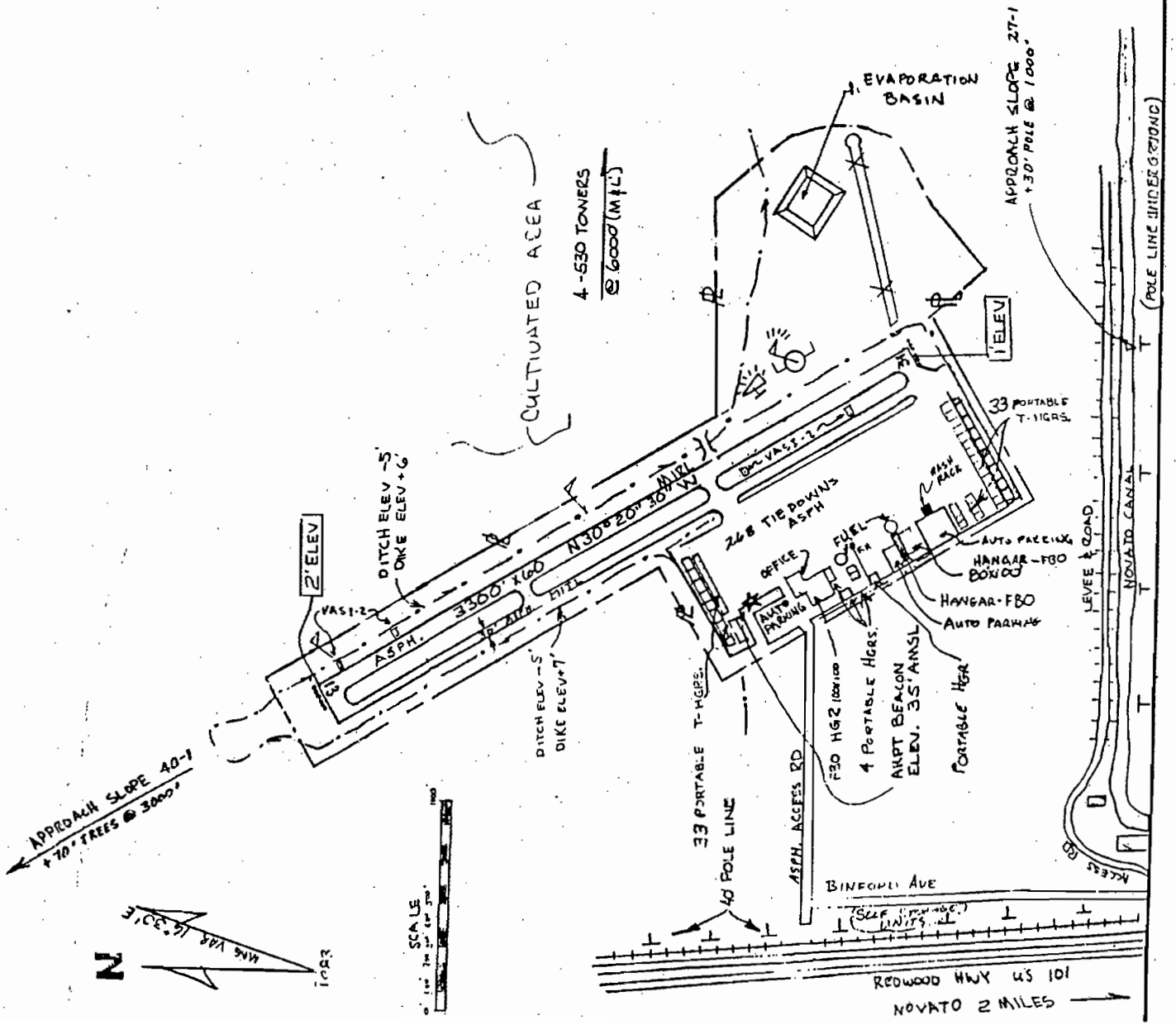
AIRPORT LOCATION



REMARKS:

RUNWAY CATEGORIES

RUNWAY							
EXISTING							
PLANNED							
CORRECTED LENGTH							



APPENDIX D

Aircraft Accident / Incident Data

See Field Entry Description And ATA Code

DATE / NNUM	DO / PROD	ACFT MAKE / ACFT MODEL	CITY / AIRPORT	ST / RWAY	VRST / RWYC	PHASE OF FLIGHT / ACCIDENT TYPE	CAUSAL / CAUSAL	SUPPTF / CONTRF	TFLYP / TFLYS	FLTCP / FLYCS	LTCON / SKCON	CERT / PROF	TMM / TMM90	T90 / TOTHR	FAT / INJ
800308	WP14	PIPER	SAN RAFAEL	CA		LAND-ROLL FW	BRAKE/GRDCTL	UNSKL	PERS	VFR	DAY	COM	00150	00020	000
82454	WP14	PA18150	PRIVATE	22		DIR CNTL LOOP		MISCL	PLEA	NOWX	CLER	SALE	00020	01500	002
A	LOST DIRECTIONAL CONTROL OF TAIL WHEEL TYPE AIRPLANE ON LANDING ROLL. VEERED OFF RUNWAY INTO A DITCH.														
800402	WP14	PIPER	NOVATO	CA		LAND-ROLL FW	OV/SHOOT	MISJG	PERS	VFR	DAY	PVT		00004	000
31322	WP02	PA22	GNOSS	13		DIR CNTL LOOP		MISCL	PLEA	WIND	CLER	UNKN	00003	00412	000
A	UNABLE TO STOP ON RUNWAY. GROUND-LOOPED TO AVOID RUNNING OFF END OF RUNWAY. GUSTY CROSSWIND.														
800411	WP14	CESSNA	NOVATO	CA		LAND-ROLL FW	BRAKE/GRDCTL	UNSKL	BSNS	VFR	DAY	PVT	00151	00011	000
3893C	WP14	180	GNOSS	31	DRY	NOSE-UP-OVR		MISCL	OTHR	NOWX	CLER	CONT		00152	000
A	WIND LIFTED WING ON CROSSWIND LANDING. OTHER WING HIT RUNWAY. OVER-CONTROLLED, AIRPLANE NOSED OVER.														
800419	WP14	CESSNA	NOVATO	CA		LAND-LVL OFF TOUCH	LVL/OFF	UNSKL	INST	VFR	DAY	PVT	00003		000
3378J	WP14	150	GNOSS	31	DRY	HARD LAND		MISCL	TRNG	NOWX	CLER	UNKN		00082	000
G	NOSE WHEEL AND PROPELLER WERE DAMAGED ON LANDING.														
800629	WP14	PIPER	NOVATO	CA		LAND-LVL OFF TOUCH	LVL/OFF	CARLS	PERS	VFR	DAY	PVT	00003		000
2938X	WP14	PA28/	GNOSS	31		HARD LAND		MISCL	PLEA	NOWX	CLER	UNKN		00121	000
G	LANDING DAMAGE TO NOSE WHEEL AND PROPELLER. RUNWAY CONDITION FAIR, SETTLEMENT IN RUNWAY.														
800722	WP14	BEECH	SAN RAFAEL	CA		LAND-ROLL FW	OV/SHOOT	MISJG	PERS	VFR	DAY	PVT	00164	00015	000
17CV	WP02	D17S	PRIVATE	22		OVERSHOOT		MISCL	PLEA	NOWX	CLER	UNKN	00013	00557	002
A	RAN OFF END OF RUNWAY ON LANDING. HIT ROCKY AREA. NOSED OVER.														
800920	WP14	PIPER	NOVATO	CA		CLIMB-TO CRUISE	PREFLT/INSP	CARLS	PERS	VFR	DAY	PVT	00100		000
44611	WP14	PA28R200	GNOSS		DRY	FORCED LANDING	2810SYES	EMLAND	PLEA	NOWX	CLER	UNKN		00300	000
G	FORCED LANDING AFTER ENGINE QUIT SHORTLY AFTER TAKEOFF. FOUND WATER IN FUEL.														
800928	WP14	DHAVXX	SAN RAFAEL	CA		APPR-GO ARND VFR	GRND/WTR	MISJG	PERS	VFR	DAY	COM			000
CFF0Z	NM03	DH82ARGHRTSN	SMITH RANCH	22	DRY	COLL-OTHER	FLTCNTL/AIR	MISCL	PLEA	NOWX	CLER	OTHR	00049		001
A	PILOT ATTEMPTED TO GO AROUND DURING LANDING APPROACH AND HIT LEVEE AND CRASHED.														
801012	WP14	CESSNA	SAN RAFAEL	CA		LAND-ROLL FW	BRAKE/GRDCTL	MISTK	INST	VFR	DAY	STU	00014	00015	000
1839C	WP14	170B	PRIVATE			DIR CNTL LOOP		MISCL	TRNG	NOWX	CLER	CTHR	00014	00050	000
A	PILOT LOST CONTROL DURING LANDING AND AIRCRAFT FLIPPED INVERTED.														
810118	WP14	PIPER	NOVATO	CA		LAND-LVL OFF TOUCH	GEAR/NONE	INATT	PERS	VFR	DAY	PVT	00200		000
42243	WP14	PA28R200	GNOSS FIELD	13		WHEELS UP	3260SYND	MISCL	UNKN	NOWX		UNKN		00591	000
G	PILOT FORGOT TO EXTEND LANDING GEAR. WIRE FOUND BROKEN OFF WARNING HORN. AUTO EXTENDER WAS FUNCTIONAL.														
810309	WP05	CESSNA	NOVATO	CA		CRUISE-FCD/PREC LD	USE/EQUIP	UNSKL	INST	VFR	DAY	STU	00015	00015	000
212MB	WP14	152	GNOSS	31		CNTLD COLL		EMLAND	TRNG	NOWX	CLER	STUD	00015	00038	000
A	FORGOT TO ENRICH MIXTURE FOR LANDING. ENGINE QUIT DUE TO LEAN MIXTURE. LANDED SHORT OF AIRPORT IN A SWAMP.														
810417	WP14	BLANCA	NOVATO	CA		APPR-FINAL	FUEL/SYS	CARLS	BSNS	VFR	DAY	PVT	00400	00065	000
4934V	WP14	1730	GNOSS FIELD	31	DRY	FORCED LANDING	MGT/FUEL	MISCL	OTHR	NOWX	CLER	UNKN	00025	01100	000
G	ENGINE QUIT ON DOWNWIND. UNABLE TO START AFTER SWITCHING TANKS.														
810425	WP14	BEECH	NOVATO	CA	RAI	LAND-LVL OFF TOUCH	LVL/OFF	MISTK	PERS	VFR	DSK	PVT	00065	00021	000

