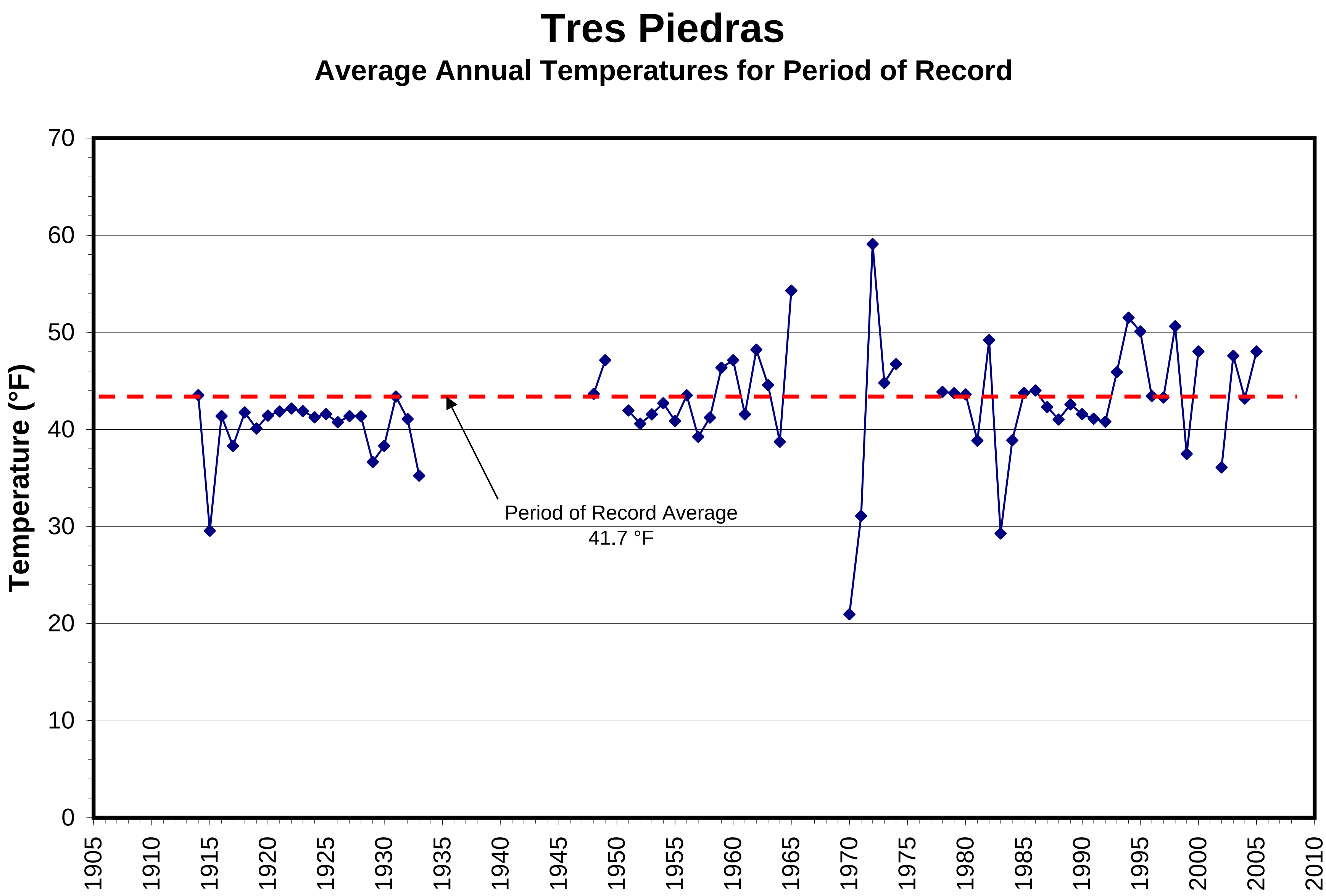
Appendix E

Hydrologic Information

Appendix E1

Climate Statistics



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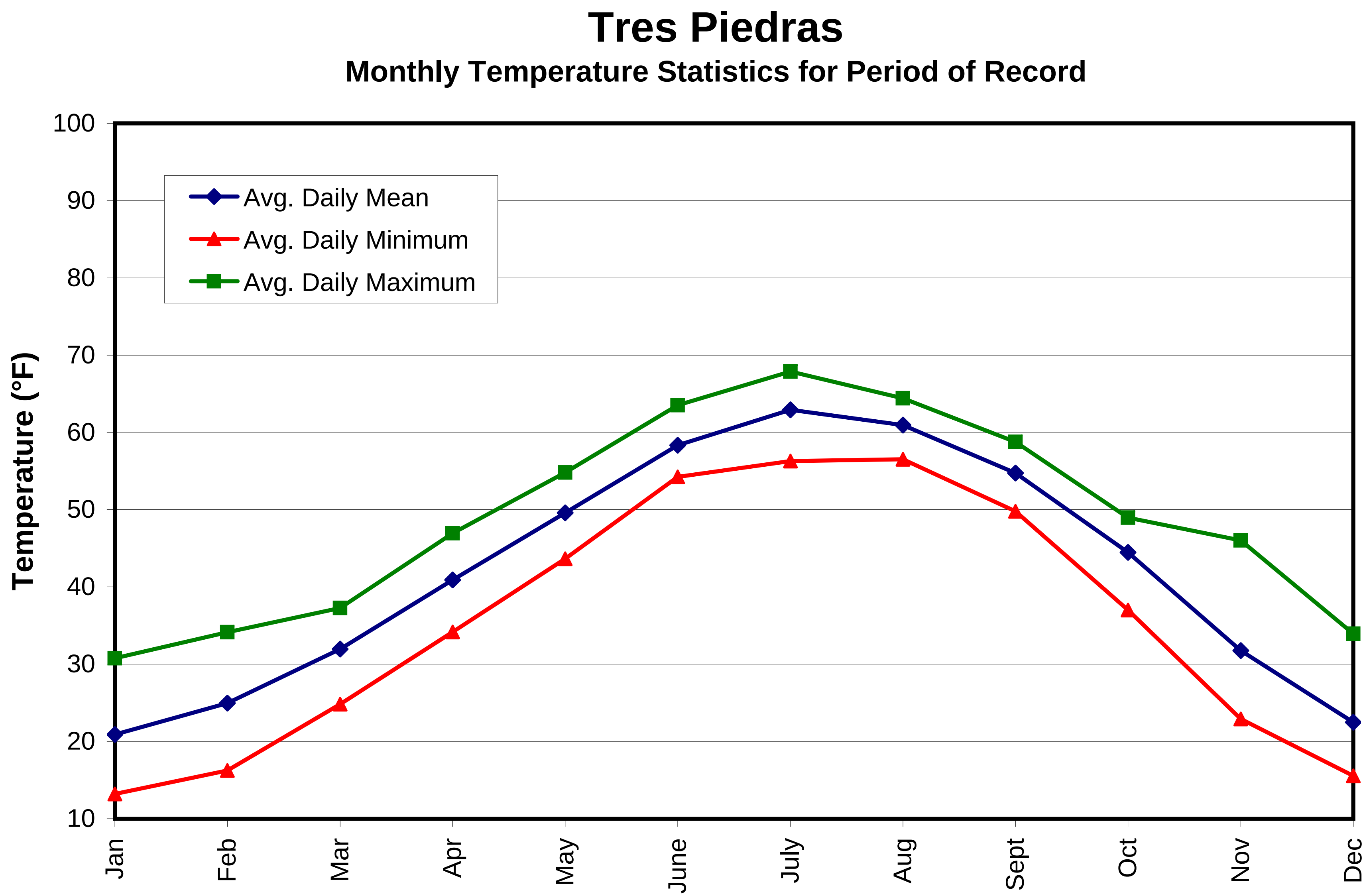

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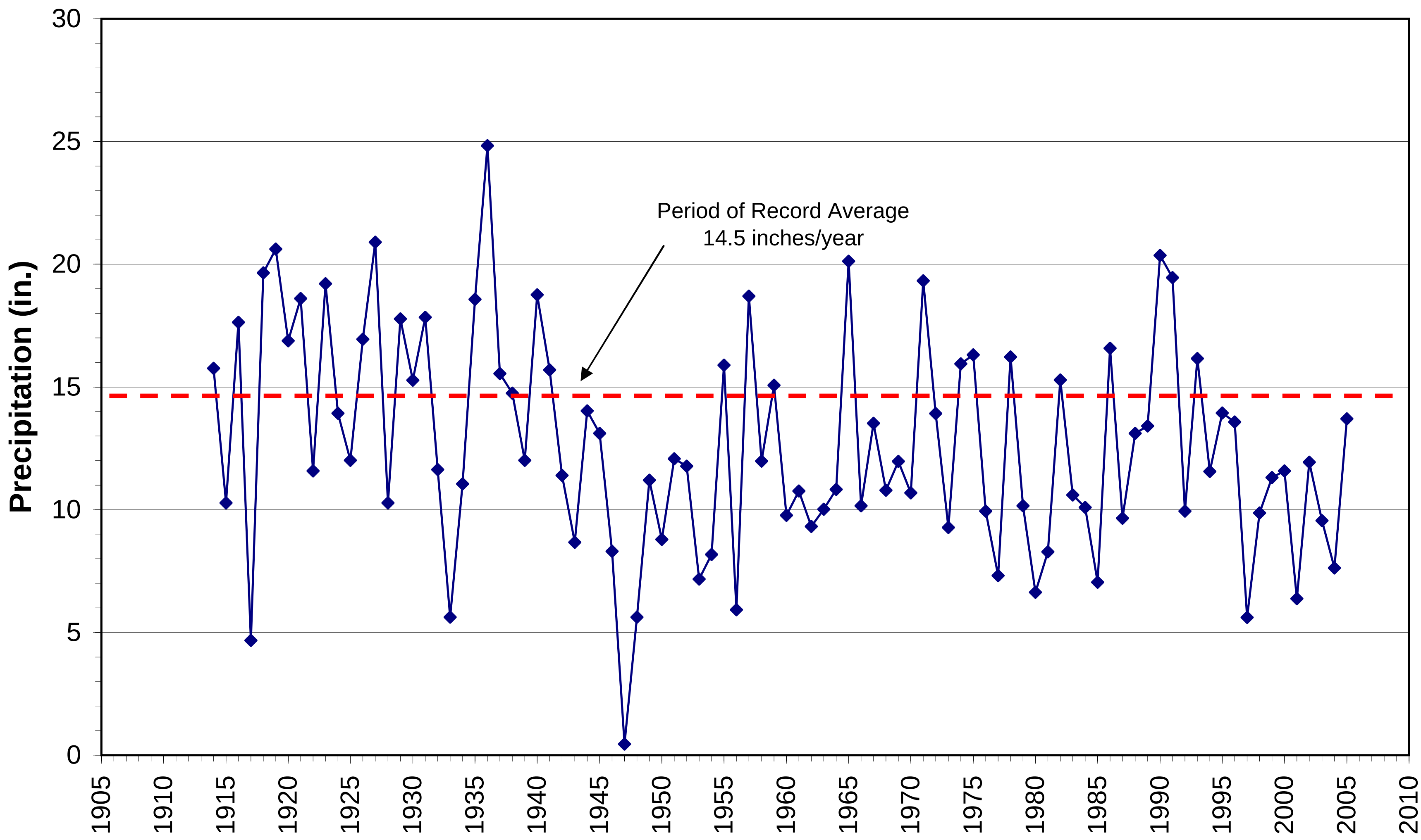
Tres Piedras

Total Annual Precipitation for Period of Record



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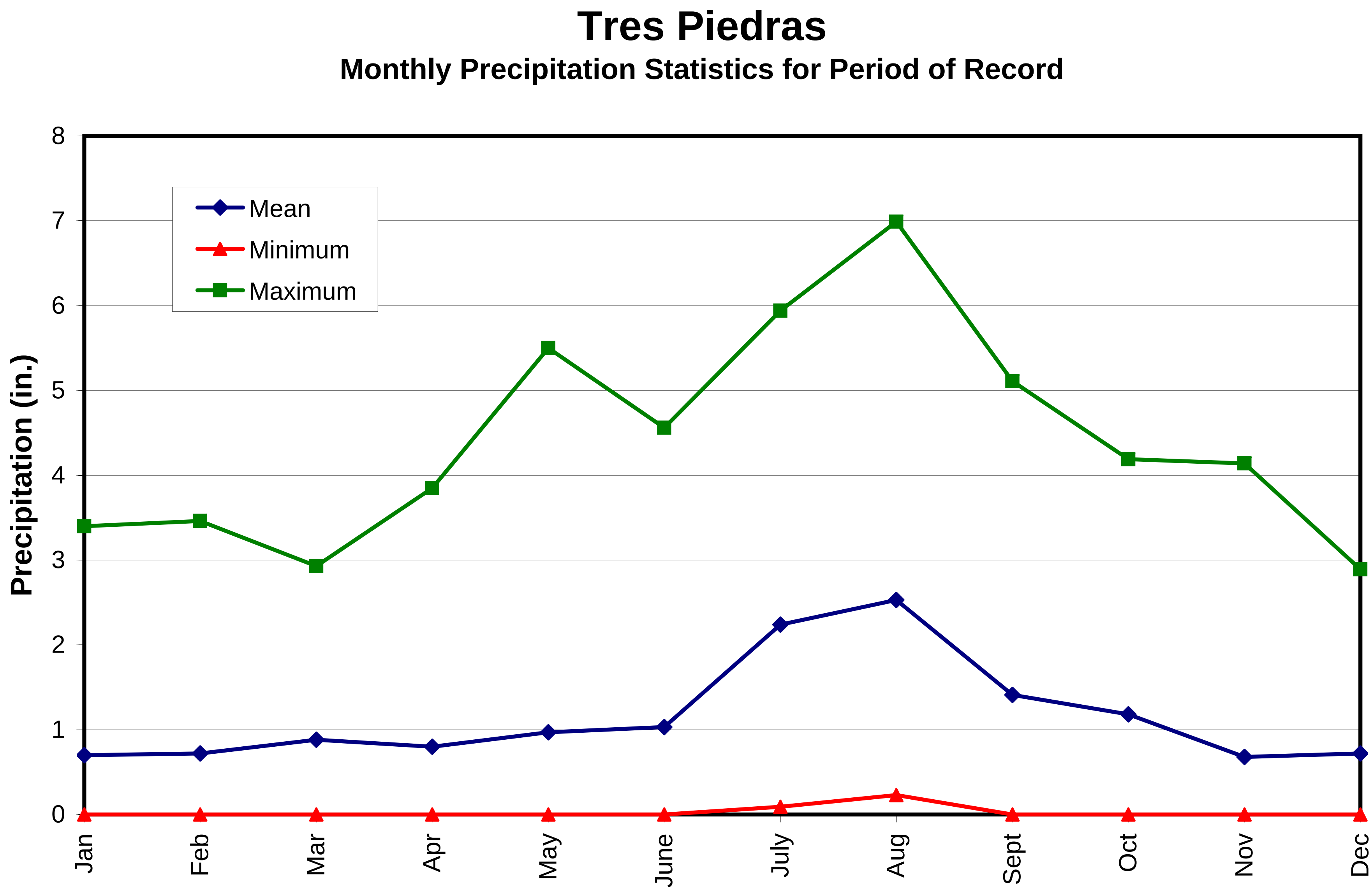

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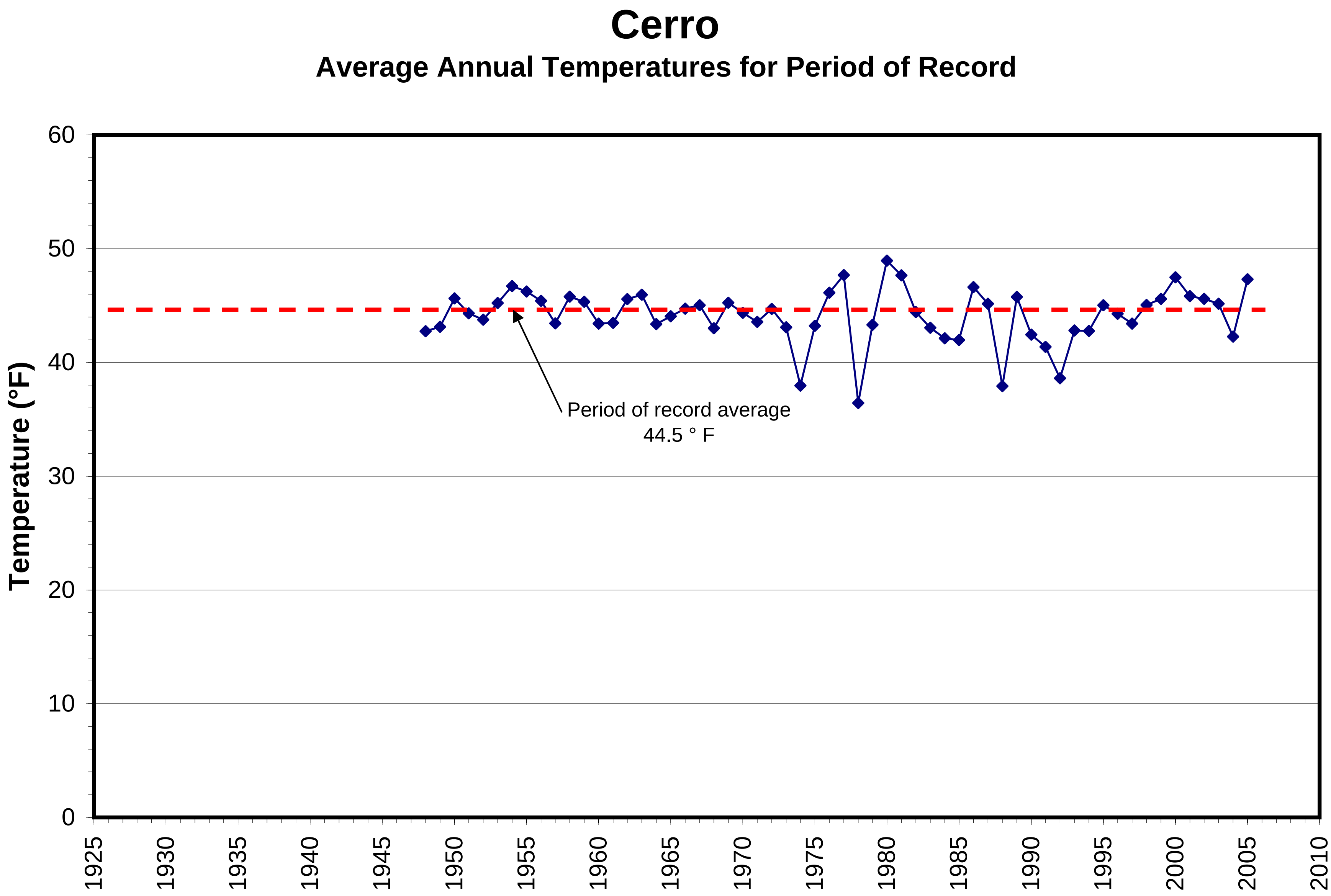
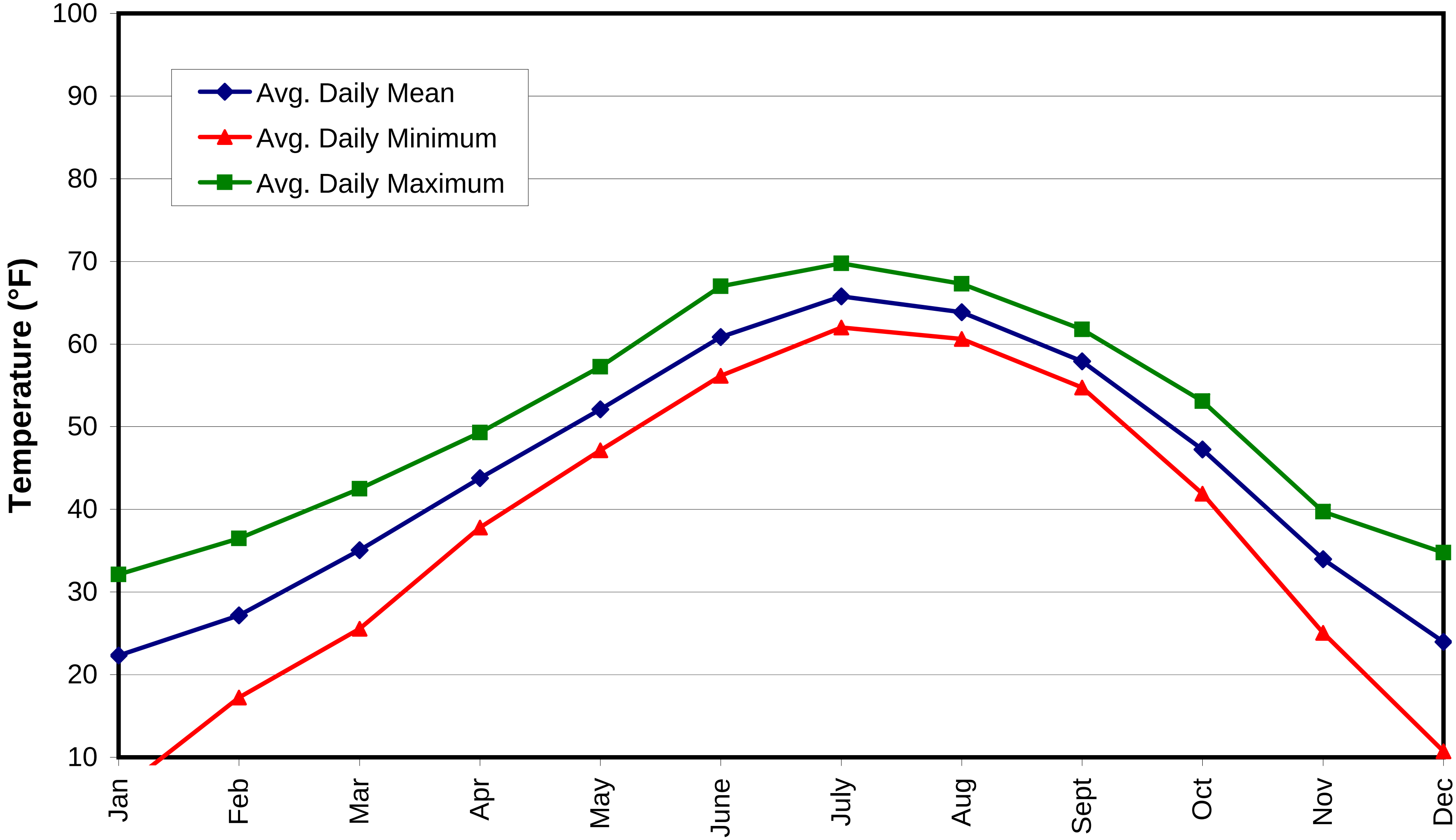

Cerro
Average Annual Temperatures for Period of Record
Temperature (°F)
60
50
40
30
20
10
0
Period of record average
44.5 ° F
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010

Cerro

Monthly Temperature Statistics for Period of Record



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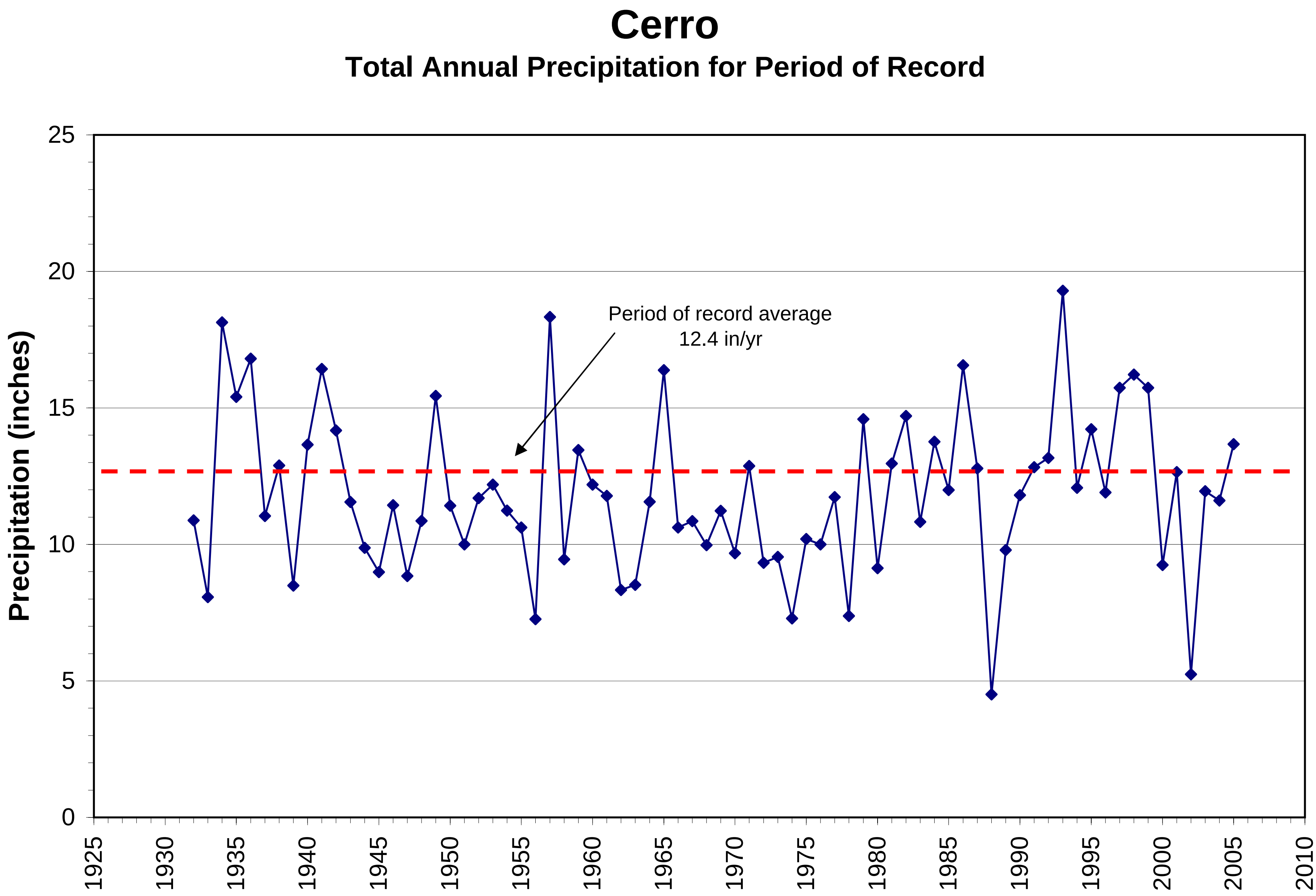

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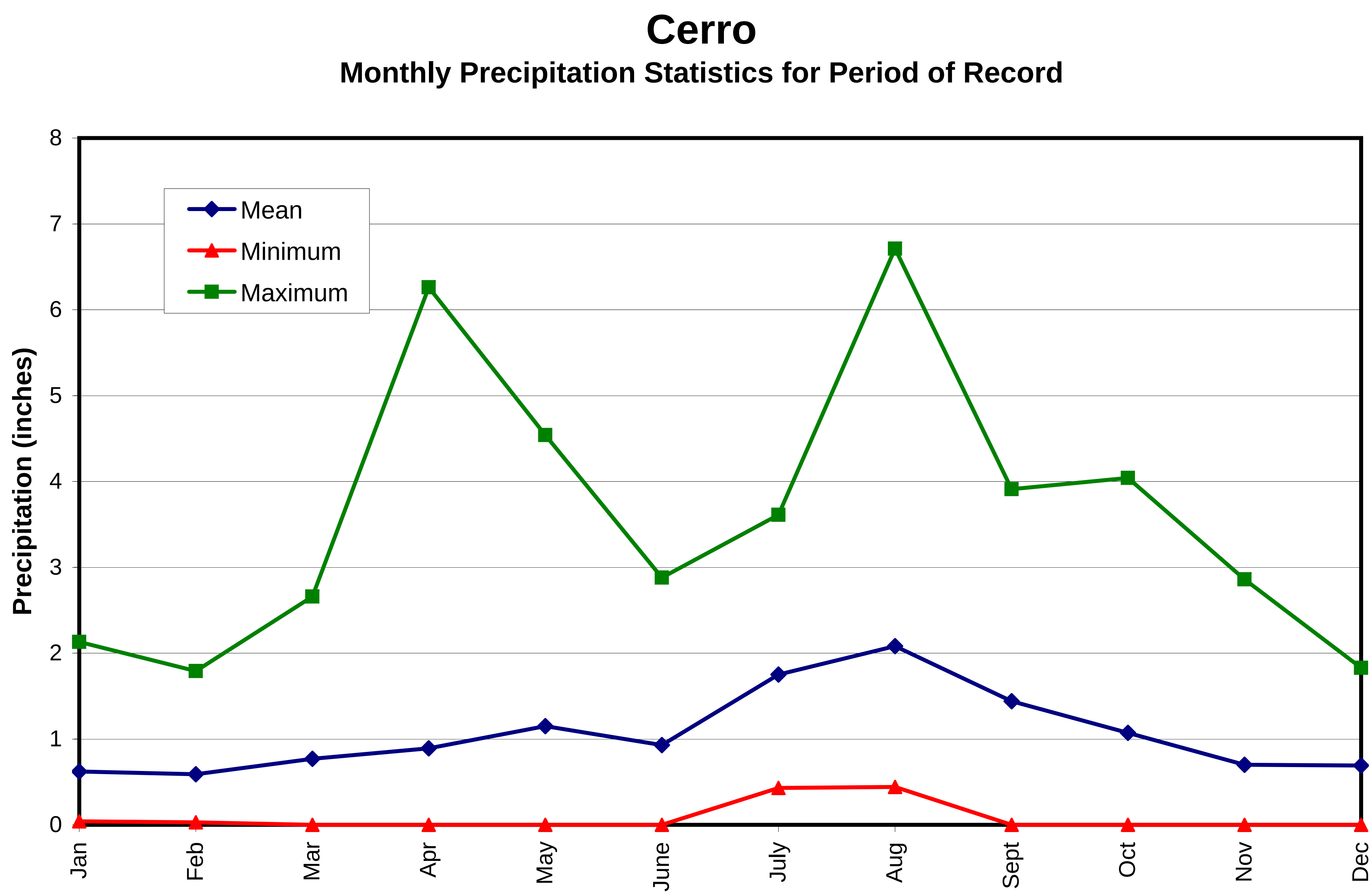

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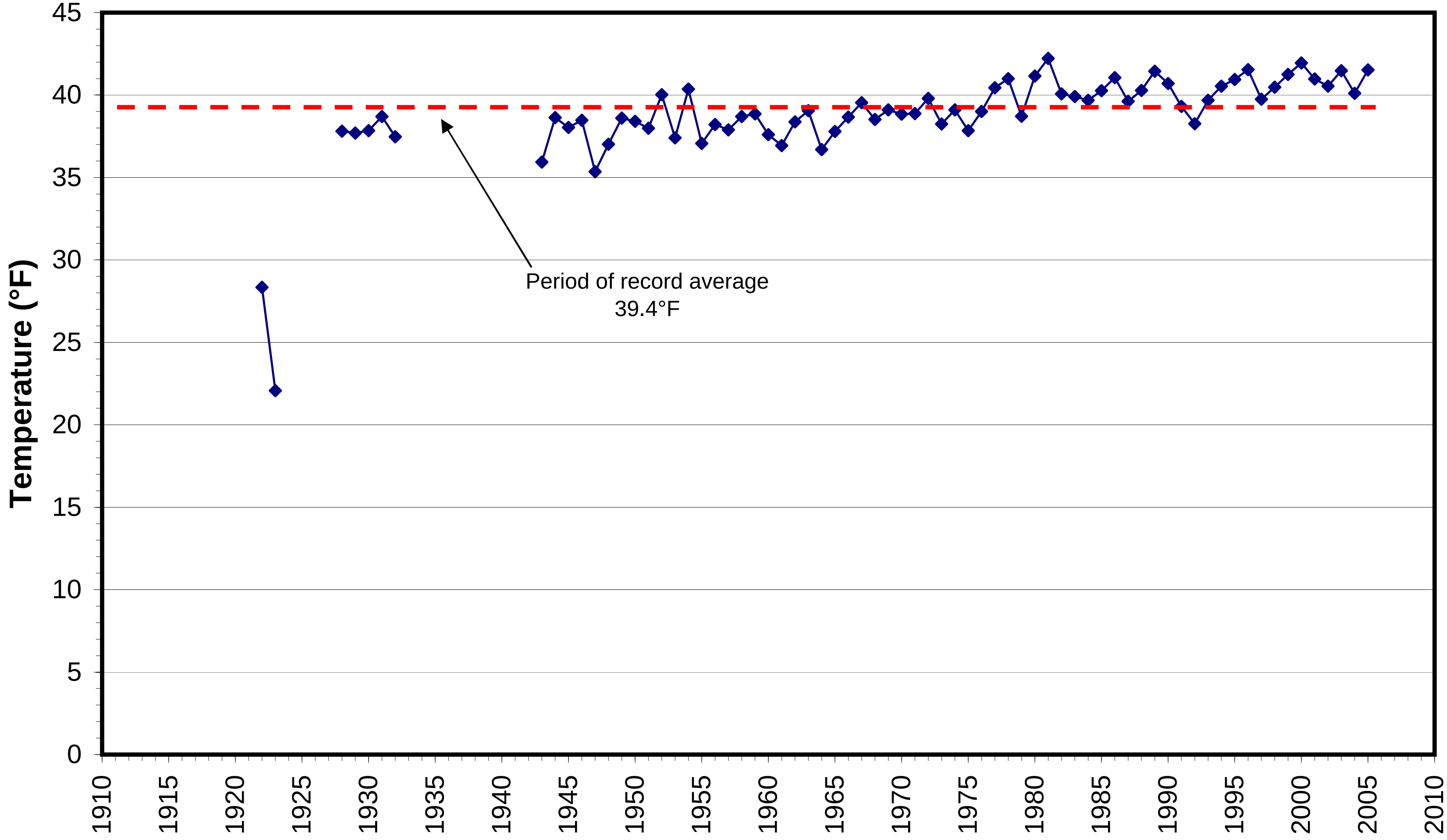
Red River

Average Annual Temperatures for Period of Record



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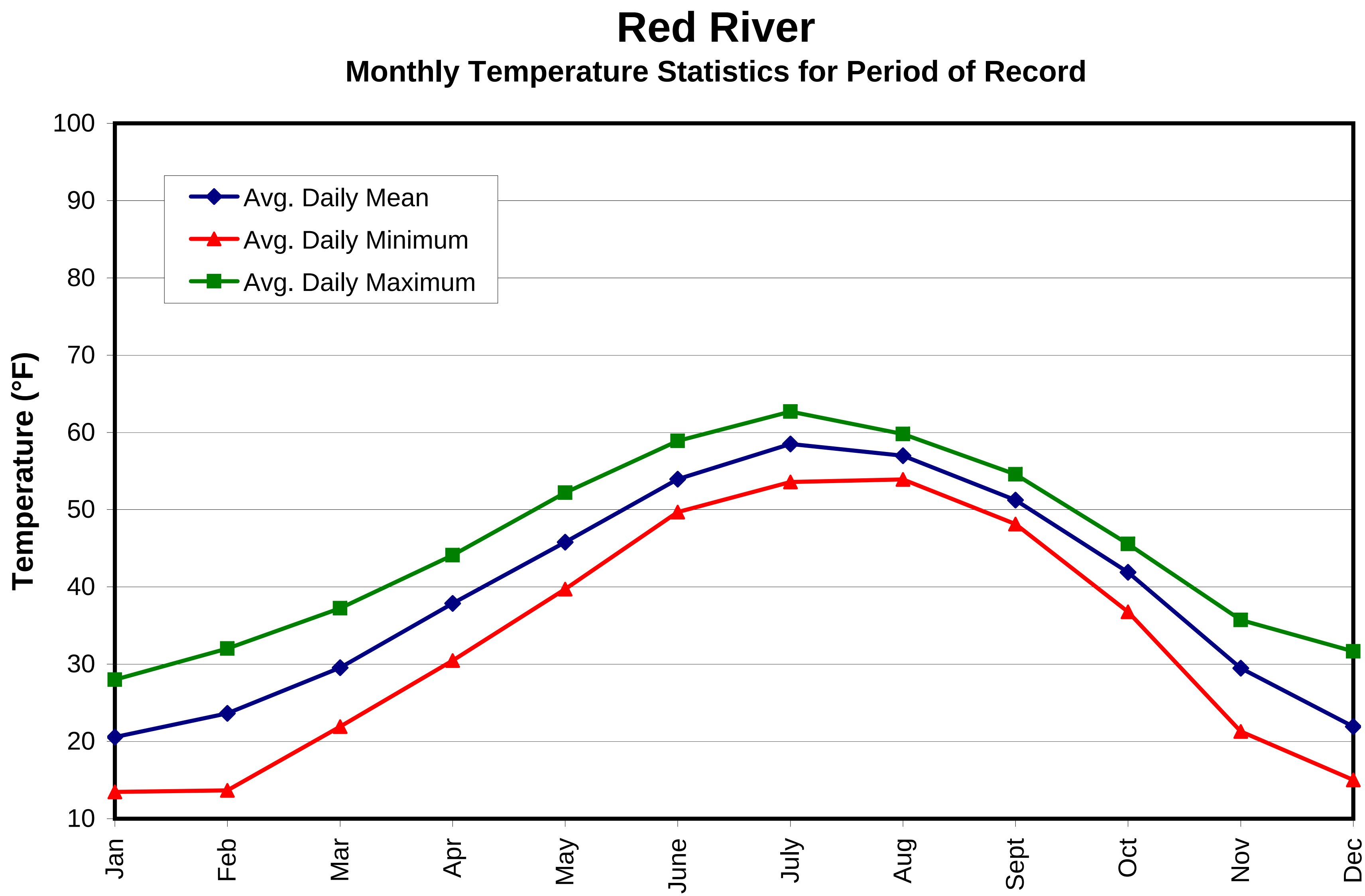

