

## METEOROLOGICAL AND ENVIRONMENTAL CONDITIONS

### 5.1 *Describe the general geographical features of the City and its surroundings.*

The San Francisco Bay Area is characterized by stunning and complex terrain consisting of coastal mountain ranges, inland valleys, the Pacific Ocean and bays. The fertile coastal plains and valleys are near sea level, while elevations of 2,000 feet (610 meters) are common for the higher terrain. This juxtaposition of geographical elements provides the many breathtaking and ever-changing vistas. These combinations also lead to a variety of microclimates that make the San Francisco Bay Area weather as beautiful as its terrain.

A semipermanent area of high pressure centered over the northeastern Pacific Ocean dominates the summer climate of the West Coast. Because this high-pressure cell is quite persistent, storms rarely affect the California coast during the summer. Thus the conditions that prevail near and along the coast of California during July and August are a northwest airflow and negligible precipitation. This steady northwest flow induces the upwelling of cold water along the California coast, which, in turn, cools moisture-laden air moving toward the interior. This is often sufficient to produce condensation and a high incidence of fog and stratus clouds primarily in the evening and early-morning hours along the coast and sometimes spreading inland. This nearly daily influx of cool moist marine air, though it clears in most areas by mid-morning, acts as the region's natural air-conditioning.

### 5.2 ALTITUDE

#### 5.2.1 *Give, in feet and meters, the average altitude of the city and the altitude of any competition sites within the city that are significantly different.*

The average altitude of the populated areas in the region is approximately 50 feet (15 meters) above sea level. All the competition sites lie between 20 and 100 feet (6 and 30 meters).

#### 5.2.2 *List the altitude of the competition sites outside the bid city.*

The Lake Natoma competition site for rowing, canoe/kayak and slalom is at 132 feet (40 meters).

The Monterey Fort Ord venue is approximately 50 feet (15 meters) above sea level at the competition site.

### 5.3 POLLUTION

The proximity to the Pacific Ocean and the San Francisco Bay Area, and the presence of a cool marine climate and consistent daily winds, ensure that the region's air remains fresh and plentiful, providing athletes with optimal competitive conditions.

#### 5.3.1 **Ambient Air Quality**

- *Provide detailed information of the ambient air quality (according to international standards) in the Bid City, including an assessment of the analyses performed over the last five years.*
- *Explain any significant differences in data between different parts of the city or other Olympic subsites.*

Ambient Air Quality standards are based on criteria codified by the United States Environmental Protection Agency's (EPA) Clean Air Act. "Primary" standards are designed to establish limits to protect public health, including the health of "sensitive" populations, such as asthmatics, children and the elderly. The EPA has set national air-quality standards for six principal pollutants (referred to as "criteria" pollutants): carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>), particulate matter (PM) and sulfur dioxide (SO<sub>2</sub>). [Note: The pollutant ozone is not emitted directly into the air, but is formed when sunlight acts on emissions of nitrogen oxides (NO<sub>x</sub>) and volatile organic compounds (VOC).]

The San Francisco Bay Area is in "attainment" status, having met requirements in all the above categories except ozone. The average number of days at the present time when the 1-hour ozone criteria would be exceeded in the San Francisco Bay Area during the period selected for the 2012 Olympic Games would be 1.1 days. However, the San Francisco Bay Area is expected to be in attainment status for 1-hour ozone in 2000.

Lake Natoma is in attainment status in all the above categories except ozone. The average number of days at the present time when the 1-hour ozone criteria would be exceeded during the period selected for the 2012 Olympic Games would be 1.6 days. However, Sacramento is expected to be in attainment status for 1-hour ozone in 2005.

### 5.3.2 Water Quality

As unique as its geography and climate is the quality of the San Francisco Bay Area's drinking water. The primary source of water is the Hetch Hetchy Valley in the pristine Yosemite National Park in the Sierra Nevada mountain range – a region of clean, cascading waterfalls and fresh mountain air. This water is so pure that both the city of San Francisco and the Public Utilities Commission have considered bottling it for sale.

*Provide detailed information on the quality of the drinking water (according to international standards) in the Bid City, including an assessment of the analyses performed over the last five years.*

The San Francisco Bay Area is served by three major water utilities: the San Francisco Public Utilities Commission, East Bay Municipal Water District and the Santa Clara Valley Water District. Drinking water in the San Francisco Bay Area and other competition sites has met all standards established by the EPA for the past five years, which meets all federal and state criteria for watershed protection, disinfection treatment, bacteriological quality and operational standards. As a result of this high quality, the EPA does not require water from the Hetch Hetchy reservoir to be filtered before it is delivered to customers. Even so, Hetch Hetchy and secondary water sources are continually monitored and treated for contaminants, organic chemicals, microbiological agents, inorganic chemicals and heavy metals.