DATE / NNUM	DD / ACFT MAKE / ACFT MODEL	CITY / AIRPORT	ST / RWAY	VRST / RWYC	PHASE OF FLIGHT / ACCIDENT TYPE	CAUSAL / CAUSAL	SUPPTF / CONTRF	TFLYP / TFLYS	FLTCP / FLYCS	LTCON / SKCON	CERT / PROF	TMM / TMM90	T90 / TOTHR	FAT / INJ
EVENT	REMARKS													
60498	WP02 23BEECH	GNOSS	13		HARD LAND	FLTCNTL/AIR	MISCL	PLEA	NOWX	CLER	DCTR	00021	00093	000
A	LOW TIME PILOT MADE HARD LANDING WHICH CAUSED SUBSTANTIAL DAMAGE TO AIRCRAFT.													
810511	WP14 CESSNA	NOVATO	CA		TKOF-GRND ROLL	APT/COND	MISTK	BSNS	VFR	NIT	PVT	00630	00052	000
6085A	WP14 172	GNOSS	31		COLL-APT HAZ	OBJECT/AVOID	HAZOBS	OTHR	NOWX	CLER	UNKN	00052	01803	000
A	PILOT ATTEMPTED TO TAKE OFF FROM RUNWAY UNDER CONSTRUCTION. AIRPORT WAS CLOSED.													
810719	WP14 CESSNA	NOVATO	CA		LAND-LVL OFF TOUCH	LAND/UNDER	MISJG	PERS	VFR	DAY	PVT	00089	00007	000
110Y	WP14 140	PRIVATE	04		COLL-OTHER		MISCL	PLEA	NOWX	CLER	OTHR	00007	00343	000
A	AIRCRAFT STRUCK ROCK 600 FEET SHORT OF RUNWAY.													
810719	WP14 GRUMAV	NOVATO	CA		LAND-ROLL FW	32428K	BURST	PERS	VFR	DAY	COM	00150	00040	000
9497L	WP14 AA1A	GNOSS	31		OVERSHOOT	OV/SHOOT		PLEA	NOWX	CLER	UNKN	00040	00780	000
G	LEFT BRAKE FAILED ON LANDING ROLL. RAN OFF END OF RUNWAY INTO A DITCH. BRAKE LINE HAD CRACKED AT B NUT AT WHEEL END													
810903	WP14 GRUMAV	NOVATO	CA		LAND-LVL OFF TOUCH	LVL/OFF	MISTK	PERS	VFR	DAY	PVT	00150	00030	000
45293	WP03 AA59	GNOSS	31	DRY	HARD LAND		MISCL	PLEA	NOWX	CLER	UNKN	00030	00400	000
G	PILOT MADE HARD LANDING CAUSING DAMAGE TO NOSE WHEEL AND PROPELLOR.													
810922	WP14 BBAVIA	NOVATO	CA		LAND-ROLL FW	BRAKE/GRDCTL	UNOPS	PERS	VFR	DAY	COM	00232	00050	000
2584F	WP01 7ECA	GNOSS	31	DRY	DIR CNTL LOOP		MISCL	PLEA	WIND	CLER	OTHR	00025	00763	000
A	LOST CONTROL OF TAILWHEEL TYPE AIRCRAFT ON THE LANDING ROLL. RAN INTO ADJACENT DITCH. STRONG CROSSWIND.													
820313	WP14 CESSNA	NOVATO	CA		LAND-LVL OFF TOUCH	BRAKE/GRDCTL	UNOPS	INST	VFR	DAY	STU	00036	00014	000
63466	WP14 152	GNOSS	31	DRY	DIR CNTL LOOP		WIND	TRNG	NOWX	CLER	UNKN	00014	00036	000
A	STUDENT LOST CONTROL ON TOUCHDOWN. AIRPLANE RAN OFF RUNWAY INTO AN EMBANKMENT. GUSTY CROSWIND.													
820501	WP14 CESSNA	NOVATO	CA		LAND-ROLL FW	DRIFT	UNSKL	PERS	VFR	DAY	PVT	00012	00005	000
5440J	WP02 172N	GNOSS FIELD	31	DRY	NOSE-UP-OVR		MISCL	PLEA	NOWX	CLER	UNKN	00003	00089	000
A	AIRCRAFT LEFT THE RUNWAY WHILE LANDING IN A CROSSWIND. PILOT WAS UNABLE TO CORRECT. AIRPLANE NOSED OVER IN A DITCH.													
830515	WP14 BEECH	SAN RAFAEL	CA		APPR-FINAL VFR	COLLIDE/APP	UNSIT	PERS	VFR	DAY	COM	00012	00009	000
8512M	WP14 P35BEECH	SMITH RANCH	22	DRY	COLL-OTHER	MISC/THDPTY	MISCL	PLEA	NOWX	CLER	PILT	00009	00909	001
A	STRUCK A MOWING MACHINE OPERATOR ON LANDING. PILOT UNAWARE OF IMPACT OF OPERATOR AND THE LEFT WING.													
830522	WP14 PIPER	NOVATO	CA		LAND-LVL OFF TOUCH	GEAR/NONE	CARLS	PERS	VFR	DAY	PVT	00020	00081	000
193P	WP14 PA24400	GNOSS	31		WHEELS UP		MISCL	PLEA	NOWX	CLER	UNKN	00020	01400	000
G	DISTRACTED BY TRAFFIC LANDED GEAR UP.													
830730	WP14 PIPER	NOVATO	CA		LAND-ROLL FW	BRAKE/GRDCTL	MISTK	PERS	VFR	DAY	PVT	00057	00009	000
2510U	WP14 PA28RT201T	GNOSS FIELD	13	DRY	COLL-OTHER		MISCL	PLEA	NOWX	CLER	OTHR	00009	00128	000
A	AFTER LANDING AND DURING RAISING THE FLAPS PILOT INADVERTENTLY APPLIED BRAKES CAUSING LOSS OF DIRECTIONAL CONTROL.													
830906	WP14 CESSNA	NOVATO	CA		TKOF-GRND ROLL	BRAKE/GRDCTL	CALCR	PERS	VFR	DAY	PVT	00073	00035	000
2333E	WP12 172N	GNOSS	31	DRY	DIR CNTL LOOP		WIND	FERY	WIND	CLER	OTHR	00012	00430	000
A	PILOT LOST DIRECTIONAL CONTROL OF AIRCRAFT DURING ATTEMPTED TAKEOFF IN CROSSWIND.													
831108	WP14 CESSNA	NOVATO	CA		TKOF-ABORTED	TKOF/DELAY	MISJG	PERS	VFR	DAY	PVT	00175	00014	000
6317Y	WP14 T210N	GNOSS	31	DRY	COLL-OTHER		MISCL	PLEA	NOWX	SCAT	UNKN	00014	00600	000
G	ABORTED TAKEOFF. RAN OFF END OF RUNWAY. STRUCK A SMALL DITCH. DID NOT FEEL THE ENGINE WAS DEVELOPING FULL POWER.													

DATE / NNUM	DO / PRDO	ACFT MAKE / ACFT MODEL	CITY / AIRPORT	ST / RWAY	VRST / RWYC	PHASE OF FLIGHT / ACCIDENT TYPE	CAUSAL / CAUSAL	SUPPTF / CONTRF	TFLYP / TFLYS	FLTCP / FLYCS	LTCON / SKCON	CERT / PROF	TMM / TMM90	T90 / TOTHR	FAT / INJ
EVENT REMARKS															
840311	WP14	PIPER	NOVATO	CA		LAND-LVL OFF TOUCH LVL/OFF		UNSKL	PERS	VFR	DAY	PVT	00006	00020	000
8439N	WP02	PA34220T	GNOSS	31		HARD LAND		MISCL	PLEA	NOWX	BRKN	UNKN	00006	00610	000
G	BOUNCED 12 FEET HIGH ON LANDING. CAME DOWN RIGHT WING LOW AND PORPOISED. DAMAGED PROP AND BLEW A TIRE.														
840328	WP14	CESSNA	NOVATO	CA		LAND-LVL OFF TOUCH LVL/OFF		MISJG	PERS	VFR	NIT	PVT	00004	00005	000
9614Y	WP02	210				HARD LAND		MISCL	PLEA	NOWX	CLER	OTHR	00002	00132	000
A	AIRCRAFT BOUNCED HARD DURING LANDING CAUSING PILOT TO LOSE DIRECTIONAL CONTROL.														
840328	WP14	PIPER	NOVATO	CA		CRUISE-FCD/PREC LD PLAN/FUELQT		CARLS	PERS	VFR	NIT	PVT	00035	00013	000
8285E	WP14	PA28181				CNTLD COLL		EMLAND	PLEA	NOWX	CLER	OTHR	00007	00247	000
A	CRASH OCCURRED DURING EMERGENCY LANDING IN BAY AFTER ENGINE QUIT FROM FUEL EXHAUSTION.														
840525	WP14	PIPER	NOVATO	CA		LAND-ROLL FW	PLAN/ACPERF	MISJG	PERS	VFR	DAY	PVT	00044	00019	000
5693H	WP05	PA16	GNOSS	31	DRY	DIR CNTL LOOP	BRAKE/GRDCTL	WIND	PLEA	WIND	CLER	ENGR	00019	00069	000
A	STRONG GUSTY CROSSWINDS EXCEED CONTROL CAPABILITY ON ROLLOUT. WEATHERVANED, OFF SIDE OF RUNWAY, STRUCK VASI LIGHT.														
840718	WP14	PIPER	NOVATO	CA		LAND-ROLL FW	3211SXAH	CRACK	INST	VFR	DAY	CPF	00500		000
25732	WP14	PA38112	GNOSS FIELD		DRY	GEAR COLL			TRNG	NOWX	CLER	PILT	00050	02500	000
G	MAIN LANDING GEAR COLLAPSED ON ROLLOUT. FOUND RETAINING BOLT ON LEFT MAIN GEAR BROKEN.														
850329	WP14	PIPER	NOVATO	CA		LAND-LVL OFF TOUCH	3260SYND	CORSN	PERS	VFR	DAY	PVT	00096	00038	000
6012P	WP14	PA24250	GNOSS	31	DRY	WHEELS UP	GEAR/POSCK		PLEA	NOWX	CLER	OTHR	00038	00680	000
A	FAILED TO CHECK GEAR DOWN LIGHT. GEAR MOTOR WORKING BUT CIRCUIT BREAKER POPPED. GEAR LIGHT WIRE CORRODED, BURNED.														
850511	WP14	CESSNA	SAN RAFAEL	CA		LAND-LVL OFF TOUCH	GEAR/NONE	CARLS	PERS	VFR	DAY	PVT	01755	00012	000
22468	WP14	T210J	SMITH RANCH	22		WHEELS UP		MISCL	PLEA	NOWX		UNKN	00012	02130	000
G	PILOT FAILED TO EXTEND GEAR FOR LANDING AND DID NOT HEAR GEAR WARNING HORN. LANDED GEAR UP.														
850522	WP14	BEECH	NOVATO	CA		GRND GRD TAXI	UNSAFE/COND	LASUP	EXEC	UNK	DAY	ATP	07000	00030	000
9298G	WP01	C90	GNOSS		DRY	COLL-APT HAZ	TERRAIN/UNSU	MISCL	OTHR	NOWX		PILT	00030	11000	000
G	NOSEWHEEL DROPPED INTO UNCOVERED HOLE DURING TAXI. DAMAGE TO NOSEWHEEL, STRUT AND PROPELLERS.														
850716	WP14	CESSNA	NOVATO	CA		LAND-LVL OFF TOUCH PROC/INST		CARLS	PERS	UNK	NIT	PVT			000
6348F	MM64	182P	GNOSS			OTHER		MISCL	PLEA	NOWX		UNKN			000
G	BECAME OVERDUE ON VFR FLIGHT PLAN. PILOT FAILED TO CLOSE FLIGHT PLAN.														
850725	WP04	CESSNA	SAN RAFAEL	CA		LAND-LVL OFF TOUCH	GEAR/NONE	MISTK	PERS	VFR	DAY	COM	00450	00075	000
6127Y	WP02	172RG	SMITH RANCH	22		WHEELS UP		MISCL	PLEA	NOWX		PILT	00075	04150	000
G	PILOT FORGOT TO USE CHECKLIST AND LOWER GEAR FOR LANDING.														
850726	WP14	PIPER	NOVATO	CA		CLIMB-TO CRUISE	ASG/ALT	CARLS	OTHR	UNK	DAY	ATP			000
4341N	WP05	PA46310P				OTHER		MISCL	UNKN	NOWX		PILT			000
G	CLIMBED 400 FEET ABOVE THE ATC ASSIGNED ALTITUDE. LOSS OF SEPARATION FROM OTHER AIRCRAFT.														
860404	WP14	PIPER	NOVATO	CA		TKOF-GRND ROLL			INST						000
91301	WP03	PA38112				DIR CNTL LOOP			TRNG						000
A	LOST CONTROL														
860620	WP14	BEECH	SAN RAFAEL	CA		TKOF-GRND ROLL			PERS				00000	00000	000