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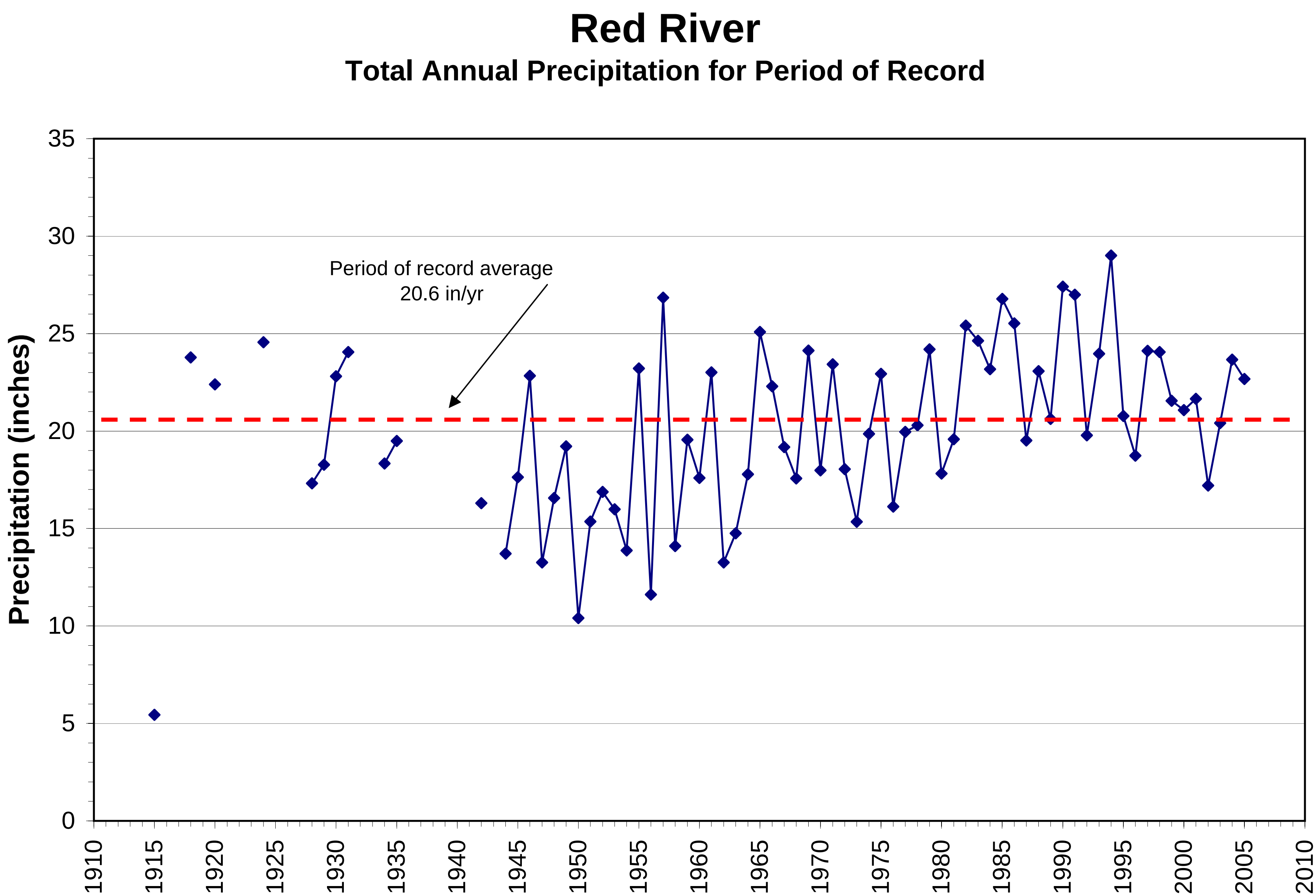

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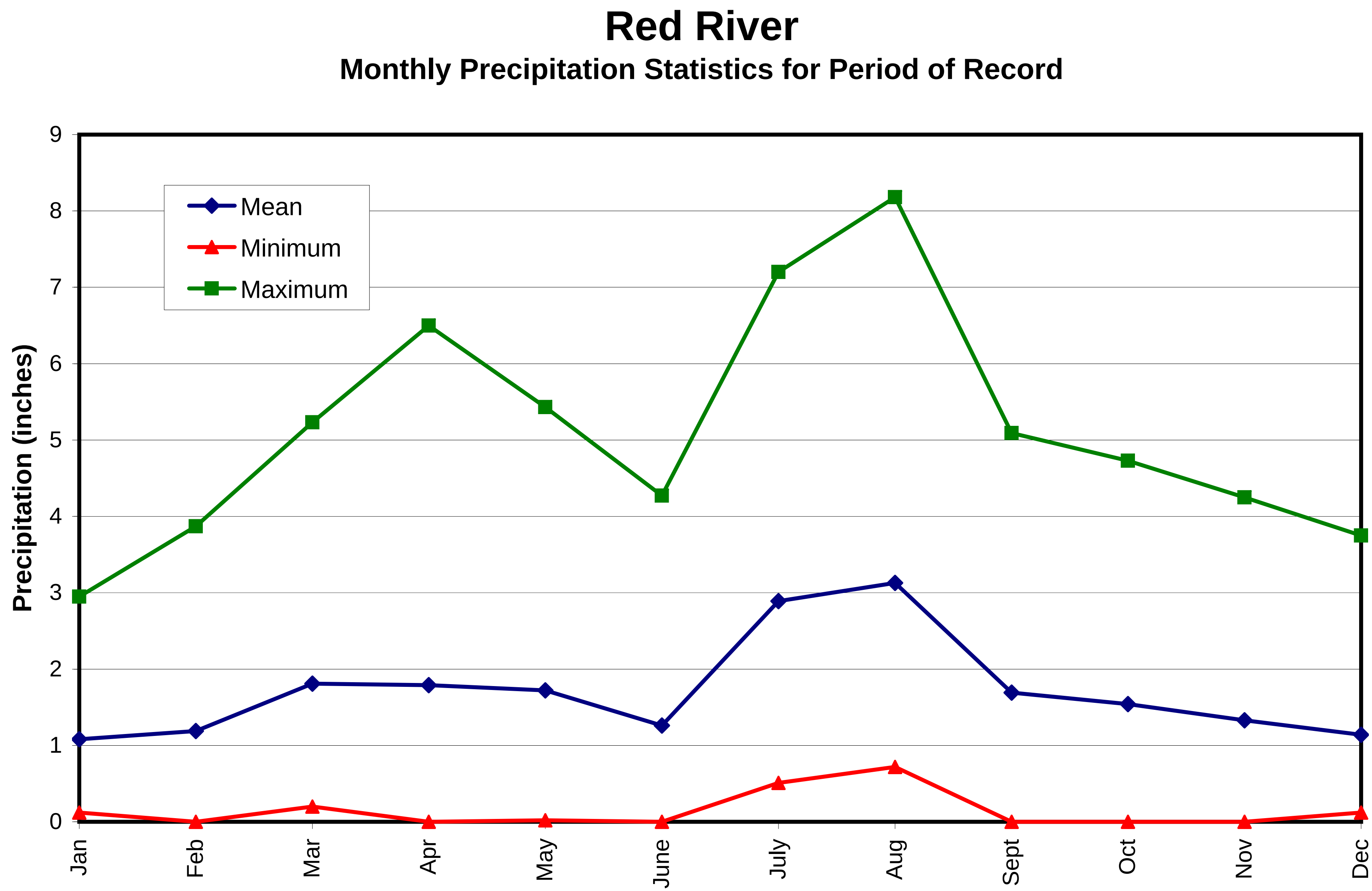

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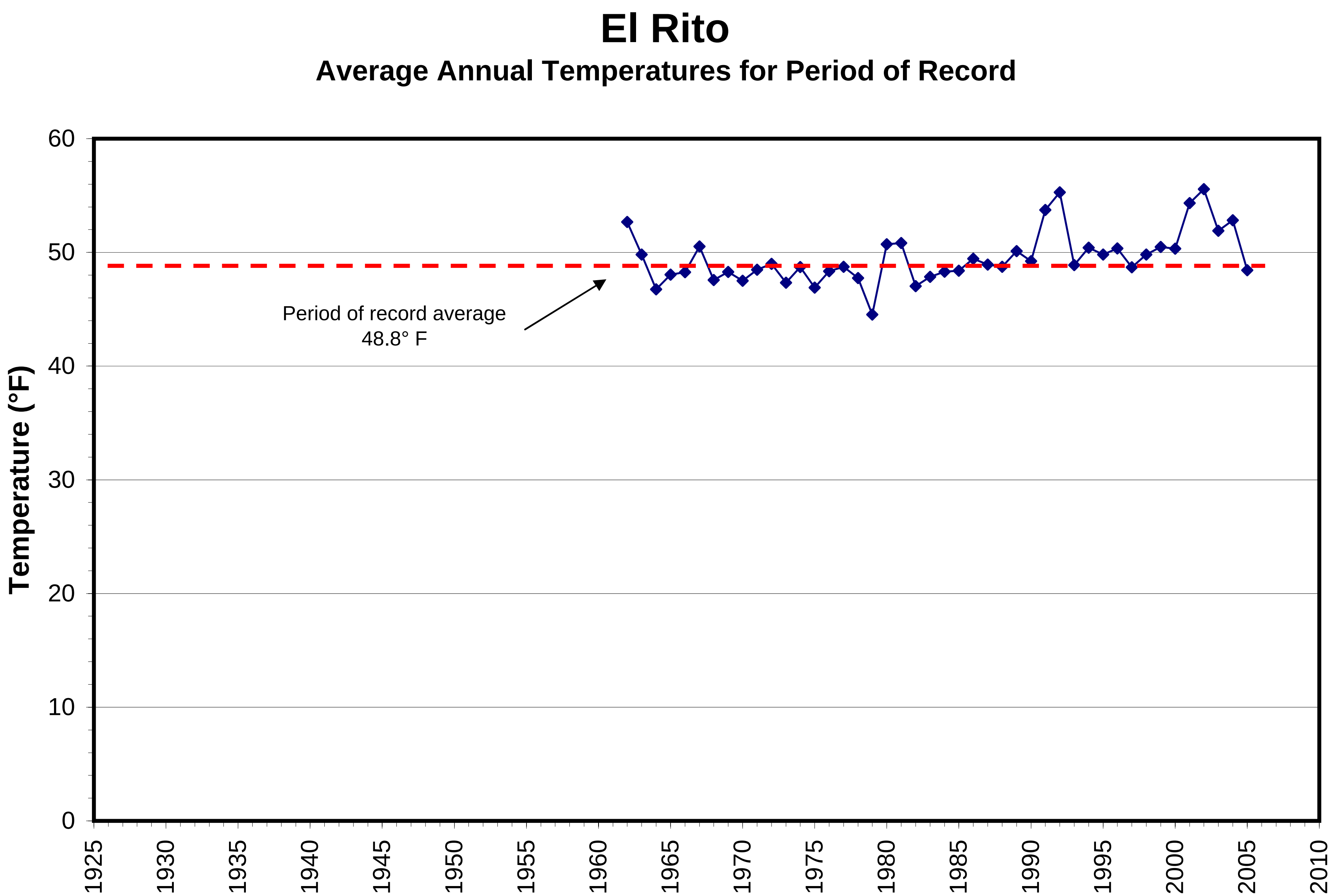

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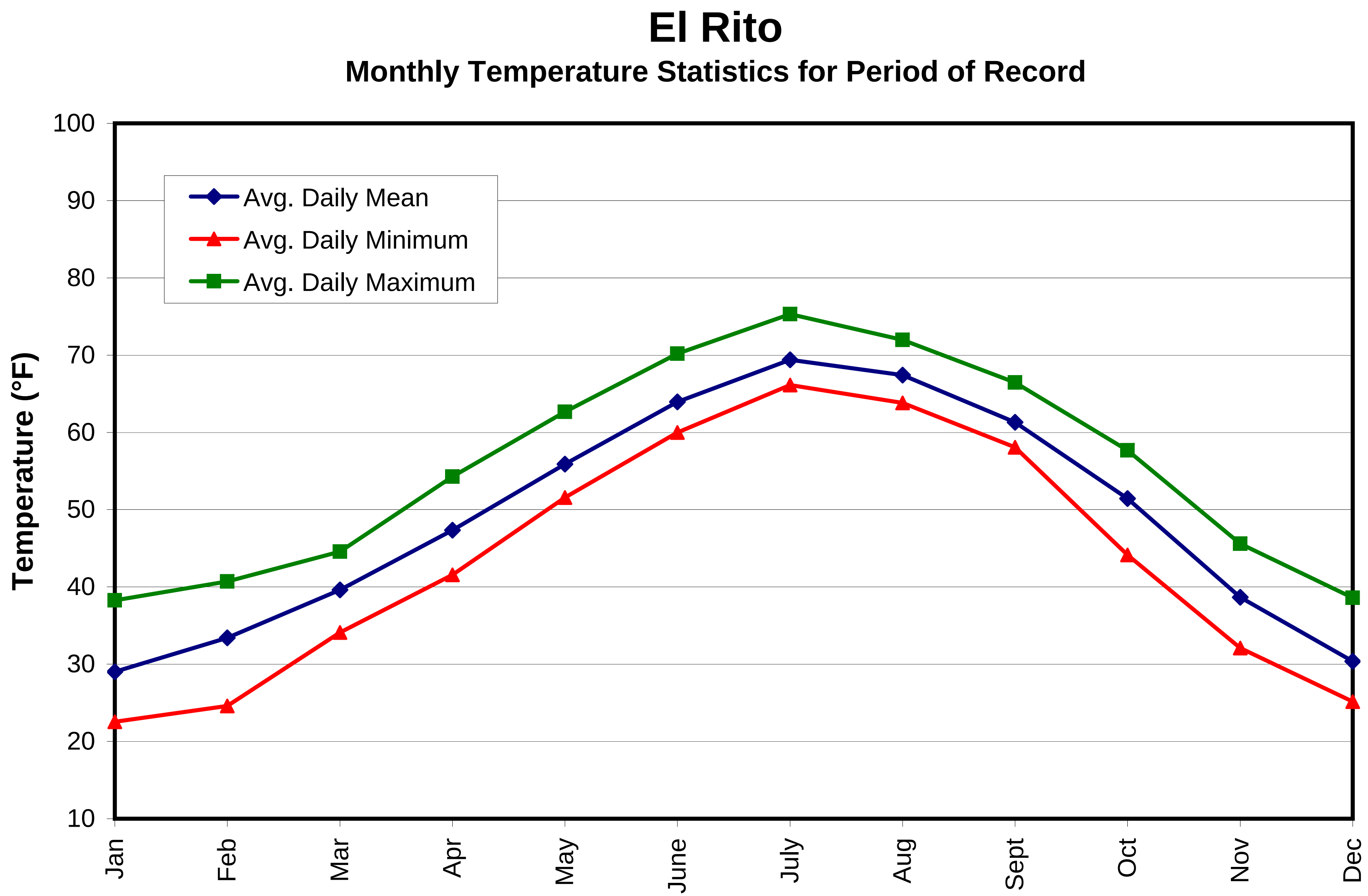

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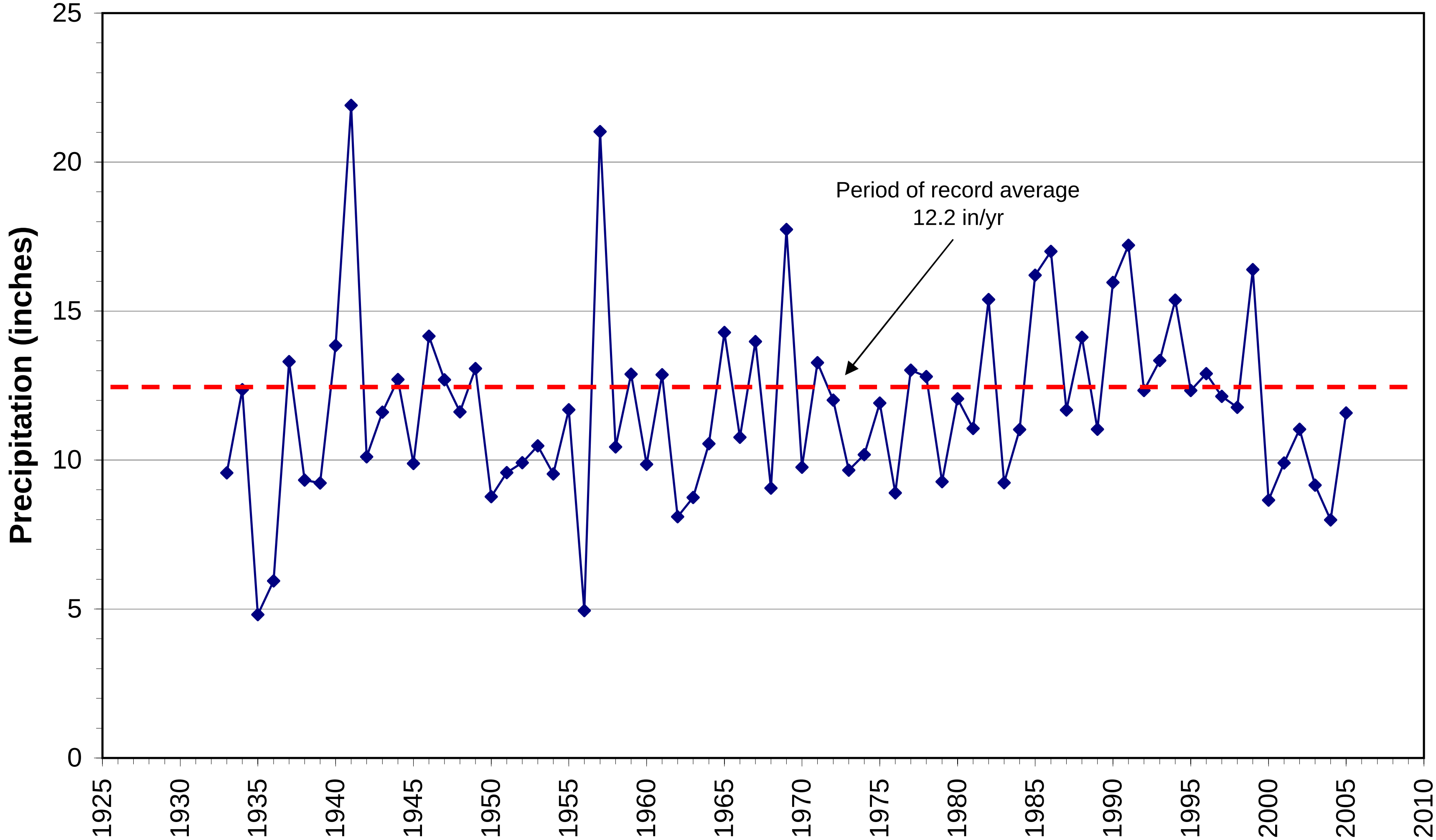
El Rito

Total Annual Precipitation for Period of Record



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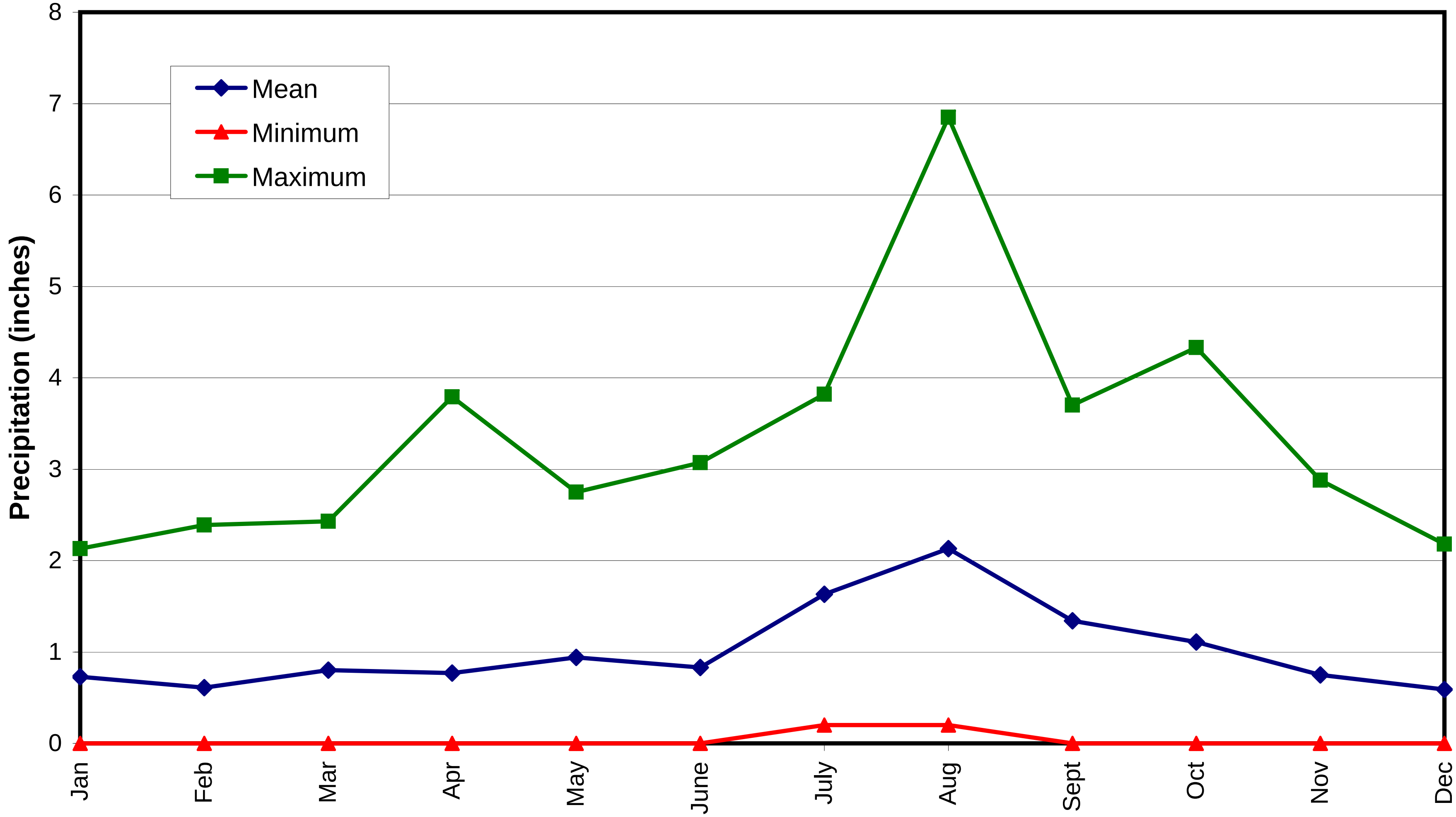
El Rito

Monthly Precipitation Statistics for Period of Record



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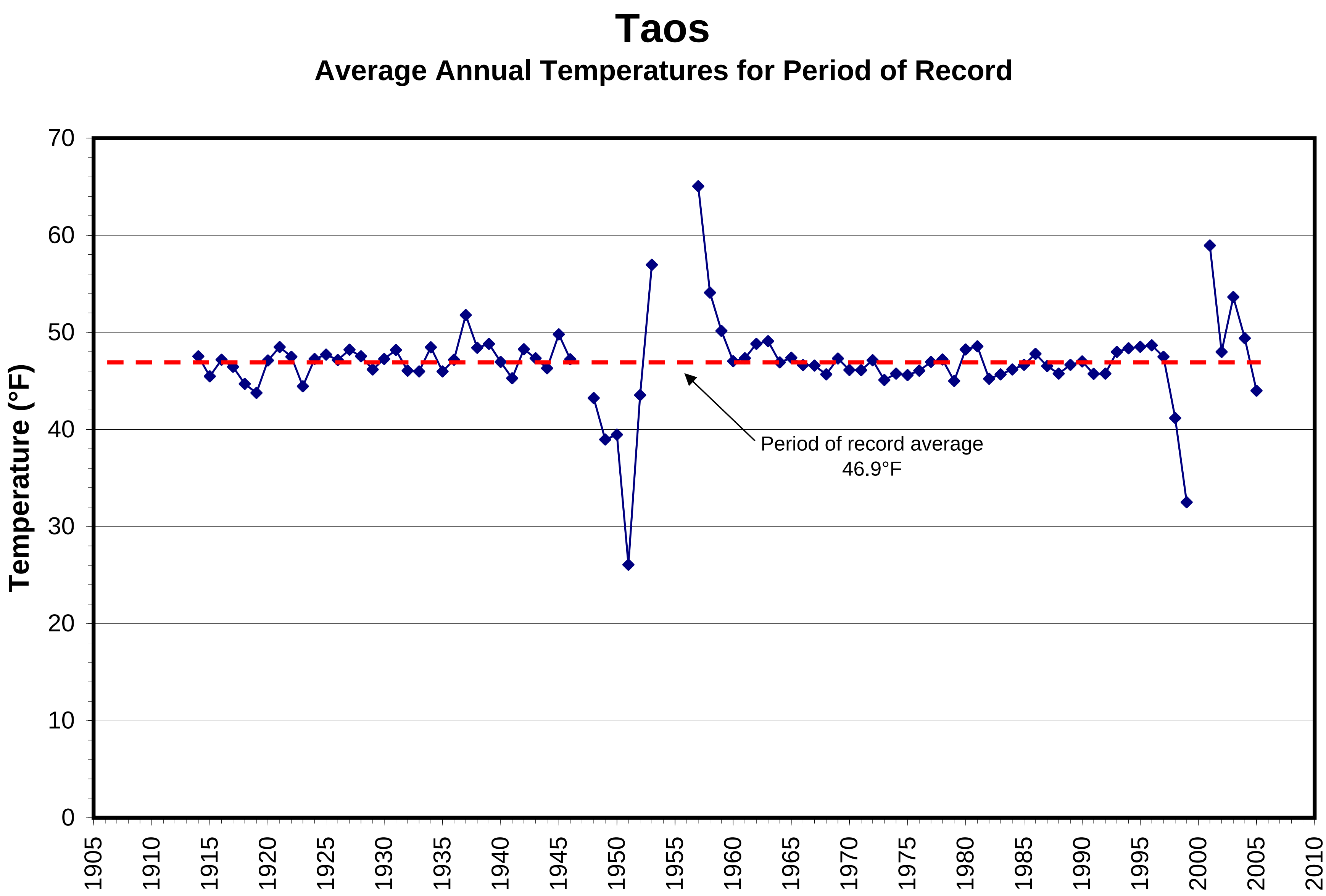

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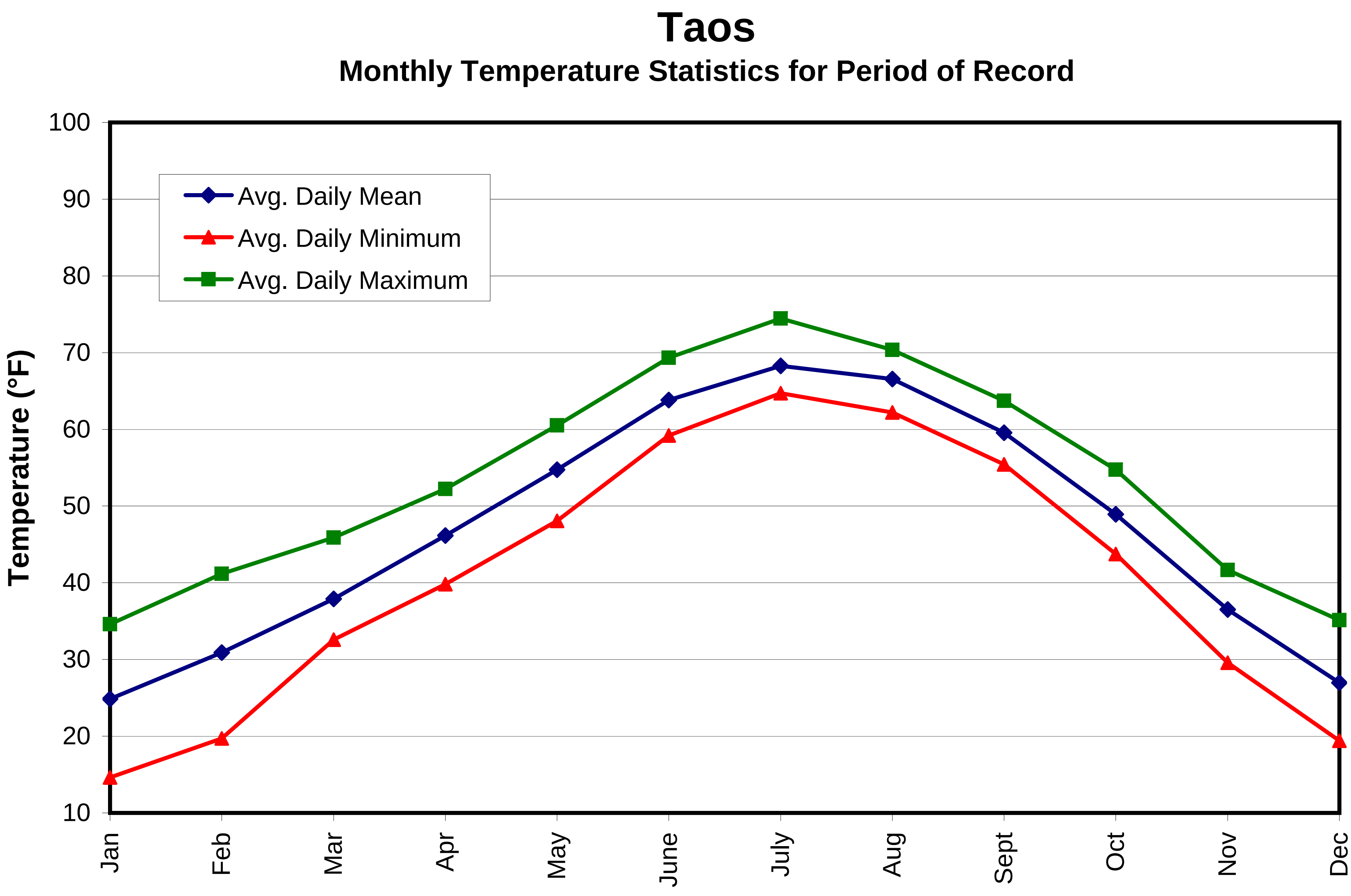

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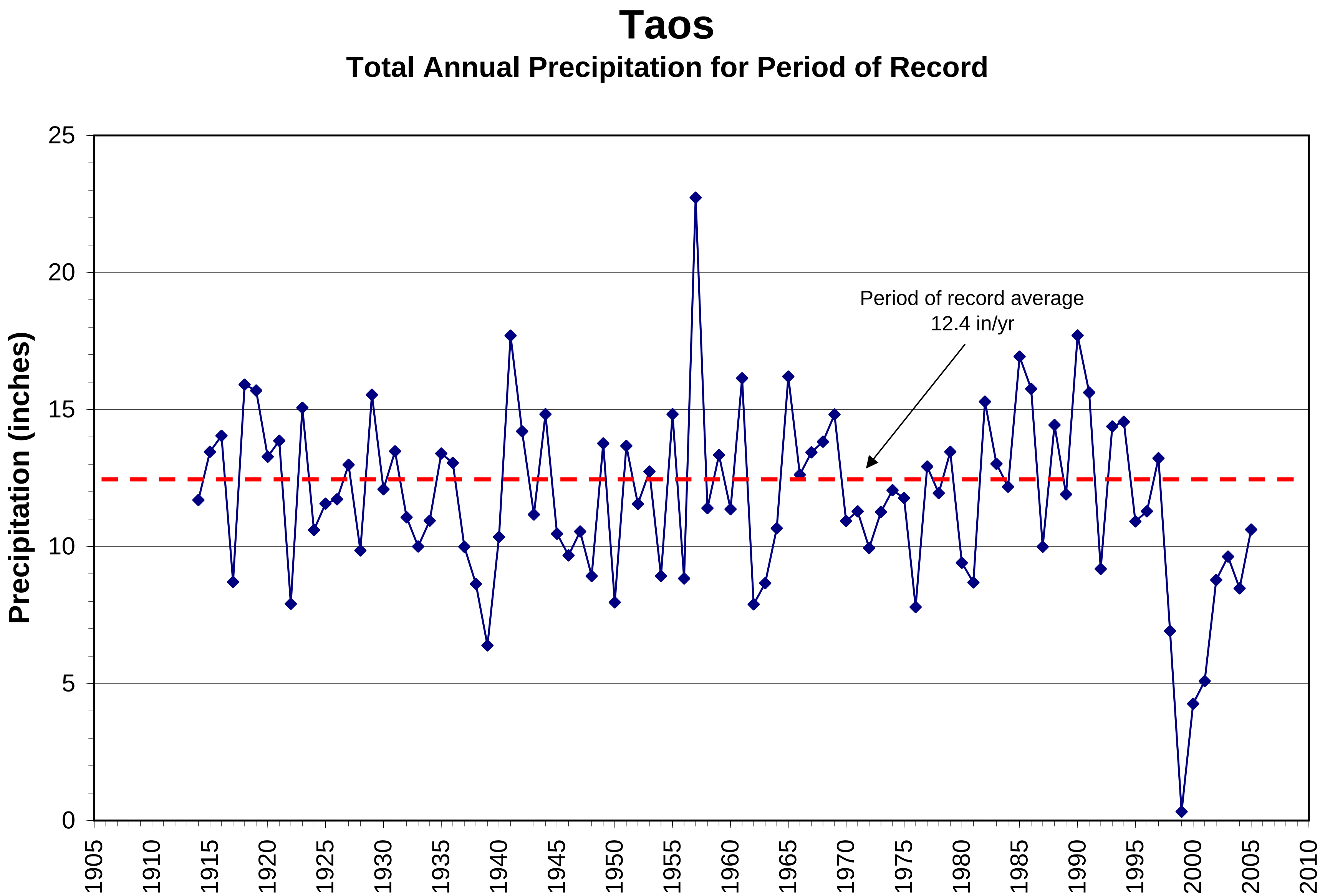

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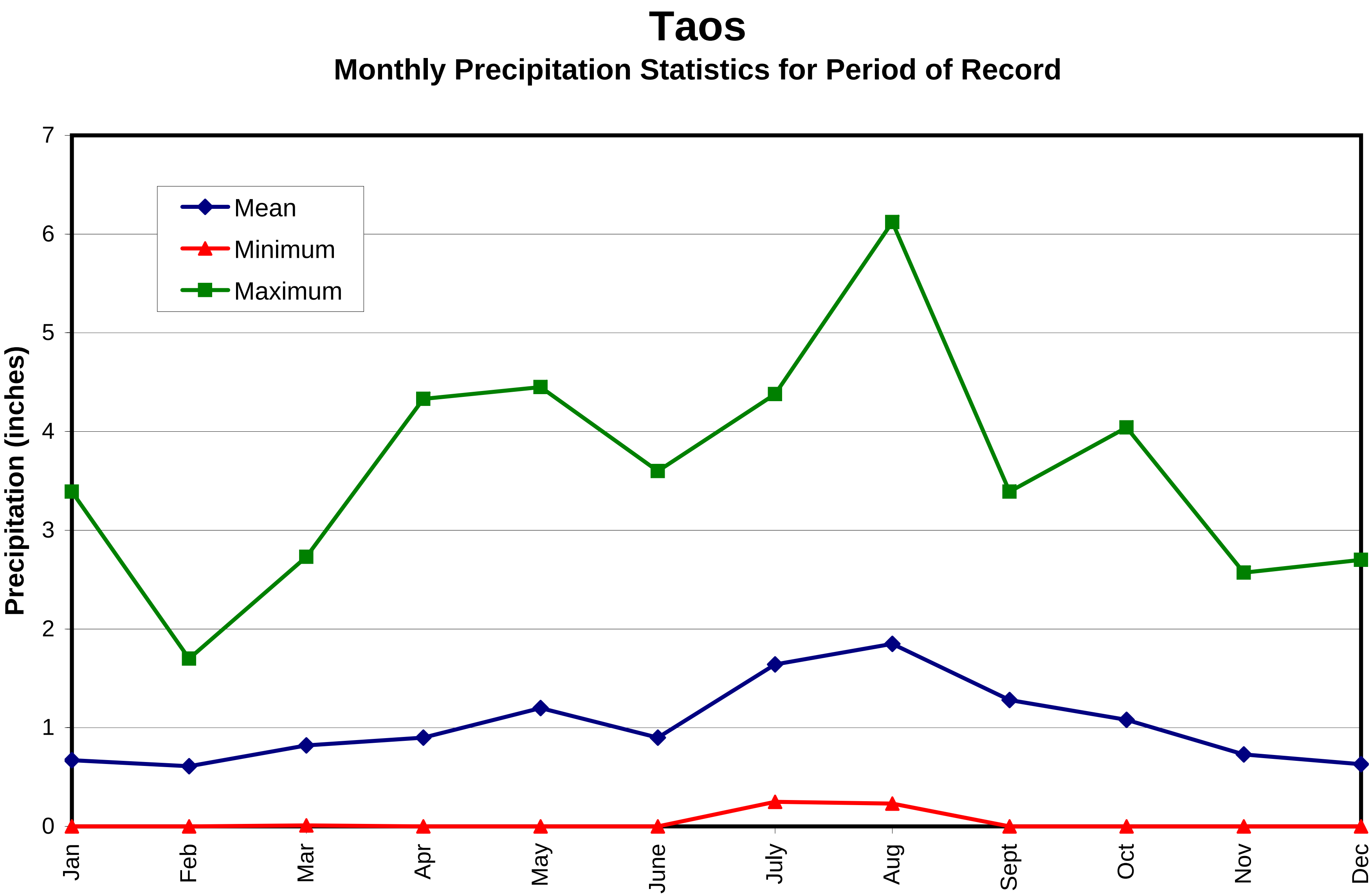