## 5.4 TEMPERATURE

The San Francisco Bay Area's climate is globally one of the most temperate. The year-round mean temperature varies by only 16 degrees, from a low monthly norm in January of 49°F (9°C) to a high mean in August of 65°F (18°C). Generally, summertime temperatures are cooler along the coast and warmer in the inland valleys.

#### 5.4.1 Provide in table form:

- Average temperature in Fahrenheit and Celsius
- Absolute maximum temperature stating year and date
- Absolute minimum temperature stating year and date
- In the Bid City at 9:00 a.m., 12:00 p.m., 3:00 PM, 6:00 p.m. and 9:00 p.m.

**Table 5.4.1a Average Monthly Temperatures (1970–1999)**

	SAN FRANCISCO	SAN JOSE	SANTA CRUZ	LAKE NATOMA
1970	62.2°F / 16.8°C	68.8°F / 20.5°C	62.9°F / 17.1°C	75.7°F / 24.3°C
1971	62.9°F / 17.2°C	69.6°F / 20.9°C	63.6°F / 17.5°C	76.5°F / 24.7°C
1972	64.1°F / 17.8°C	70.3°F / 21.3°C	64.6°F / 18.1°C	75.9°F / 24.4°C
1973	61.3°F / 16.3°C	68.2°F / 20.1°C	62.0°F / 16.7°C	75.5°F / 24.2°C
1974	63.4°F / 17.4°C	68.9°F / 20.5°C	62.2°F / 16.8°C	74.0°F / 23.3°C
1975	62.4°F / 16.9°C	67.6°F / 19.8°C	62.4°F / 16.9°C	77.1°F / 25.0°C
1976	63.4°F / 17.4°C	68.2°F / 20.1°C	64.4°F / 18.0°C	74.9°F / 23.8°C
1977	63.2°F / 17.4°C	69.2°F / 20.7°C	64.3°F / 18.0°C	74.0°F / 23.3°C
1978	62.3°F / 16.8°C	69.5°F / 20.8°C	63.0°F / 17.2°C	75.0°F / 23.9°C
1979	63.7°F / 17.6°C	69.0°F / 20.6°C	64.3°F / 17.9°C	74.3°F / 23.5°C
1980	62.2°F / 16.8°C	68.6°F / 20.3°C	63.9°F / 17.7°C	73.2°F / 22.9°C
1981	62.3°F / 16.8°C	68.8°F / 20.5°C	62.0°F / 16.7°C	74.8°F / 23.8°C
1982	62.5°F / 16.9°C	68.2°F / 20.1°C	63.7°F / 17.6°C	71.8°F / 22.1°C
1983	65.9°F / 18.9°C	70.4°F / 21.3°C	66.2°F / 19.0°C	74.4°F / 23.6°C
1984	65.0°F / 18.3°C	71.3°F / 21.8°C	65.4°F / 18.5°C	76.8°F / 24.9°C
1985	64.4°F / 18.0°C	71.0°F / 21.7°C	65.2°F / 18.4°C	74.9°F / 23.9°C
1986	61.8°F / 16.5°C	70.1°F / 21.2°C	62.6°F / 17.0°C	75.1°F / 23.9°C
1987	64.1°F / 17.8°C	69.0°F / 20.5°C	63.8°F / 17.7°C	73.3°F / 23.0°C
1988	65.1°F / 18.4°C	72.0°F / 22.2°C	64.6°F / 18.1°C	78.1°F / 25.6°C
1989	63.4°F / 17.4°C	69.4°F / 20.8°C	62.9°F / 17.1°C	74.9°F / 23.9°C
1990	65.4°F / 18.5°C	71.5°F / 22.0°C	65.2°F / 18.5°C	77.1°F / 25.1°C
1991	64.0°F / 17.8°C	69.7°F / 21.0°C	64.0°F / 17.8°C	75.1°F / 23.9°C
1992	64.8°F / 18.2°C	71.8°F / 22.1°C	65.9°F / 18.8°C	76.1°F / 24.5°C
1993	66.0°F / 18.9°C	71.4°F / 21.9°C	64.2°F / 17.9°C	74.2°F / 23.4°C
1994	63.2°F / 17.4°C	69.8°F / 21.0°C	62.0°F / 16.6°C	74.6°F / 23.6°C
1995	63.9°F / 17.7°C	72.3°F / 22.4°C	65.1°F / 18.4°C	74.6°F / 23.7°C
1996	62.9°F / 17.2°C	73.1°F / 22.8°C	63.6°F / 17.5°C	78.5°F / 25.8°C
1997	65.4°F / 18.6°C	71.9°F / 22.1°C	64.8°F / 18.2°C	76.2°F / 24.6°C
1998	63.5°F / 17.5°C	72.9°F / 22.7°C	64.1°F / 17.8°C	75.8°F / 24.3°C
1999	62.8°F / 17.1°C	69.4°F / 20.8°C	63.0°F / 17.2°C	72.5°F / 22.5°C