DATE NNUM	DO PROD	ACFT MAKE ACFT MODEL	CITY AIRPORT	ST RWAY	VRST RWYC	PHASE OF FLIGHT ACCIDENT TYPE	CAUSAL CAUSAL	SUPPTF CONTRF	TFLYP TFLYS	FLTCP FLYCS	LTCON SKCON	CERT PROF	TMM TMM90	T90 TOTHR	FAT INJ
EVENT REMARKS															
3823A	WP02	A36TC				TURB STRUCTURE/P			PLEA				00000	00000	002
A	HIT DIKE														

APPENDIX E

Gnoss Field - Wind Study

GNOSS FIELD WIND STUDY

JANUARY 1986 - JANUARY 1987

Prepared for

MARIN COUNTY

Prepared by

CORTRIGHT & SEIBOLD

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113 G Street, Suite 203
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415:754-6965

April, 1987

GNOSS FIELD WIND STUDY, JANUARY 1986 - JANUARY 1987

INTRODUCTION

As part of developing an updated Airport Master Plan for Marin County Airport (Gnoss Field), the Public Works Department of Marin County retained Cortright & Seibold to purchase, construct field facilities, and install wind monitoring and recording equipment at Gnoss Field. The purpose of this project was to: 1) collect accurate and up-to-date wind direction and velocity information for the Airport master planning study and 2) to provide the Airport Manager with real-time wind information that could be provided over the unicom frequency to pilots.

This report presents the results of the year-long wind study, as well as summary tabulations of the data for use in preparing the Airport Master Plan.

MONITORING LOCATION

The wind monitoring field instrumentation was installed on a 15-foot tower along the edge of the old crosswind runway approximately 500 feet east of the threshold for Runway 31. This site was selected because it was in an undeveloped area of the Airport property and was also in the approximate location anticipated for the construction of a new crosswind runway if the study results justified this project.

DEFINITION OF CROSSWINDS

The following definition of "crosswinds" is paraphrased from FAA Advisory Circular 150/5300-4B:

A crosswind component of wind direction and velocity is the resultant vector which acts at a right angle (90-degree angle) to the runway alignment. It is equal to the wind speed multiplied by the trigonometric sine of the angle between the wind direction and the runway alignment.

For general aviation airports, the 12 miles per hour, or 10.5-knot wind vector has been determined by FAA to be the critical value for most general aviation aircraft and private pilots of average flying skills.

Due to the recording capabilities of the wind monitoring equipment used for the Gnoss Field study, a breakpoint at 10 knots was selected for the analysis of wind conditions.

Wind coverage is that percent of time for which aircraft operations are safe due to acceptable crosswind components. FAA standards are for crosswind coverage at a general aviation airport to be 95% or more on the available runway(s). Where a single runway can not be oriented to provide 95% coverage, one or more additional runways are required to raise the coverage to 95% or more.

DATA COLLECTED

The following Tables 1, 2, 3, and 4 summarize the wind direction and velocity data collected at Gnoss Field:

Table 1 - Wind direction versus average hourly speed in knots
Table 2 - Wind direction versus average hourly speed in percent
Table 3 - Wind direction versus peak hourly speed in knots
Table 4 - Wind direction versus peak hourly speed in percent

Table 1

WIND DIRECTION VERSUS AVERAGE WIND SPEED
01-19-86 TO 01-31-87
Gnoss Field

Magnetic Wind Direction	Hourly Average Observations of Wind Speed (knots)							
	0-10	11-16	17-21	22-27	28-33	34-40	41+	Total
01	106	1						107
02	99	5						104
03	145	6						151
04	102	4						106
05	78	2						80
06	192	2			1			195
07	118							118
08	132	5						137
09	268	7	1					276
10	202	6						208
11	198	6						204
12	261	7						268
13	183	13	1		1			198
14	185	6	1					192
15	309	11	1					321
16	220	10						230
17	266	9						275
18	338	7	1					346
19	182	10						192
20	167	14	1	2				184
21	309	44	2					355
22	216	42		3				261
23	199	38						237
24	245	15		1				261
25	134	21		1				156
26	135	27	4	5				171
27	191	28	2					221
28	160	23	1	2				186
29	152	14	1	2				169
30	249	46	1	2				298
31	264	49	1					314
32	401	48						449
33	553	28			1			582
34	408	31		1				440
35	180	21	1	2		1		205
36	162	15		3				180
Totals =	7709	621	19	24	3	1	0	8377

123:gftl:

Table 2

WIND DIRECTION VERSUS PERCENT AVERAGE WIND SPEED
01-19-86 to 01-31-87
Gnoss Field

Magnetic Wind Direction	Hourly Average Observations of Wind Speed (knots)							
	0-10	11-16	17-21	22-27	28-33	34-40	41+	Total
01	1.3	0.0						1.28
02	1.2	0.1						1.24
03	1.7	0.1						1.80
04	1.2	0.0						1.27
05	0.9	0.0						0.95
06	2.3	0.0			0.0			2.33
07	1.4							1.41
08	1.6	0.1						1.64
09	3.2	0.1	0.0					3.29
10	2.4	0.1						2.48
11	2.4	0.1						2.44
12	3.1	0.1						3.20
13	2.2	0.1	0.0		0.0			2.33
14	2.2	0.1	0.0					2.29
15	3.7	0.1	0.0					3.82
16	2.6	0.1						2.75
17	3.2	0.1						3.28
18	4.0	0.1	0.0					4.13
19	2.2	0.1						2.29
20	2.0	0.2	0.0	0.0				2.20
21	3.7	0.5	0.0					4.24
22	2.6	0.5		0.0				3.12
23	2.4	0.5						2.83
24	2.9	0.2		0.0				3.12
25	1.6	0.3		0.0				1.86
26	1.6	0.3	0.0	0.1				2.04
27	2.3	0.3	0.0					2.64
28	1.9	0.3	0.0	0.0				2.22
29	1.8	0.2	0.0	0.0				2.02
30	3.0	0.5	0.0	0.0				3.56
31	3.2	0.6	0.0					3.75
32	4.8	0.6						5.36
33	6.6	0.3			0.0			6.95
34	4.9	0.4		0.0				5.25
35	2.1	0.3	0.0	0.0		0.0		2.45
36	1.9	0.2		0.0				2.15
Totals =	92.0	7.4	0.2	0.3	0.0	0.0	0.0	100.0

123:gft2:

Table 3

WIND DIRECTION VERSUS PEAK WIND SPEED
01-19-86 TO 01-31-87
Gnoss Field

Magnetic Wind Direction	Hourly Peak Observations of Wind Speed (knots)							Total
	0-10	11-16	17-21	22-27	28-33	34-40	41+	
01	79	19	1		1			100
02	81	27	2	2				112
03	115	20	1	1				137
04	92	8	1	2				103
05	57	13						70
06	130	9						139
07	95	23		1				119
08	96	26	1	1				124
09	209	56	3	3	1			272
10	163	40	1		1			205
11	152	39	1	1				193
12	179	50		4	1			234
13	120	54	1	8		1		184
14	121	50	1	10	1			183
15	220	33	2	6			1	262
16	182	39	4	7		1	1	234
17	226	21	3	6		6	2	264
18	295	40	5	12	1	2		355
19	166	40	3	17	3	4	1	234
20	107	61	5	15	3	4	2	197
21	147	200	19	38		5		409
22	69	131	24	42	3		1	270
23	59	114	16	32	2		1	224
24	109	121	14	31	2	2		279
25	49	50	8	29	2		1	139
26	49	49	7	38	2	2		147
27	64	67	11	23		1		166
28	47	53	10	23	2	2	1	138
29	73	49	9	28		1		160
30	159	112	10	16	1		1	299
31	165	128	19	28	1			341
32	300	220	9	5	1	1		536
33	444	192	15	6	1			658
34	323	162	8	12				505
35	178	49	8	6	1	1		243
36	114	21	2	5				142
Totals =	5234	2386	224	458	30	33	12	8377

123:gft3:

Table 4

WIND DIRECTION VERSUS PERCENT PEAK WIND SPEED
01-19-86 to 01-31-87

Magnetic Direction	Hourly Peak Observations of Wind Speed (knots)							
	0-10	11-16	17-21	22-27	28-33	34-40	41+	Total
01	0.9	0.2	0.0		0.0			1.19
02	1.0	0.3	0.0	0.0				1.34
03	1.4	0.2	0.0	0.0				1.64
04	1.1	0.1	0.0	0.0				1.23
05	0.7	0.2						0.84
06	1.6	0.1						1.66
07	1.1	0.3		0.0				1.42
08	1.1	0.3	0.0	0.0				1.48
09	2.5	0.7	0.0	0.0	0.0			3.25
10	1.9	0.5	0.0		0.0			2.45
11	1.8	0.5	0.0	0.0				2.30
12	2.1	0.6		0.0	0.0			2.79
13	1.4	0.6	0.0	0.1		0.0		2.20
14	1.4	0.6	0.0	0.1	0.0			2.18
15	2.6	0.4	0.0	0.1			0.0	3.13
16	2.2	0.5	0.0	0.1		0.0	0.0	2.79
17	2.7	0.3	0.0	0.1		0.1	0.0	3.15
18	3.5	0.5	0.1	0.1	0.0	0.0		4.24
19	2.0	0.5	0.0	0.2	0.0	0.0	0.0	2.79
20	1.3	0.7	0.1	0.2	0.0	0.0	0.0	2.35
21	1.8	2.4	0.2	0.5		0.1		4.88
22	0.8	1.6	0.3	0.5	0.0		0.0	3.22
23	0.7	1.4	0.2	0.4	0.0		0.0	2.67
24	1.3	1.4	0.2	0.4	0.0	0.0		3.33
25	0.6	0.6	0.1	0.3	0.0		0.0	1.66
26	0.6	0.6	0.1	0.5	0.0	0.0		1.75
27	0.8	0.8	0.1	0.3		0.0		1.98
28	0.6	0.6	0.1	0.3	0.0	0.0	0.0	1.65
29	0.9	0.6	0.1	0.3		0.0		1.91
30	1.9	1.3	0.1	0.2	0.0		0.0	3.57
31	2.0	1.5	0.2	0.3	0.0			4.07
32	3.6	2.6	0.1	0.1	0.0	0.0		6.40
33	5.3	2.3	0.2	0.1	0.0			7.85
34	3.9	1.9	0.1	0.1				6.03
35	2.1	0.6	0.1	0.1	0.0	0.0		2.90
36	1.4	0.3	0.0	0.1				1.70
Totals =	62.5	28.5	2.7	5.5	0.4	0.4	0.1	100

123:gft4:

Of a total 8,760 hours in the year, 8,377 hours of valid wind data was collected. Some data was not recorded due to malfunctions of the chart recorder. In total, 96% of all possible hours in the year were successfully recorded, giving enough data for valid statistical analysis.