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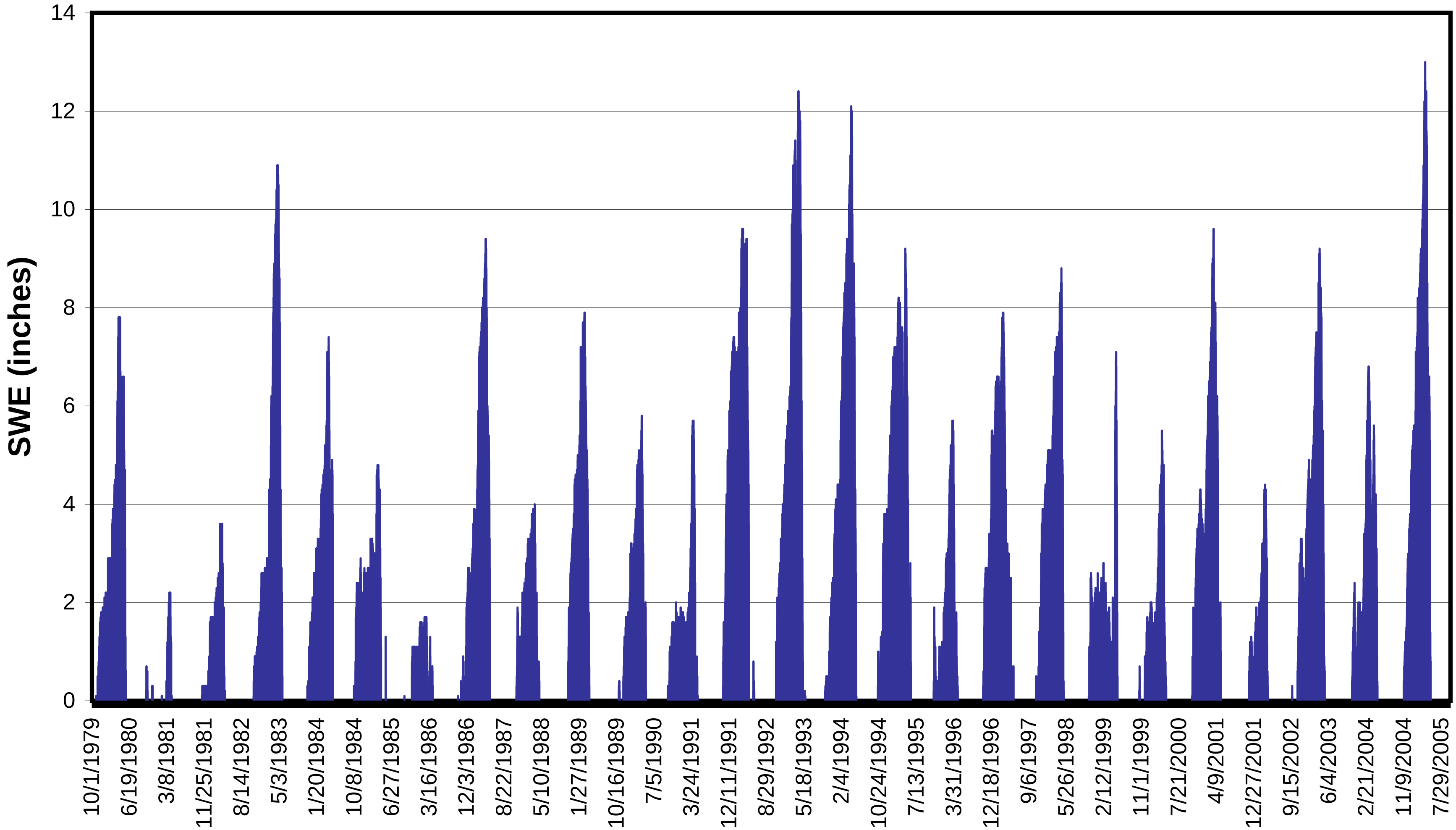
North Costilla SNOTEL Station

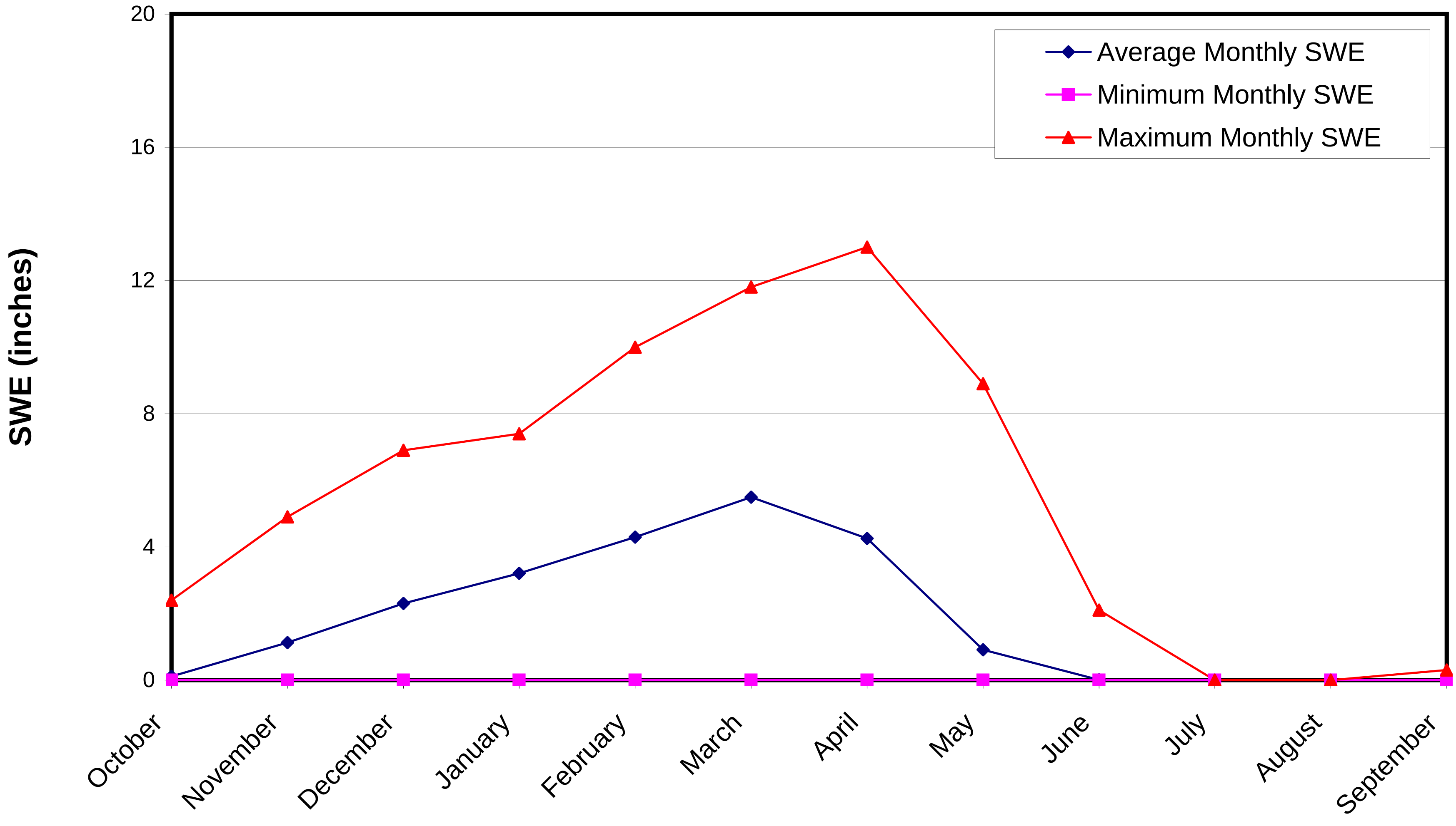
Daily Snow Water Equivalents for Period of Record



P:_WR05-235\RegWtrPln.N-07\Sec_5\AppxE\E1\6_Taos SNOTEL.xls North Costilla SWE

North Costilla SNOTEL Station

Monthly SWE Statistics for Period of Record



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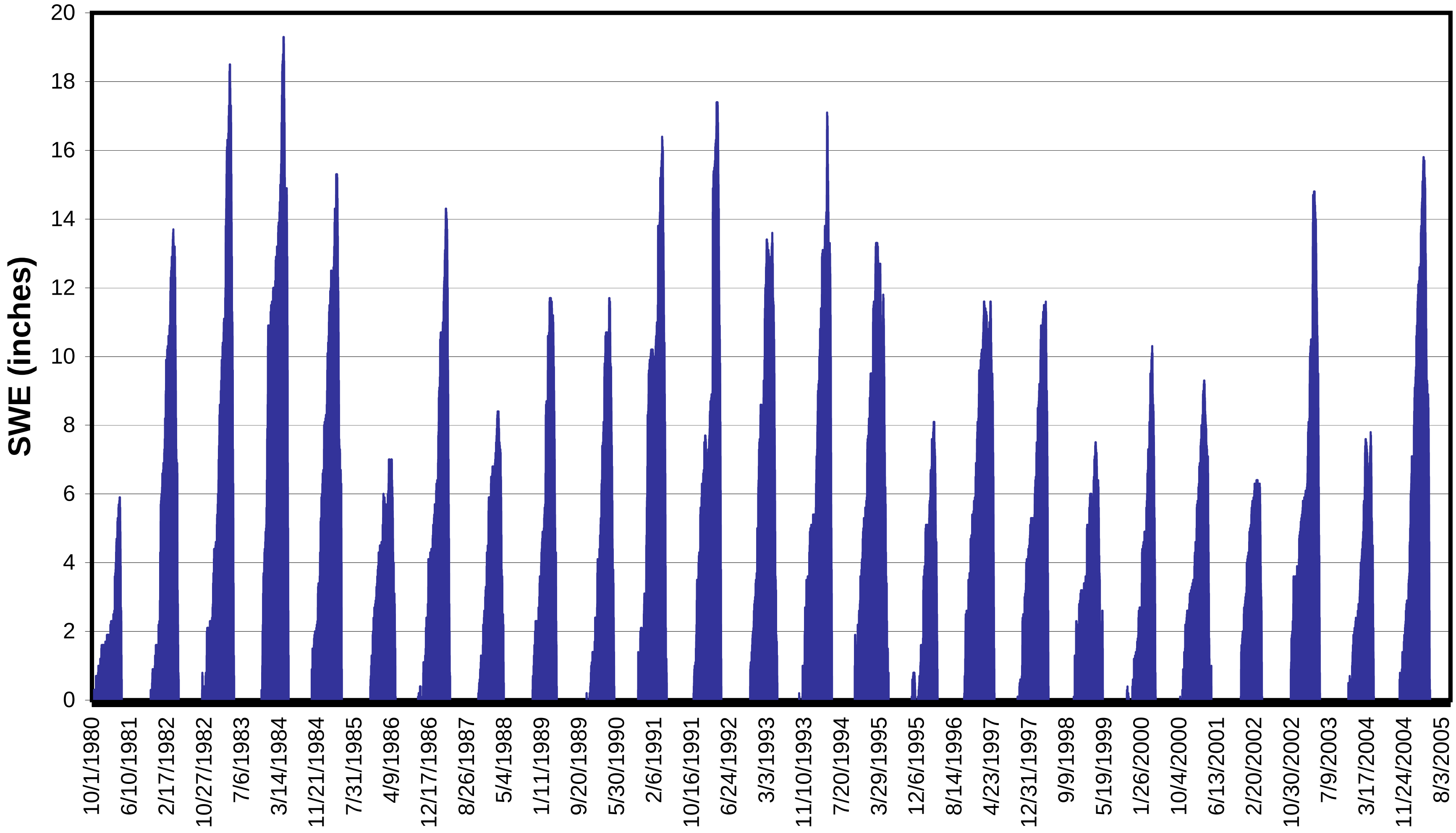
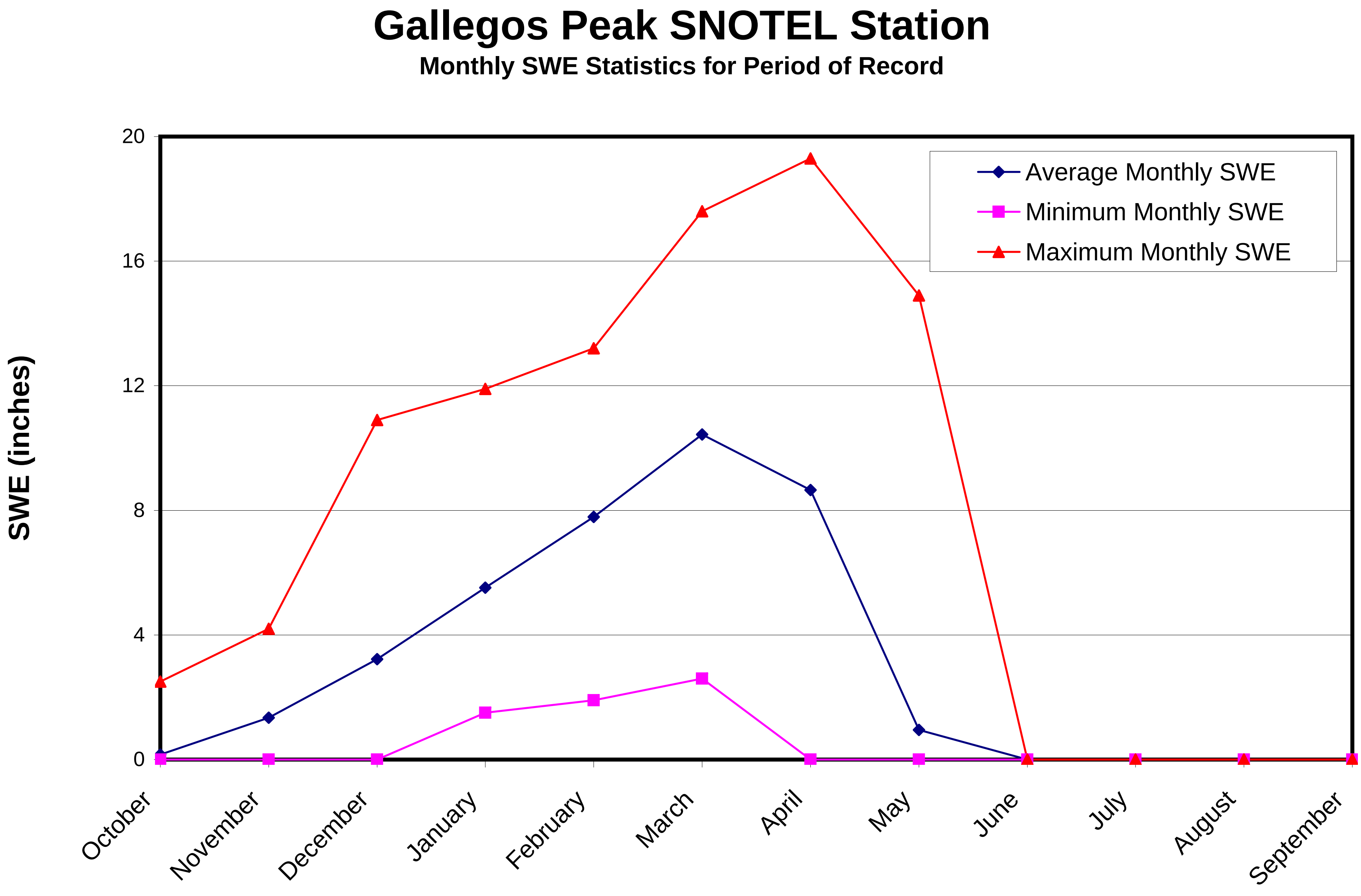
Gallegos Peak SNOTEL Station

Daily Snow Water Equivalents for Period of Record



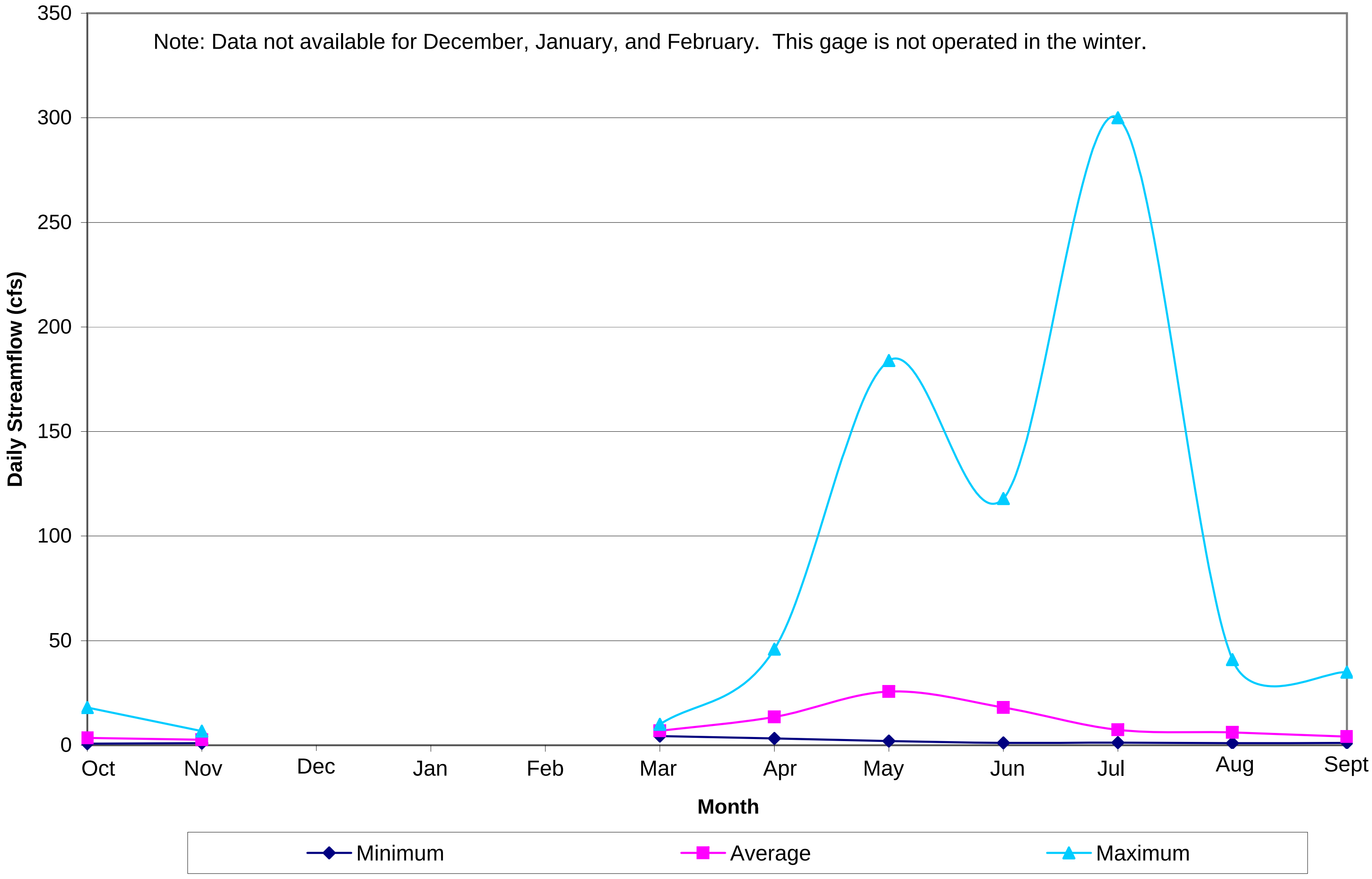


P:_WR05-235\RegWtrPln.N-07\Sec_5\AppxE\E1\6_Taos SNOTEL.xls Gallegos Peak stats

Appendix E2

Streamflow Data

Average Daily Streamflow for Each Month, Costilla Creek above Costilla Dam



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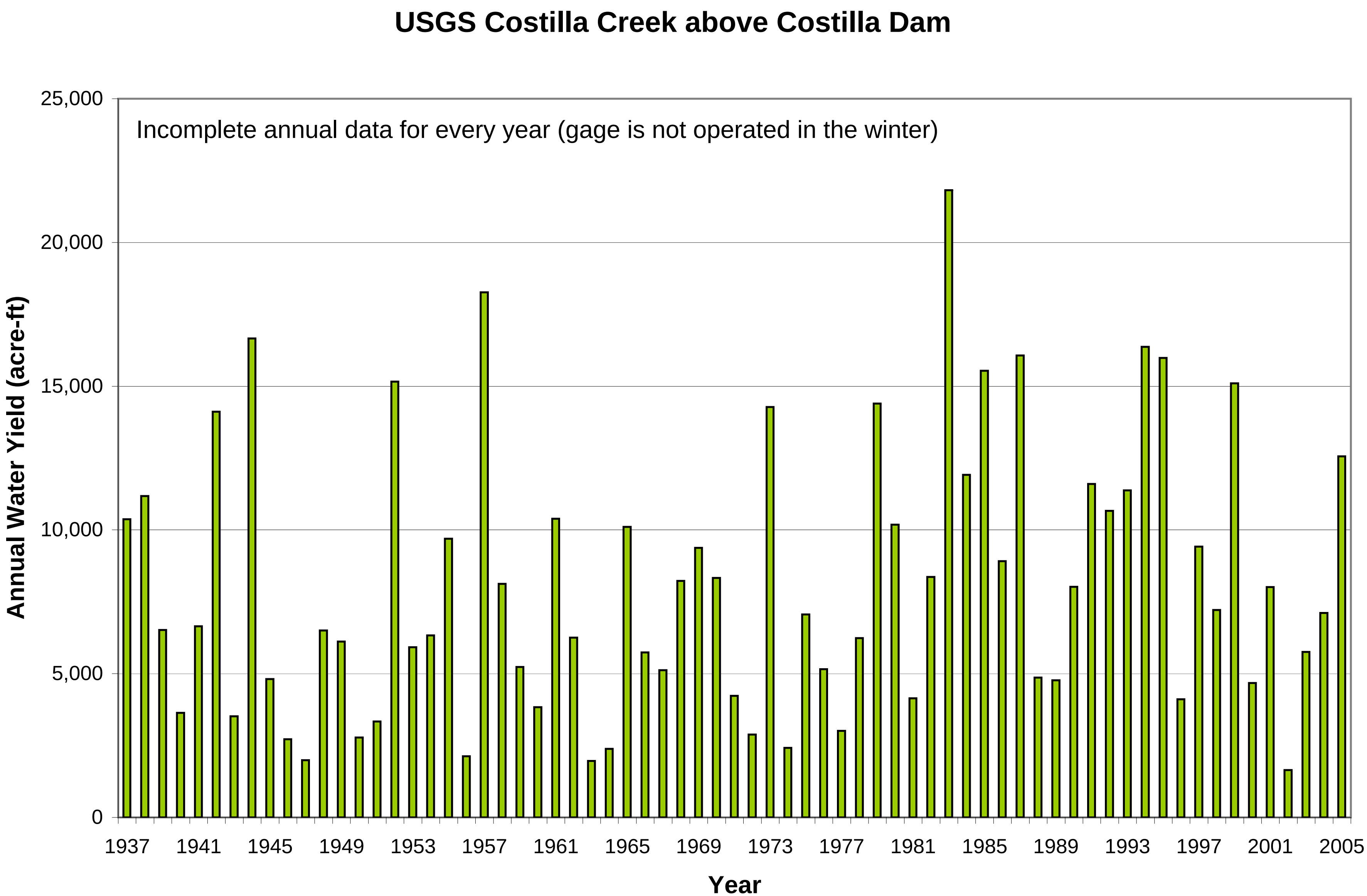

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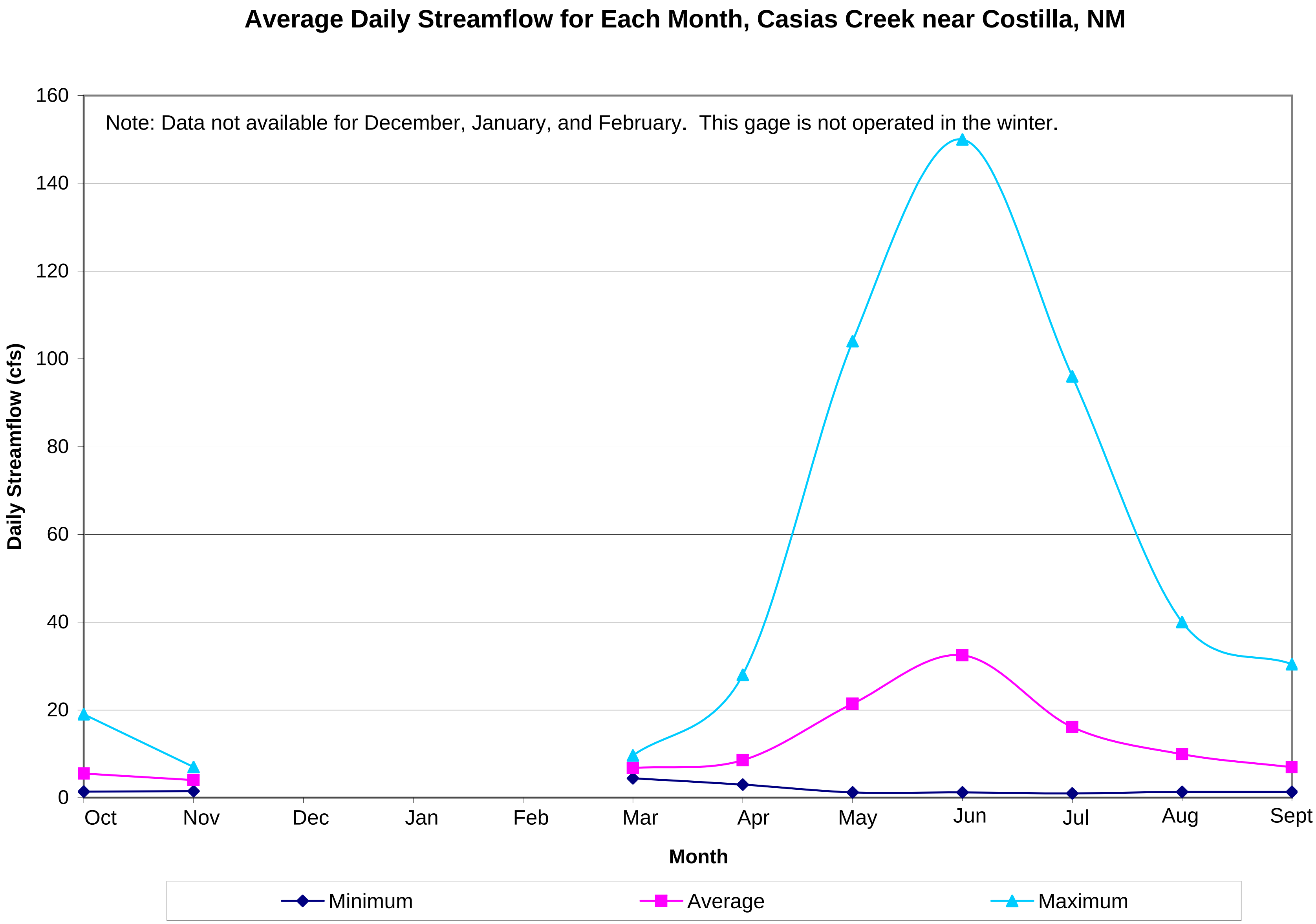
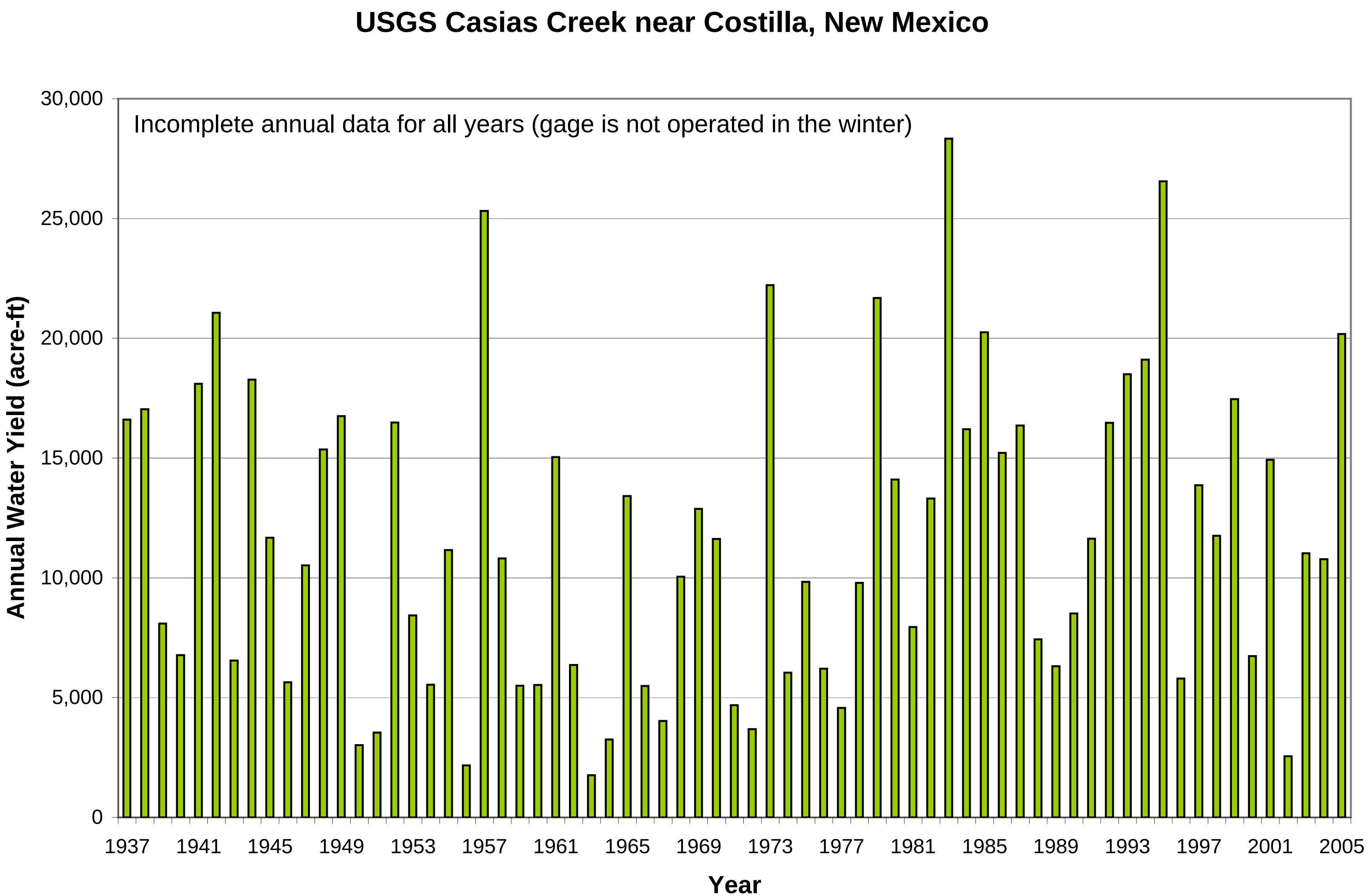


P:_WR05-235\RegWtrPln.N-07\Sec_5\AppxE\E2\2_08253000_Casias near Costilla.xls daily flow plot



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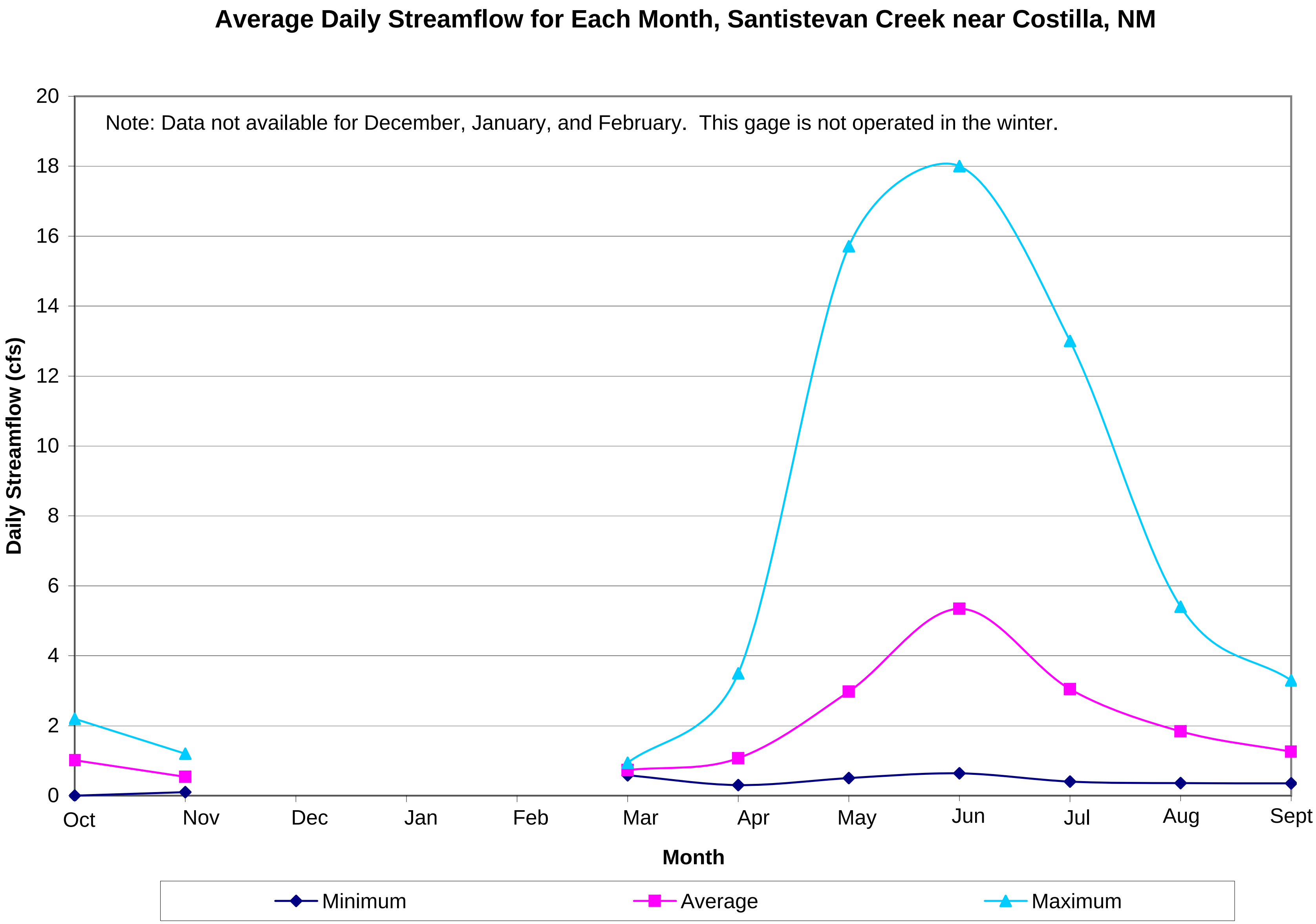