**Table 5.4.1b San Francisco – Temperature Range from July 27 through August 12 (1970–1999)**

AVERAGE TEMPERATURE	AVERAGE MAXIMUM	ABSOLUTE MAXIMUM	AVERAGE MINIMUM	ABSOLUTE MINIMUM
63°F / 17°C	72°F / 22°C	100°F / 38°C Aug 1, 1993	54°F / 12°C	49°F / 9°C Jul 30, 1986

#### Average San Francisco Temperature by Hour

9:00 AM	12:00 PM	3:00 PM	6:00 PM	9:00 PM
64°F / 18°C	70°F / 21°C	70°F / 21°C	64°F / 18°C	59°F / 15°C

5.4.2 *Provide further tables for each of the proposed Olympic subsites, if such subsites are farther than 30 miles from the Bid City or if conditions differ significantly from those of the Bid City.*

**Table 5.4.2a San Jose – Temperature Range from July 27 through August 12 (1970–1999)**

AVERAGE TEMPERATURE	AVERAGE MAXIMUM	ABSOLUTE MAXIMUM	AVERAGE MINIMUM	ABSOLUTE MINIMUM
63°F / 17°C	72°F / 22°C	105°F / 41°C Aug 1, 1993	54°F / 12°C	49°F / 9°C Jul 30, 1986

**Average San Jose Temperature by Hour**

9:00 AM	12:00 PM	3:00 PM	6:00 PM	9:00 PM
66°F / 19°C	75°F / 24°C	80°F / 27°C	76°F / 24°C	62°F / 17°C

**Table 5.4.2b Lake Natoma – Temperature Range from July 27 through August 12 (1970–1999)**

AVERAGE TEMPERATURE	AVERAGE MAXIMUM	ABSOLUTE MAXIMUM	AVERAGE MINIMUM	ABSOLUTE MINIMUM
77°F / 25°C	94°F / 34°C	114°F / 41°C Aug 10, 1978	60°F / 16°C	51°F / 11°C Aug 1, 1970

**Average Lake Natoma Temperature by Hour**

9:00 AM	12:00 PM	3:00 PM	6:00 PM	9:00 PM
72°F / 22°C	85°F / 29°C	91°F / 33°C	84°F / 29°C	70°F / 21°C

5.4.3 *If any data obtained for a particular year during the period of the Games is significantly different from the two previous tables, give a brief explanation.*

Not applicable.

## 5.5 HUMIDITY

The San Francisco Bay Area enjoys one of the most comfortable climates in the world, mostly due to its close proximity to the Pacific Ocean and the cool moist marine air that acts as the region's natural air-conditioning. Despite the relatively high morning humidity because of the presence of marine air, the afternoon Heat Index (a combined measurement of temperature and humidity relating to the body's ability to cool itself through perspiration) is one of the lowest for a major metropolitan area in the middle latitudes.

5.5.1 *Provide in table form*

- *Average humidity (percentage)*
- *Absolute maximum humidity (percentage), stating date and year*
- *Absolute minimum humidity (percentage), stating date and year*
- *In the Bid City at 9:00 a.m., 12:00 p.m., 3:00 p.m., 6:00 p.m. and 9:00 p.m.*

**Table 5.5.1a San Francisco – Relative Humidity (RH) from July 27 through August 12 (1970–1999)**

AVERAGE RH	ABSOLUTE MAXIMUM RH	ABSOLUTE MINIMUM RH
75%	100% Numerous	17% Aug 8, 1995

**Average San Francisco Relative Humidity by Hour**

9:00 AM	12:00 PM	3:00 PM	6:00 PM	9:00 PM
71%	59%	57%	69%	82%

5.5.2 *Provide further tables for each of the proposed Olympic subsites, if such subsites are farther than 30 miles from the Bid City or if conditions differ significantly from those of the Bid City.*

**Table 5.5.2a San Jose – Relative Humidity (RH) from July 27 through August 12 (1970–1999)**

AVERAGE RH	ABSOLUTE MAXIMUM RH	ABSOLUTE MINIMUM RH
75%	100% Numerous	12% August 8, 1995

**Average San Jose Relative Humidity by Hour**

9:00 AM	12:00 PM	3:00 PM	6:00 PM	9:00 PM
73%	61%	57%	62%	71%

**Table 5.5.2b Lake Natoma– Relative Humidity (RH) from July 27 through August 12 (1970–1999)**

AVERAGE RH	ABSOLUTE MAXIMUM RH	ABSOLUTE MINIMUM RH
75%	100% Numerous	11% July 31, 1981

**Average Lake Natoma Relative Humidity by Hour**

9:00 AM	12:00 PM	3:00 PM	6:00 PM	9:00 PM
56%	38%	29%	37%	57%

5.5.3 *Give a brief explanation if any data obtained for a particular year, during the period of the Games is significantly different from the two previous tables.*

Not applicable.