Table 5 and Table 6 present a summary of the data which shows the percentage of the time the wind velocity was less than 10 knots and over 10 knots. For the average hourly observations (Table 5), the total amount of time the wind velocity was over 10 knots was 7.97%. For the peak hourly observations (Table 6), the total amount of time the wind velocity was over 10 knots was 45.49%. This indicates that the peak hourly wind velocity is very often well above the hourly averages at Gnoss Field.

Table 7 presents an tabulation of average wind velocity/direction and peak wind velocity/direction data from a statistical standpoint. The annual average wind velocities and directions were computed, as well as the standard deviations. The results show that the peak gusts are over twice the hourly averages, 7.50 and 3.31 knots, respectively. The analysis also shows that the wind direction is very similar for average hourly and peak hourly conditions -- 185.95 degrees for the average recordings and 186.24 degrees for the peak recordings.

What is more important is the standard deviation of the wind direction data. The standard deviation for the average hourly recordings is 58.69 degrees and for the peak hourly recordings it is 63.20 degrees. The average of the standard deviations is 60.95 degrees. This means that their is a 67% probability of the wind direction at any one time being within a directional range of 125 degrees to 247 degrees (magnetic).

It is noted that the alignment of the existing Runway 13-31 just barely falls within the plus or minus one standard deviation range for the data recorded for this study. This indicates that

Table 5

AVERAGE WIND SPEEDS ABOVE 10 KNOTS
Gnoss Field

From	To	Hourly Entries	Entries > 10	% > 10
01-19-86	02-28-86	878	29	3.3
03-01-86	03-31-86	723	4	0.55
04-01-86	04-30-86	625	8	1.28
05-01-86	05-31-86	656	6	0.91
06-01-86	06-30-86	625	84	13.44
07-01-86	07-31-86	594	4	0.67
08-01-86	08-31-86	734	44	5.99
09-01-86	09-31-86	702	88	12.54
10-01-86	10-31-86	735	135	18.37
11-01-86	11-31-86	717	112	15.62
12-01-86	12-31-86	650	21	3.23
01-01-87	01-31-87	738	133	18.02
Total Entries =		8377.00		
Total Entries > 10 =			668.00	
% > 10 =				7.97

123:gft5:

Table 6

PEAK WIND SPEEDS ABOVE 10 KNOTS
Gnoss Field

From	To	Hourly Entries	Entries > 10	% > 10
01-19-86	02-28-86	878	356	40.54
03-01-86	03-31-86	723	303	41.91
04-01-86	04-30-86	625	272	43.52
05-01-86	05-31-86	656	325	49.54
06-01-86	06-30-86	625	429	68.64
07-01-86	07-31-86	594	258	43.43
08-01-86	08-31-86	734	318	43.32
09-01-86	09-31-86	702	400	56.98
10-01-86	10-31-86	735	361	49.12
11-01-86	11-31-86	717	315	43.93
12-01-86	12-31-86	650	103	15.85
01-01-87	01-31-87	738	371	50.27
	Total Entries =	8377.00		
	Total Entries > 10 =		3811.00	
	% > 10 =			45.49

123:gft6:

Table 7

STANDARD DEVIATION OF WIND SPEED AND DIRECTION
Gnoss Field

From	To	Hourly Average Velocity (knots)	Hourly Average Direction (degrees)	Peak Average Velocity (knots)	Peak Average Direction (degrees)
01-19-86	02-28-86	3.24	196.71	10.20	206.38
03-01-86	03-31-86	2.85	219.82	9.14	227.11
04-01-86	04-30-86	2.94	234.40	9.44	240.16
05-01-86	05-31-86	2.95	176.17	8.89	186.20
06-01-86	06-30-86	4.29	188.86	9.20	192.60
07-01-86	07-31-86	2.49	177.33	7.55	118.18
08-01-86	08-31-86	3.41	219.52	8.41	222.00
09-01-86	09-30-86	4.38	210.79	8.64	211.79
10-01-86	10-31-86	4.84	234.31	7.16	242.83
11-01-86	11-30-86	4.24	219.92	6.90	227.65
12-01-86	12-31-86	2.54	151.72	4.32	159.03
01-01-87	01-31-87	4.91	187.76	7.70	187.13
	Average =	3.31	185.95	7.50	186.24
Standard	Deviation =	1.26	58.69	2.60	63.20

123:gft7:

Runway 13-31 is probably not correctly aligned with the most common wind directions at this location and tends to support the opinion of pilots using the Airport that a crosswind problem does exist.

CROSSWIND COVERAGE

Using the methodology set forth by FAA in AC 150/5300-4B, an analysis of the crosswind coverage at Gnoss Field for the Runway 13-31 and several other potential crosswind runway alignments was developed. The results of this analysis are presented in Table 8.

As indicated, when using only the average hourly wind direction and velocity data, almost any runway alignment would give 95% or better crosswind coverage. However, the hourly average values are of little importance to a pilot trying to land or takeoff. What is more important is the peak wind velocity and direction.

When the peak hourly observations are evaluated for crosswind coverage, a different picture results. Using this data, it was determined that no single runway alignments by itself, including the existing Runway 13-31, provides anywhere near 95% crosswind coverage. In fact, it requires a combination of two alignments, approximately at right angles to each other, to achieve better than 95% crosswind coverage at this location.

The best combination of runway alignments which did provide more than 95% coverage was the existing Runway 13-31 and a second alignment of approximately 030-210 degrees magnetic. This combination of alignments provides 96.7% crosswind coverage at 10 knots.

For this reason, the crosswind runway alignment adopted for the master planning study was the 030-210 degree alignment.

Table 8

PERCENT CROSSWIND COVERAGE
Gnoss Field

Magnetic Runway Alignment (degrees)		Average Hourly Wind Vectors (percent)	Peak Hourly Wind Vectors (percent)
130-310		97.8	84.3
169-340		97.6	82.7
030-210		96.4	80.9
130-310 & 160-340	combined	--	89.6
130-310 & 030-210	combined	--	96.7

123:gft8:

APPENDIX F

General Aviation Aircraft

CURRENT AIRCRAFT ARRANGED BY AIRPLANE DESIGN GROUP

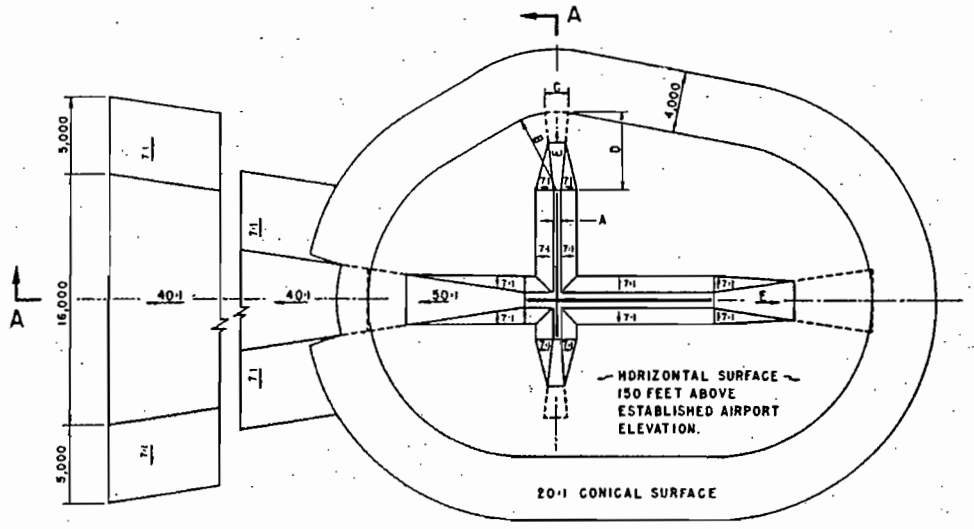
Aircraft	Appch Speed Knots	Wingspan Feet	Wingspan Meters	Length Feet	Length Meters	Tail Height Feet	Tail Height Meters	Maximum Takeoff Weight Lbs	Maximum Takeoff Weight Kg
AIRCRAFT APPROACH CATEGORY A AND B SMALL AIRPLANES IN AIRPLANE DESIGN GROUP I									
Beech Skipper 77	63	30.0	9.1	24.0	7.3	6.9	2.1	1,675	759
Foxjet 600	97	31.6	9.6	31.5	9.6	10.2	3.1	4,449	2,018
Beech Sierra C24R	70	32.8	9.9	25.8	7.8	8.1	2.4	2,750	1,247
Beech Sundowner C23	68	32.8	9.9	25.8	7.8	8.3	2.5	2,450	1,111
Cessna-150	55	33.3	10.1	24.1	7.3	8.5	2.6	1,670	757
Beech Bonanza V35B	70	33.5	10.2	26.4	8.0	7.6	2.3	3,400	1,542
Beech Bonanza F33A	70	33.5	10.2	26.7	8.1	8.3	2.5	3,400	1,542
Beech Bonanza A36	72	33.5	10.2	27.5	8.3	8.4	2.5	3,600	1,632
AJI Hustler	98	34.3	10.5	41.0	12.5	13.1	4.0	9,500	4,309
Cessna-177	64	35.5	10.8	27.2	8.3	8.6	2.6	2,500	1,134
Embraer-326	102	35.6	10.9	35.0	10.7	12.2	3.7	11,500	5,216
Piper Aerostar	94	36.7	11.2	34.8	10.6	12.1	3.7	6,000	2,722
Beech Bonanza B36TC	75	37.8	11.5	27.5	8.3	8.4	2.5	3,850	1,723
Beech Baron 58P	101	37.8	11.5	29.9	9.1	9.1	2.7	6,200	2,812
Beech Baron 58TC	101	37.8	11.5	29.9	9.1	9.1	2.7	6,200	2,812
Beech Baron E55	88	37.8	11.5	29.9	9.1	9.1	2.8	5,300	2,404
Beech Baron 58	96	37.8	11.5	29.9	9.1	9.5	2.8	5,400	2,449
Beech Baron B55	90	37.8	11.5	28.0	8.5	9.6	2.9	5,100	2,313
Beech Duchess 76	76	38.0	11.5	29.0	8.8	9.5	2.9	3,900	1,769
Mitsubishi Solitaire	87	39.1	11.9	33.2	10.1	12.9	3.9	10,470	4,749
Mitsubishi Marquise	88	39.1	11.9	39.4	12.0	13.6	4.1	11,575	5,250
Mitsubishi MU-2	119	39.1	11.9	39.5	12.0	13.6	4.1	10,800	4,899
Beech Duke B60	98	39.3	11.9	33.8	10.3	12.3	3.7	6,775	3,073
Partenavia 68B Victor	73	39.4	12.0	30.7	9.4	11.2	3.4	4,321	1,960
Learfan 2100	86	39.9	12.2	38.7	11.8	11.5	3.5	7,200	3,266
Embraer-820	74	40.7	12.4	34.6	10.5	13.0	4.0	7,000	3,175
Piper Navajo	100	40.7	12.4	32.6	9.9	13.0	4.0	6,500	2,948
Cessna-421	96	41.1	12.5	36.4	11.1	12.9	3.9	7,500	3,402
Piper Cheyenne	110	42.7	13.0	32.1	9.8	12.6	3.8	10,500	4,763
Cessna-402	95	44.1	13.4	36.3	11.1	11.4	3.5	6,850	3,107
Cessna-414	94	44.1	13.4	36.4	11.1	11.5	3.5	6,785	3,078
Beech C99 Airliner	107	45.9	13.9	44.5	13.5	14.4	4.3	11,300	5,125
Beech King Air F90	108	45.9	13.9	39.8	12.1	15.1	4.6	10,950	4,966
Beech King Air B100	111	45.9	13.9	39.9	12.1	15.4	4.6	11,800	5,352
Hamilton Westwind	96	46.0	14.0	45.0	13.7	9.2	2.8	12,495	5,668
Volpar Turbo 18	100	46.0	14.0	37.4	11.4	9.6	2.9	10,286	4,666
Cessna-404	92	46.3	14.1	39.5	12.0	13.3	4.1	8,450	3,833
Swearingen Merlin	105	46.3	14.1	42.2	12.9	16.8	5.1	12,500	5,670
Swearingen Metro	112	46.3	14.1	59.4	18.1	16.8	5.1	12,500	5,670
Rockwell 690	97	46.5	14.2	44.3	13.5	15.0	4.6	10,250	4,649
Cessna Citation I	108	47.1	14.4	43.5	13.3	14.3	4.4	11,850	5,375
Embraer-121	92	47.4	14.4	40.2	12.3	15.9	4.8	12,500	5,670
Lapan XT-400	75	47.9	14.6	33.5	10.2	14.1	4.3	5,555	2,520
DeH DHC-2	50	48.0	14.6	30.3	9.2	9.0	2.7	5,100	2,313
Piaggio P-166 Portofino	82	48.2	14.7	39.2	11.9	16.4	5.0	9,480	4,300