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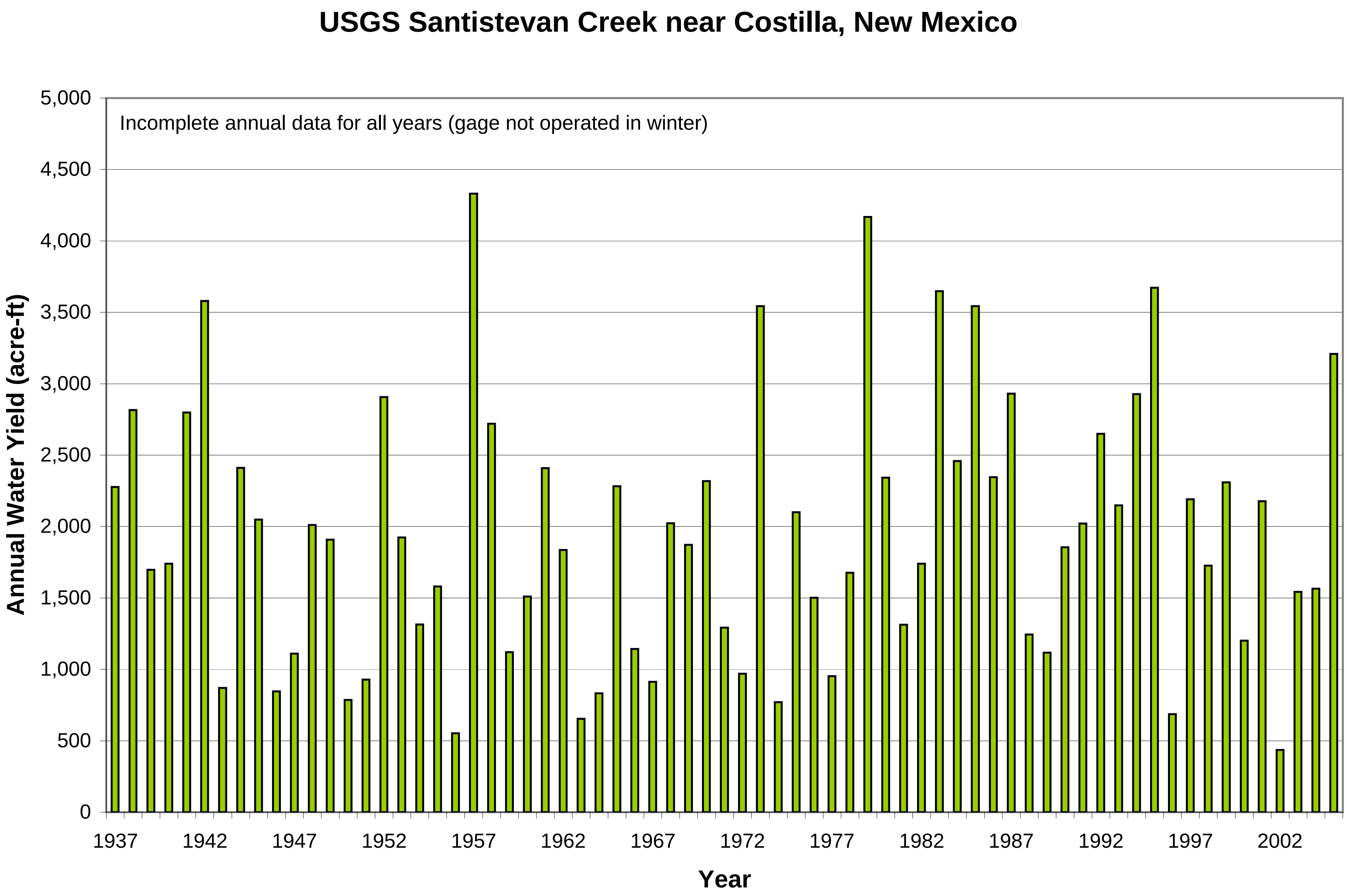
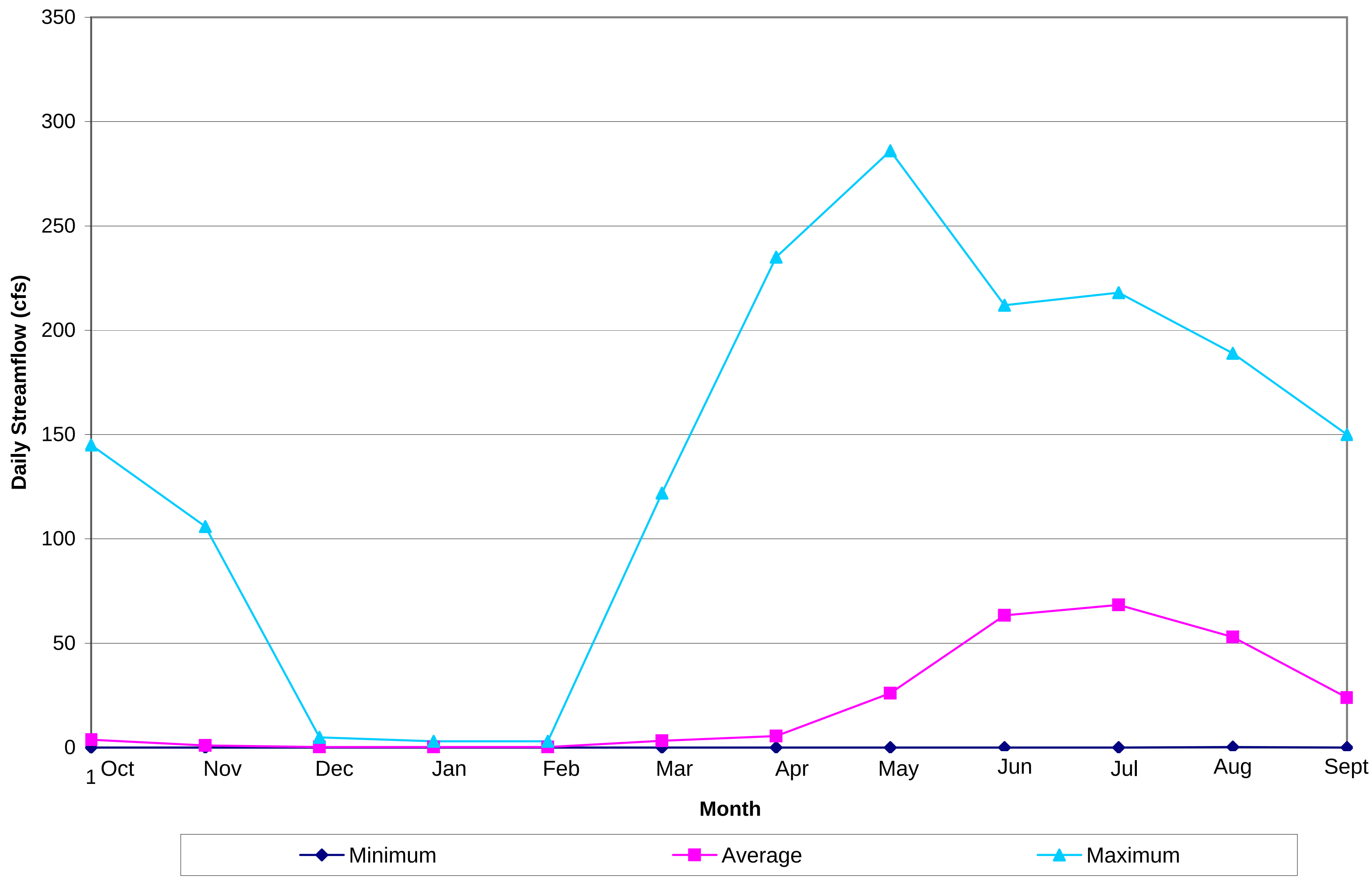


P:_WR05-235\RegWtrPln.N-07\Sec_5\AppxE\E2\3_08253500_SC near Costilla.xls annual yield plot

Average Daily Streamflow for Each Month, Costilla Creek below Costilla Dam



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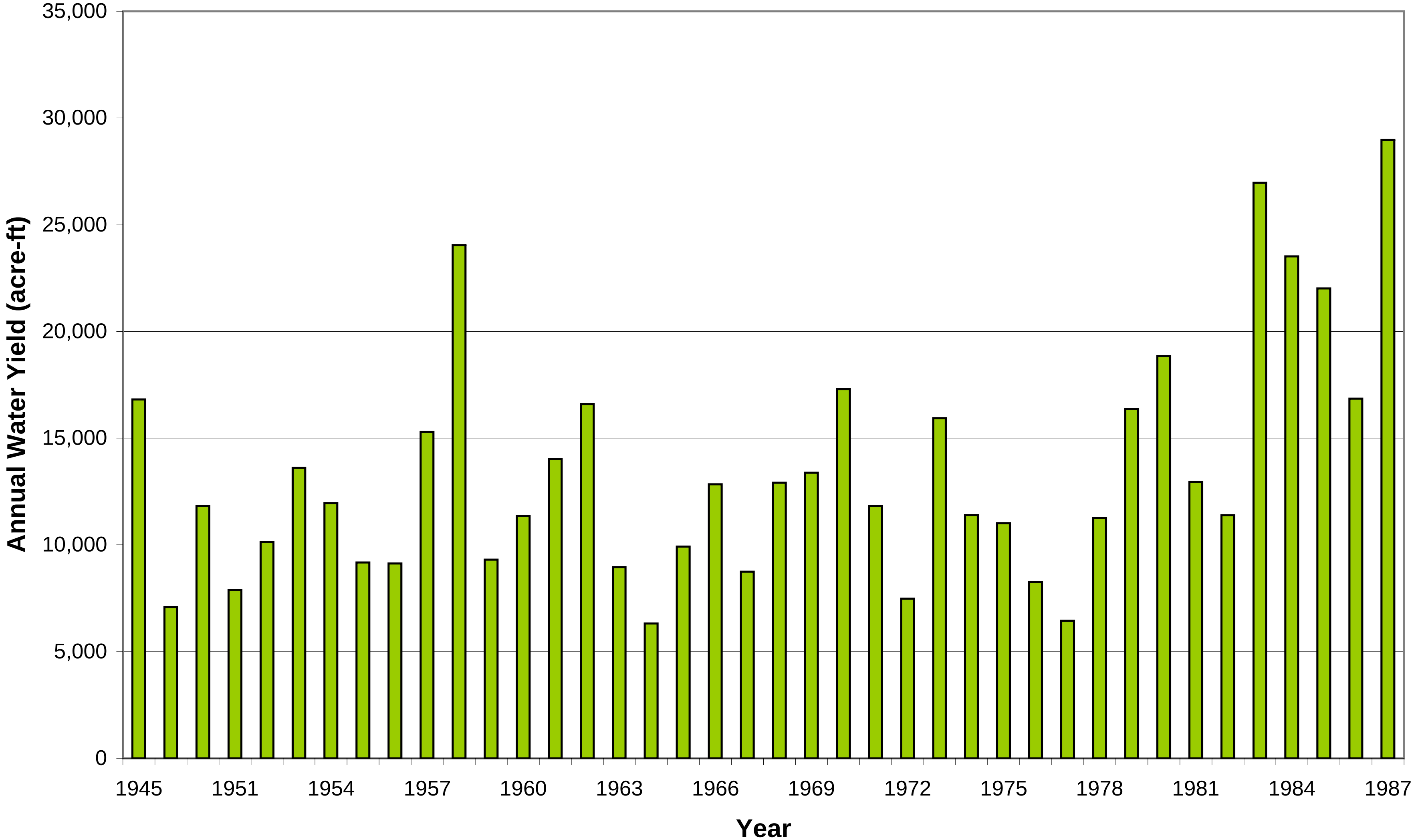
USGS Costilla Creek below Costilla Dam



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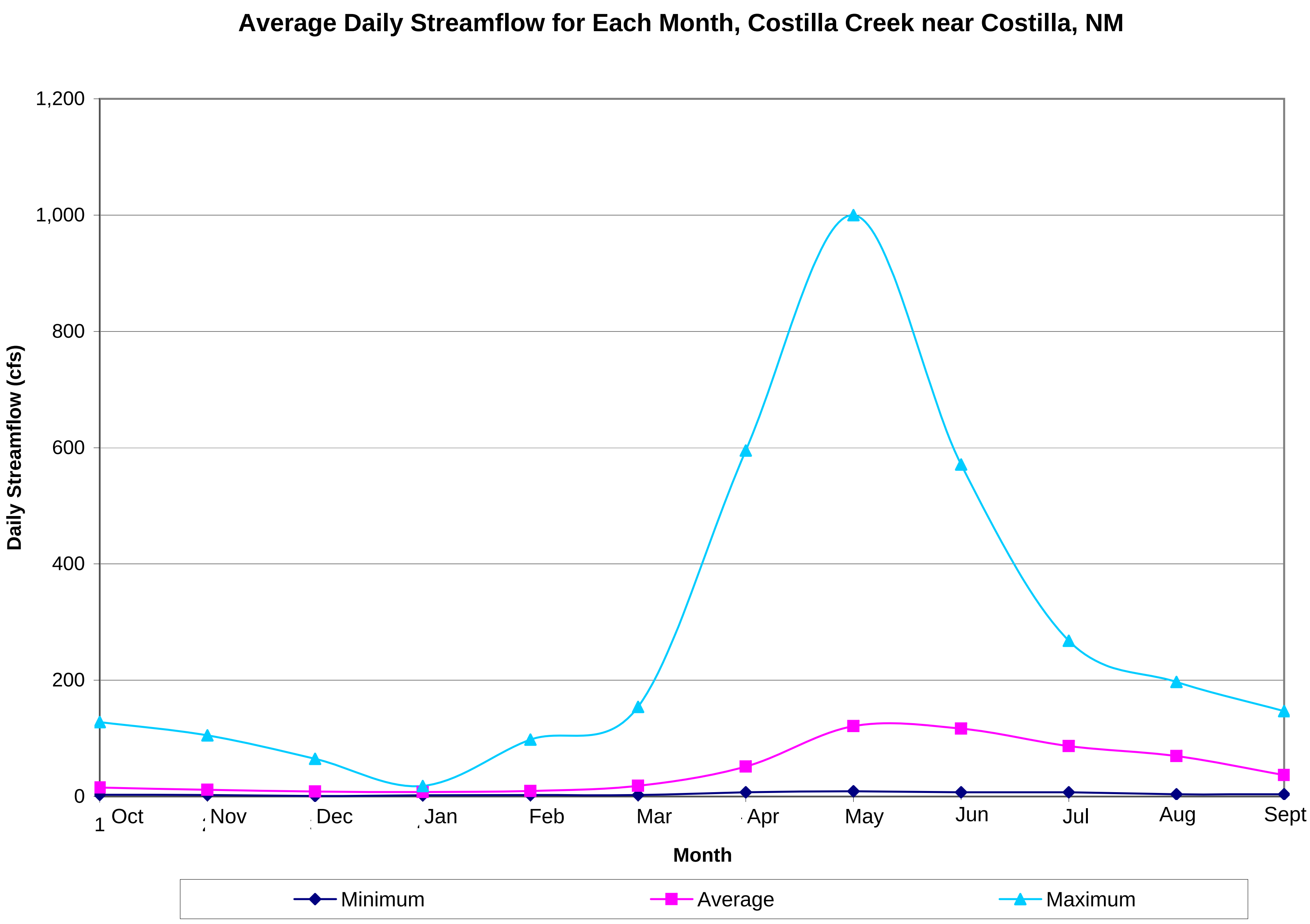

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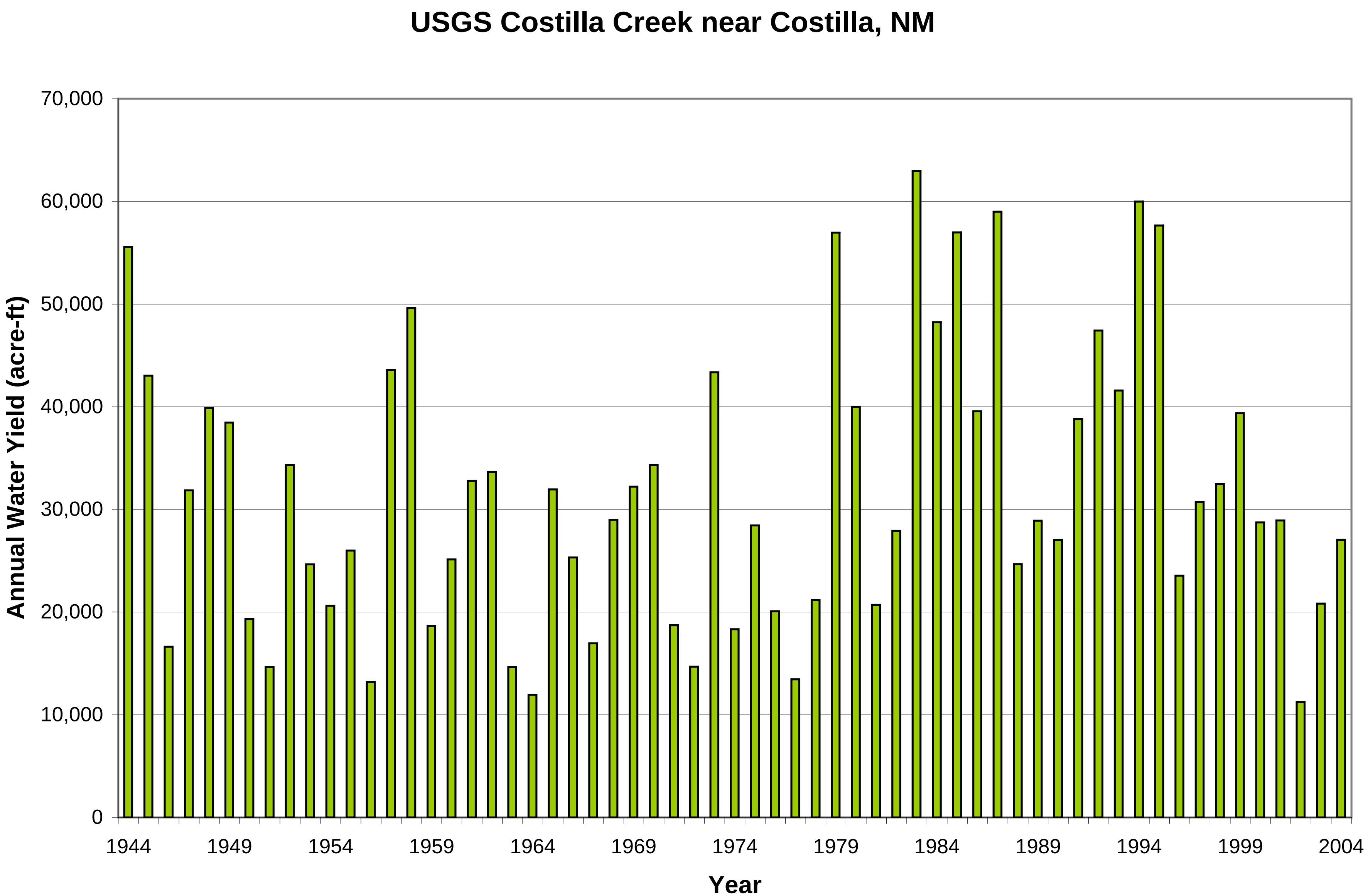
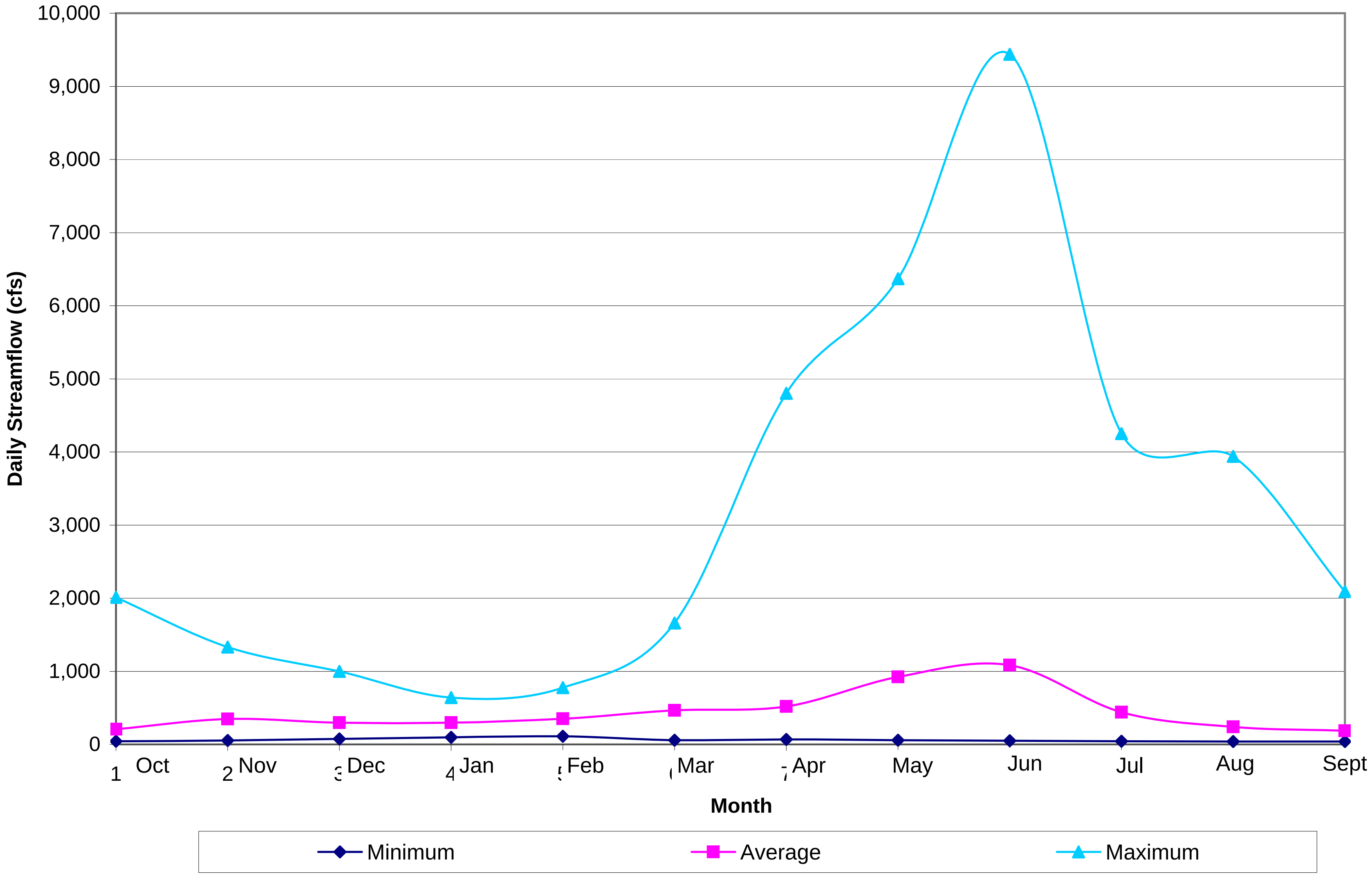


P:_WR05-235\RegWtrPln.N-07\Sec_5\AppxE\E2\5_08255500_CC near Costilla.xls annual yield plot

Average Daily Streamflow for Each Month, Rio Grande near Cerro, NM



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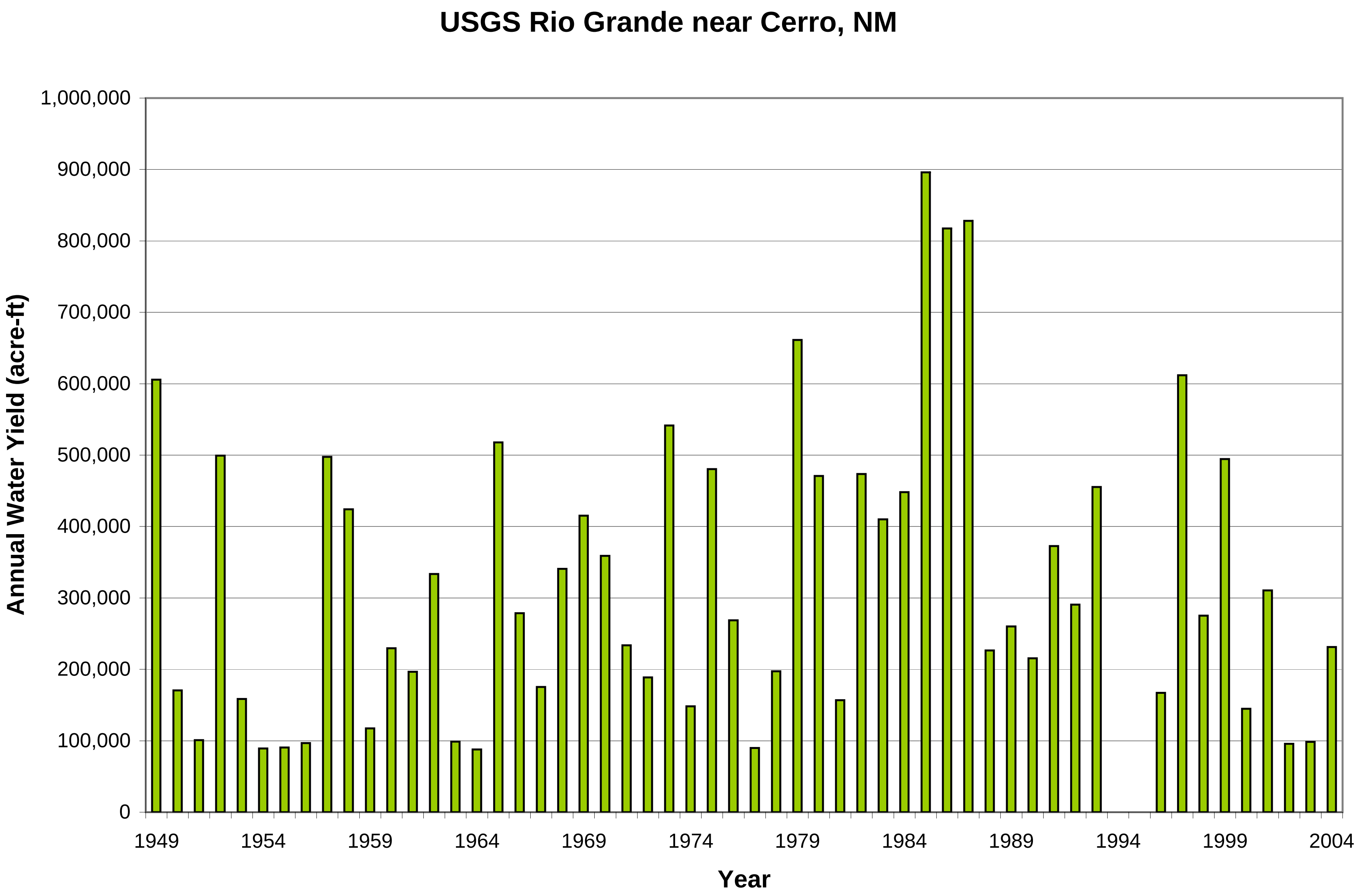

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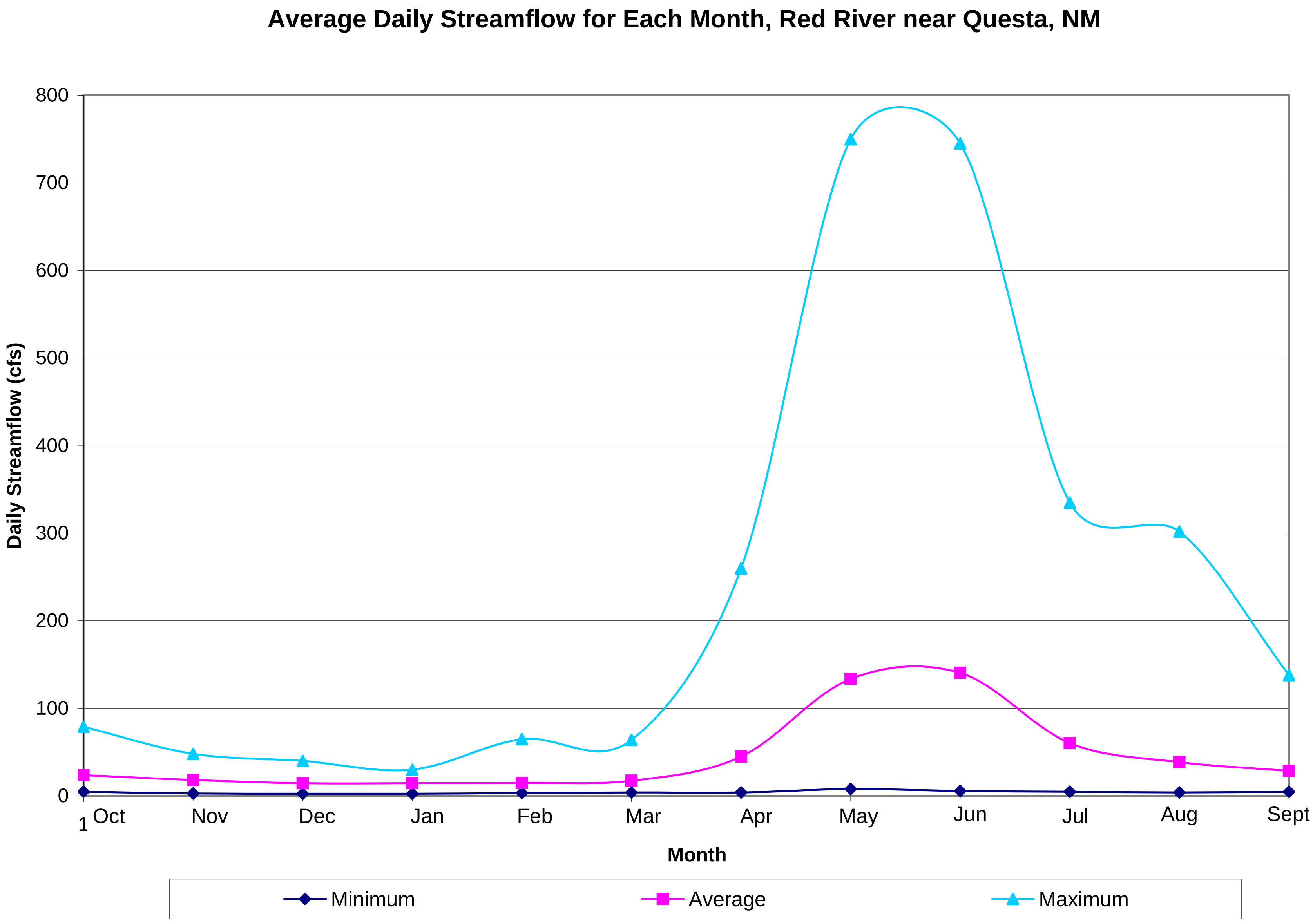

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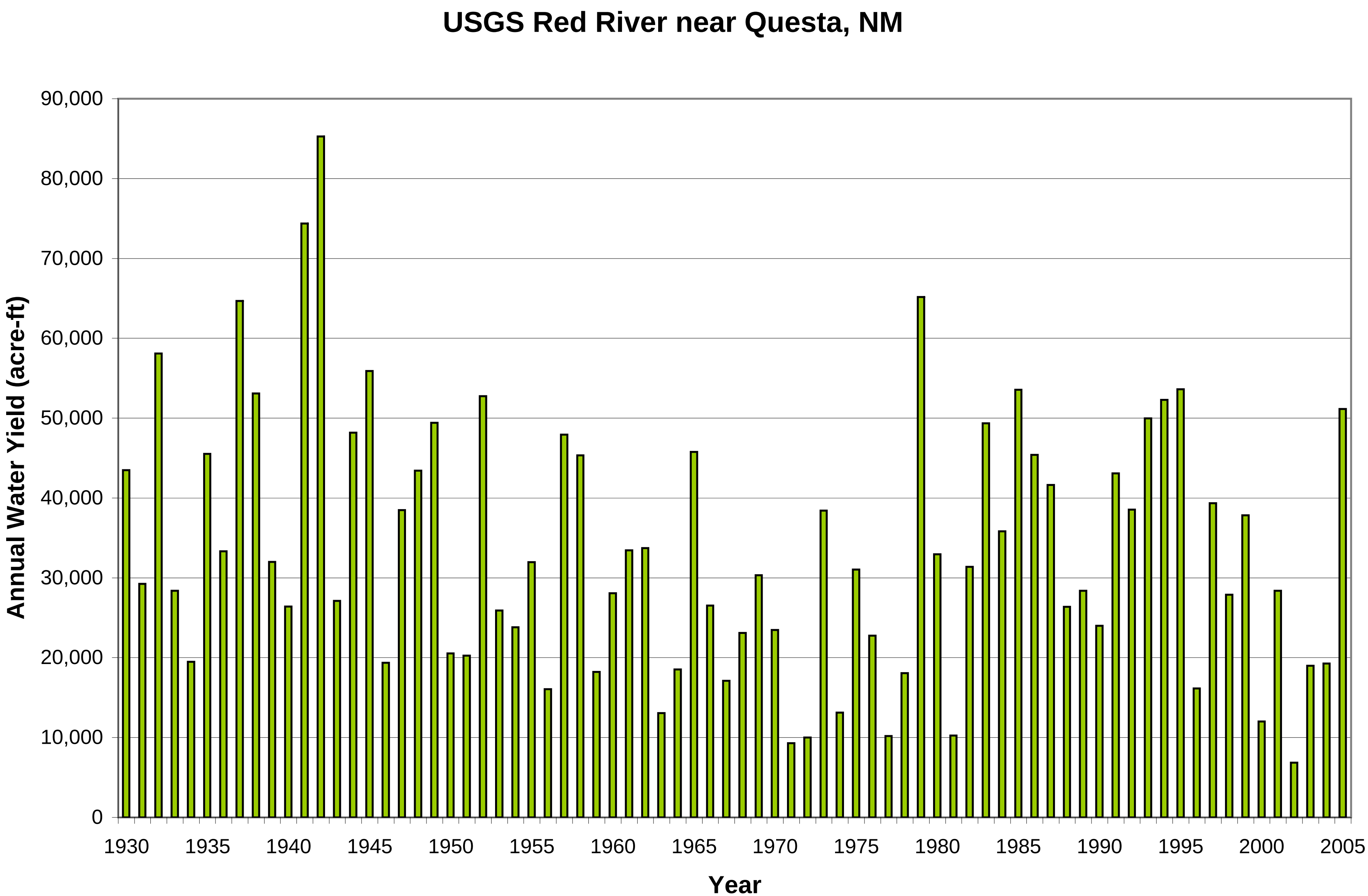

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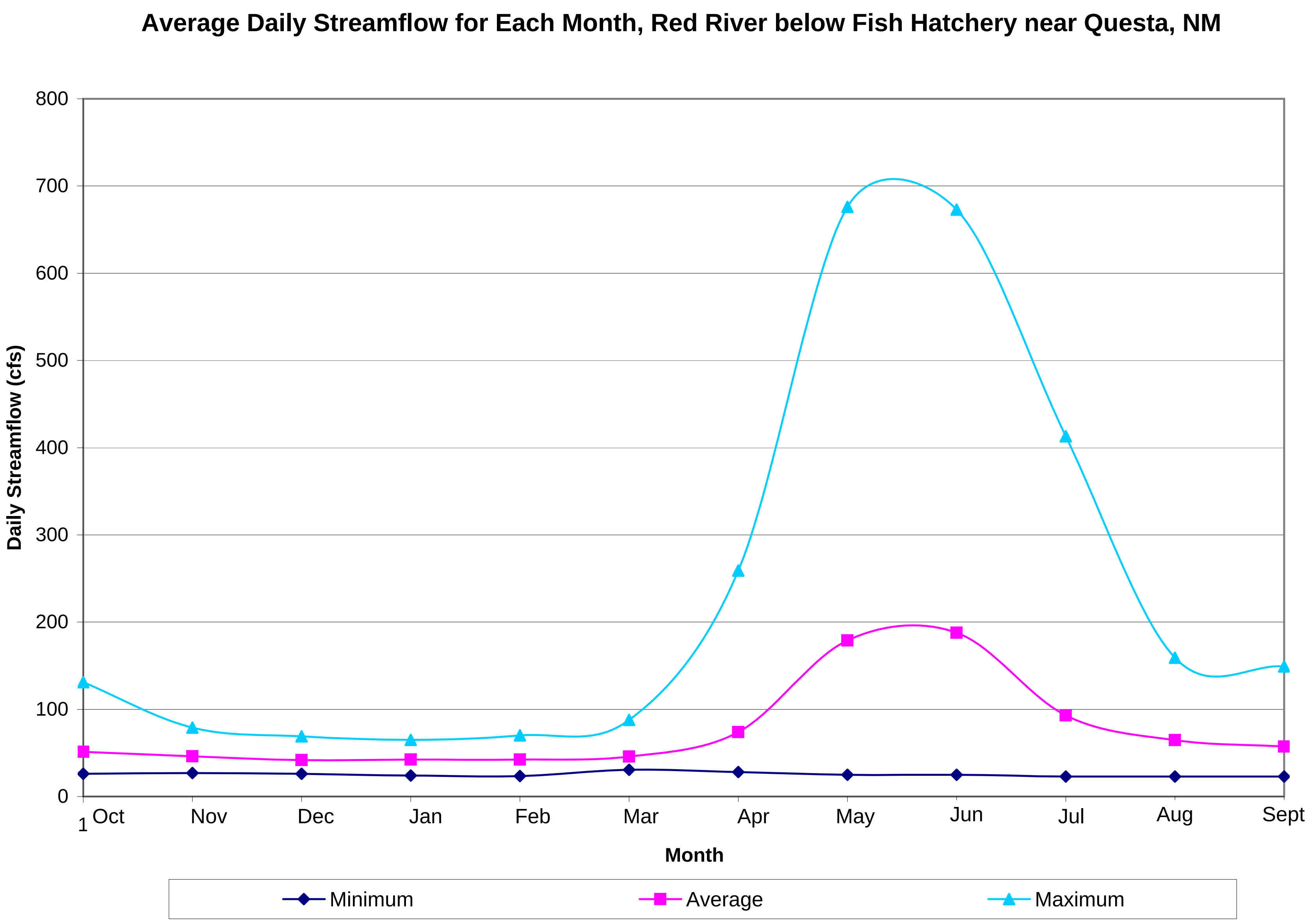

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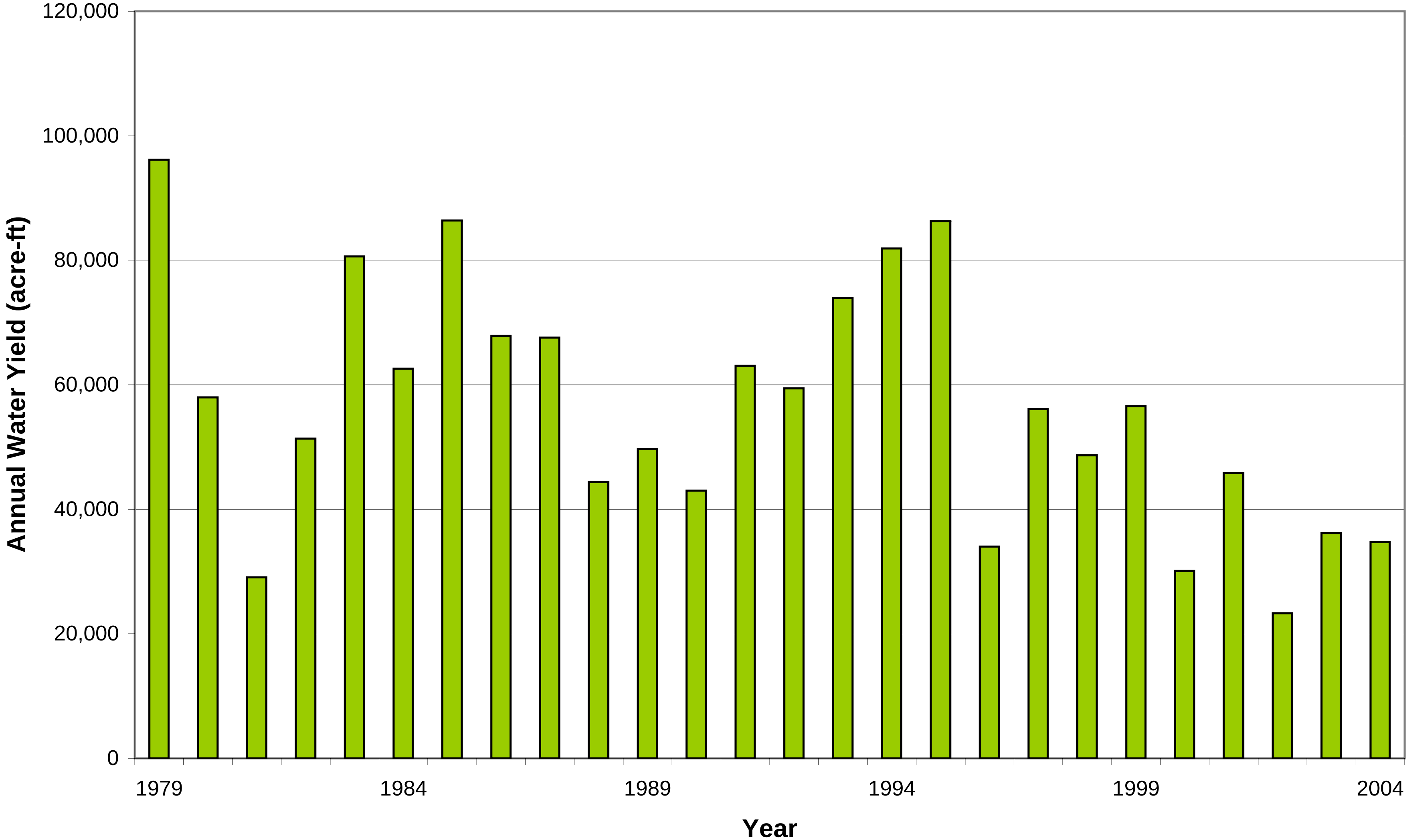
USGS Red River below Fish Hatchery near Questa, NM