**5.6 PRECIPITATION**

Statistically speaking, it will not rain during the 2012 Summer Games in the San Francisco Bay Area. Historically, the average rainfall in the region during this period is .03 days per year, or about once every 30 years.

5.6.1 *Please provide the following information:*

- *Number of days precipitation (specify for each separate year)*
- *Average per year*
- *Days with precipitation are understood to be those on which there is a minimum of .01 ml precipitation in 24 hours.*

**Table 5.6.1 San Francisco – Days of Rain from July 27 through August 12 (1970–1999)**

1970	0	1976	0	1982	0	1988	0	1994	0
1971	0	1977	0	1983	0	1989	0	1995	0
1972	0	1978	0	1984	0	1990	0	1996	0
1973	0	1979	0	1985	0	1991	0	1997	0
1974	0	1980	0	1986	0	1992	0	1998	0
1975	0	1981	0	1987	0	1993	0	1999	1

**5.6.2 Volume of precipitation.**

*Please provide the following information:*

- *Total precipitation (in l/m<sup>2</sup> and inches) for each year*
- *Average per year (in l/m<sup>2</sup> and inches)*
- *Specify the three days with maximum precipitation (giving l/m<sup>2</sup> and inches, date and year)*

**Table 5.6.2 San Francisco – Volume of Rain (in l/m<sup>2</sup> and inches) from July 16 through August 15 (1970–1999)**

YEAR	L/M <sup>2</sup>	INCHES	YEAR	L/M <sup>2</sup>	INCHES	YEAR	L/M <sup>2</sup>	INCHES
1970	0	0	1980	0	0	1990	0	0
1971	0	0	1981	0	0	1991	0	0
1972	0	0	1982	0	0	1992	0	0
1973	0	0	1983	0	0	1993	0	0
1974	0	0	1984	0	0	1994	0	0
1975	0	0	1985	0	0	1995	0	0
1976	0	0	1986	0	0	1996	0	0
1977	0	0	1987	0	0	1997	0	0
1978	0	0	1988	0	0	1998	0	0
1979	0	0	1989	0	0	1999	.25	.01

- Average volume of rain for San Francisco for the period from July 27 through August 12 is .0084 l/m<sup>2</sup> and .0003 inch.
- Days with maximum precipitation for the period from July 27 through August 12: August 6, 1999 – .25 l/m<sup>2</sup> and .01 inch.

**5.7 SPECIAL INFORMATION**

*With regard to the proposed sites for yachting, rowing, whitewater kayaking and flat-water canoeing, provide a brief explanation on the following:*

- *Water quality (level of pollution, according to international norms and over the past five years)*
- *Average water temperature (period previewed for the Olympic Games)*
- *Depth (in the competition area)*
- *Wind type, tendencies (direction) and strength (during the period previewed for the Olympic Games)*
- *Fog risk and at what time of day this may occur*
- *San Francisco Bay Sailing Site*
  - Water Quality: serves as a contact recreation area with abundant aquatic life and no restrictions to fishing or consumption. Field and laboratory chemical measurements for San Francisco Bay are within international standards. The only incidents of contamination in the past five years have been during periods of high runoff following winter storms.
  - Average Water Temperature: 65°F/18°C
  - Average Water Depth: 30ft/9m to 196ft/60m

- Average Wind: San Francisco Bay has some of the most consistent summer winds in the world and is renowned for its premier sailing weather. Winds in the “Olympic Circle” average westerly at 5 to 10 mph during the morning hours and gradually rise to between 15 and 20 mph in the middle- and late-afternoon hours.
- Fog Risk: Near zero. There is a low overcast during the period of interest between approximately 8:00 p.m. and 10:00 a.m., but ceilings rarely are below 500 feet and visibility is rarely below six miles.
- *Lake Natoma Rowing, Canoe/Kayak and Slalom Sites*
  - Water Quality: Lake Natoma serves as a contact recreation area with abundant aquatic life and no restrictions to fishing or consumption. Field and laboratory chemical measurements for Lake Natoma are within international standards. Monitoring of Lake Natoma by the U.S. Bureau of Reclamation over the past five years has shown the Lake to be well within state and federal standards for contaminants, organic chemicals, microbiological agents, inorganic chemicals and heavy metals.
  - Average Water Temperature: 65°F/18°C
  - Average Water Depth: 120ft/37m
  - Average Wind: Lake Natoma’s inland location is well removed from the Pacific Ocean’s sea breeze, ensuring smooth water for rowing and canoe/kayak. Winds average less than 3 mph in the morning and peak at 4 to 6 mph south-southwest in the late afternoon.
  - Fog Risk: Zero