Aircraft	Appch Speed Knots	Wingspan Feet	Wingspan Meters	Length Feet	Length Meters	Tail Height Feet	Tail Height Meters	Maximum Takeoff Weight Lbs	Maximum Takeoff Weight Kg
AIRCRAFT APPROACH CATEGORY A AND B LARGE AIRPLANES IN AIRPLANE DESIGN GROUP I									
Learjet 28/29	120	42.2	12.9	45.0	13.7	12.6	3.8	15,000	6,804
SN-600 Corvette	118	42.2	12.9	45.4	13.8	13.9	4.2	14,550	6,600
Breguet FAL-10	104	42.9	13.1	45.5	13.9	15.1	4.6	18,740	8,500
Mitsubishi Diamond MU-300	100	43.3	13.2	48.3	14.7	13.7	4.2	13,890	6,300
Piaggio PD-808	117	43.3	13.2	42.2	12.9	15.8	4.8	18,300	8,301
Rockwell Sabre 40	120	44.4	13.5	43.8	13.4	16.0	4.9	18,650	8,459
AIRCRAFT APPROACH CATEGORY C AND D AIRPLANES IN AIRPLANE DESIGN GROUP I									
Learjet 24	128	35.6	10.9	43.2	13.2	12.6	3.8	13,500	6,123
Learjet 25	137	35.6	10.9	47.6	14.5	12.6	3.8	15,000	6,804
Learjet 35A/36A	143	39.6	12.1	48.6	14.8	12.6	3.8	18,000	8,165
Rockwell JC1121	130	43.3	13.2	50.4	15.4	15.8	4.8	16,800	7,620
Learjet 54-55-56	128	43.8	13.4	55.1	16.8	14.8	4.5	20,500	9,299
Rockwell Sabre 75A	137	44.7	13.6	47.2	14.4	17.2	5.2	23,000	10,433
IAI-1124 Westwind	129	44.8	13.7	52.3	15.9	15.8	4.8	23,650	10,727
HS-125-1/400	124	47.0	14.3	47.4	14.4	16.5	5.0	26,500	12,020
HS-125-600	125	47.0	14.3	50.5	15.4	17.3	5.3	25,000	11,340
HS-125-700	125	47.0	14.3	50.7	15.5	17.6	5.4	25,000	11,340
Hansa HAB-320	125	47.5	14.5	54.5	16.6	16.2	4.9	20,280	9,199
AIRCRAFT APPROACH CATEGORY A AND B AIRPLANES IN AIRPLANE DESIGN GROUP II									
Beech E-18	87	49.2	15.0	35.1	10.7	10.5	3.2	8,750	3,969
Cessna-441	100	49.3	15.0	39.0	11.9	13.1	4.0	9,850	4,468
Pilatus PC-6 Porter	57	49.7	15.1	37.4	11.4	10.5	3.2	4,850	2,200
Volpar Centennial	88	50.0	15.2	51.9	15.8	16.5	5.0	12,500	5,670
Beech King Air C90-1	100	50.3	15.3	35.5	10.8	14.3	4.3	9,650	4,377
Embraer-110	92	50.3	15.3	49.5	15.1	15.5	4.7	12,500	5,670
Rockwell Sabre 60	120	50.4	15.4	46.9	14.3	16.0	4.9	20,172	9,150
Rockwell Sabre 65	105	50.4	15.4	46.9	14.3	16.0	4.9	24,000	10,886
Cessna Citation III	114	50.6	15.4	51.6	15.7	17.0	5.2	17,000	7,711
Dornier DO-28	74	51.0	15.5	37.5	11.4	12.8	3.9	8,853	4,016
Cessna Citation II	108	51.6	15.7	47.2	14.4	14.8	4.5	13,300	6,033
HP Jetstream	99	52.0	15.8	47.1	14.4	17.5	5.3	12,566	5,700
Rockwell 840	98	52.1	15.9	42.9	13.1	14.9	4.5	10,325	4,683
BN-2A Trislander	65	53.0	16.2	49.3	15.0	14.2	4.3	10,000	4,536
Breguet FAL-20	107	53.5	16.3	56.3	17.2	17.4	5.3	28,660	13,000
Nomad N-22	69	54.0	16.5	41.2	12.6	18.1	5.5	8,500	3,856
Nomad N-24	73	54.0	16.5	47.1	14.4	18.1	5.5	9,400	4,264
Beech 1900 Airliner	120*	54.5	16.6	57.8	17.6	14.9	4.5	15,245	6,915
Beech Super King Air B200	103	54.5	16.6	43.8	13.3	15.0	4.5	12,500	5,670
Yu Shi-11	80*	55.7	17.0	39.4	12.0	15.1	4.6	7,150	3,243
DeH Dove-104	84	57.0	17.4	39.5	12.0	13.3	4.1	8,950	4,060
Dornier LTA	74*	58.4	17.8	54.4	16.6	18.2	5.5	15,100	6,849
PZL-AN-2	54	59.7	18.2	40.7	12.4	13.1	4.0	12,125	5,500
Breguet FAL-50	113	61.9	18.9	60.8	18.5	22.9	7.0	38,480	17,454
Casa C-212 Aviocar	81	62.3	19.0	50.0	15.2	21.0	6.4	13,889	6,300

Aircraft	Appch Speed Knots	Wingspan Feet	Wingspan Meters	Length Feet	Length Meters	Tail Height Feet	Tail Height Meters	Maximum Tafeoff Weight Lbs	Maximum Tafeoff Weight Kg
Air Metal C-111	96	63.0	19.2	55.2	16.8	21.0	6.4	18,629	8,450
LET L-410	81	63.9	19.5	47.4	14.4	19.1	5.8	12,566	5,700
Dolphin IA-50	101	64.1	19.5	48.8	14.9	19.1	5.8	16,200	7,348
DeH DHC-6	75	65.0	19.8	51.8	15.8	19.5	5.9	12,500	5,670
Ahrens 404	98	66.0	20.1	52.8	16.1	17.5	5.3	17,000	7,711
IAI Arava-201	81	68.8	21.0	42.8	13.0	17.1	5.2	15,000	6,804
GAC-100	86	70.0	21.3	67.3	20.5	24.9	7.6	28,900	13,109
Fokker VFW-614	111	70.5	21.5	67.5	20.6	25.6	7.8	44,000	19,958
DeH Heron-114	85	71.5	21.8	45.5	13.9	15.6	4.8	13,500	6,123
NORD-262	96	71.9	21.9	63.3	19.3	20.4	6.2	23,800	10,795
Antonov AN-14	52	72.1	22.0	37.5	11.4	15.2	4.6	7,935	3,599
PZL-AN-28	85	72.2	22.0	42.6	13.0	15.1	4.6	13,450	6,101
Antonov AN-28	88	72.4	22.1	42.6	13.0	15.1	4.6	13,450	6,101
PZL-M-15	62	73.5	22.4	41.8	12.7	17.5	5.3	12,465	5,654
Shorts Skyvan	96	74.7	22.8	58.0	17.7	16.3	5.0	24,000	10,886
Breguet 914S	59	76.7	23.4	77.9	23.7	31.7	9.7	26,500	12,020
Fokker F-28-1000	119	77.4	23.6	89.9	27.4	27.8	8.5	65,000	29,484
Fokker F-28-2000	119	77.4	23.6	97.1	29.6	27.8	8.5	65,000	29,484
Gulfstream I	113	78.5	23.9	64.0	19.5	22.8	6.9	35,100	15,921
AIRCRAFT APPROACH CATEGORY C AND D AIRPLANES IN AIRPLANE DESIGN GROUP II									
Rockwell Sabre 80	128	50.4	15.4	47.2	14.4	17.3	5.3	24,500	11,113
Rockwell 980	121	52.1	15.9	42.9	13.1	14.9	4.5	10,325	4,683
Lockheed 1329-25	132	54.4	16.6	60.4	18.4	20.4	6.2	44,500	20,185
Lockheed SR-71	180	55.6	16.9	112.4	34.3	18.5	5.6	170,000	77,111
Canadair CL-600	125	61.8	18.8	68.4	20.8	20.7	6.3	32,500	14,742
Gulfstream II	141	68.8	21.0	79.9	24.4	24.5	7.5	65,500	29,710
Gulfstream II-TT	142	71.7	21.9	79.9	24.4	24.5	7.5	66,000	29,937
Gulfstream III	136	77.8	23.7	82.7	25.2	23.2	7.1	68,700	31,162