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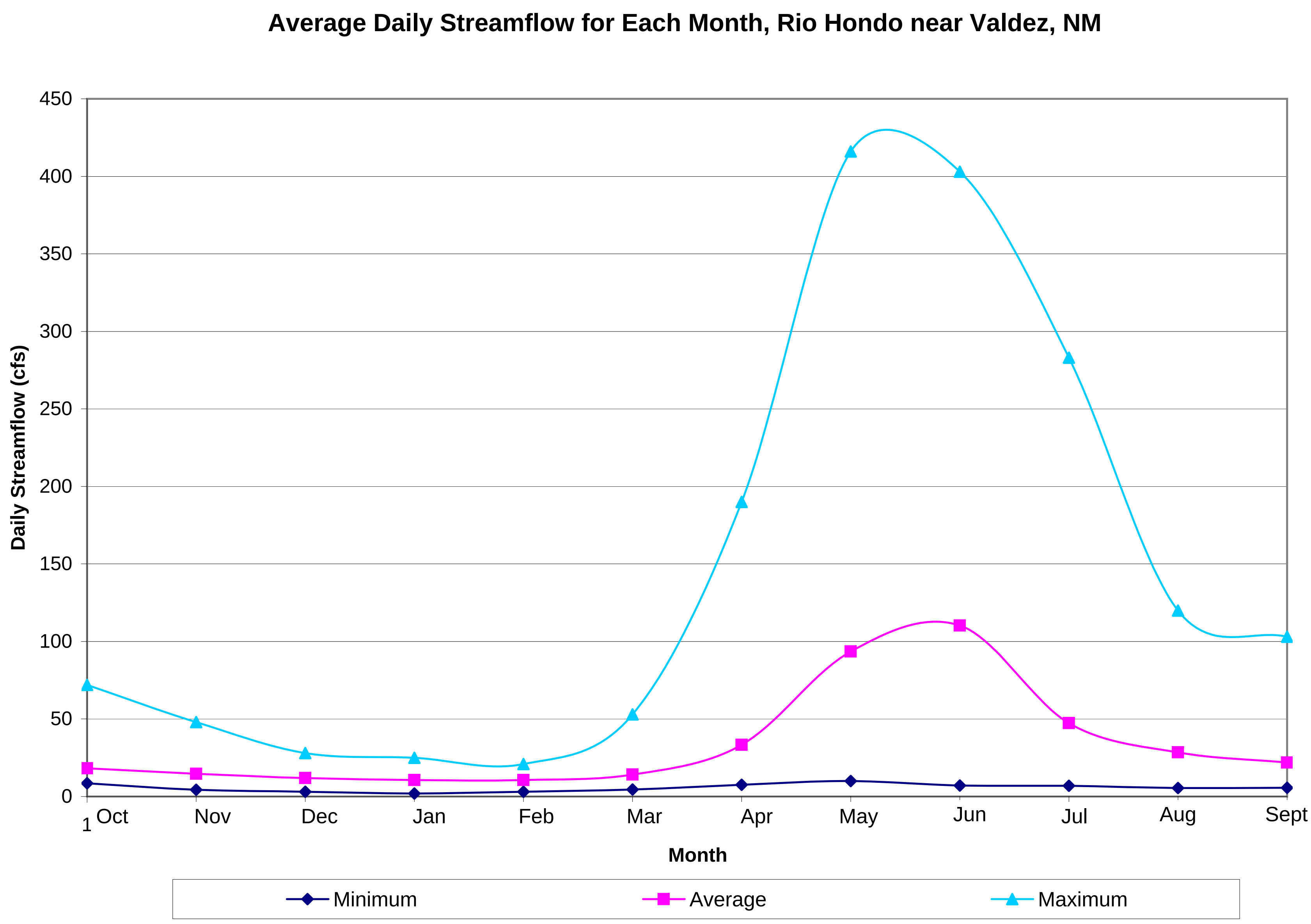

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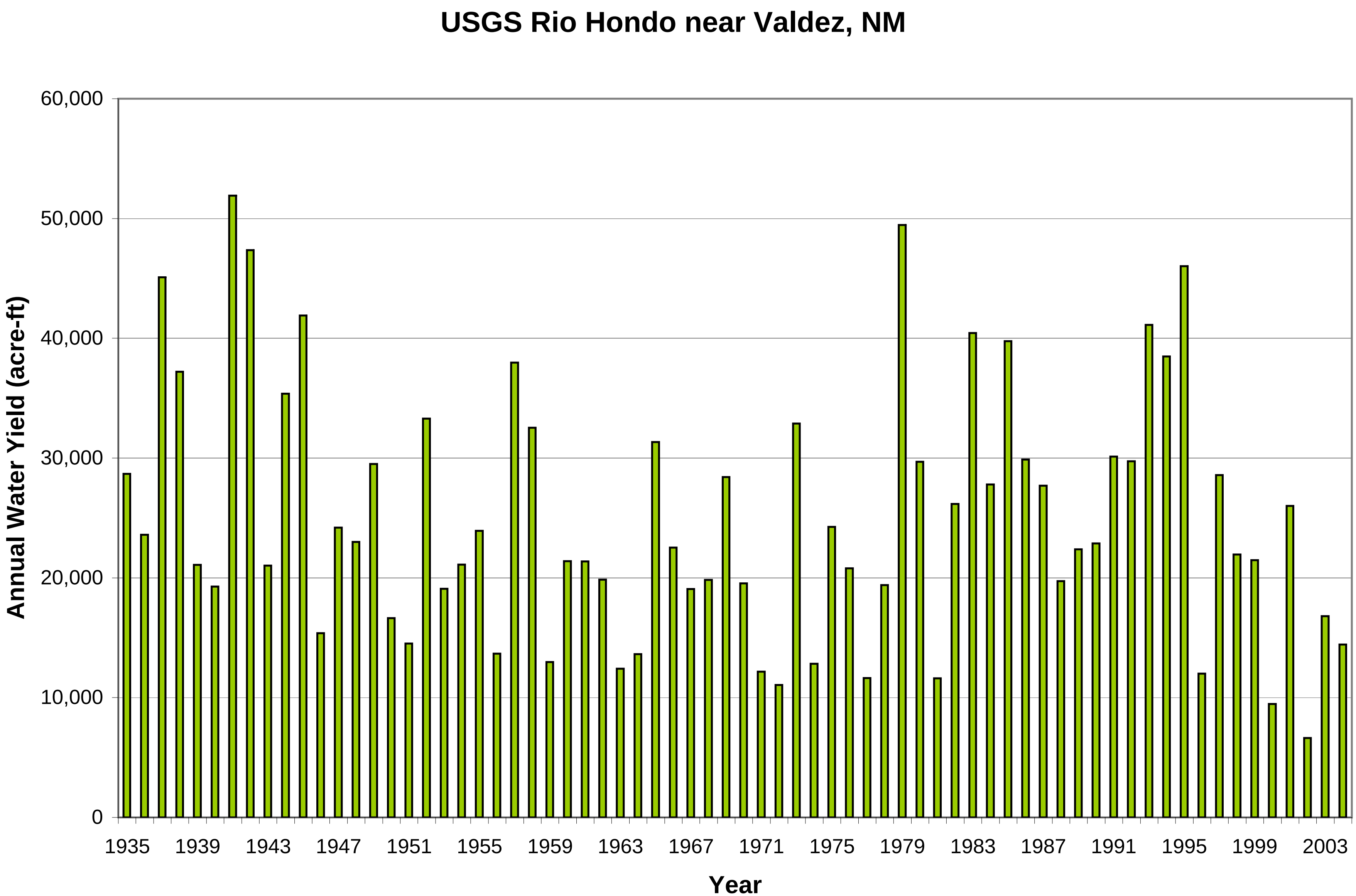

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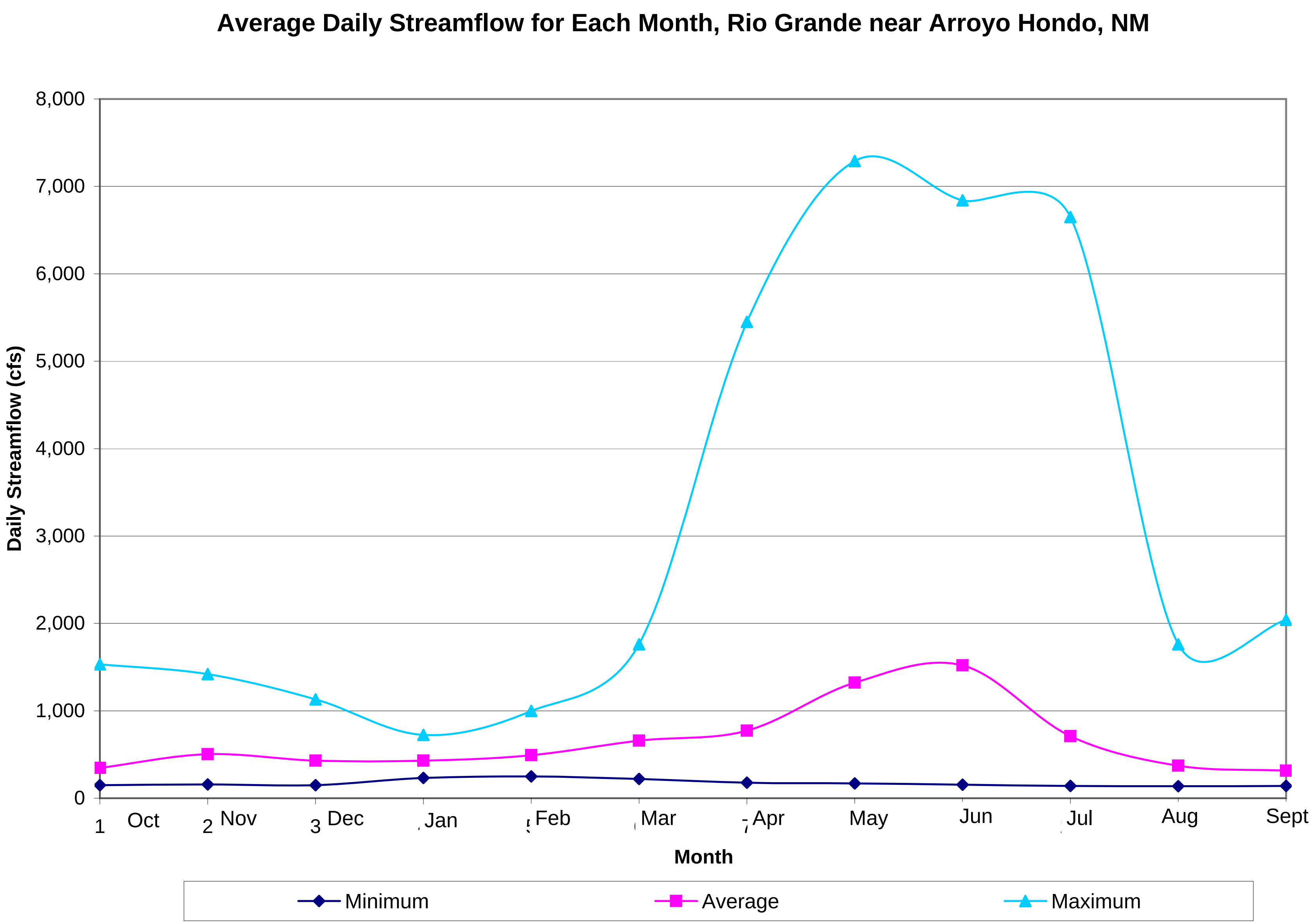

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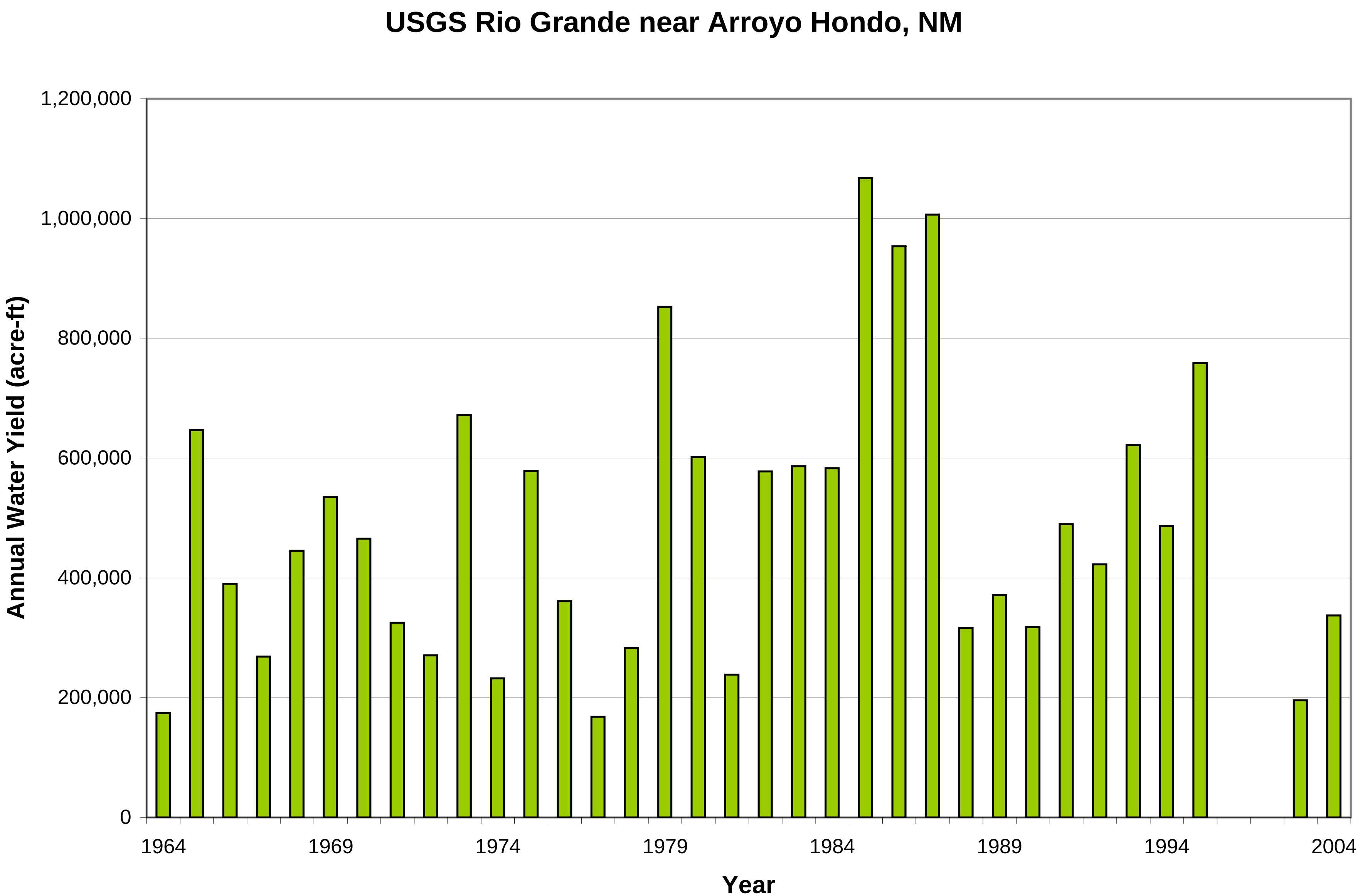

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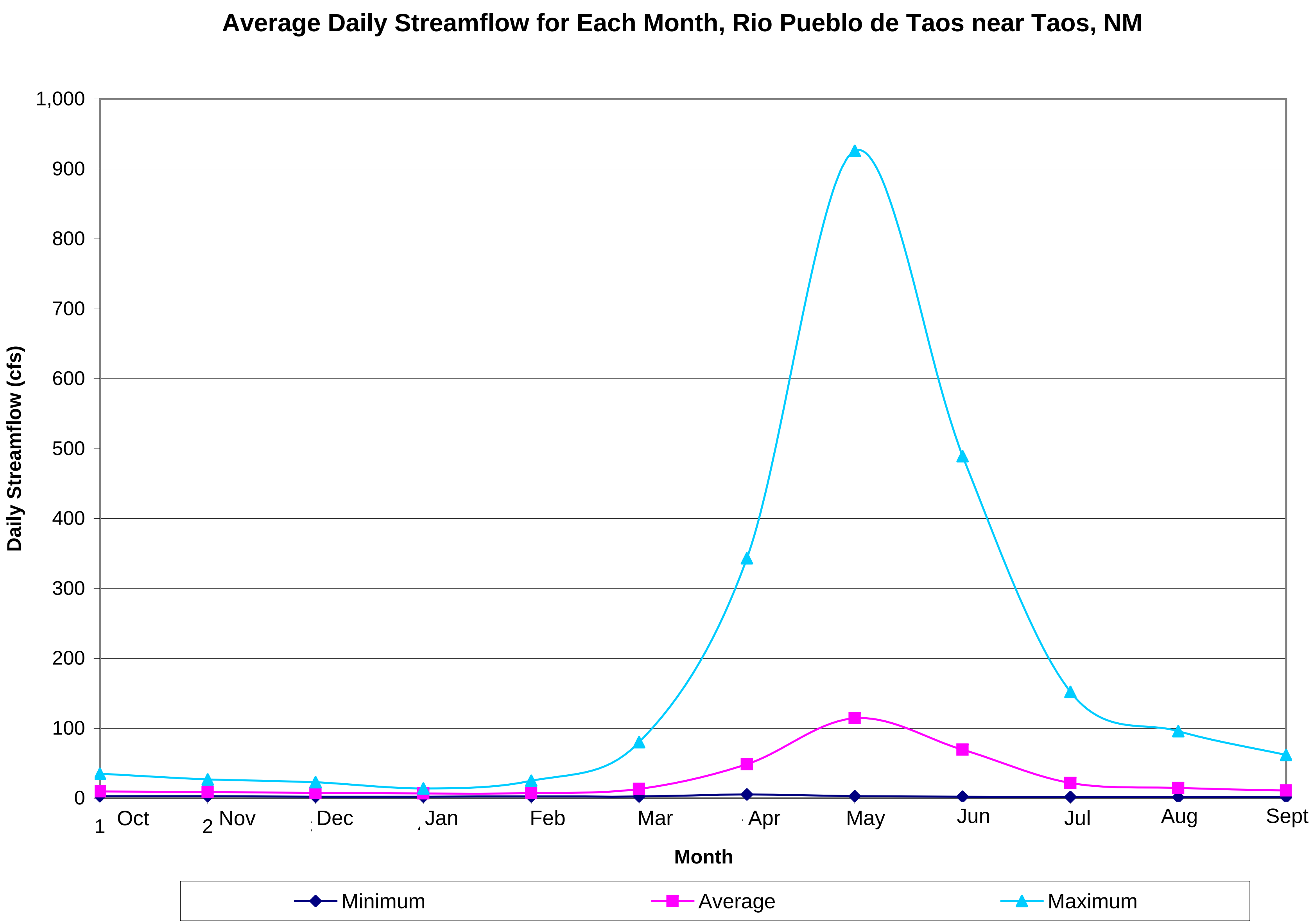

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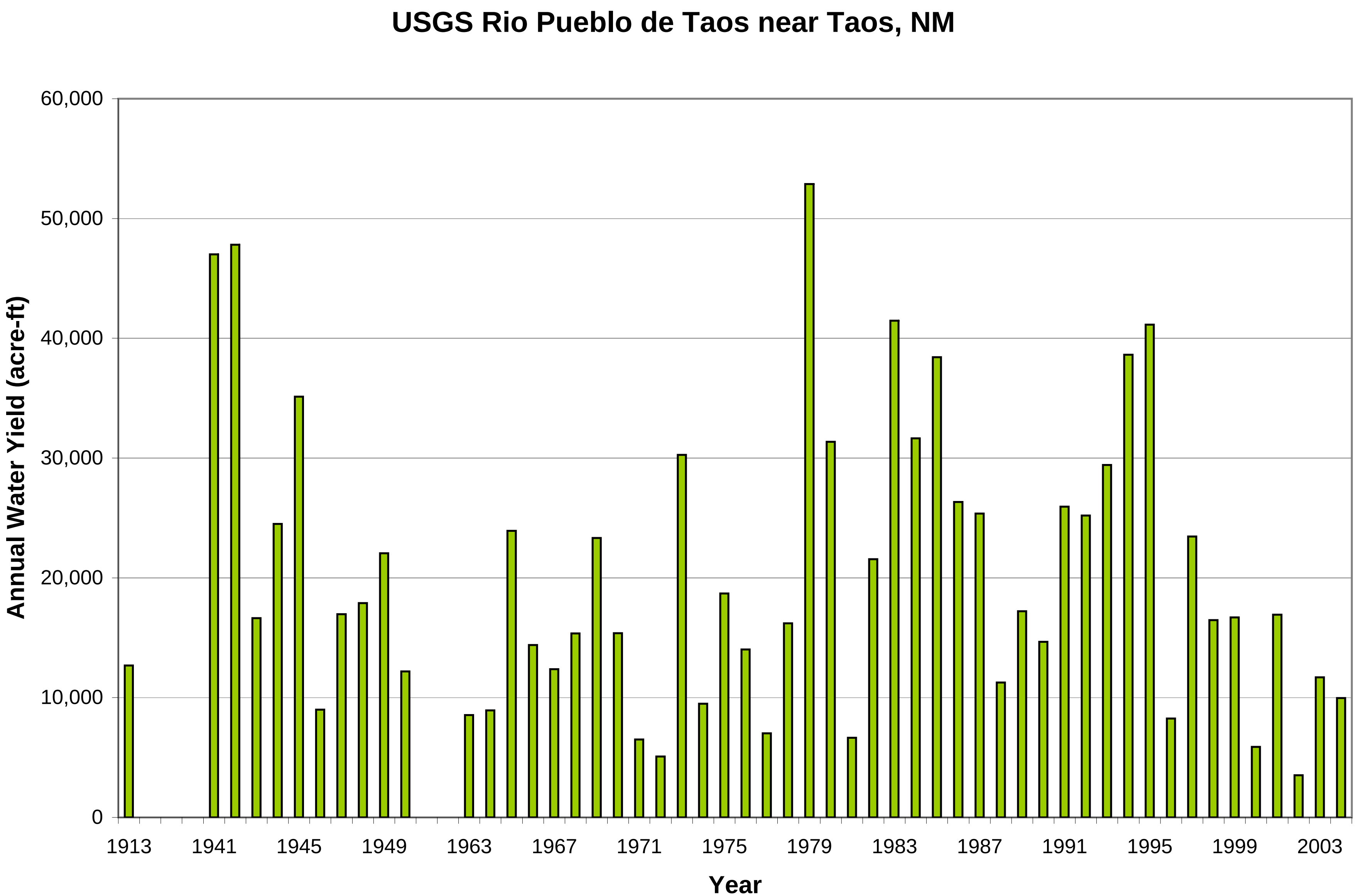

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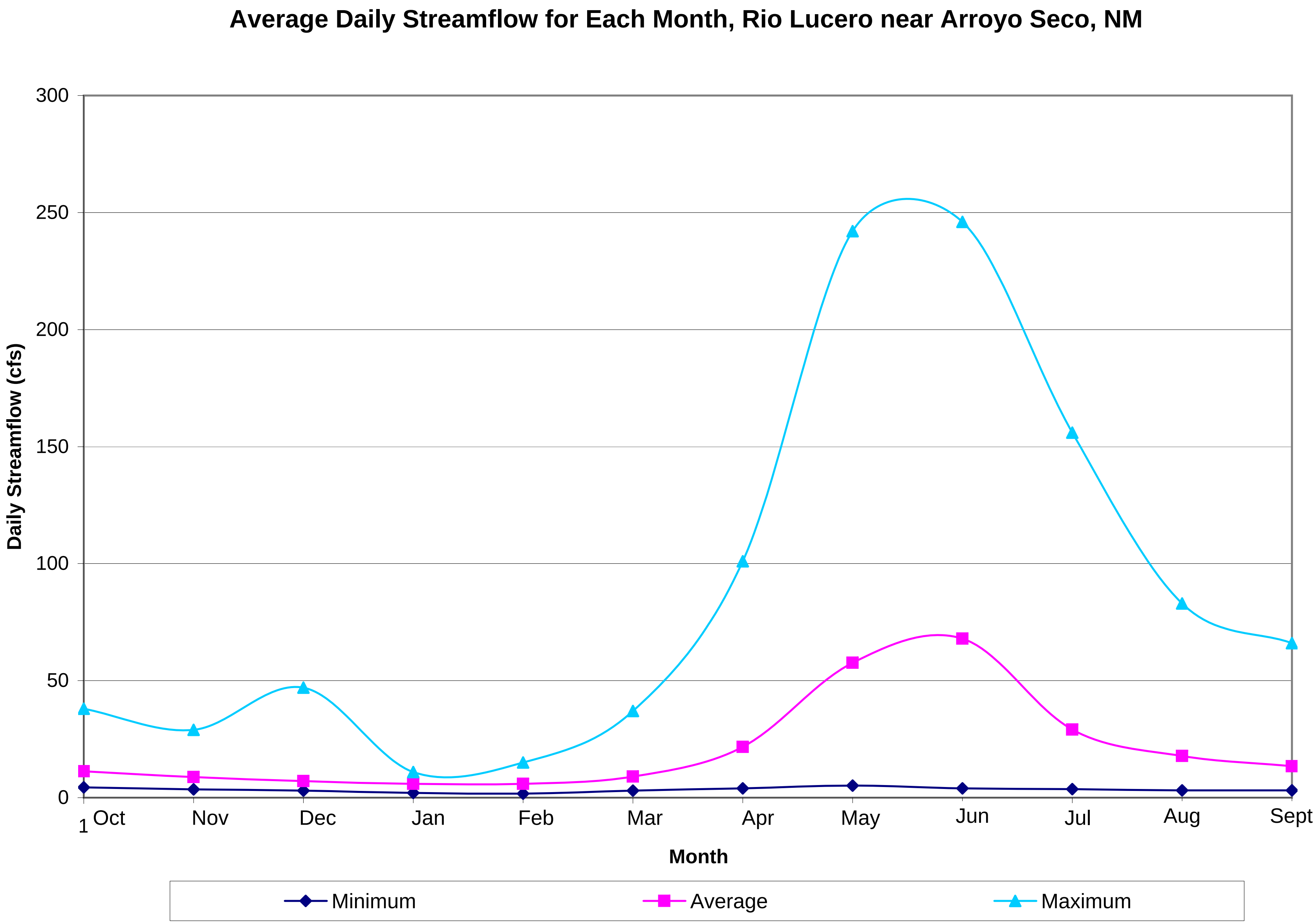

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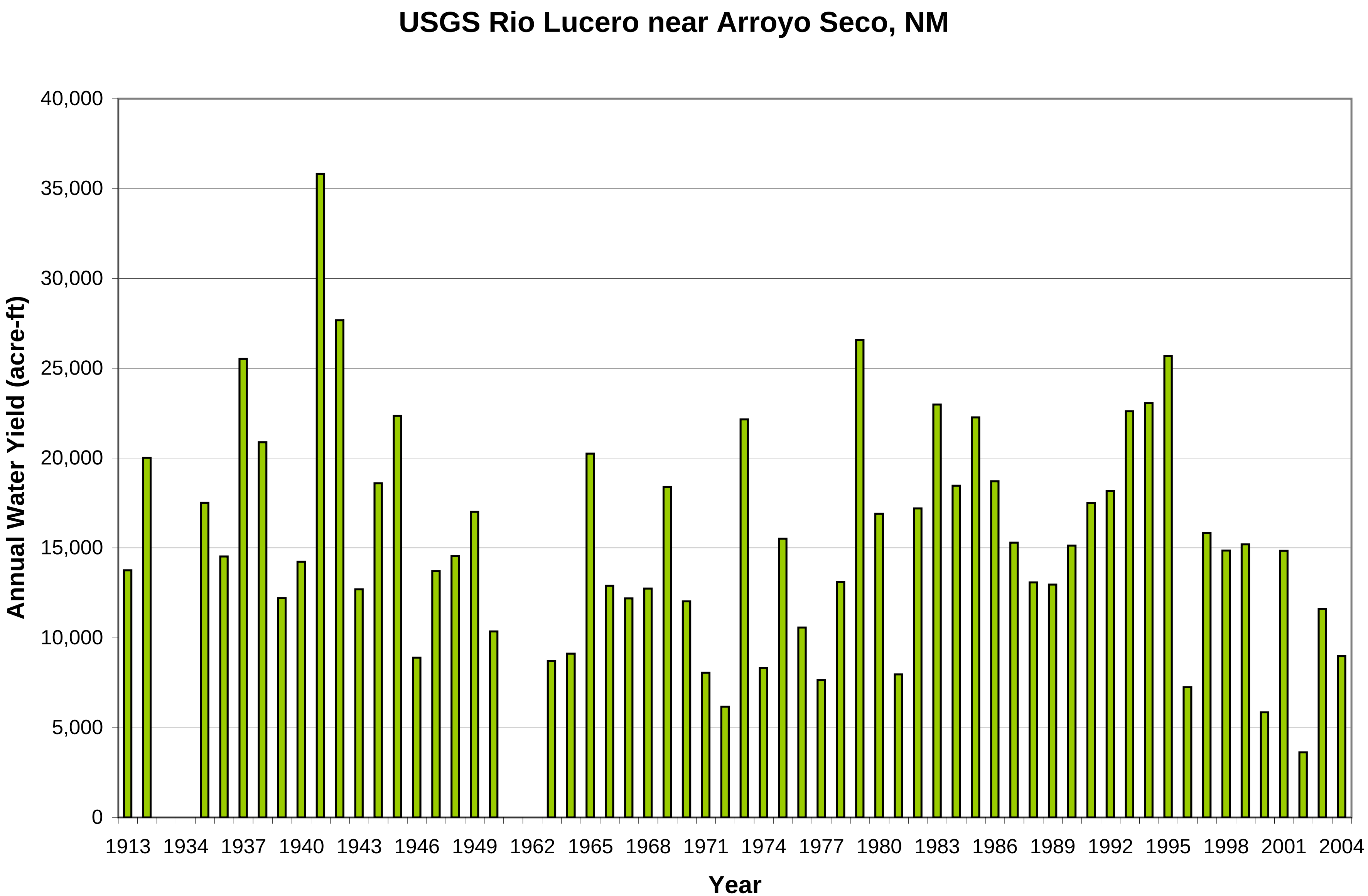

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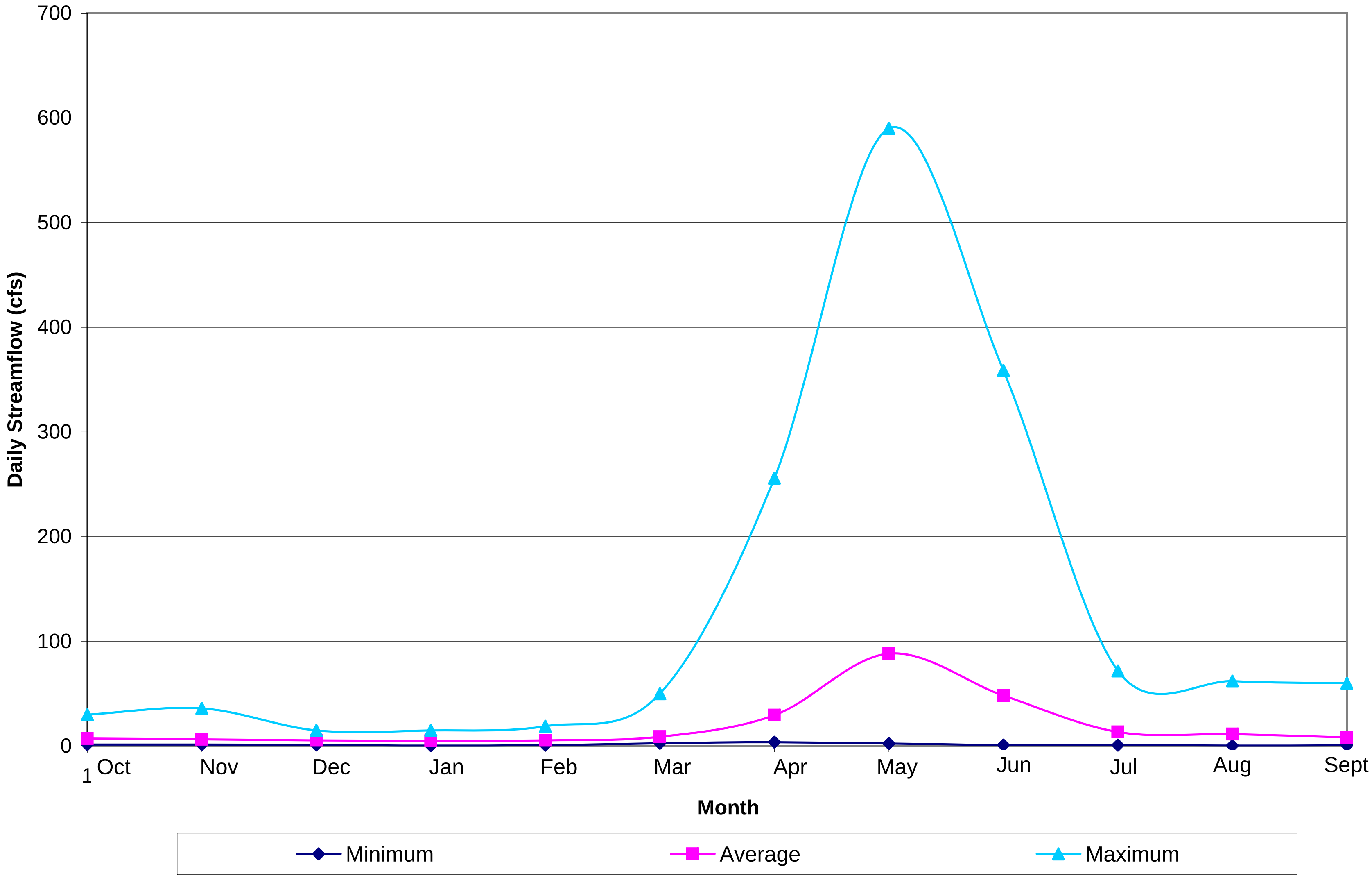
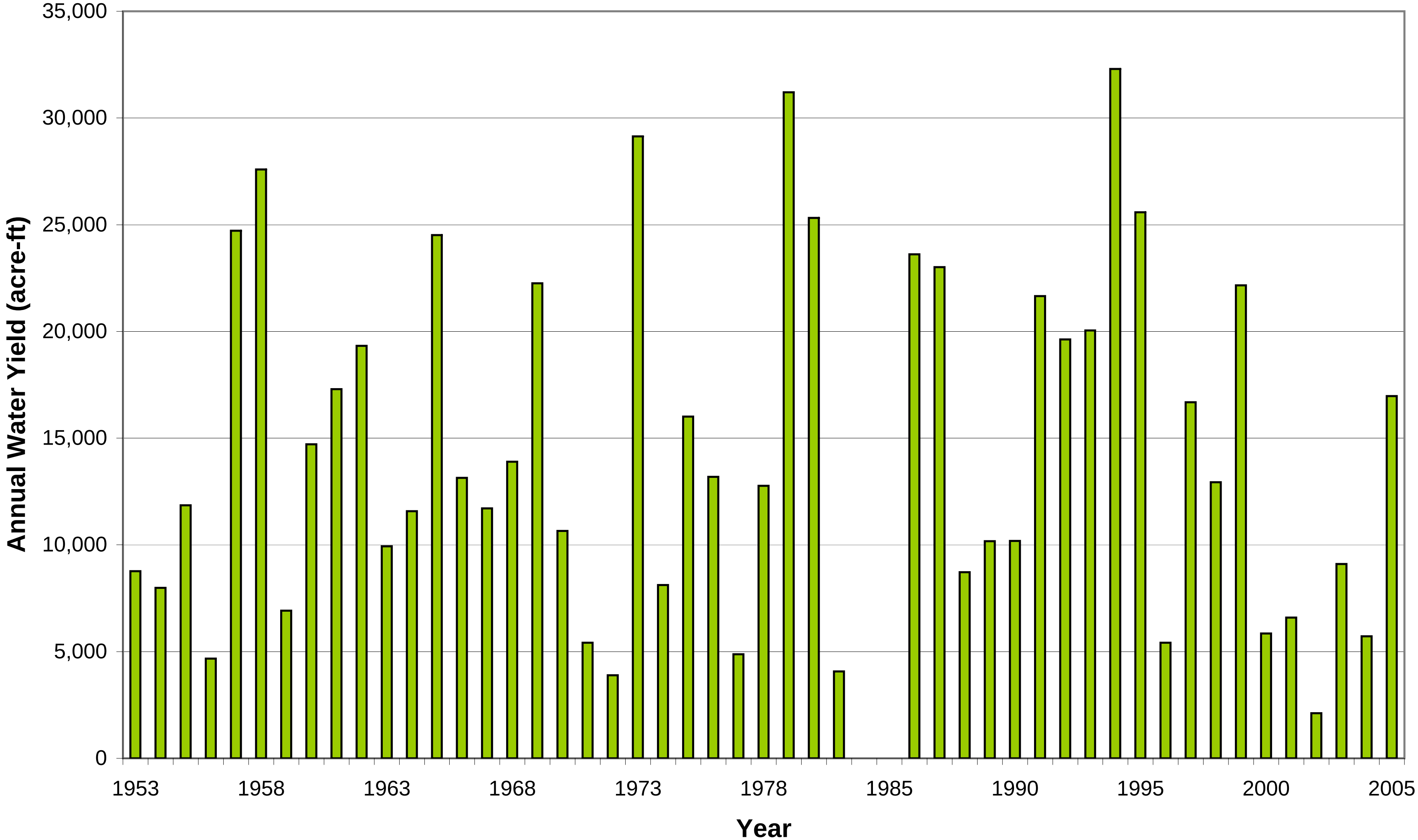
Average Daily Streamflow for Each Month, Rio Grande del Rancho near Talpa, NM