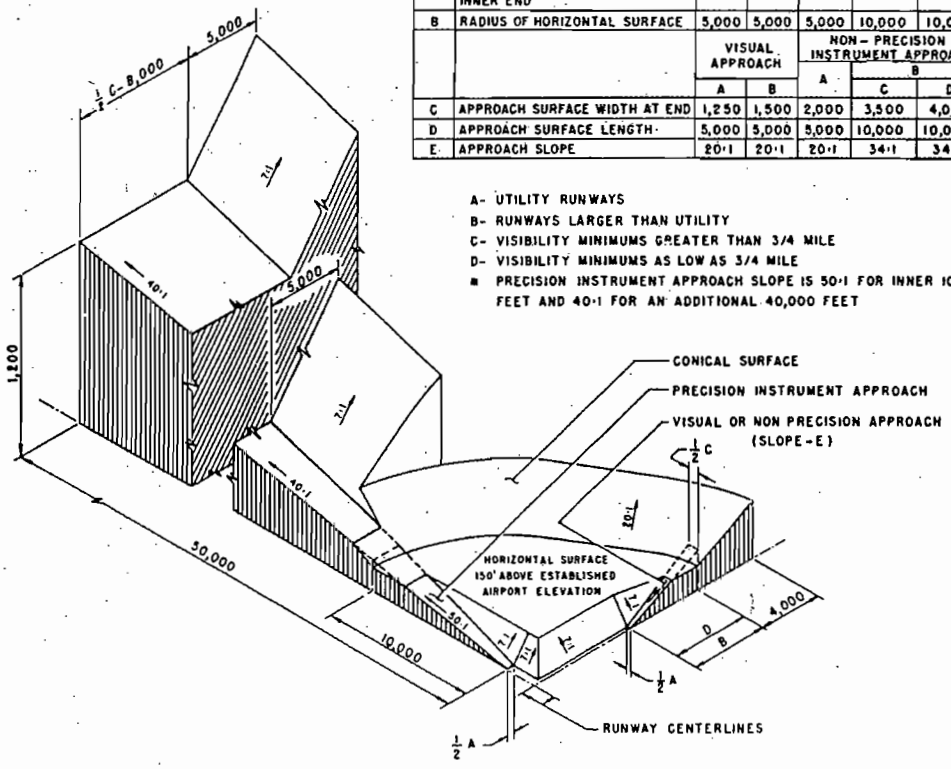
APPENDIX G

FAR Part 77 Criteria



DIM	ITEM	DIMENSIONAL STANDARDS (FEET)					
		VISUAL RUNWAY		NON-PRECISION INSTRUMENT RUNWAY			PRECISION INSTRUMENT RUNWAY
		A	B	A	B C	B D	
A	WIDTH OF PRIMARY SURFACE AND APPROACH SURFACE WIDTH AT INNER END	250	500	500	500	1,000	1,000
B	RADIUS OF HORIZONTAL SURFACE	5,000	5,000	5,000	10,000	10,000	10,000
		VISUAL APPROACH		NON-PRECISION INSTRUMENT APPROACH			PRECISION INSTRUMENT APPROACH
		A	B	A	B C	B D	
C	APPROACH SURFACE WIDTH AT END	1,250	1,500	2,000	3,500	4,000	16,000
D	APPROACH SURFACE LENGTH	5,000	5,000	5,000	10,000	10,000	*
E	APPROACH SLOPE	20:1	20:1	20:1	34:1	34:1	*

A- UTILITY RUNWAYS
B- RUNWAYS LARGER THAN UTILITY
C- VISIBILITY MINIMUMS GREATER THAN 3/4 MILE
D- VISIBILITY MINIMUMS AS LOW AS 3/4 MILE
* PRECISION INSTRUMENT APPROACH SLOPE IS 50:1 FOR INNER 10,000 FEET AND 40:1 FOR AN ADDITIONAL 40,000 FEET



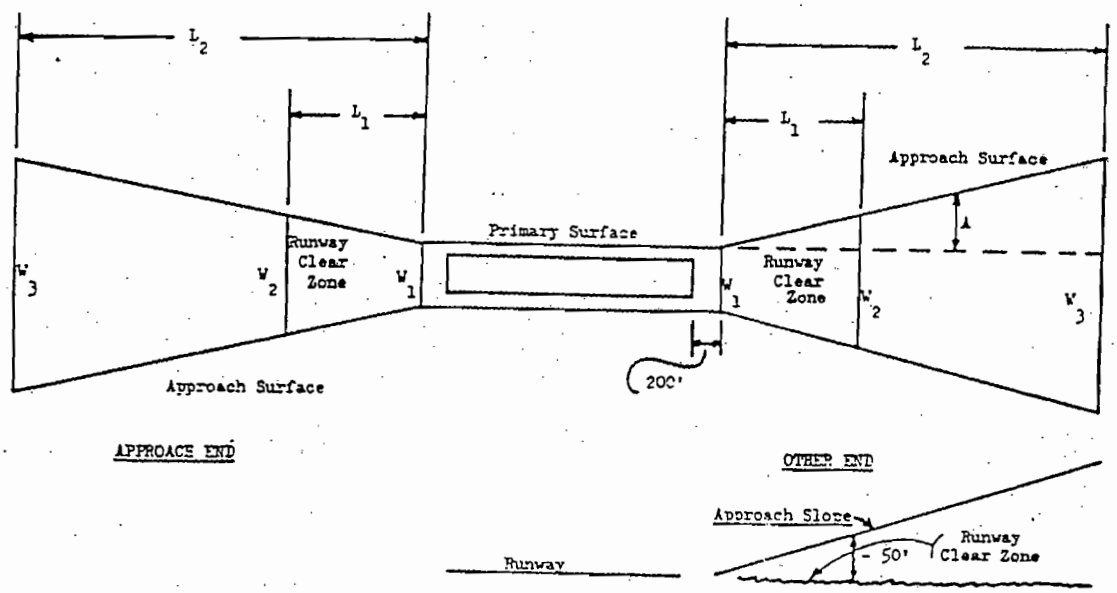
ISOMETRIC VIEW OF SECTION A-A

§ 77.25 CIVIL AIRPORT IMAGINARY SURFACES

APPENDIX H

FAA Clear Zone Criteria

APPENDIX 6. RUNWAY CLEAR ZONE DIMENSIONS



R/W TYPE	SET NO.	RUNWAY END		DIMENSIONS (FEET)							
		APPROACH	OTHER	L 1	L 2	W 1	W 2	W 3	SLOPE	R/W CZ AREA	FLARE RATIO A
UTILITY RUNWAYS	1	V		1,000	5,000	250	450	1,250	20:1	8.035	.1:1
			V	1,000	5,000	250	450	1,250	20:1	8.035	.1:1
	2	V		1,000	5,000	500	650	1,250	20:1	13.200	.075:1
			N.P.	1,000	5,000	500	800	2,000	20:1	14.922	.15:1
	3	N.P.		1,000	5,000	500	800	2,000	20:1	14.922	.15:1
			N.P.	1,000	5,000	500	800	2,000	20:1	14.922	.15:1
OTHER THAN UTILITY RUNWAYS	4	V		1,000	5,000	500	700	1,500	20:1	13.77	.1:1
			V	1,000	5,000	500	700	1,500	20:1	13.77	.1:1
	5	V		1,000	5,000	500	700	1,500	20:1	13.77	.1:1
			N.P. 3/4+	1,700	10,000	500	1,010	3,500	34:1	29.465	.15:1
	6	V		1,000	5,000	1,000	1,100	1,500	20:1	24.105	.05:1
			N.P. 3/4	1,700	10,000	1,000	1,510	4,000	34:1	48.978	.15:1
	7	V		1,000	5,000	1,000	1,100	1,500	20:1	24.105	.05:1
			P	2,500	50,000	1,000	1,750	16,000	50:1/40:1	78.914	.15:1
	8	N.P. 3/4+		1,700	10,000	500	1,010	3,500	34:1	29.465	.15:1
			N.P. 3/4+	1,700	10,000	500	1,010	3,500	34:1	29.465	.15:1
	9	N.P. 3/4+		1,700	10,000	1,000	1,425	3,500	34:1	47.320	.125:1
			N.P. 3/4	1,700	10,000	1,000	1,510	4,000	34:1	48.978	.15:1
	10	N.P. 3/4+		1,700	10,000	1,000	1,425	3,500	34:1	47.320	.125:1
			P	2,500	50,000	1,000	1,750	16,000	50:1/40:1	78.914	.15:1
	11	N.P. 3/4		1,700	10,000	1,000	1,510	4,000	34:1	48.978	.15:1
			N.P. 3/4	1,700	10,000	1,000	1,510	4,000	34:1	48.978	.15:1
	12	N.P. 3/4		1,700	10,000	1,000	1,510	4,000	34:1	48.978	.15:1
			P	2,500	50,000	1,000	1,750	16,000	50:1/40:1	78.914	.15:1
	13	P		2,500	50,000	1,000	1,750	16,000	50:1/40:1	78.914	.15:1
			P	2,500	50,000	1,000	1,750	16,000	50:1/40:1	78.914	.15:1

ABBREVIATIONS USED IN THE ABOVE CHART

V = Visual approach
N.P. = Non-precision approach
N.P. 3/4+ = Non-precision approach with visibility minimums greater than 3/4-mile
N.P. 3/4 = Non-precision approach with visibility minimums as low as 3/4-mile
P = Precision inctrument approach

APPENDIX I

Individual Project Cost Distribution

MARIN STAGE 1 COST DISTRIBUTION
1988

Project	Total	County	FAA	Caltrans	Private
1.1	$10,000		$10,000		
1.2	$10,000		$10,000		
1.3	$5,000	$5,000			
1.4	$1,000	$1,000			
1.5	$125,000	$12,500		$112,500	
1.6					
1.7					
1.8					
1.9					
1.10					
1.11					
1.12					
1.13					
1.14					
1.15					
1.16					
1.18	$37,400	$37,400			
TOTAL =	$188,400	$55,900	$20,000	$112,500	$0

5 April, 1988
123:1988:

MARIN STAGE 1 COST DISTRIBUTION
1989

Project	Total	County	FAA	Caltrans	Private
1.1					
1.2					
1.3	$5,000	$5,000			
1.4					
1.5					
1.6	$250,000	$25,000	$225,000		
1.7	$315,625	$31,563	$284,063		
1.8	$167,500	$16,750	$150,750		
1.9	$1,181,250	$40,997	$368,972		$771,280
1.10	$37,500	$37,500			
1.11					
1.12					
1.13					
1.14					
1.15					
1.16					
1.18	$50,000	$50,000			
TOTAL =	$2,006,875	$206,810	$1,028,785	$0	$771,280

5 April, 1988
123:1989:

MARIN STAGE 1 COST DISTRIBUTION
1990

Project	Total	County	FAA	Caltrans	Private
1.1					
1.2					
1.3	$5,000	$5,000			
1.4					
1.5					
1.6					
1.7					
1.8					
1.9					
1.10					
1.11	$331,875	$33,188	$298,688		
1.12	$2,248,750	$996,343	$1,252,406		
1.13	$300,000	$266,250	$33,750		
1.14	$62,500				$62,500
1.15					
1.16					
1.18	$50,000	$50,000			
TOTAL =	$2,998,125	$1,350,781	$1,584,844	$0	$62,500

5 April, 1988
123:1990:

MARIN STAGE 1 COST DISTRIBUTION
1991

Project	Total	County	FAA	Caltrans	Private
1.1					
1.2					
1.3					
1.4					
1.5					
1.6					
1.7					
1.8					
1.9					
1.10					
1.11					
1.12					
1.13					
1.14					
1.15	$57,500	$5,750		$51,750	
1.16	$250,000	$25,000	$225,000		
1.18	$50,000	$50,000			
TOTAL =	$357,500	$80,750	$225,000	$51,750	$0

5 April, 1988
123:1991:

MARIN STAGE 1 COST DISTRIBUTION
1992

Project	Total	County	FAA	Caltrans	Private
1.1					
1.2					
1.3					
1.4	$1,000	$1,000			
1.5					
1.6					
1.7					
1.8					
1.9					
1.10					
1.11					
1.12					
1.13					
1.14					
1.15					
1.16					
1.17	$571,875	$57,187	$514,688		
1.18	$50,000	$50,000			
TOTAL =	$622,875	$108,187	$514,688	$0	$0

5 April, 1988
123:1992:

MARIN STAGE 1 COST DISTRIBUTION
1993

Project	Total	County	FAA	Caltrans	Private
2.1	$25,000		$25,000		
2.2	$25,000		$25,000		
2.3					
2.4					
2.5	$481,250	$48,125	$433,125		
2.6					
2.7					
2.8	$21,000	$21,000			
TOTAL =	$552,250	$69,125	$483,125	$0	$0

5 April, 1988
123:1993:

MARIN STAGE 1 COST DISTRIBUTION
1994

Project	Total	County	FAA	Caltrans	Private
2.1					
2.2					
2.3	$5,000	$5,000			
2.4					
2.5					
2.6	$850,000	$85,000	$765,000		
2.7					
2.8	$100,000	$100,000			
TOTAL =	$955,000	$190,000	$765,000	$0	$0

5 April, 1988
123:1994:

MARIN STAGE 1 COST DISTRIBUTION
1995

Project	Total	County	FAA	Caltrans	Private
2.1					
2.2					
2.3					
2.4					
2.5					
2.6					
2.7	$2,081,875	$208,187	$1,873,688		
2.8	$100,000	$100,000			
TOTAL =	$2,181,875	$308,187	$1,873,688	$0	$0

5 April, 1988
123:1995:

MARIN STAGE 1 COST DISTRIBUTION
1996

Project	Total	County	FAA	Caltrans	Private
2.1					
2.2					
2.3					
2.4					
2.5					
2.6					
2.7	$2,081,875	$208,188	$1,873,687		
2.8	$100,000	$100,000			
TOTAL =	$2,181,875	$308,188	$1,873,687	$0	$0

5 April, 1988
123:1996:

MARIN STAGE 1 COST DISTRIBUTION
1997

Project	Total	County	FAA	Caltrans	Private
2.1					
2.2					
2.3					
2.4	$1,000	$1,000			
2.5					
2.6					
2.7					
2.8	$100,000	$100,000			
TOTAL =	$101,000	$101,000	$0	$0	$0

5 April, 1988
123:1997:

APPENDIX J

Resolution 89-152

MARIN COUNTY BOARD OF SUPERVISORS

RESOLUTION NO. 89-152

A RESOLUTION ADOPTING THE GNOSS FIELD MASTER PLAN AND PROGRAM ENVIRONMENTAL IMPACT REPORT/ENVIRONMENTAL ASSESSMENT

* *

I. WHEREAS the Marin County Board of Supervisors requested and received grant funding from the Federal Aviation Administration to prepare a Gnoss Field Airport Master Plan and Program EIR/EA; and

II. WHEREAS the Aviation Consultant firm of Cortright and Seibolt and Environmental Consultant Quad Associates was retained to prepare these plans and analyses; and

III. WHEREAS the Gnoss Field Master Plan and EIR/EA were circulated through the State Clearinghouse and the Draft Program EIR for the specified 45 day time period in late 1988; and

IV. WHEREAS, the Marin County Airport Land Use Commission held a public hearing on February 27, 1989 to consider comments on the Master Plan and Draft Program EIR/EA; and

V. WHEREAS the Commission ordered the project consultants to prepare response to comments received on the project according to Section 15090 of the CEQA Guidelines; and

VI. WHEREAS the consultants prepared the Final Program EIR and Response to Comments and the Final Program EIR/EA was circulated with a public Notice of Completion on April 21, 1989; and

VII. WHEREAS the Commission held a public hearing on May 22, 1989 reviewed and recommended Board of Supervisors Approval of the Final Gnoss Field Master Plan and Final Program EIR/EA; and

VIII. WHEREAS the Board of Supervisors held a noticed public hearing to consider the Airport Land Use Commission/Planning Commission recommendation to approve the Gnoss Field Master Plan and to certify the Program EIR/EA, and

IX. WHEREAS after reviewing the administrative record and hearing public testimony, the Board of Supervisors finds that the Gnoss Field Master Plan is consistent with the Marin Countywide Plan Policies specifically Transportation Policy C-5, (CWP pg. 4 and 5) which states that Gnoss Field should be the only civilian airport facility in Marin County; and

X. WHEREAS the Board of Supervisors finds that the Gnoss Field Master Plan is consistent with the current zoning for the airport and adjacent land; and

XI. WHEREAS the Board of Supervisors finds that the Gnoss Field Master Plan is consistent with the Bayfront Conservation Zone Policies of the Countywide Plan providing wetland mitigation, preservation, restoration and enhancement

plans are provided prior to approval of specific project related development; and

XII. WHEREAS the Board of Supervisors finds that the Gnoss Field Master Plan and Program EIR/EA is a long-range conceptual plan which provides guidelines and sets priorities for future airport planning; and

XIII. WHEREAS the Board of Supervisors finds that prior to specific approval of project related development, further environmental and permit review by Local and State and Federal Agencies including but not limited to Marin County, BCDC and the Army Corps of Engineers shall be required; and

XIV. WHEREAS the Board of Supervisors finds that Marin County and the City of Novato are considering a complete land use study of the entire North Novato area and the Gnoss Field Master Plan and Program EIR/EA provides a basis of understanding for future land use planning; and

XV. WHEREAS the Board of Supervisors finds that the Gnoss Field Master Plan and Program EIR/EA provides for several project alternatives to ensure future planning for a safe and convenient public airport which provides public health and safety services such as emergency medical services, while protecting the environment and quality of life for neighbors of the airport.

NOW, THEREFORE, LET IT BE RESOLVED that the Marin County Board of Supervisors hereby approves the Gnoss Field Master Plan and certifies the Program EIR/EA subject to the modifications contained in Exhibit "A" attached herewith.

PASSED AND ADOPTED at a regular meeting of the Board of Supervisors of the County of Marin, State of California, on the 27th day of June, 1989, by the following vote to wit:

AYES: Harold Brown, Bob Roumiguiere, Robert Stockwell
NOES: ---
ABSENT: Al Aramburu, Gary Giacomini

ATTEST:

Vickie J. Day

VICKIE DAY
Clerk of the Board

Robert B. Stockwell

CHAIRMAN OF THE BOARD OF SUPERVISORS
COUNTY OF MARIN

EXHIBIT A

RECOMMENDED MODIFICATION BY THE MARIN COUNTY BOARD OF SUPERVISORS OF THE GNOSS FIELD AIRPORT MASTER PLAN AND PROGRAM EIR/EA
June 27, 1989

- Air traffic patterns:

  Straight-in approaches should be prohibited. The County shall consider development of an Ordinance, to be included in the Pilots Manual, addressing prohibition of straight-in approaches to protect the safety and convenience and health of the Atherton Avenue Homeowners.

  On Pg. 9-49, T.14.b, discuss advantages of north versus south traffic patterns for the existing and proposed runways.

- Mitigation Measures should be organized in one comprehensive table. Provide a summary statement indicating what the wetland mitigation plan will consist of and what studies or surveys will be conducted, including: offsite vegetation study; wetlands preservation, restoration, and enhancement program; land acquisition; revegetation design and implementation; and maintenance and monitoring.

- Strengthen and clarify discussion of enhancement versus mitigation measures. In the restoration plan, the final ratio for mitigation of habitat values lost will be determined at the time the permits are sought from agencies including the County. As stated in the Certified EIR, this ratio shall be no less than 1.5:1 acres (as stated on page 6.31 of Draft EIR, Working Paper 6, and on Page 10.2 of Final EIR).

- The monitoring plan should indicate who prepares monitoring reports, when they are to be completed, who reviews them, and what must be done to correct mitigation deficiencies. The monitoring plan should discuss maintenance and replacement of vegetation in restored areas.

- Page 10.1 (Errata), last paragraph and Page 10.2, first paragraph - strengthen language.

- Page 11.2 (Mitigation Monitoring Plan), 2nd paragraph, last line - add the words "and implemented" after "should be devised".

APPENDIX K
1997 UPDATE

RESOLUTION NO. 97 - 23
RESOLUTION OF THE MARIN COUNTY BOARD OF SUPERVISORS

A RESOLUTION ADOPTING CHAPTER 6.0 - AIRPORT DEVELOPMENT PROGRAM UPDATE 1997 - MARIN COUNTY AIRPORT MASTER PLAN (GNOSS FIELD)

WHEREAS the Marin County Board of Supervisors approved the Airport Master Plan - Marin County Airport (Gnoss Field) and certified the program Environmental Impact Report and Environmental Assessment on June 27, 1989; and

WHEREAS the Airport Master Plan contains long range-range conceptual plans for growth and development of Gnoss Field and Chapter 6.0 Airport Development Program of the master plan lists development projects and timeframes for future development; and

WHEREAS staging of facilities uevelopment at Gnoss Field has been slower than projected in the original master plan due to changes in aviation demand and lack of available funding for plan implementation; and

WHEREAS the development program staging and timeframe contained in the Master Plan is out of date and in need of revision to ensure future planning for airport growth and development that avoids land use conflicts at the airport and on surrounding lands; and

WHEREAS the Marin County Aviation Commission (Resolution 97-1), Marin County Airport Land Use Commission (Resolution ALUC 97-100); and Marin County Planning Commission (Resolution PC-97-101) and held noticed public hearings (February 5, 1997 and February 10, 1997) to consider the updated development program staging and priorities; and subsequently approved the amendment and adopted resolutions recommending Board approval; and

WHEREAS the Board of Supervisors find that the update is exempt from CEQA review under Sections 15061, 15162 and 15378; and

WHEREAS the Board of Supervisors finds that the update is consistent with the Airport Master Plan, Countywide Plan and the Marin County Airport Land Use Plan;

NOW, THEREFORE, BE IT RESOLVED that the Marin County Board of Supervisors hereby approves the CHAPTER 6.0 - AIRPORT DEVELOPMENT PROGRAM UPDATE 1997 - MARIN COUNTY AIRPORT MASTER PLAN (GNOSS FIELD) (Exhibit A - Attached Herewith).

PASSED AND ADOPTED at a regular meeting of the Board of Supervisors of the County of Marin held on this 11th day of MARCH, 1997, by the following vote:

AYES: SUPERVISORS Harold C. Brown, Jr., Steve Kinsey, Annette Rose, John B. 1

NOES: NONE

ABSENT: SUPERVISOR Harry J. Moore

CHAIR, BOARD OF SUPERVISORS
PRO TEM

ATTEST:

CLERK

JR:aa:c:\rawles\airport\rs022797.doo

EXHIBIT A
PROPOSED AIRPORT MASTER PLAN TEXT AMENDMENT - UPDATE 1997

CHAPTER 6.0 - AIRPORT DEVELOPMENT PROGRAM UPDATE 1997
MARIN COUNTY AIRPORT MASTER PLAN (GNOSS FIELD)

The proposed facility development program for Marin County Airport (Gnoss Field) is outlined in this Chapter based upon the aviation activity forecasts developed in the Master Plan studies prepared in 1988-89. The original 20-year study period was from 1986 through 2006. However, the implementation time-frame was extended because the original Master Plan was not completed until 1989. This airport development program update includes a modified time-frame and project priority list.