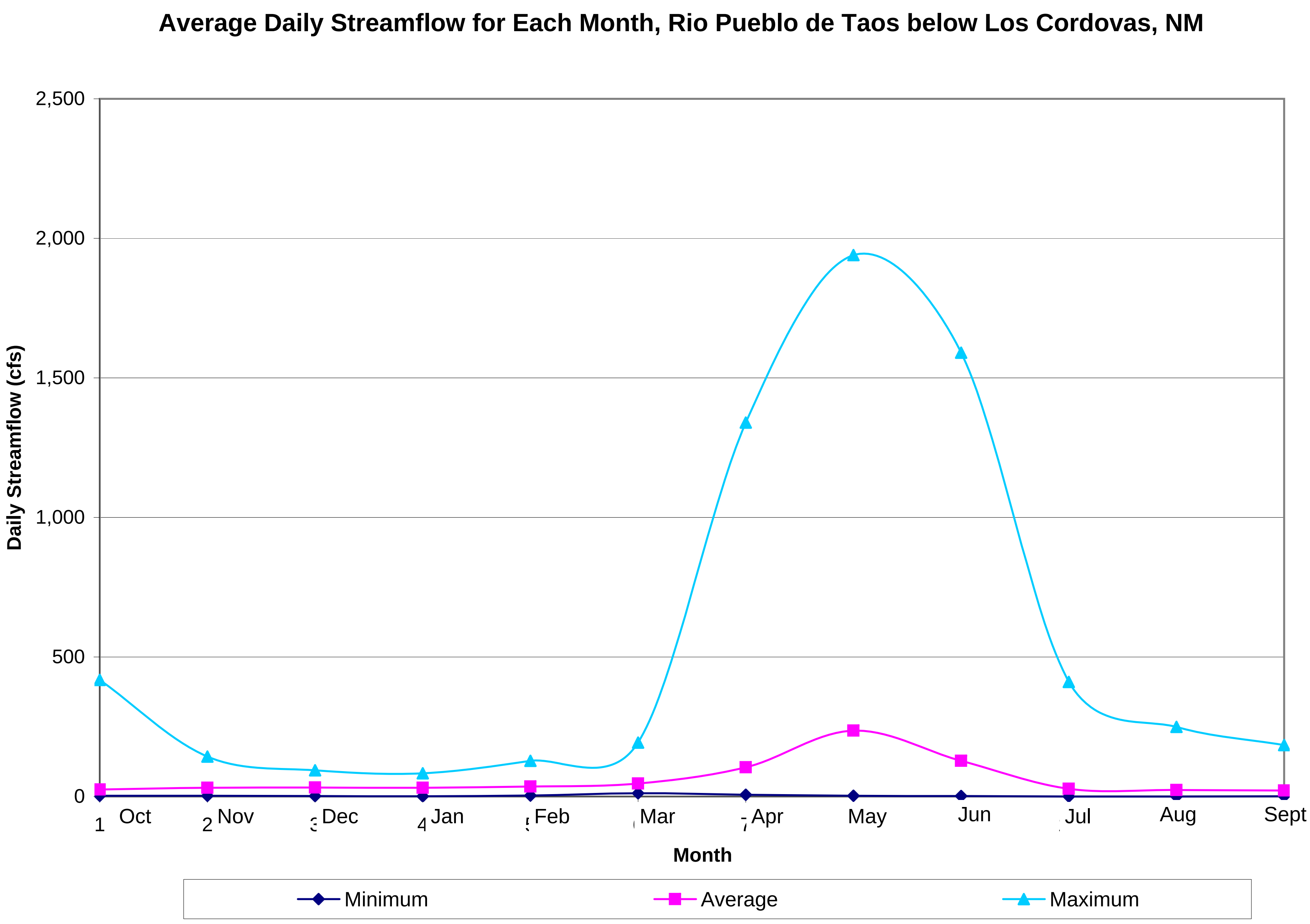


P:_WR05-235\RegWtrPln.N-07\Sec_5\AppxE\E2\13_08275500_RGdR near Talpa.xls daily flow plot

USGS Rio Grande del Rancho near Talpa, NM



P:_WR05-235\RegWtrPln.N-07\Sec_5\AppxE\E2\13_08275500_RGdR near Talpa.xls annual yield plot



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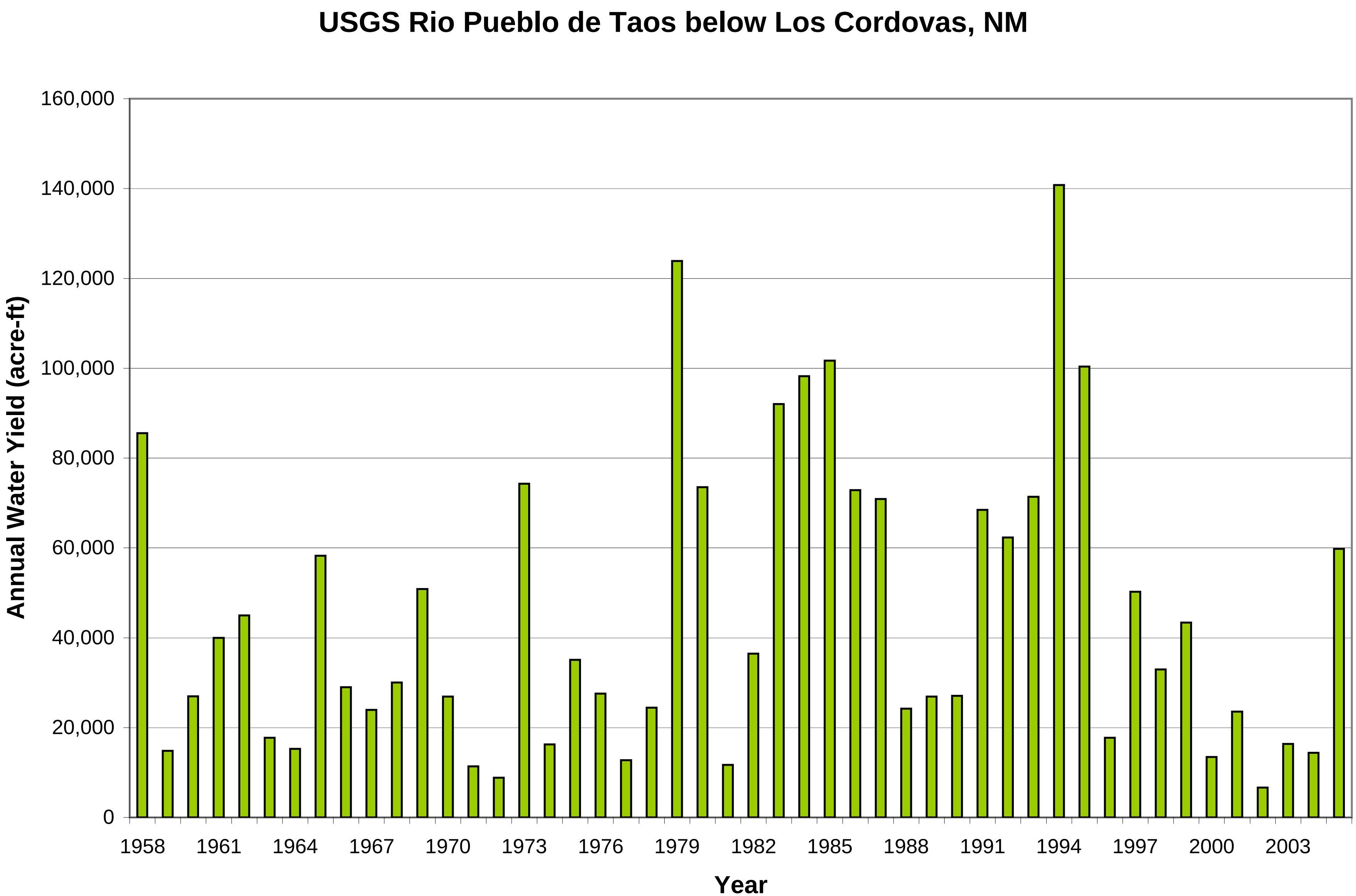

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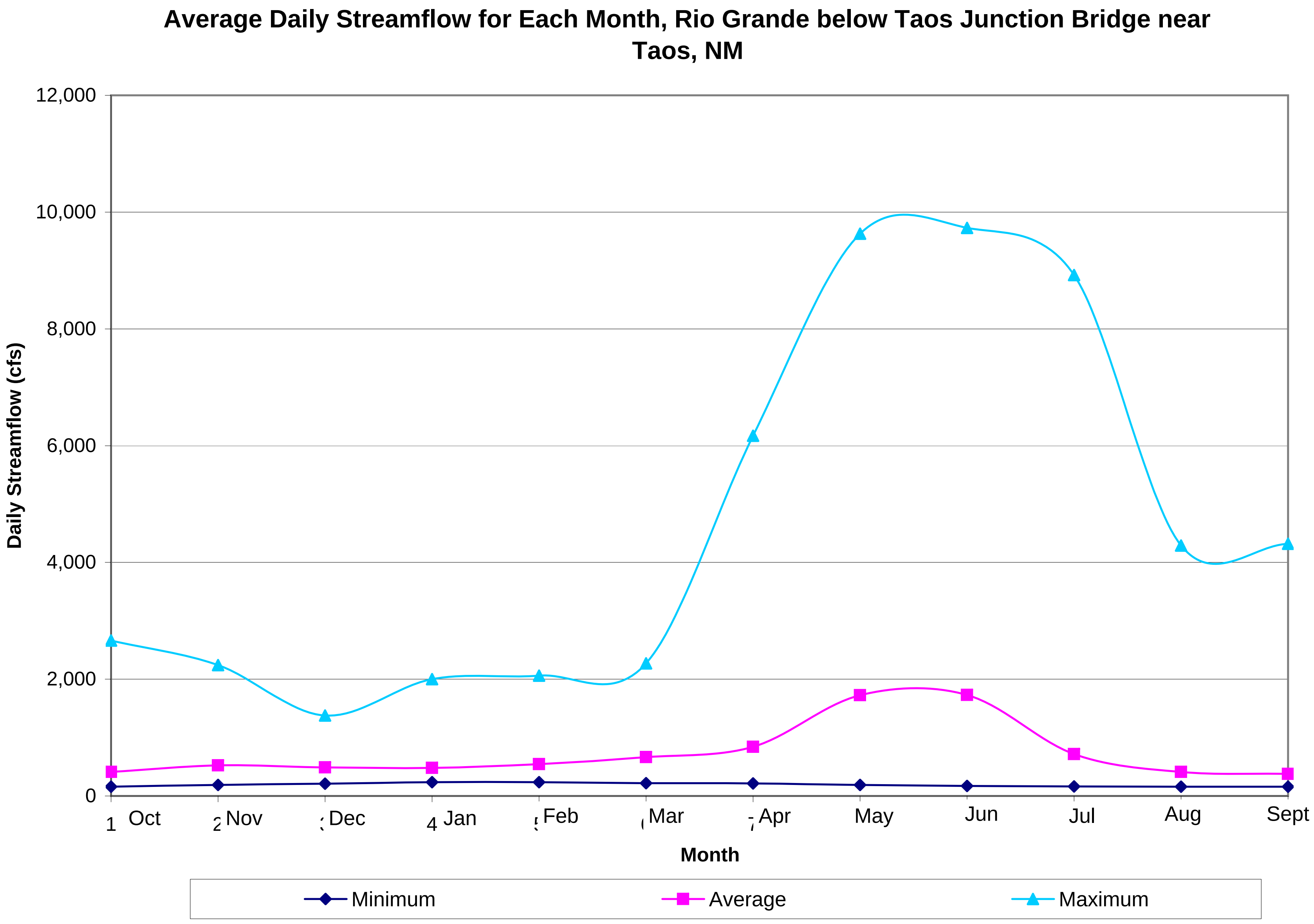
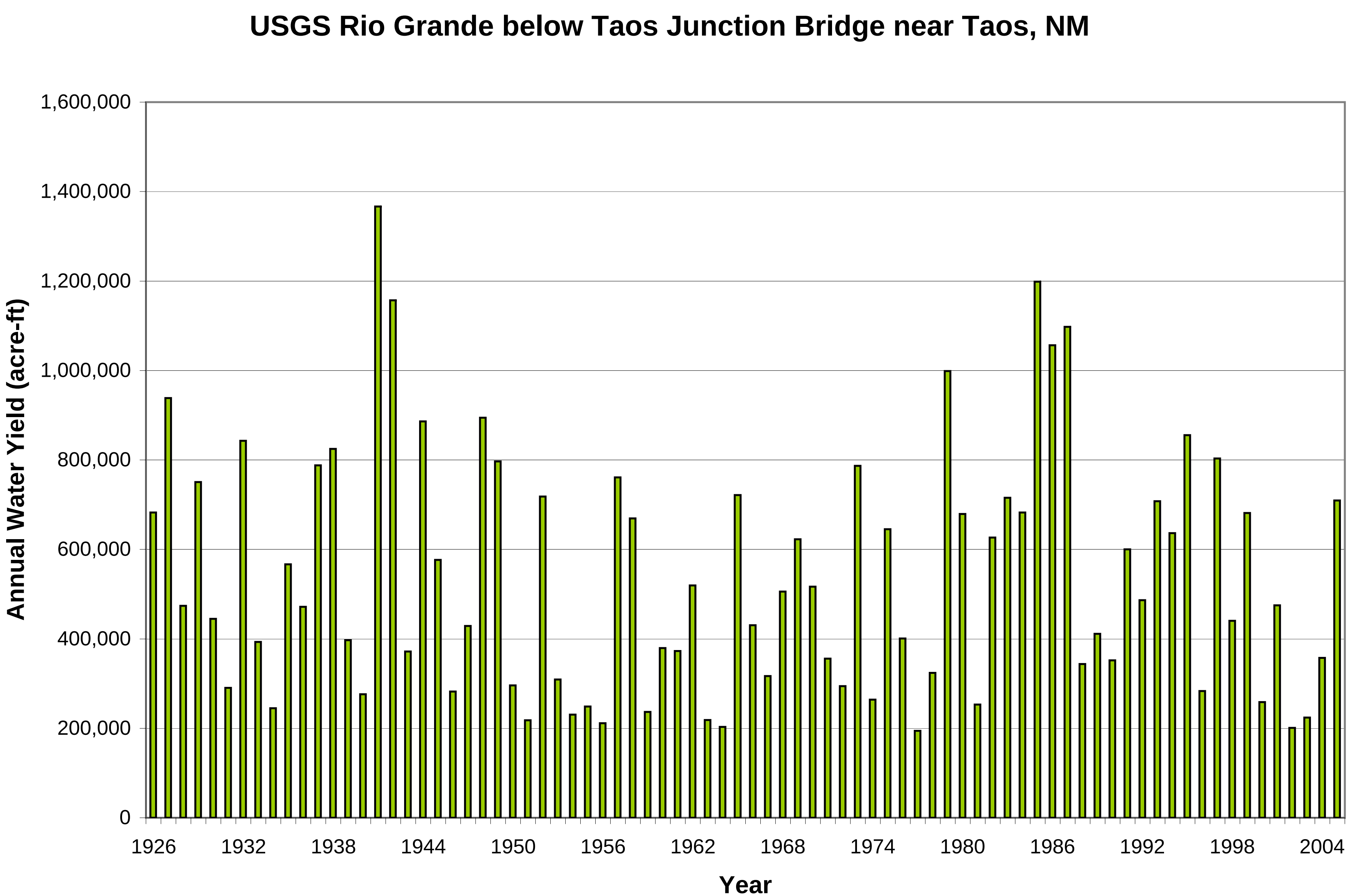


P:_WR05-235\RegWtrPln.N-07\Sec_5\AppxE\E2\15_08276500_RG below Taos Bridge.xls daily flow plot



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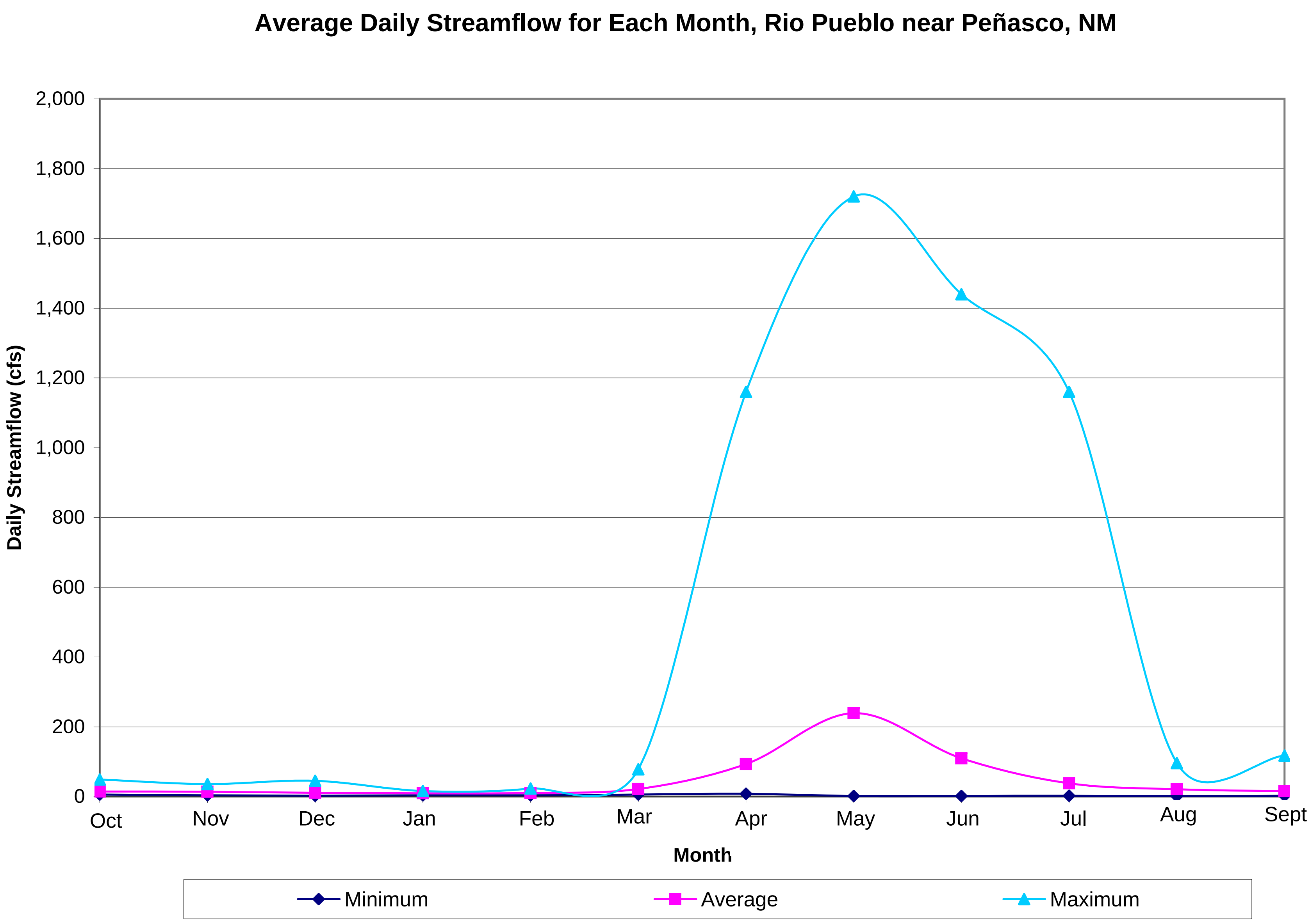

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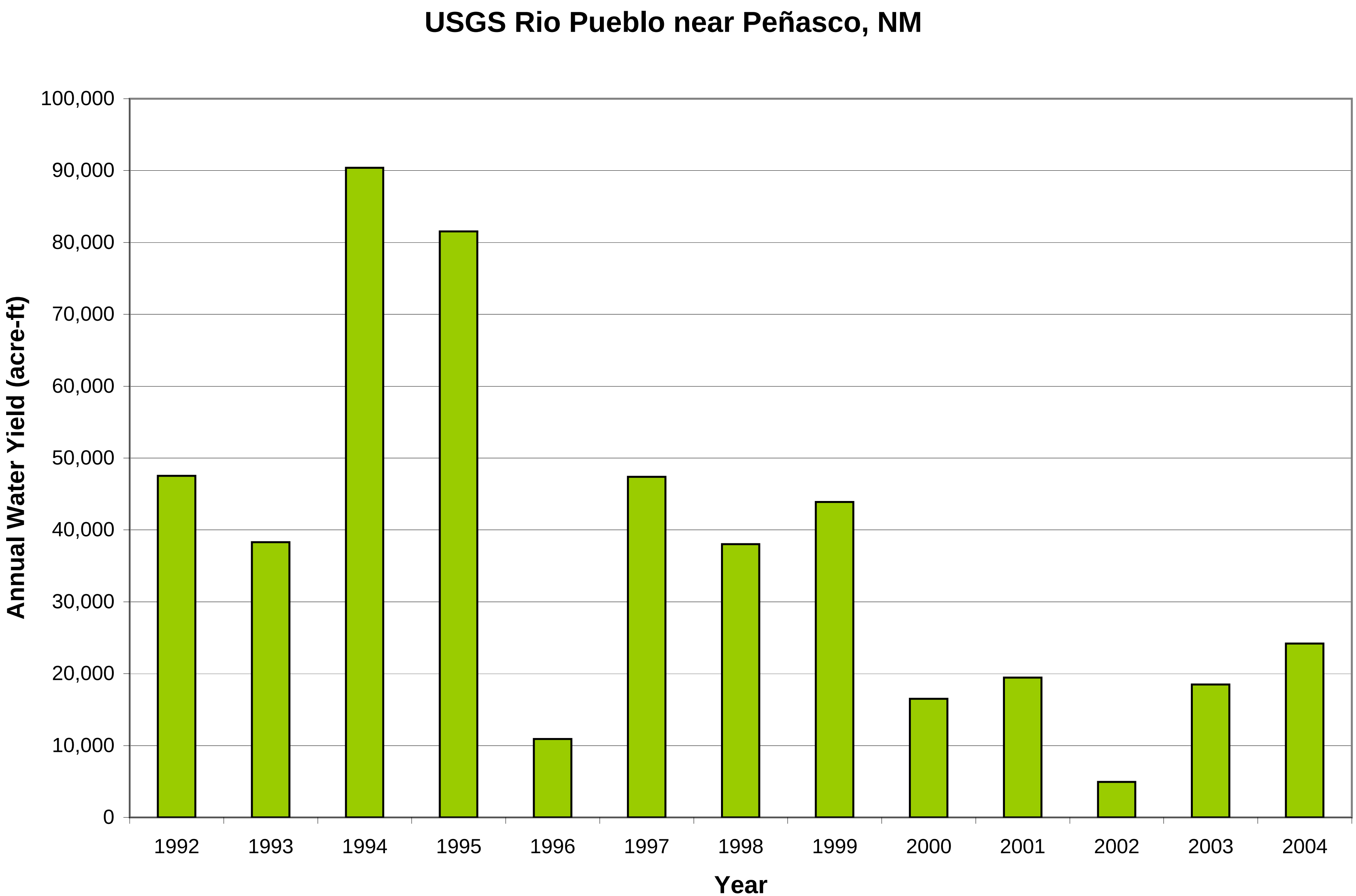

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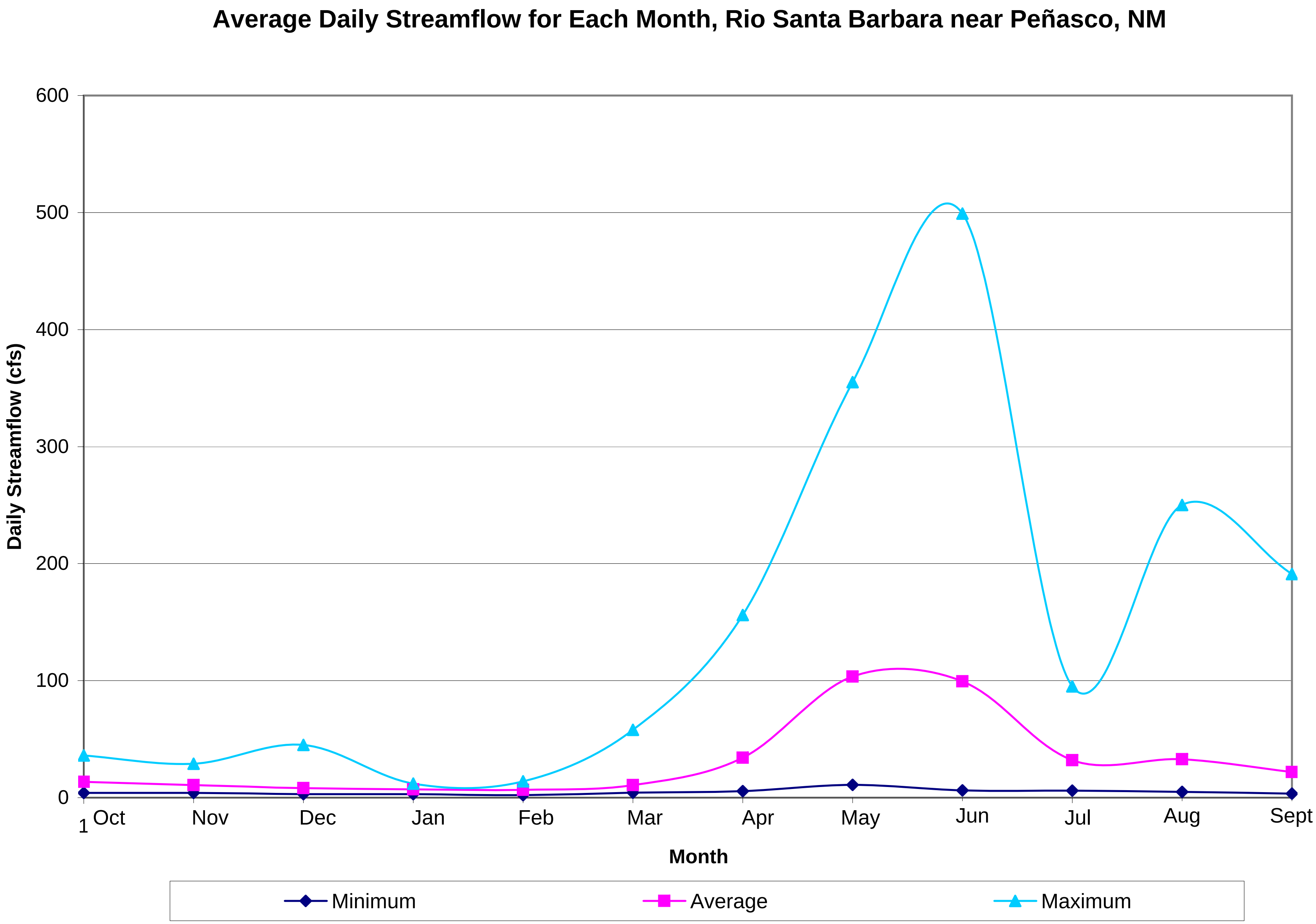

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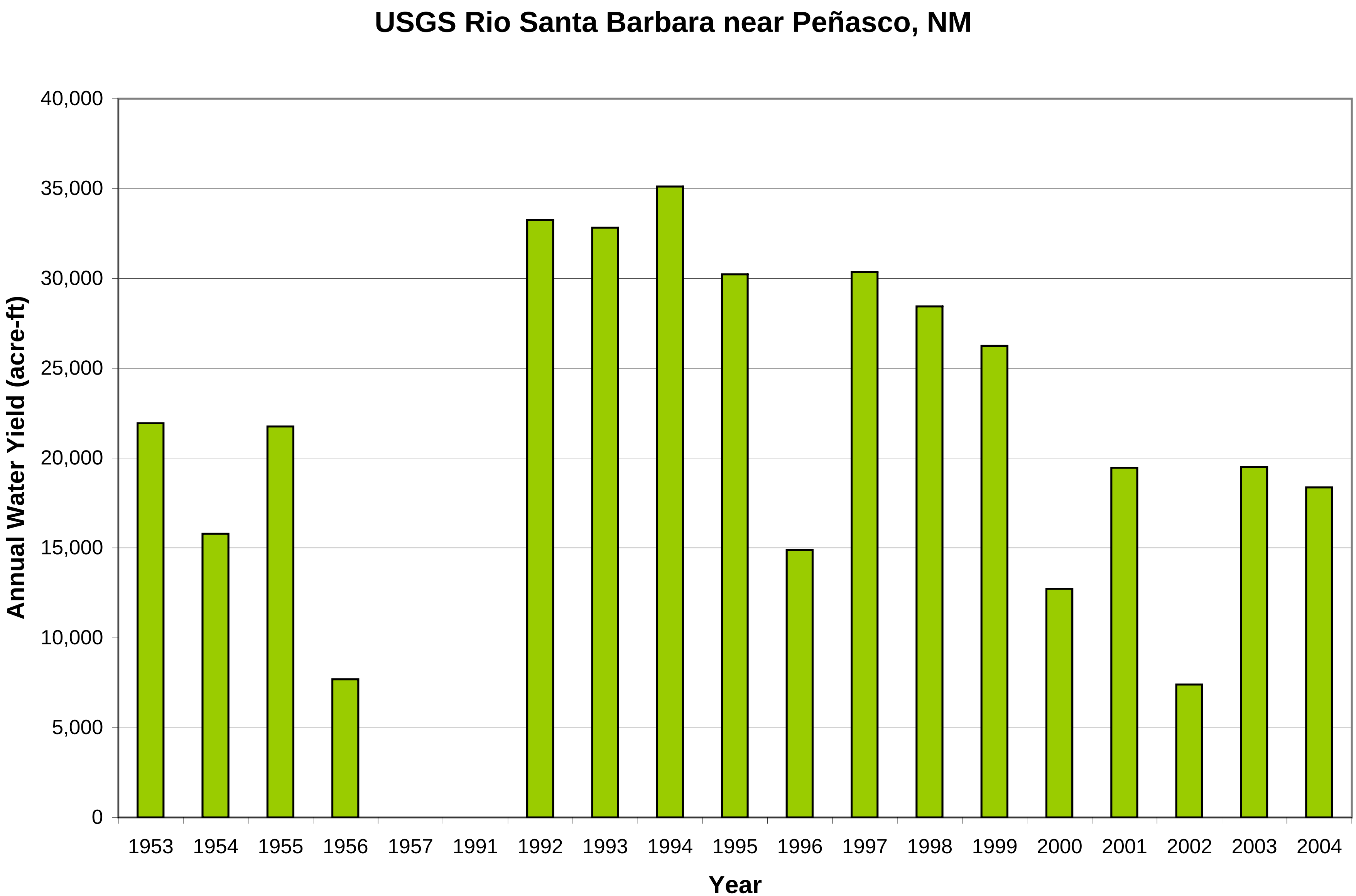

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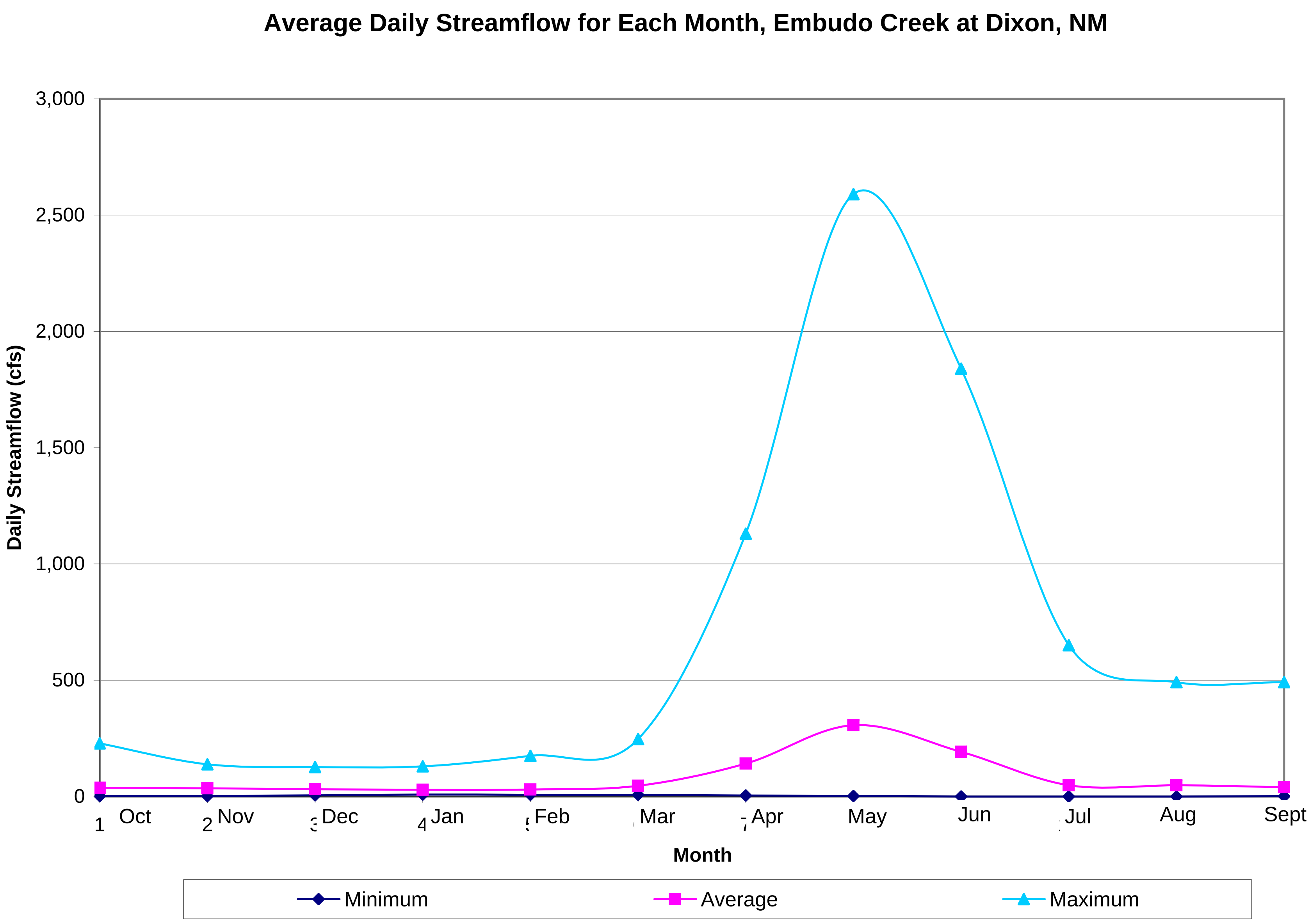

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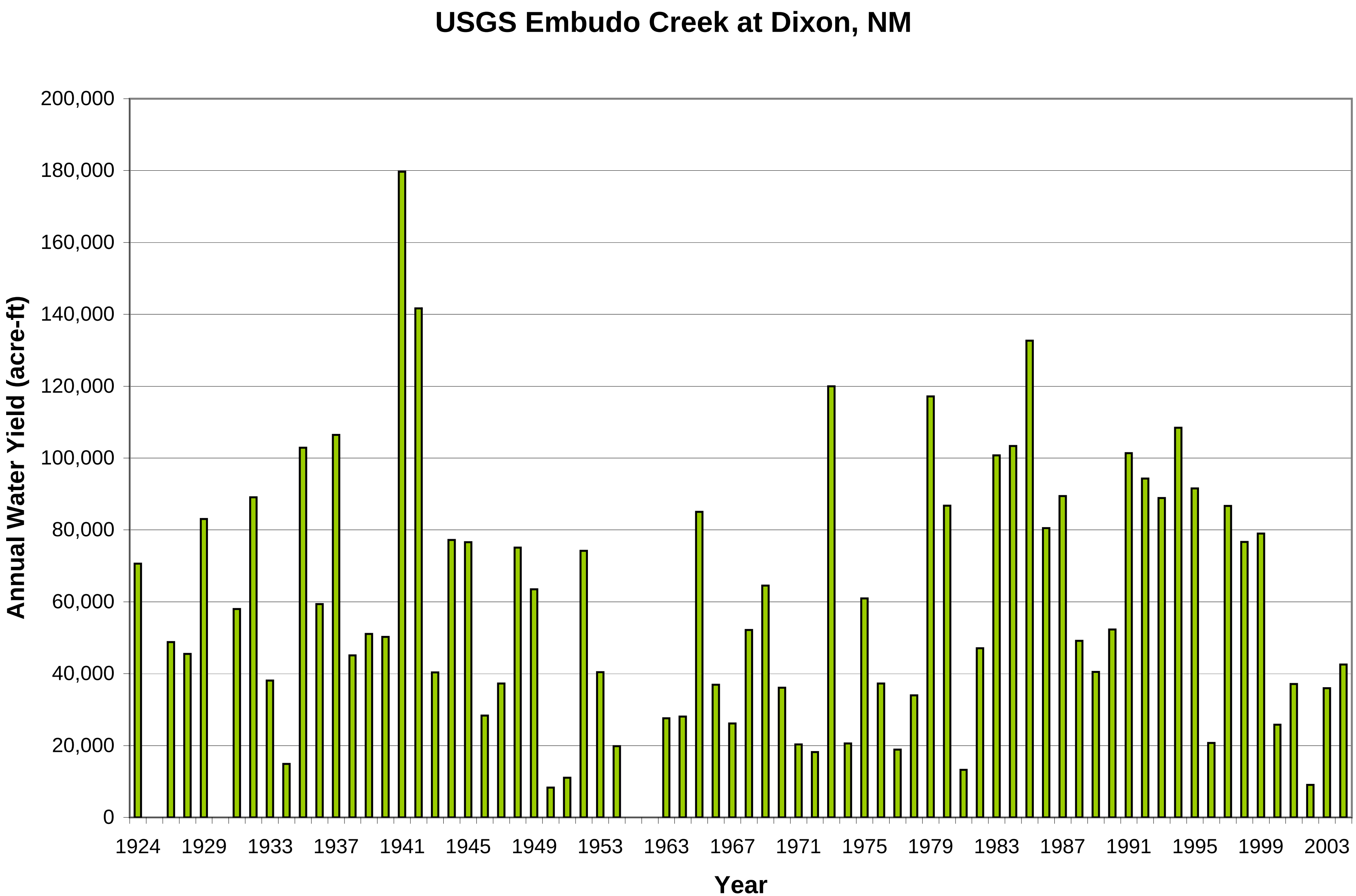

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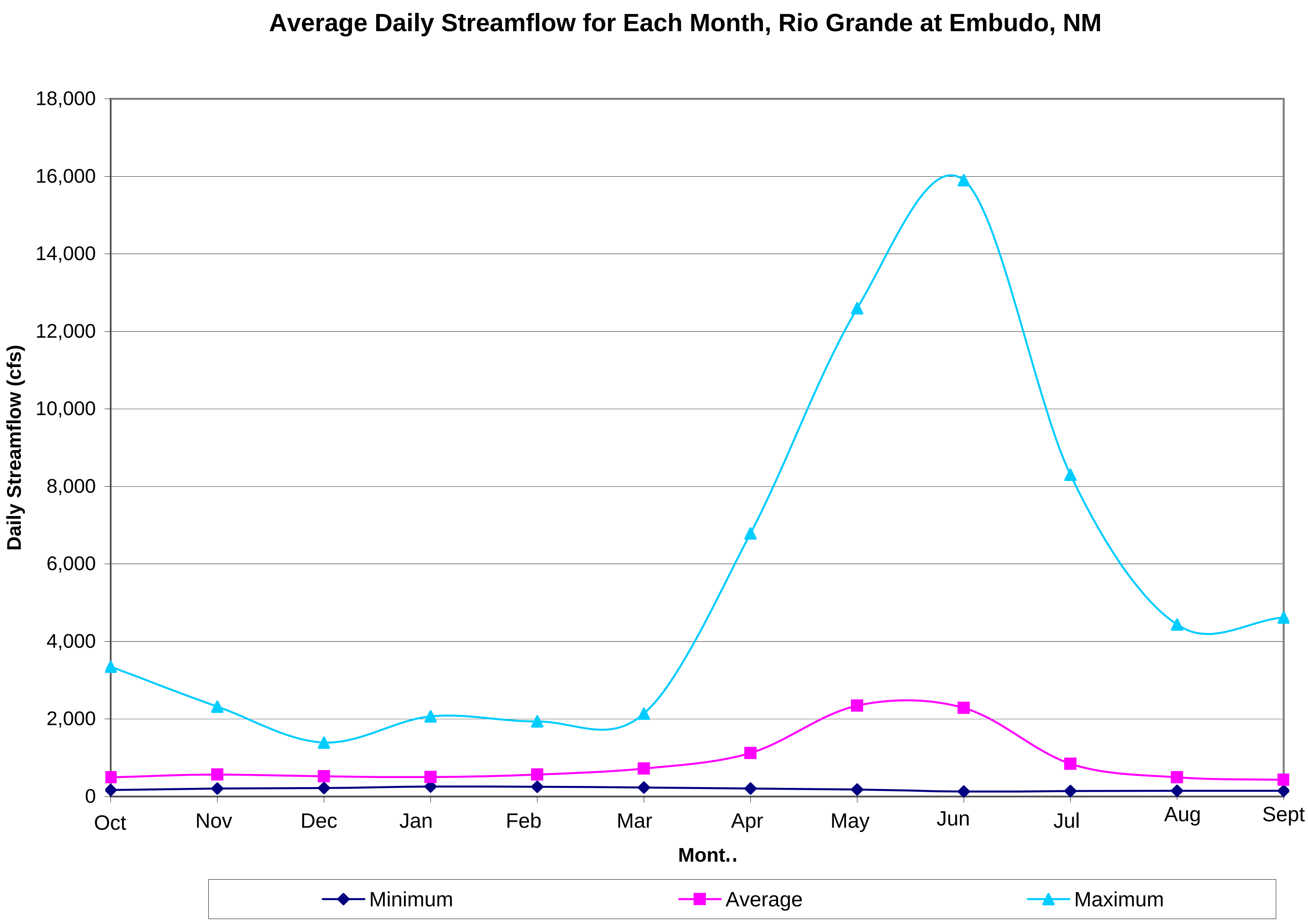
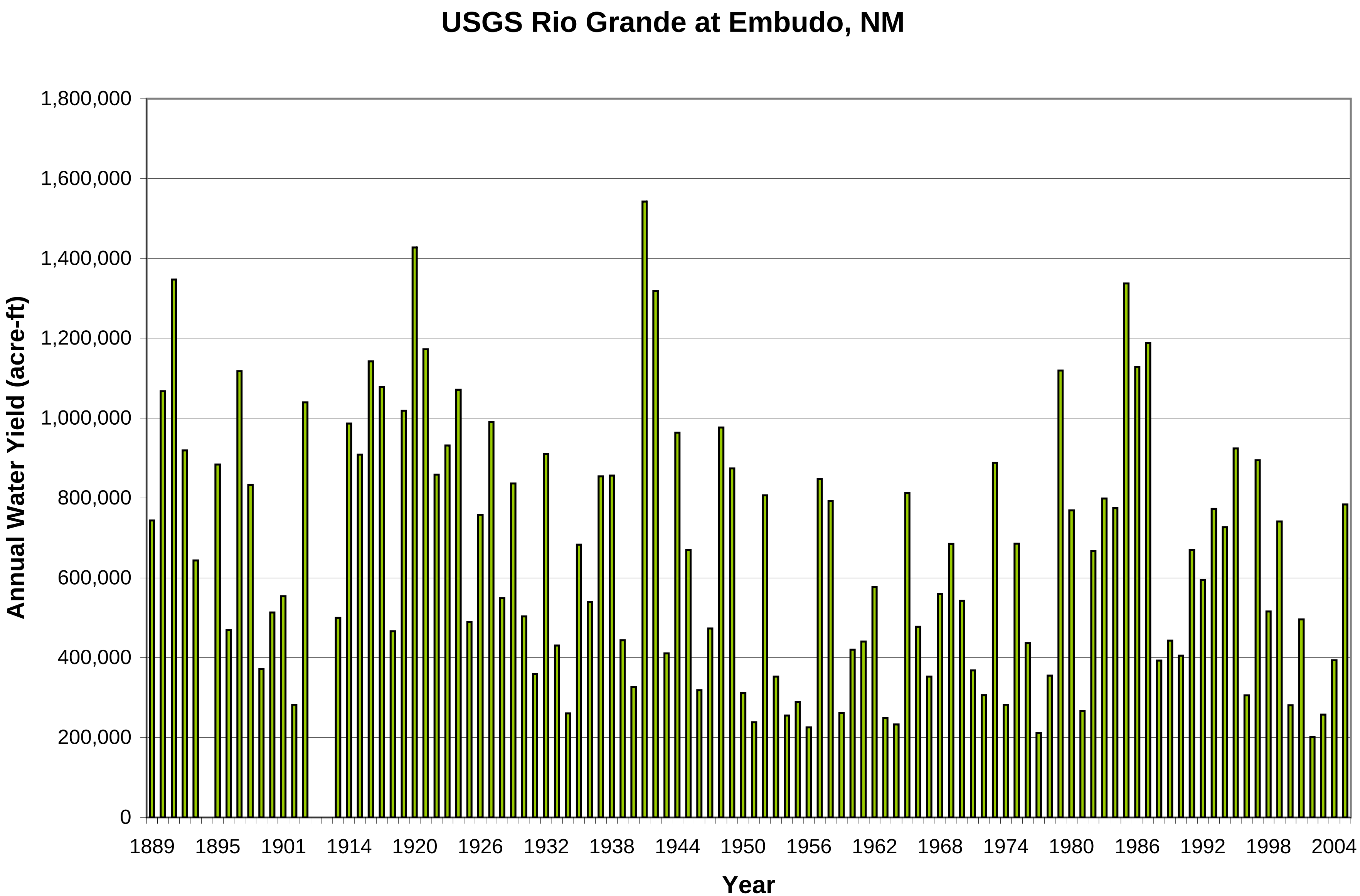


P:_WR05-235\RegWtrPln.N-07\Sec_5\AppxE\E2\19_08279500_RG at Embudo.xls daily flow plot



P:_WR05-235\RegWtrPln.N-07\Sec_5\AppxE\E2\19_08279500_RG at Embudo.xls annual yield plot

Appendix E3

Town of Taos Area Hydrogeology

TOWN OF TAOS AREA HYDROGEOLOGY

Provided by Glorieta Geoscience, October 2007

INTRODUCTION

The Town of Taos, Taos Pueblo, and adjacent communities are situated primarily within the Rio Pueblo de Taos and Rio Hondo drainage basins. The Rio Pueblo de Taos basin includes the following streams from north to south; Arroyo Seco, Rio Lucero, Rio Pueblo de Taos, Rio Fernando de Taos, and Rio Grande del Rancho (Figure 1). Northern tributaries to Rio Pueblo de Taos drain Precambrian granite and gneiss, and Tertiary granite and rhyolite, whereas southern tributaries drain Paleozoic sandstone, shale, and limestone (Kelson and Wells, 1989).

The majority of the historic water supply for municipal, domestic, livestock, and sanitary purposes for the Town of Taos, Taos Pueblo, and adjacent communities in the Taos Valley has historically been derived from the shallow stream-connected alluvial aquifer system. In an effort to minimize stream depletion effects resulting from new groundwater development, the Town of Taos and Taos Pueblo, with funding from the U.S. Bureau of Reclamation (BOR) conducted a deep drilling program to evaluate the productivity and water quality of the Tertiary basin-fill aquifer system underlying the Servilleta Formation. The results of this drilling program, in conjunction with data collected from shallow basin fill and alluvial wells and additional deep exploratory wells, allow for an evaluation of aquifer characteristics of the basin-fill aquifer system.

GEOLOGIC SETTING

The Taos Valley lies within the southern San Luis Basin (Fig. 1). The San Luis Basin is situated in the northern Rio Grande rift, a generally north-south trending series of faultbounded basins extending from Colorado to Mexico (Hawley, 1978; Chapin and Cather, 1994). Rifting in the San Luis Basin dates from approximately 30-27 Ma and has resulted in approximately 8-12% extension, primarily along north-south trending, down to the west normal faults (Tweto, 1979; Brister and Gries, 1994; Chapin and Cather, 1994; Kluth and Schaftenaar, 1994). The southern San Luis Basin in the vicinity of Taos is a deep graben with predominant down to the west faulting along the east margin (Bauer and Kelson, 2004).

REGIONAL GEOHYDROLOGIC SETTING

The Taos Valley is located within the Rio Grande Rift, which is a northern arm of the Basin and Range physiographic province. The rift is a well-defined series of asymmetrical grabens that extend from Colorado to Mexico for a distance of more than 600 miles (Baldridge, et al., 1984). Taos is situated near the southern boundary and the eastern margin of the San Luis Basin west of the Sangre de Cristo uplift (Figure 1). The asymmetrical basins that define the Rio Grande Rift in northern New Mexico are the Albuquerque, Española, and San Luis Basins, from south to north. The San Luis Basin is an east-tilted basin that is separated from the west-tilted Española Basin by the Embudo Fault Zone (Dungan et al., 1984). The Rio Grande has generally cut its canyon parallel to the axis of the rift, locally through the Servilleta basalts. Sediments deposited to the east of the rift axis dip generally to the west; those on the west side of the axis generally dip less severely and are less uniform in orientation (Coons and Kelley, 1984). Faulting in the rift is dominated by normal faults that dip 50-80 degrees from horizontal (Kelley, 1978). Taos is situated on Quaternary alluvial fan sediments derived from the Sangre de Cristo Mountains, and is located within the Rio Pueblo de Taos drainage basin (Figure 1). The Rio Pueblo de Taos drains the Sangre de Cristo Mountains and enters the Rio Grande within the Rio Grande Gorge. Northern tributaries to Rio Pueblo de Taos drain Precambrian granite and gneiss, and Tertiary granite and rhyolite, whereas southern tributaries drain Paleozoic sandstone and shale.

In the vicinity of the Taos Plateau Volcanic Field the Rio Grande Rift consists of a series of horsts and grabens, with the Rio Grande flowing along the surface of a deep graben separated from the Taos Plateau by a granite-cored horst block. The Taos Plateau volcanic field originated from volcanic centers located primarily in the western side of the rift.

The Taos Valley is underlain by a sequence of Quaternary alluvial deposits, Pliocene basalt flows, and Pliocene through Miocene-age basin fill sediments (Figure 2). Paleozoic sedimentary rocks or Precambrian crystalline rocks underlie the basin fill sediments. Based on regional gravity data, the estimated thickness of Tertiary basin fill sediments in the site vicinity is between 7500 and 8000 feet (Reynolds, 1989). Bauer et al. (1999) estimate the thickness of the Tertiary section in the site vicinity to be approximately 14,000 ft.

Pleistocene and Holocene surficial deposits that underlie the Taos Basin landscapes and overlie the Plio-Pleistocene Blueberry Hill Formation or older units include alluvial fan deposits that interfinger with Rio Grande fluvial deposits and with fluvial terrace deposits of the Rio Grande and Rio Pueblo de Taos stream system. The high terrace surfaces throughout the Taos basin record the culmination of aggradation along the Rio Grande during the Middle Pleistocene (Pazzaglia and Wells, 1990). The thickness of Pleistocene and Holocene terrace deposits ranges from 0 to 100+ ft (0 to 30+ meters (m)) (Pazzaglia and Wells, 1990). The Plio-Pleistocene rift fill sequence underlying younger alluvium in the Taos basin has been informally named the Lama Formation (Pazzaglia and Wells, 1990), but this nomenclature has largely fallen into disuse, and these older fan deposits have been designated the Blueberry Hill Formation (Bauer et al., 1999, 2001; Kelson and Bauer, 2003). Blueberry Hill Formation deposits thin from east to west in a cross section drawn along the Rio Pueblo de Taos using available well log data, from nearly 300 ft at the K2/K3 well site to less than 50 ft between BIA5 and RP3200 (Figure 3).

Interbedded basalt flows and sediments that comprise the Servilleta Formation underlie the Blueberry Hill Formation. Although some authors have separated the basalt flows and sediments into separately named units (e.g. the Cieneguilla Member of the Tesuque Formation of Dungan et al. (1984) and the Servilleta Basalt of Lipman and Mehnert (1979)), other researchers have grouped the interbedded sequence of basalt flows and sediments together as the Servilleta Formation (e.g. Lambert, 1966). Bauer et al (1999) consider the sediments between the Upper, Middle, and Lower Servilleta basalts, and Pliocene sediments overlying the Upper Servilleta basalt, to be part of the Chamita Formation. The Servilleta Formation will be used in this report to include the interbedded basalt flows and sediments from the fine-grained sediments at top of the Upper Servilleta basalt to baked zone at the base of the Lower Servilleta basalt. Sediments interbedded between the basalt flows are a locally important shallow aquifer in parts of the San Luis Basin (Drakos et al., 2004a). The Servilleta basalts range in age from 2.8 to 4.5 million years (Lipman and Mehnert, 1979; Manley, 1976). The thickness of the Servilleta Formation ranges from 0 to 650 ft (0 to 200 m) (Dungan et al., 1984), with flows pinching out to the east.

The aquifer comprising the combined lower Blueberry Hill Formation and interbedded sediments within the Servilleta Formation is generally a good water producer, with production coming from channel sands and gravels, and locally from fractured basalt.

The Servilleta Formation is underlain by the Miocene-Pliocene-age Chamita Formation, originally defined in the Española Basin as the uppermost formation in the Santa Fe Group (Galusha and Blick, 1971). The Santa Fe Group includes middle Miocene to middle to upper Pliocene rift fill sediments located in the Rio Grande Rift in the north-central part of New Mexico (Galusha and Blick, 1971). In the Ranchos de Taos Quadrangle, the Chamita Formation consists of moderate to poorly sorted sands with clasts of intermediate volcanic rock, quartzite, and other metamorphic rocks (Bauer and Kelson, 1998). Due to regional southeast dip of 3-5°, the Chamita Formation is estimated to be 1600+ feet thick at K3 and less than 150 ft thick at the Taos Municipal Airport Well (Figure 4). Due to offset across the Town Yard fault, the Tertiary section is absent at the Town Yard exploratory boring (Figure 4).

The lower formation of the Santa Fe Group is the Miocene-age Tesuque Formation, which has a much greater thickness and lateral extent than the overlying Chamita Formation. Spiegel and Baldwin (1963), who described it as "several thousand feet of pinkish-tan soft arkosic, silty sandstone and minor conglomerate and siltstone" originally named the Tesuque Formation. Galusha and Blick (1971) subdivided the Tesuque Formation into five members. From lowermost to uppermost, the five Members are: (1) Nambe Member, (2) Skull Ridge Member, (3) Pojoaque Member, (4) Chama-El Rito Member, and (5) the Ojo Caliente Sandstone. Additional Tesuque Formation Member names proposed in the Velarde and Dixon areas are the Cejita Member (Manley, 1977) and the Dixon Member (Steinpress, 1981), located stratigraphically above and below the

Ojo Caliente Sandstone, respectively. Tesuque Formation sediments penetrated by deep wells in the Taos basin include the Ojo Caliente and Chama-El Rito Members (Figure 2).

The Ojo Caliente Member of the Tesuque Formation is a buff to light brown, fine to very fine-grained, typically poorly consolidated eolian sandstone with large-scale tabular crossbeds (GGI outcrop descriptions; Bauer and Kelson, 1998). In outcrop, the Ojo Caliente ranges from unconsolidated to well-cemented sandstone. Based on previous GGI subsurface data and thickness estimates from Bauer and Kelson (1998), the thickness of the Ojo Caliente Member ranges from 100 to greater than 960 ft (30 to 283 m). The upper part of the Ojo Caliente Member of the Tesuque Formation interfingers with the Chamita Formation in some locations.

The Chama-El Rito Member of the Tesuque Formation consists of roughly equal proportions of interbedded conglomerate and sandstone, with minor mudstone (Steinpress, 1981; Bauer and Kelson, 1998). Conglomerates contain a predominance of volcanic clasts with subordinate Precambrian granitic and quartzite clasts. The Chama-El Rito Member has a thickness of up to 1570 ft (480 m) (Bauer and Kelson, 1998).

Preliminary testing of the Ojo Caliente sand and Chama-El Rito sandy gravel aquifers indicate potentially good production from these deeper basin fill aquifers in the southern San Luis Basin. Little aquifer testing or production data are available for the Chamita Formation.

Regional correlations based on geophysical logs indicate a regional dip of 3-5^{o} to the southeast throughout most of the basin; however, geophysical log correlations from several wells near the Picuris Mountain front near the Stakeout indicate a dip of 5^{o} to the northwest. This change in dip and correlation of units from Picuris Mountain front wells to RP3200 and BOR1 indicates the presence of a fault between BOR1 and the Picuris Mountain front (Figure 5).

DESCRIPTION OF THE SHALLOW AQUIFER SYSTEM

Two major aquifer systems are identified in the Taos area: 1) A shallow aquifer that includes the Servilleta Formation and overlying alluvial deposits and, 2) A deeper aquifer associated with Tertiary age rift-fill sediments (Fig. 2). The lower Servilleta basalt and underlying Chamita Formation may act as a transition zone and/or boundary between the shallow and deep aquifers.

The shallow aquifer system generally includes unconsolidated alluvial fan and axial-fluvial deposits overlying and interbedded with the Servilleta basalt flows. The shallow aquifer is subdivided on the basis of lithology and pumping test analyses into: 1) unconfined alluvium; 2) leaky-confined alluvium, and; 3) the Servilleta Formation (Fig. 2). Several wells in the study area are completed into shallow aquifers in fractured Paleozoic sedimentary formations and fractured Precambrian crystalline rocks along the Sangre de Cristo mountain front. These aquifers discharge to alluvium and/or the Servilleta Formation and are therefore part of the shallow alluvial-aquifer flow system. The shallow alluvial aquifer has a maximum thickness of 1500 ft (457 m) or more in the graben formed by the down-to-the-west Town Yard fault and the down-to-the-east Seco fault (Drakos et al., 2004), and pinches out in the western part of the study area where the alluvium is unsaturated at the Taos Airport domestic well.

Hydrologic Characteristics of the Shallow Aquifer

Aquifer testing data are available for the shallow aquifer from 32 pumping tests at locations throughout the Taos Valley. Pumping tests were run for times ranging from 350 to 12,960 minutes (min) at discharge (Q) ranging from 18 to 440 gallons per minute (gpm).

Unconfined alluvium

Pumping tests conducted on 18 unconfined alluvial wells at discharges ranging from 18 to 370 gallons per minute (gpm) exhibit hydraulic conductivity (K) values ranging from 1.8 to 22 ft/day (mean = 6.8 ft/day, ± (1σ) 5.9 ft/day). No clear pattern is observed in geographic distribution of K in the unconfined alluvial aquifer. The K value calculated at a given location is likely controlled by local facies changes (e.g. better sorted axial fluvial deposits yield higher K values than less well sorted overbank or fan deposits) and well design (e.g. whether the well was drilled and screened to sufficient depth to encounter a productive zone). Pumping tests were not run long enough to observe delayed yield and allow for a calculation of specific yield (S_y), but storativity (S) ranged from 10^{-4} to 10^{-2}. Possible recharge boundaries were observed in the TOT#3 and TOT#1 tests, and, although data are somewhat ambiguous, an impermeable boundary may be indicated in the BJV#1 test (Table 1). The possible recharge boundary observed in the TOT#3 and TOT#1 tests is likely a result of leakage into the shallow aquifer from the nearby Rio Pueblo de Taos and Rio Lucero.

Leaky-confined alluvium

Pumping tests conducted on nine leaky-confined alluvial wells at discharge rates ranging between 19 and 400 gpm exhibit K values ranging from 0.1 to 17.4 ft/day. Wells in the leaky-confined aquifer fall into two distinct populations and geographic groupings.

Low-K (mean K = 0.4 ft/day) northern wells correspond to older Blueberry Hill mudflow or weathered fan deposits underlying the large Rio Hondo alluvial fan at the northern portion of the study area. High-K (mean K = 11.4 ft/day) values observed in southern wells correspond to young (?), less-weathered deposits underlying the small Rio Pueblo de Taos fan. The Howell well and BIA 2 (Buffalo Pasture) wells, which both exhibit high K values of 12 to 17 ft/day, lie along the northern trace (approximately located) of the Town Yard fault. This segment of the fault may be a high-permeability zone or may be coincident with high-permeability Rio Lucero and/or ancestral Rio Hondo or Rio Pueblo de Taos channel fill deposits. The Town Yard fault may have been a control on stream channel location during aggradation of paleo-Rio Pueblo de Taos or paleo-Rio Hondo deposits. The Town Yard fault projects into the present day Rio Lucero drainage, and the “Seco fault” projects into the Arroyo Seco drainage.

Servilleta Formation (Agua Azul aquifer)

Aquifer testing data are available for the Servilleta Formation from five pumping tests. All wells tested are completed into the “Agua Azul” aquifer between the upper and middle basalt flow members and are located along the Rio Pueblo de Taos and Arroyo Seco drainages. Pumping test duration ranged from 2,880 to 5,760 min at Q ranging from 8 to 120 gpm. Agua Azul wells exhibit K ranging from 4.7 to 26.7 ft/day (mean K = 12.0 ± 8.6 ft/day). Because the five wells tested in the “Agua Azul” aquifer are relatively close to one another, determining the geographic distribution of K is not possible. Storativity values range around 10^{-4}.

Groundwater Flow Direction in the Shallow Aquifer System

Groundwater flow direction in the composite Alluvial plus Aqua Azul (Servilleta) aquifer system is generally from northeast to southwest e north of the Town of Taos and generally east to west south of the Town of Taos (Drakos et al., 2004b). The composite Alluvial plus Servilleta aquifer system becomes unsaturated in the western part of the study area, indicating this upper aquifer is discharging to surface water where it is stream connected and/or leaking into the deeper basin-fill aquifer. The steepening gradient in the vicinity of the Los Cordovas faults suggests that the faults are an area of downward leakage through which the shallow aquifer may be recharging the deep aquifer system.

Equipotential lines are deflected downstream along most of the Arroyo Seco and the upper Rio Lucero, indicating that these are losing streams west of the mountain front Based on equipotential lines, the upper Rio Hondo is a gaining reach, whereas the lower Rio Hondo is a losing reach. Equipotential lines are generally deflected upstream along the Rio Pueblo de Taos, lower Rio Lucero, and Rio Fernando de Taos, indicating that these streams are gaining reaches.

DEEP TERTIARY BASIN FILL AQUIFER

The deep Tertiary basin fill aquifer includes generally weakly to moderately cemented eolian, alluvial fan, fluvial, and volcaniclastic deposits that underlie the Servilleta Formation (Fig. 2). The deep Tertiary basin fill aquifer includes the Chamita Formation, the Ojo Caliente Member of Tesuque Formation, the Chama-El Rito Member of Tesuque Formation, and the Lower Picuris Formation. No pumping test data are available from wells completed solely in the Picuris Formation and only one well (K3) is completed solely in the Chamita Formation. While future studies may yield information from these units, only discuss the hydrologic characteristics of the Ojo Caliente and Chama-El Rito Members of the Tesuque Formation are discussed here.

The Tertiary basin fill aquifer exhibits confined or leaky-confined characteristics in the central and eastern part of the study area, but is likely unconfined in the western part of the study area along the Rio Grande. A deep fractured crystalline rock aquifer at or near the Sangre de Cristo Mountain front may discharge to the deep basin fill aquifer system, but no wells are known to be completed into this zone. The Chamita Formation and the overlying Servilleta Formation, while not extensively studied, may represent a transition zone between the shallow and deep aquifer systems (Fig. 2). The deep aquifer is, where investigated thus far, greater than 2000 ft thick. However, the Taos graben has a depth of approximately 5 km (16,000 ft) (Cordell, 1978; Bauer and Kelson, 2004), so further investigations may show the deep aquifer to be significantly thicker than is presently known.

Hydrologic Characteristics of the Deep Aquifer

Ojo Caliente Member of Tesuque Formation

Aquifer testing data are available from four wells completed entirely or predominantly in the Ojo Caliente Sandstone of Tesuque Formation. Three of the tests were multiple-well pumping tests. Wells completed into the Ojo Caliente Sandstone of the Tesuque Formation range in depth from 1720 to 2991 ft (524 to 912 m), and exhibit pressure head (height of water column above the screened interval in a well) ranging from 500 ft (150 m) in the Airport well to greater than 1700 ft (500 m) in BOR7. Pumping test durations ranged from 1,361 to 11,965 min at Q ranging from 57 to 400 gpm (Table 3). Ojo Caliente wells exhibit K ranging from 0.2 to 0.8 ft/day (mean K = 0.4 ± 0.25 ft/day). Hydraulic conductivity in the Ojo Caliente is relatively consistent throughout the area and does not show variability relative to geographic location. S values range from 1×10^{-3} to 2×10^{-2}.

Chama-El Rito Member of Tesuque Formation

Aquifer testing data are available from five wells completed entirely or predominantly into the Chama-El Rito Member of the Tesuque Formation, three of which are multiple-well tests. Wells completed into the Chama-El Rito Member range from 1200 ft (365 m) to 2109 ft (643 m) in depth, and exhibit pressure head ranging from 590 ft (180 m) at UNM/Taos to greater than 1300 ft (400 m) (BOR3). Pumping tests were run for times ranging from 2,737 to 15,840 min at Q ranging from 60 to 500 gpm. Chama-El Rito wells exhibit K ranging from 0.6 to 3.4 ft/day (mean K = 1.8 ± 1.0 ft/day). Aquifer testing data for the Chama-El Rito Member are only available for the southern part of the study area so the geographic distribution of K throughout the basin is unknown. An S of 5×10^{-4} was calculated from the BOR3/BOR2 pumping test. All Chama-El Rito wells exhibited a confined or leaky-confined response during pumping tests. These data, in conjunction with the large pressure head observed in Chama-El Rito wells, indicates that the portion of the Chama-El Rito Member investigated thus far is a confined or leaky-confined aquifer.

Groundwater Flow Direction in the Deep Tertiary Aquifer System

Water level data from deep wells in the basin were used to construct a preliminary potentiometric surface map of the deep basin fill aquifer. These limited data suggest that groundwater flow direction in the deep aquifer is generally from east to west, at a relatively shallow gradient of approximately 0.004 ft/ft. The shallow alluvial aquifer system has a much steeper gradient (measured north of and parallel to the Rio Pueblo de Taos) of approximately 0.02 ft/ft. Although the head in the shallow aquifer system is much higher in the eastern part of the study area along the Sangre de Cristo mountain front, the potentiometric surfaces in the shallow and deep aquifers project toward one another in the western part of the study area. Head in the shallow alluvial aquifer is approximately 100 to 200 ft higher than the head in the deep aquifer just east of where the shallow aquifer becomes unsaturated, suggesting the shallow aquifer discharges to the deep aquifer system in this general area.

BASIN MARGIN AQUIFER

Hydrologic Characteristics of the Basin Margin Aquifer

Wells completed into fractured sedimentary and crystalline rock aquifers, while not utilized extensively for municipal use, are utilized for individual domestic and small community water systems. Where fractured, these aquifers are relatively productive but likely are limited in areal extent and are subject to dewatering of the fracture system. In the southern part of the study area, the basin margin aquifer has a moderate to high gradient of 0.1 to 0.7 ft/ft to the northwest (Bauer et al., 1999). Water table elevation contours from Bauer et al. (1999) indicate that the basin margin aquifer discharges to the shallow basin fill aquifer.

Limited aquifer testing data are available from three wells completed into fractured Paleozoic sedimentary rocks or fractured crystalline rocks, two of which are located in basin margin settings. Well depths range from 400 to 1200 ft (120 to 365 m) in depth, and include the Town Yard well, drilled into the Paleozoic Alamitos Formation underlying the Tertiary sediments in the southeast part of the study area. Pumping tests were run for times ranging from 435 to 2880 min at Q ranging from 8 to 48 gpm. Based on these limited test results, the fractured sedimentary rock and crystalline rock aquifers exhibit hydraulic conductivity (k) ranging from 0.1 to 2.8 ft/day. Data on S are not available. Head in the Ruckendorfer and Yaravitz wells is at a similar elevation to the head in the shallow alluvial aquifer, indicating that these basin margin wells are discharging to the shallow alluvial aquifer.

Drinking water quality

Water quality from both the shallow and deep aquifer systems is generally good, with the exception of high pH and arsenic generally observed in the deep aquifer, and high fluoride occasionally observed in wells completed into the deep aquifer. High fluoride has also been reported for some shallow wells in the Llano Quemado, Chamisal, Des Montes, and Ranchos de Taos areas (Garrabrant, 1993). High sulfur, iron, and fluoride concentrations are observed in some basin margin aquifer wells (Bauer et al., 1999; Drakos and Lazarus, 1998). In some cases, the source for arsenic in the deep aquifer may be related to mineralization along mountain front faults. Time series sampling for arsenic conducted during the BOR1 pumping test, showed that arsenic concentrations increase after an impermeable boundary is encountered. These data suggest that higher-arsenic concentration water is associated with the Los Cordovas fault strand manifested as an impermeable boundary in the BOR1 test. However, a similar increase in arsenic concentration was not observed during time series sampling during the RP2500 pumping test (Drakos and Hodgins, unpubl. GGI report for the Town of Taos, 2001). This indicates that faults are not consistently associated with arsenic-enriched fluids; perhaps basin margin faults are more likely to be associated with mineralized/high-arsenic water.

TOWN OF TAOS WATER SUPPLY

The Town of Taos municipal water supply is derived from two primary sources: 1) ‘In Town Well Field’, comprising nine wells completed in the shallow aquifer system, and 2) Five wells completed into the deep aquifer system, including three San Juan Chama Wells and two Bureau of Reclamation wells. The Bureau of Reclamation wells cannot be used until there is a final settlement of the *Abeyta* litigation and final approval by the State Engineer Water Rights division.

Town of Taos municipal supply well completion and production information is summarized in Table 1.

Table 1. Summary data for existing Town of Taos municipal supply wells

Common Name	OSE File Number	Total Depth (ft)	Aquifer System	Permitted Diversion (ac-ft/yr)	Production Capacity (ac-ft/yr)*
Town #1 Pump House	7339	182	Shallow	913.43	121
Town #2 City Hall	7339-s	204	Shallow		220
Town #3 Post Office	7339-s2	330	Shallow		170
Town #4 Jack Denver	7339-s3	300	Shallow		213
Town #5 Sierra Sports	7339-s4	330	Shallow		358
Town #6 Howell	7339-s5	503	Shallow		445[1]
Mitchell	7339-s6	400	Shallow		242
Kit Carson Park	17178	270	Shallow	29.125	0
Fred Baca Park	36130	76	Shallow	3.0	0
Town #7 1995 (San Juan-Chama)	37303	180	Deep	490	130
Town #8 RP 2500	37303-s-2	2527	Deep		389
Town #9 RP 3200	37303-s-3	3180	Deep		194
BOR 1 deep	73095	2003	Deep	N/A[2]	227
BOR 3	74545-expl	2110	Deep		490

*Assumes pumping at full capacity 60% of the time
[1]Howell well (Town's best producer) is not pumping as part of negotiations with Taos Pueblo
[2]BOR wells cannot be pumped until Abeyta settlement. After Abeyta, wells still must go through OSE water rights process

Deep Ground Water Supplies

Most municipal suppliers in the Planning Region are constructing wells ranging in capacity from 25-500 gpm with some well depths exceeding 3000 feet. Most municipalities are drilling deeper wells, minimizing the effect on the aquifer connected stream system. Most agricultural wells are shallower than 1000 ft.

A properly spaced well field on the Taos Plateau with properly constructed wells should be capable of producing several thousands of acre-ft of ground water. As discussed in Section 7, recharge to the Taos Region is typically higher than withdrawals and water levels do not appear to be declining overall. Development of this deep M&I or agricultural ground water will increase well production costs and require retirement of surface water rights on the Rio Grande and/or its tributaries.

The majority of existing domestic wells and the Town of Taos in-town well field are completed into the shallow stream-connected aquifer system. The Town well field is capable of significantly higher production than the currently permitted 913 ac-ft/year, but the Town is planning future wells completed below 1000 feet to the west and south of Town to minimize surface water impacts to the shallow stream connected aquifer.

Significant ground water resources likely exist for municipal water supply below 1000 ft on the Taos Plateau. Exploratory and production wells completed into the deep Tertiary aquifer system below the Taos Plateau can sustain a production rate of 300-500 gpm. This deeper (>1000 ft) ground water is an important component of future water supplies for the Planning Region and should be developed by M&I and other ground water users. This production can likely be achieved from a series of properly completed and spaced wells.