The original airport development program is divided into Stages with specific timeframes. The time-frame for the completion of each stage is updated as follows:

Stage 1 - 1997-2007

Stage 2 - 2007-2012

Stage 3 - 2012-2020

The thrust of Stage 1 in the original Master Plan was to add aircraft parking capacity, to make safety improvement to the existing runway, acquire approximately 20 acres of private land to the north to provided a runway extension, and to construct a 500-foot extension of Runway 13-31 by 1992. Stage 2 of the master plan focuses on development of a new crosswind runway. Stage 2 includes the acquisition of approximately 68 acres of private land and construction, of a new 3,000-foot long by 75 foot wide runway on the northeast-southeast alignment, as illustrated on the ALP in Section 8.0, by 1996. The thrust of Stage 3 is to acquire an additional 6 acres at the north end of Runway 13-31 and extend the runway another 600 feet, provide additional aircraft parking, hangers and fixed-base-operator facilities on an as needed basis between 1998 and 2007.

From 1989 to the present (1997) some of the proposed facility development projects listed in Stage 1 have been developed including; installation of new portable hangars, and runway widening and needed safety improvements. (From 1989 Plan Project List - 1.1,1,5,1,6.1,1.7,1.11,1.12,1.13,1.14,1.15). Additional land has not been acquired and construction of an extension at the north end of Runway 13-31 has not occurred. The construction project involves the mitigation of environmental impacts of placing fill in "wetland" areas and other potential impacts associated with construction of the project. None of the Stage 2 and 3 projects have been started.

Updated Staging and Priority

Four key original Master Plan Study Objectives are important in the consideration of the updated staging program. Note the following; (See Page 1.2 - Study Objectives, Airport Master Plan for Marin County Airport (Gnoss Field) for the entire list of plan objectives.)

1. Prepare a plan that provides guidance for Airport operations and development.
2. Prepare a plan that provides enhanced environmental compatibility in the Airport environs in relationship to Bayfront Conservation and Wetlands protection.
3. The County plan is to maintain environs and land use compatibility at the Airport and surrounding the Airport by maintaining compatible zoning and land use.

4. The County plan objective is to maintain eligibility for future Federal and State grants to develop the Airport with future facilities as aviation needs increase and funding becomes available.

At this time the growth of aviation needs at Gnoss Field are not consistent with that projected in the original Master Plan studies. Accordingly, the demand/capacity facility requirements and timing for planned Stages of expanded facility development has lagged behind the program schedule. The County of Marin has no immediate plan for further development of airport facilities at this time. However, the need to maintain environs and land use compatibility at the Airport and on surrounding private lands has become more as development pressure increases on private lands surrounding the airport.

The County needs to continue to pursue a controlling interest in private lands surrounding the airport to meet several of the major objectives of the Master Plan. The following new time-frame for development and project priority list for Master Plan implementation, as set forth herein, takes current airport facility demand/capacity into account. However, the updated project priority list focuses on private property acquisition at this time to achieve the above noted Master plan objectives.

Based on current aircraft needs and demand/capacity over the past eight (8) years physical facility improvements such as construction of the crosswind runway, and extensive additional parking/hangar construction on 24 acres of land located northwest of Runway 13-31 are uncertain. These projects require acquisition of expensive land and entitlements from local, state and federal agencies. Current agency polices and regulations require very specific permit procedures that are costly and time consuming.

Stage 1 Development Update 1997

The Stage 1 (1997-2007) development program assumes that Federal Aviation Administration (FAA) and/or Caltrans Division of Aeronautics (DOA) pre-application grants will be needed to support project funding. It usually takes several years to obtain funding and approval of grant requests. Once project funding is in place it may also take considerable time to secure permits to construct Stage 1 improvements. Timing is of the essence for acquiring land at the north end of Runway 13-31. Accordingly, the following updated Stage 1 project combines Stage 1 and Stage 3 projects as presented in the 1989 Airport Development Program. (Projects 1.16,1.17,1.18 and Projects 3.12,3.13.3.14)

Project 1.1 Acquire approximately 26 acres of land on the north end of Runway 13-31 to enhance environmental compatibility in the Airport environs in relationship to Bayfront Conservation and Wetlands protection, to maintain environs and land use compatibility, to maintain safety zones and possible future extension of Runway 13-31 when and if permits are granted. The County of Marin has no immediate plan for further development of airport facilities at this time. However, the need to maintain environs and land use compatibility at the Airport, and on surrounding private lands, has become more apparent as development pressure increases on private lands surrounding the airport.

Project 1.2 Prepare environmental review, mitigation plan, and mitigation monitoring plan necessary to offset potential negative adverse impacts on "wetland" areas due to fill and other potential impacts caused by construction of 500-1,100-foot northern extension to Runway 13-31. The scope of environmental work and component cost estimates (1988 dollars) associated with the project are presented in the EIR/EA.

Project 1.3 Secure County permits, State permits and Federal permits necessary to allow construction of a 500- 1,100 foot extension to Runway 13-31 on the north end.

Project 1.4 Construct a 500-1,100-foot extension to Runway 13-31 on the north end.

Projects 1.1 is assumed to occur in 1997. Project 1.2, 1.3, are administrative projects. Project 1.4 can not move forward until projects 1.2 and 1.3 have been accomplished to the satisfaction of the public agencies involved. The County of Marin has no immediate plan for further development of airport facilities at this time.

Stage 2. Development Update 1997

Stage 2 (2007-2012) development program projects 2.7, 2.8 include the following administrative items: review and update of the Master Plan and Project Specific EIR/EA, certified environmental review clearance, permits and grant funding. Project 2.9 would also need grant funding FAA and/or DOA prior to construction. The proposed projects of Stage #2 (2007-2012) are updated as follows.

Project 2.5. Overlay Runway 13-31 and the parallel and connection taxiways. Based on past history and experience at Gnoss Field, reconstruction of the pavements will be needed on a recurring basis due to settlement problems.

Project 2.6. Acquire approximately 68 acres of private land northeast of the Airport to enhanced environmental compatibility in the Airport environs in relationship to Bayfront Conservation and Wetlands protection, to maintain environs and land use compatibility, to maintain safety zones and possible future crosswind runway development. The County of Marin has no immediate plan for further development of airport facilities at this time.

Project 2.7. Prepare environmental review, mitigation plan, and mitigation monitoring plan necessary to offset potential negative adverse impacts on "wetland" areas due to fill and other potential impacts caused by construction of a 3,000-foot long 75-foot wide crosswind runway on a northeast-southwest alignment as illustrated on the ALP in Section 8.0. The scope of additional environmental work and component cost estimates (1988 dollars) associated with the project are presented in the EIR/EA.

Project 2.8. Secure County permits, State permits and Federal permits necessary to allow construction of a crosswind runway.

Project 2.9 Construct a crosswind runway on a northeast-southwest alignment as illustrated on the ALP in Section 8.0 of the Master Plan.

Projects 2.7 through 2.9 are assumed to occur no sooner than 2012. The exact staging is *uncertain* given current agency policy and regulations. Reconsideration of these projects should be given during *a* Master Plan review/update within the 20-year planning period or before the year *2000*.

Stage 3 Development Update 1997

The Stage 3 (2012-2020) development program projects include administrative items: project specific environmental clearance, public agency permits and FAA/DOA grant funding (Projects 3.8 and 3.9). Projects 3.5 and 3.6 are operations and maintenance projects. Projects 3.7 and 3.10 include further land acquisition and development of aircraft parking, hangers and road access.

Project 3.5. Construct an asphalt overlay of Runway 13-31 to correct anticipated settlement problems.

Project 3.6. Construct an asphalt overlay of the existing aircraft parking aprons to repair anticipated age and settlement related problems.

Project 3.7. Acquire 24 acres of land located northwest of the west side apron to enhanced environmental compatibility in the Airport environs in relationship to Bayfront Conservation and Wetlands protection, to maintain environs and land use compatibility, to maintain safety zones and possible future aircraft parking, FBO (Fixed Base Operator: airport service operation including area for aircraft repair, fuel, sales and rental) and new hanger areas.

Project 3.8. Prepare environmental review, mitigation plan, and mitigation monitoring plan necessary to offset potential negative adverse impacts on "wetland" areas due to fill and other potential impacts caused by construction of expanded aircraft parking apron, and up to 110 hangers and new access road on the 24 acres of land northwest of the west side apron.

Project 3.9. Secure County permits, State permits and Federal permits necessary to allow construction of new parking apron, up to 110 new hangers, new access road to the are developed area.

Project 3.10 Construct expanded aircraft parking apron, FBO, road access and up to 110 hangars on 24 acres acquired per Project 3.7.

The possible timing of Stage 3 projects is uncertain at this time. The exact staging will be adjusted in response to the actual demand/capacity needs determined during the Master Plan review/update in 2000.

TABLE 6 STAGES 1-3 DEVELOPMENT PROGRAM
MARIN COUNTY AIRPORT 1997-2021

PROJECT NUMBER	DESCRIPTION	1997-2007	2007-2012	2012-2020
1.1	Acquire 26 acres	XX		
1.2	CEQA Review Extend Runway 13-31 500-1000 ft.	XX		
1.3	Permits Project 1.2	XX		
1.4	Construct Project 1.2	XX		
2.5	Overlay Runway 13-31		XX	
2.6	Acquire 68 acres		XX	
2.7	CEQA Review Crosswind Runway		XX	
2.8	Permits 2.7		XX	
2.9	Construct Project 2.7			XX
3.5	Overlay Runway 13-31			XX
3.6	Overlay Aircraft Parking			XX
3.7	Acquire 24 acres			XX
3.8	CEQA Review Expand Aircraft Parking			XX
3.9	Permits 2.7			XX
3.10	Construct Project 3.8			XX

The Commission convened as the Planning Commission.

8. MARIN COUNTY AIRPORT MASTER PLAN AMENDMENT: (GNOSS FIELD)

Hearing to consider the Airport Land Use Commission's recommendation on Item #7 - Marin County Airport Master Plan Amendment (Gnoss Field), above.

Scott L. Hochstrasser, Planning Consultant, summarized the Airport Land Use Commission's recommendations to adopt the proposed amendment, with a modification to Exhibit A, Section 2.7 to include language requiring review of the Master Plan in the year 2000.

Hearing was opened to public testimony.

Barbara Salzman, Marin Audubon Society, asked for clarification of Project 2.6. Additionally, she expressed concern that at least two minor projects have taken place since the Master Plan was approved, but the public was not involved. Noting Project 2.6, Mr. Hochstrasser stated that since the extension or the expansion of the airport is unknown, acquisition of the land northeast of the airport is necessary to preserve the existing wetlands and wildlife habitat. Regarding projects done at the property, Mr. Hochstrasser stated that these three projects has been subject to permit and environmental review by local, state and federal agencies as required.

Ms. Salzman asked that the Audubon Society be informed of any other projects in the future. Staff agreed to this request, but clarified that the projects listed in Exhibit A are already covered under the Master Plan.

Hearing was closed to public testimony.

Mr. Hochstrasser also recommended that language under Projects 2.7 through 2.9 in Exhibit A be revised to read "Projects 2.7 through 2.9 are assumed to occur no sooner than 2012. The exact staging is *uncertain* given current agency policy and regulations. Reconsideration of these projects should be given during a Master Plan review/update within the 20-year planning period or before the year 2000.

M/s Rowland/Alff Wiegel, and passed unanimously, to approve the attached Resolution recommending to the Board of Supervisors update of Chapter 6. - Airport Development Program Update 1997 - Marin County Airport Master Plan (Gnoss Field), as modified above. Motion passed 7-0.

Chair Buddie informed all parties of interest that this matter would automatically go to the Board of Supervisors for final action.