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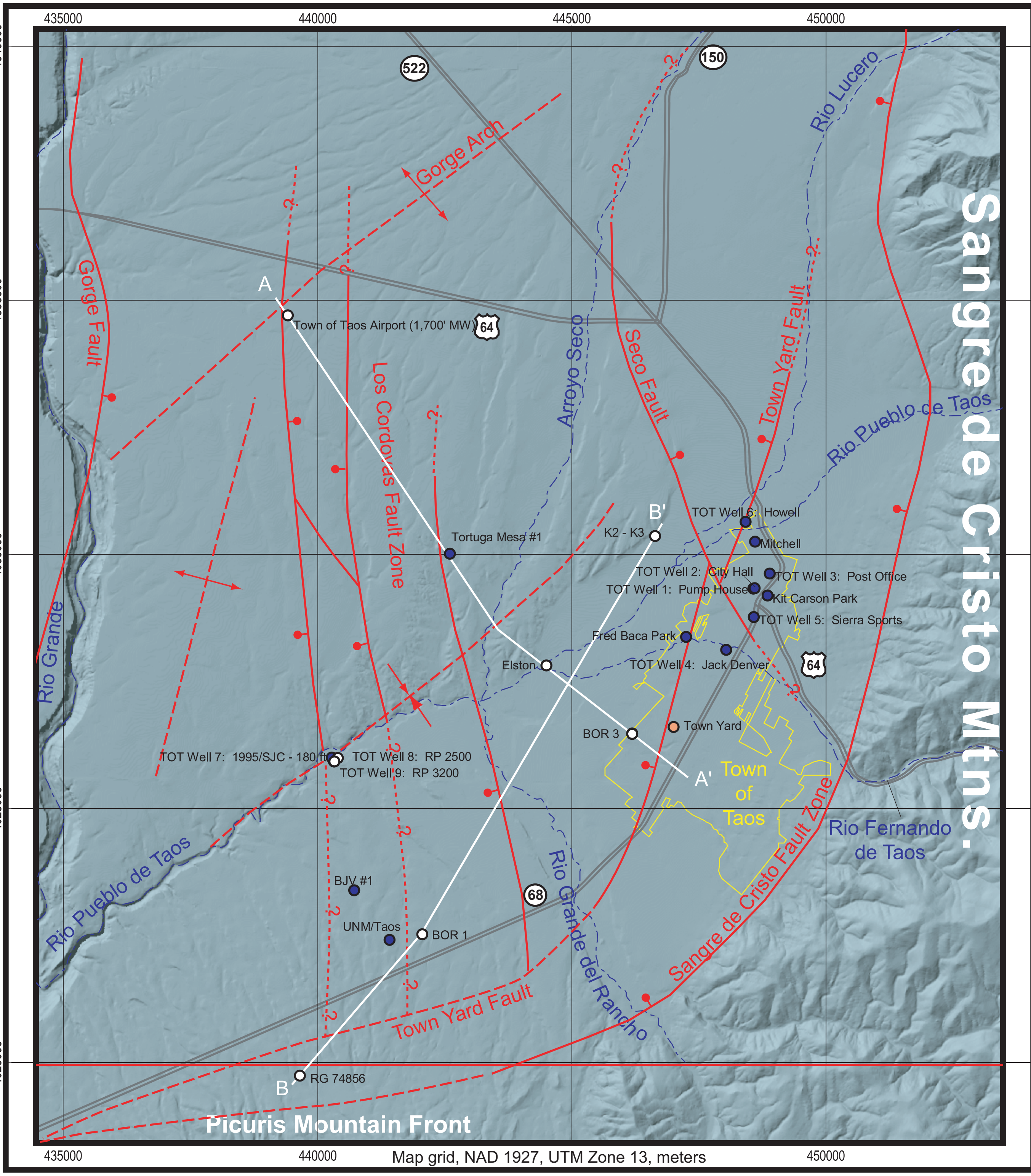
APPENDIX A

WELL LOCATIONS FOR TAOS AREA WELLS CITED IN THIS STUDY

	UTM NAD 27, zone 13, m.			UTM NAD 27, zone 13, m.	
WELL NAME	Easting	Northing	WELL NAME	Easting	Northing
Abeyta Well	448752	4024118	Howell	448470	4030712
Arroyo Hondo	452696	4046154	K2 - K3	446688	4030429
Arroyo Park	443740	4028440	Kit Carson	448900	4029260
Arroyo Seco	448745	4041260	La Percha	445760	4030300
Arroyos del Norte	446162	4042084	Landfill MW1	442758	4034011
Baranca del Pueblo	437160	4023520	Lerman	441824	4032655
Bear Stew	450352	4037199	Mariposa Ranch	445180	4040820
BIA 11	444775	4035824	McCarthy	446307	4038831
BIA 13	448320	4034830	Mesa Encantada	442346	4024531
BIA 13	449820	4029780	NGDOM	442290	4022740
BIA 14	449470	4030990	OW-6	449590	4033200
BIA 15	442470	4028200	Pettit Well	447925	4023423
BIA 17	448890	4038130	Porter	447769	4041305
BIA 2	449600	4033180	Quail Ridge	446472	4035777
BIA 20	447335	4035901	Ranchos Elem. Sch	446316	4023297
BIA 24	447500	4038340	R. Fernando de Taos	450851	4025541
BIA 9	444280	4038930	R.G. del Rancho	447172	4020228
BJV #1	441230	4023480	Rio Lucero	448028	4030617
BOR 1	442124	4022604	R. Pueblo de Taos	448731	4030516
BOR 4 Deep	444766	4035805	Riverbend	439120	4024530
BOR 6 #1	444797	4035805	Rose Gardiner	443027	4024817
BOR 6 #2	444797	4035805	RP 2000 Deep	440380	4026000
BOR2A	446247	4026541	RP 2500	440462	4026069
BOR2B/2C	446240	4026553	Ruckendorfer	449460	4023920
BOR3	446247	4026541	Taos SJC	440340	4026080

BOR5	447345	4035906	TOT #1	448626	4029394
BOR7	444280	4038930	TOT #2	448648	4029400
Cameron	446529	4034294	TOT #3	448941	4029690
Cielo Azul	446420	4040260	TOT #5	448631	4028835
Cielo Azul Deep	446400	4040250	Town Taos Airport	439480	4034760
Colonias Point	444910	4034920	Town Yard	447060	4026680
Cooper	443860	4029120	UNM/Taos	441310	4022260
Fred Baca Park	447225	4028617	Vista del Valle	443681	4023916
Hank Saxe	440507	4020477	Yaravitz	449826	4042805



Fault, inferred from surface or drilling data, ball and bar on downthrown side

Anticline

Syncline

Major road

Major stream or river

Line of cross-section

Taos Town Limits

Well in Shallow Aquifer

Well in Deep Aquifer

Exploratory Well (not completed for production)

1 0 1 2 Miles

1 0 1 2 Kilometers

North

GLORIETA GEOSCIENCE, INC.

Figure 1. Location map of Taos Valley showing location of wells discussed in text, major geologic structures, and lines of cross-section shown in figures 3,4, and 5.

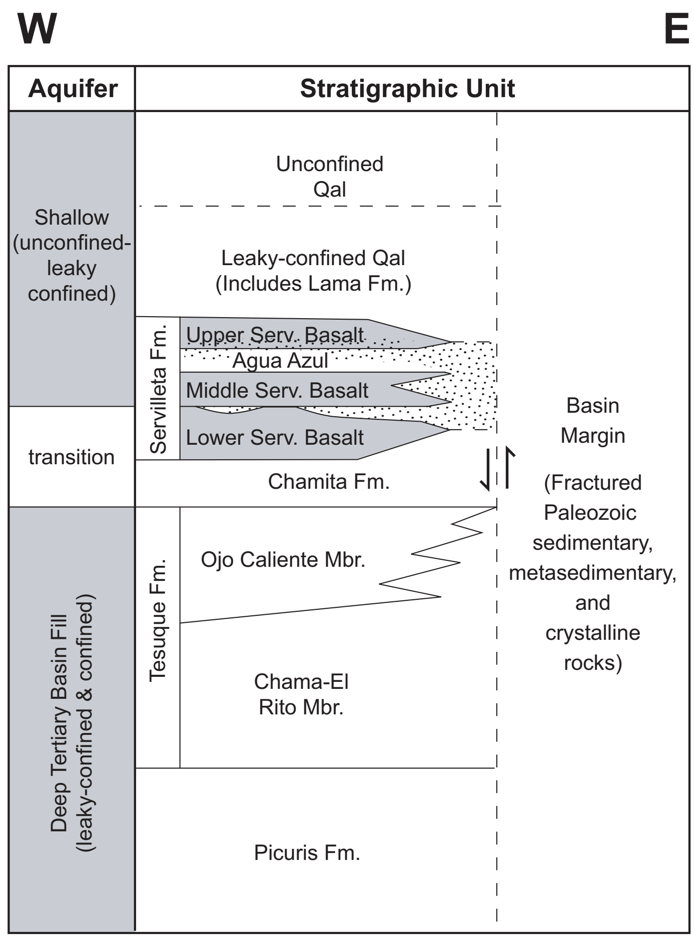


Figure 2. Taos Valley geohydrologic framework

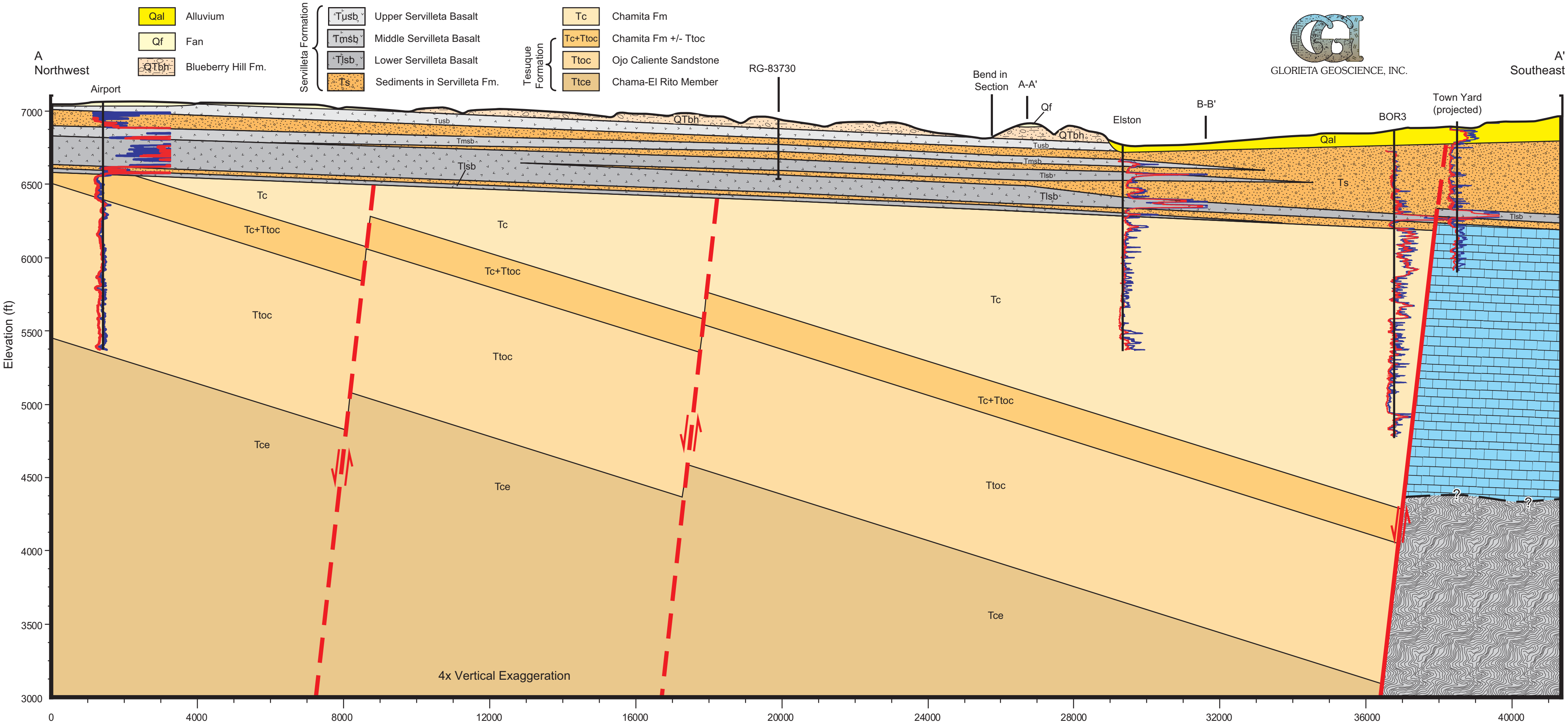


Figure 3. Cross-section from Taos Municipal Airport to Taos Town Yard exploratory well. Line of section shown on Figure 1. Surficial geologic mapping from Bauer et al. (2001); Kelson and Bauer (2003).

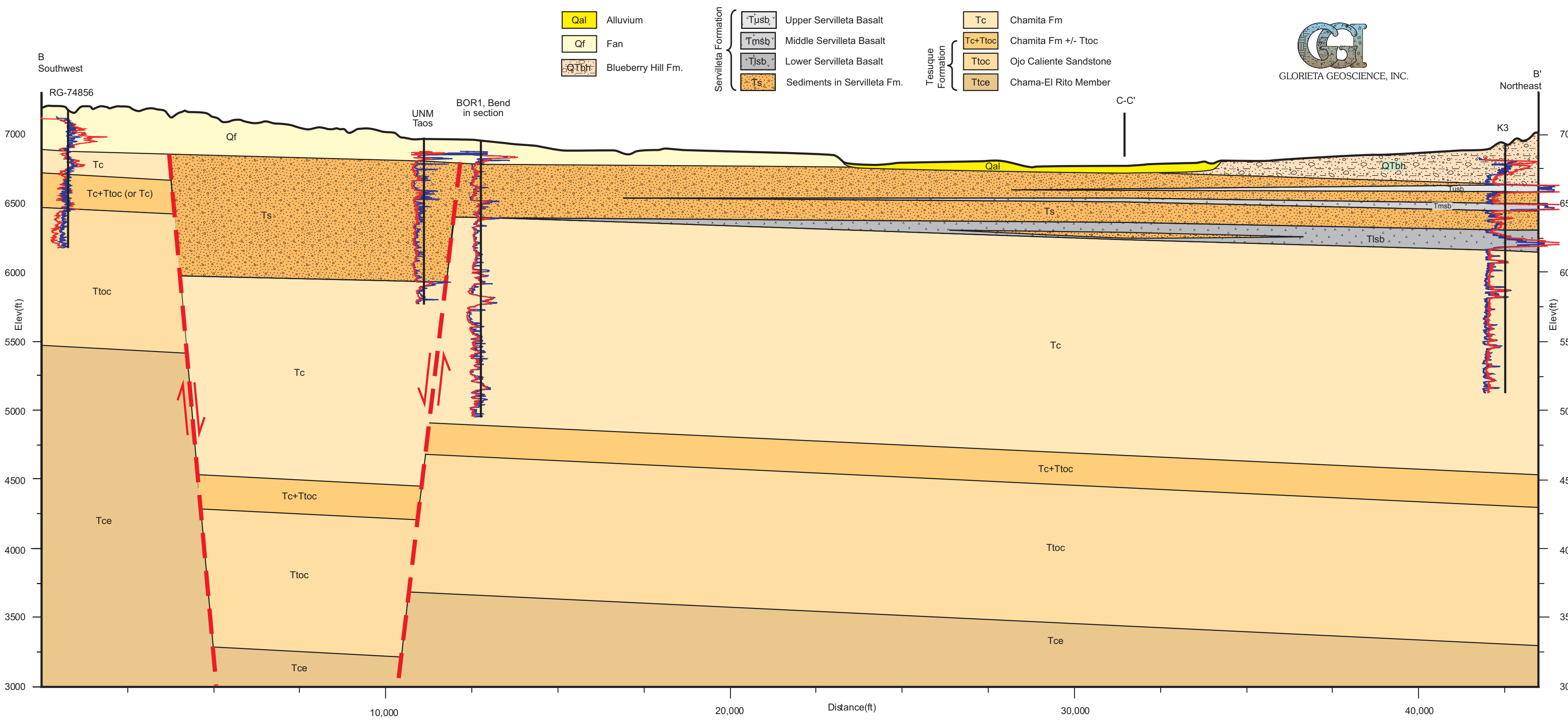
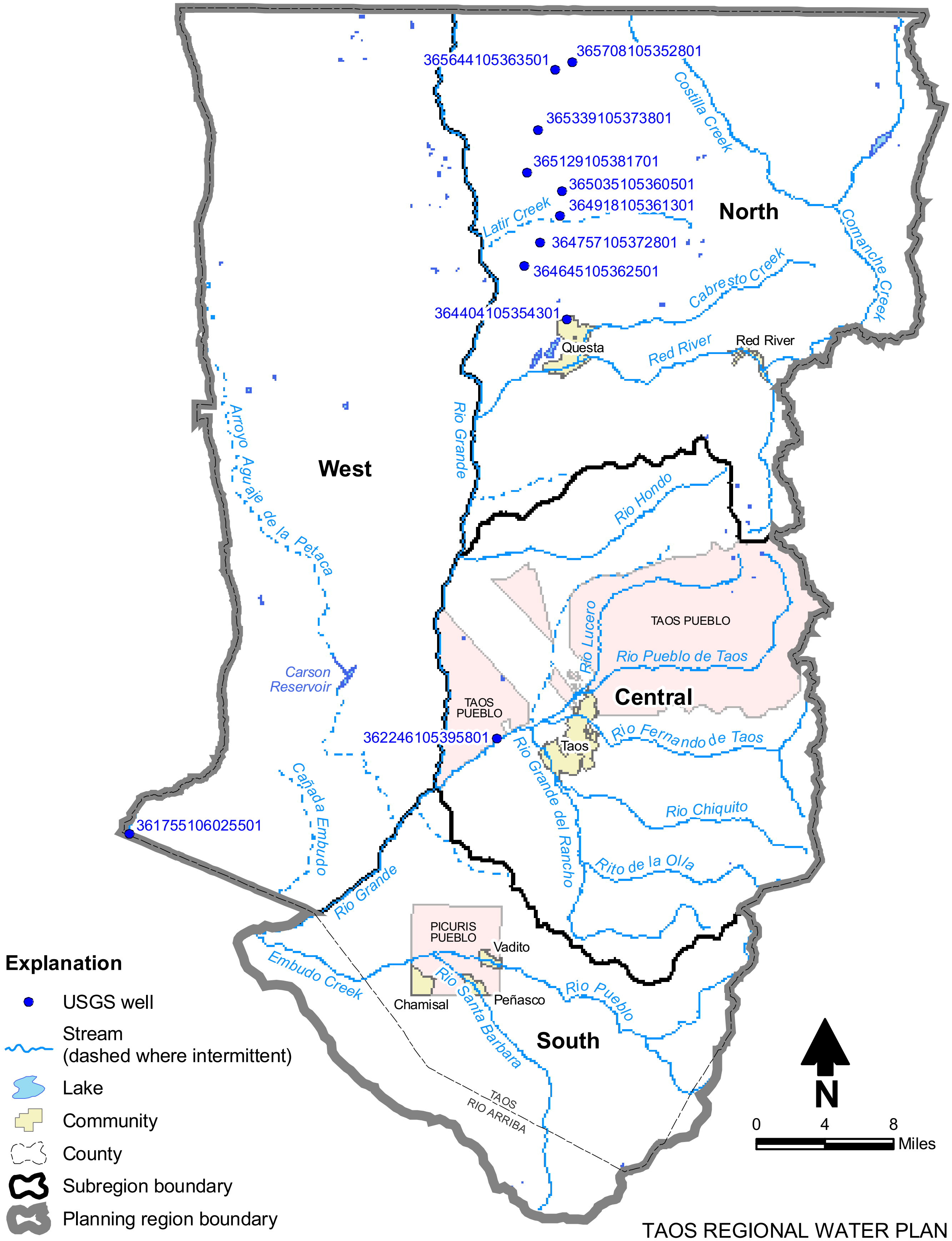


Figure 4. Cross-section from RG-74856 (Picuris Mountain front well) to K3. Line of section shown in Figure 1. Surficial geologic mapping from Bauer et al. (2001); Kelson and Bauer (2003).

Appendix E4

Groundwater Hydrographs



TAOS REGIONAL WATER PLAN

USGS Groundwater Hydrograph Locations

Daniel B. Stephens & Associates, Inc.

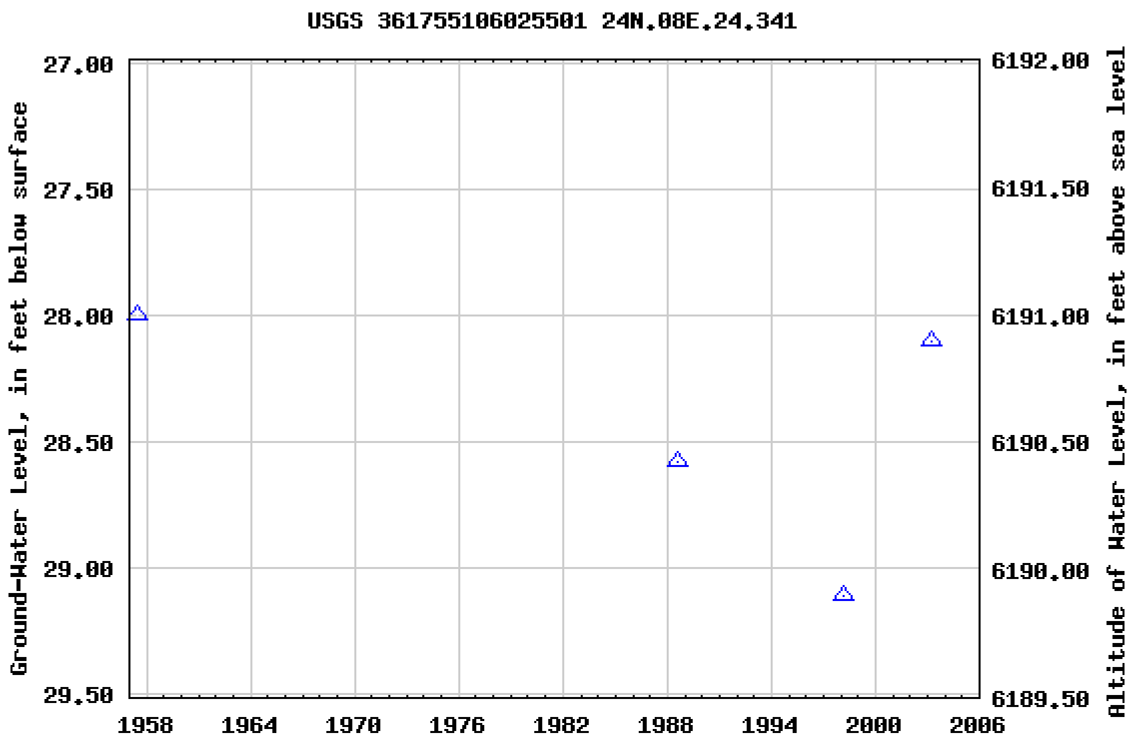
06/06/2007

JN WR05.0235

M:/PROJECTS/WR05.0077_TAOS_REGIONAL_WATER_PLAN/GIS/MXDS/FINAL_REPORT/USGS_GW_HYDROGRAPH_LOCS.MXD 706060

USGS 361755106025501 24N.08E.24.341

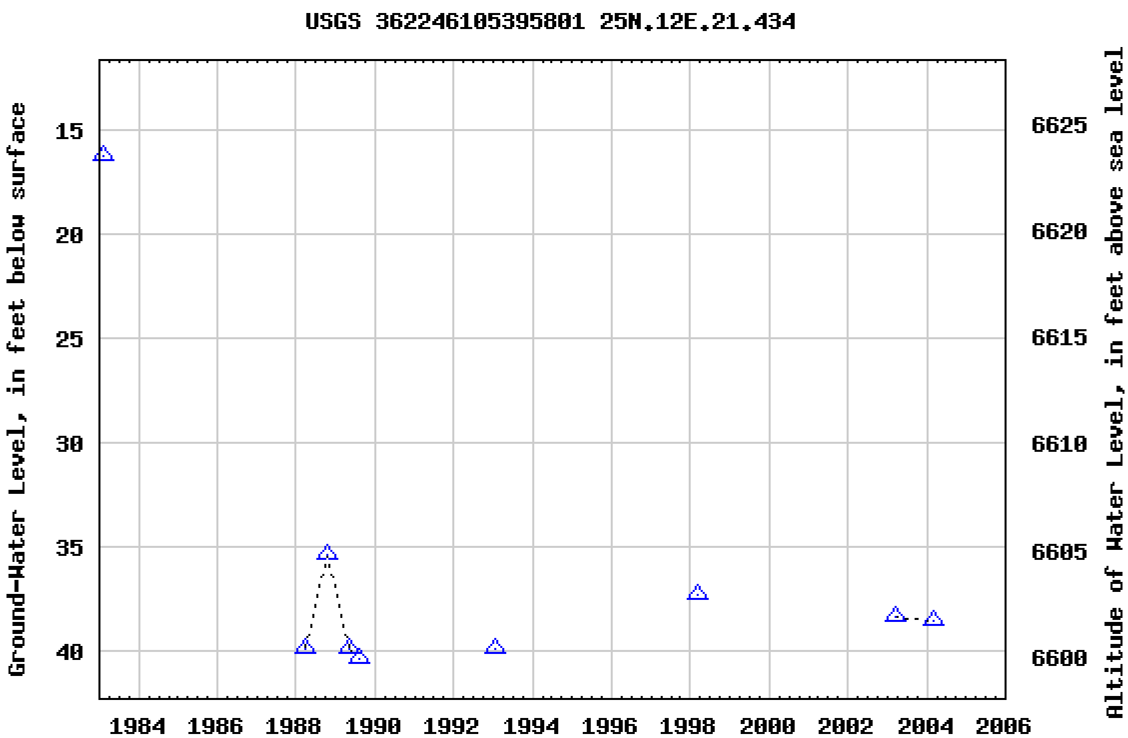
Taos County, New Mexico
Hydrologic Unit Code 13020102
Latitude 36°17'44", Longitude 106°02'59" NAD27
Gage datum 6,219.00 feet above sea level NGVD29
The depth of the well is 80.0 feet below land surface.
The depth of the hole is 122 feet below land surface.
This well is completed in SANTA FE GROUP (112SNTF)



Breaks in the plot represent a gap of at least one calendar year between two consecutive points.

USGS 362246105395801 25N.12E.21.434

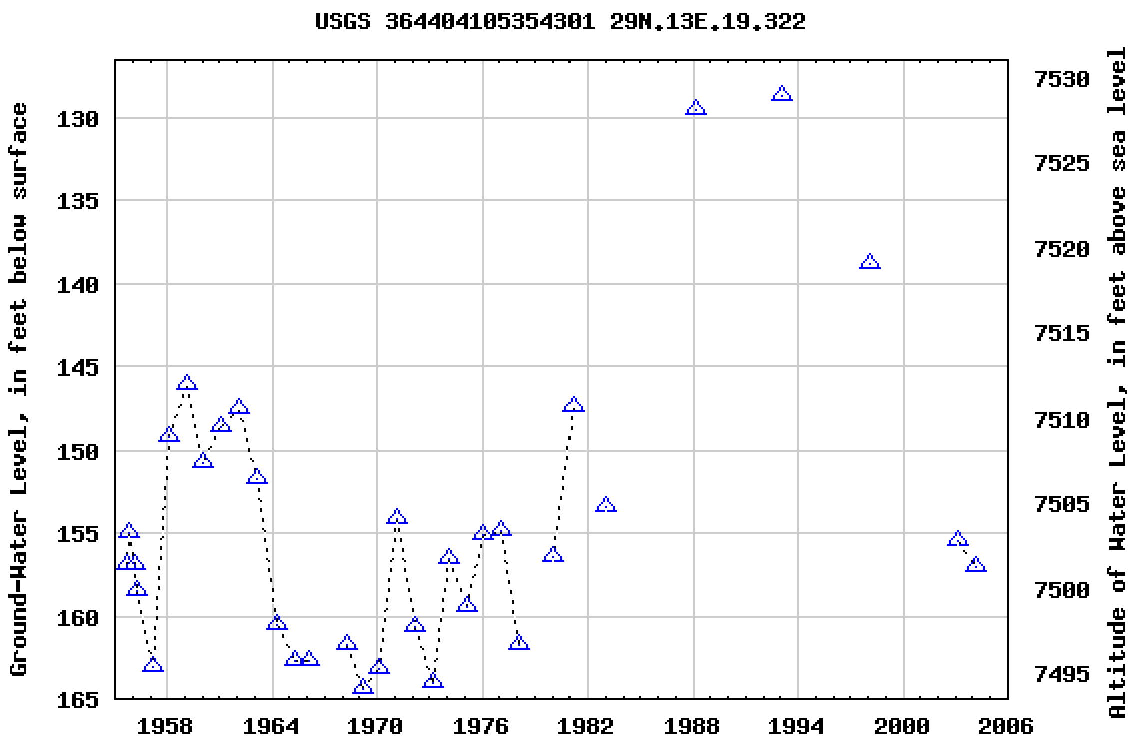
Taos County, New Mexico
Hydrologic Unit Code 13020101
Latitude 36°22'46", Longitude 105°39'58" NAD27
Gage datum 6,640 feet above sea level NGVD29
The depth of the well is 530 feet below land surface.
This well is completed in ALLUVIUM,BOLSON DEPOSITS AND OTHER SURFACE DEPOSITS (110AVMB)



Breaks in the plot represent a gap of at least one calendar year between two consecutive points.

USGS 364404105354301 29N.13E.19.322

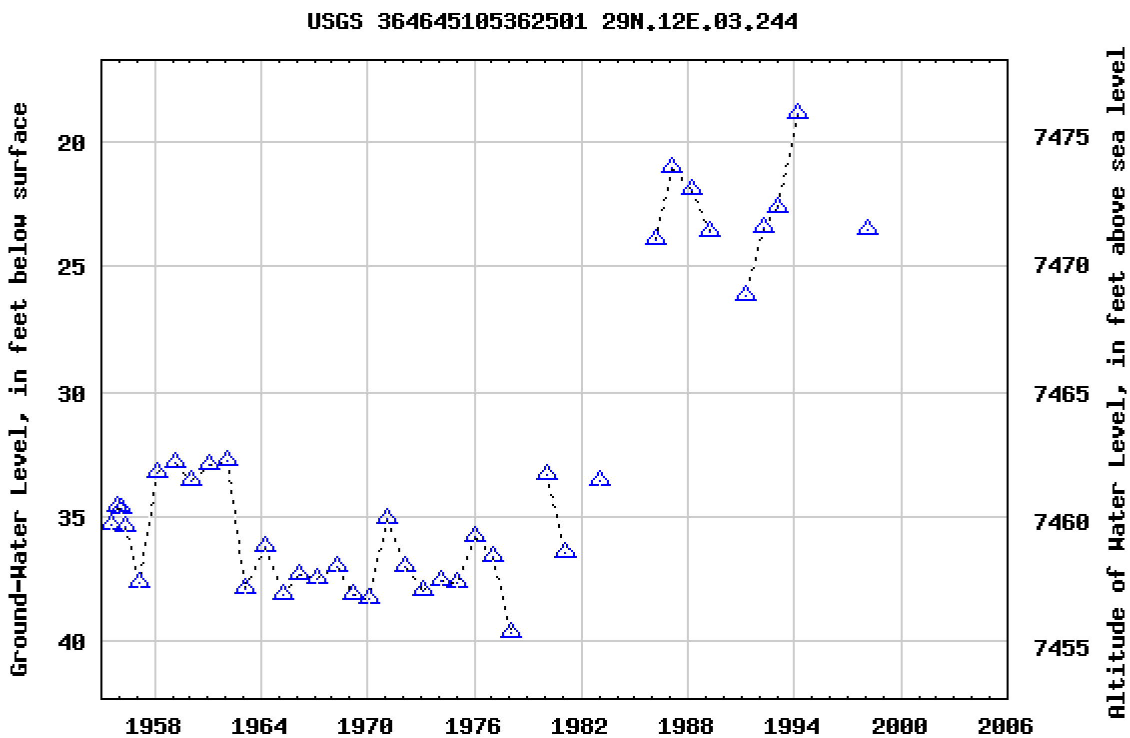
Taos County, New Mexico
Hydrologic Unit Code
Latitude 36°44'04", Longitude 105°35'43" NAD27
Gage datum 7,658.00 feet above sea level NGVD29
The depth of the well is 0,300.0 feet below land surface.
This well is completed in ALLUVIUM,BOLSON DEPOSITS AND OTHER SURFACE DEPOSITS (110AVMB)



Breaks in the plot represent a gap of at least one calendar year between two consecutive points.

USGS 364645105362501 29N.12E.03.244

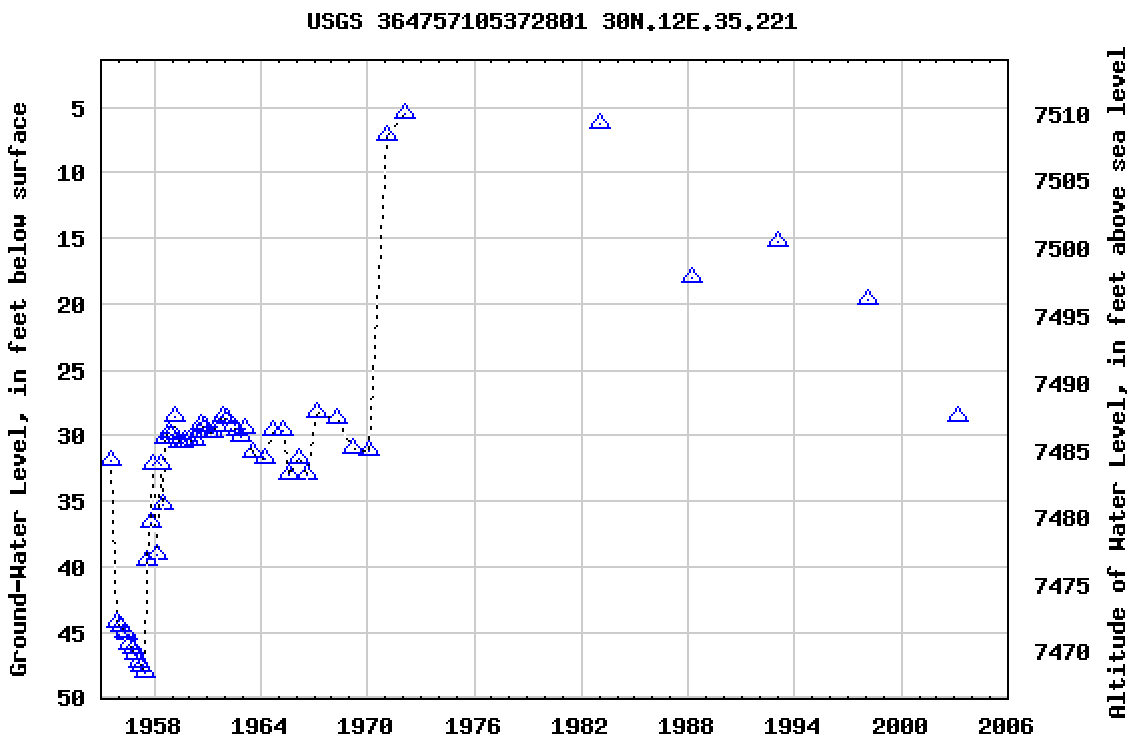
Taos County, New Mexico
Hydrologic Unit Code 13020101
Latitude 36°46'45", Longitude 105°38'25" NAD27
Gage datum 7,495.00 feet above sea level NGVD29
The depth of the well is 168 feet below land surface.
The depth of the hole is 168 feet below land surface.
This well is completed in SANTA FE GROUP (112SNTF)



Breaks in the plot represent a gap of at least one calendar year between two consecutive points.

USGS 364757105372801 30N.12E.35.221

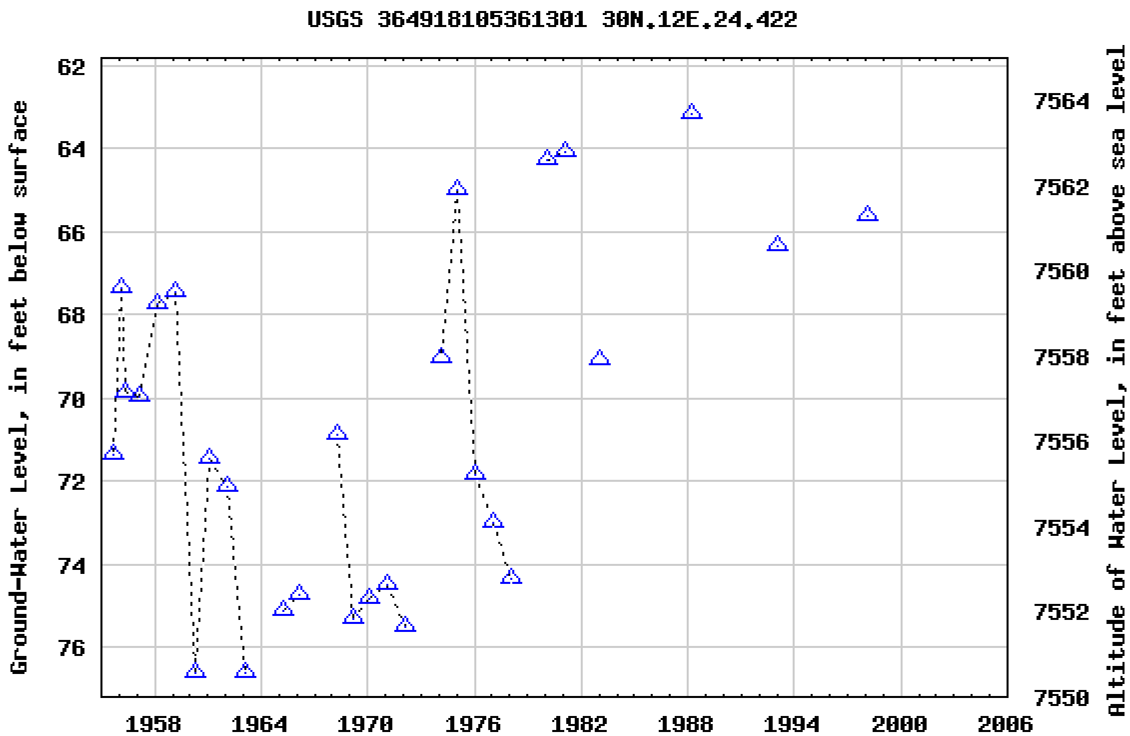
Taos County, New Mexico
Hydrologic Unit Code 13020101
Latitude 36°47'57", Longitude 105°37'28" NAD27
Gage datum 7,516.00 feet above sea level NGVD29
The depth of the well is 310 feet below land surface.
The depth of the hole is 346 feet below land surface.
This well is completed in SANTA FE GROUP (112SNTF)



Breaks in the plot represent a gap of at least one calendar year between two consecutive points.

USGS 364918105361301 30N.12E.24.422

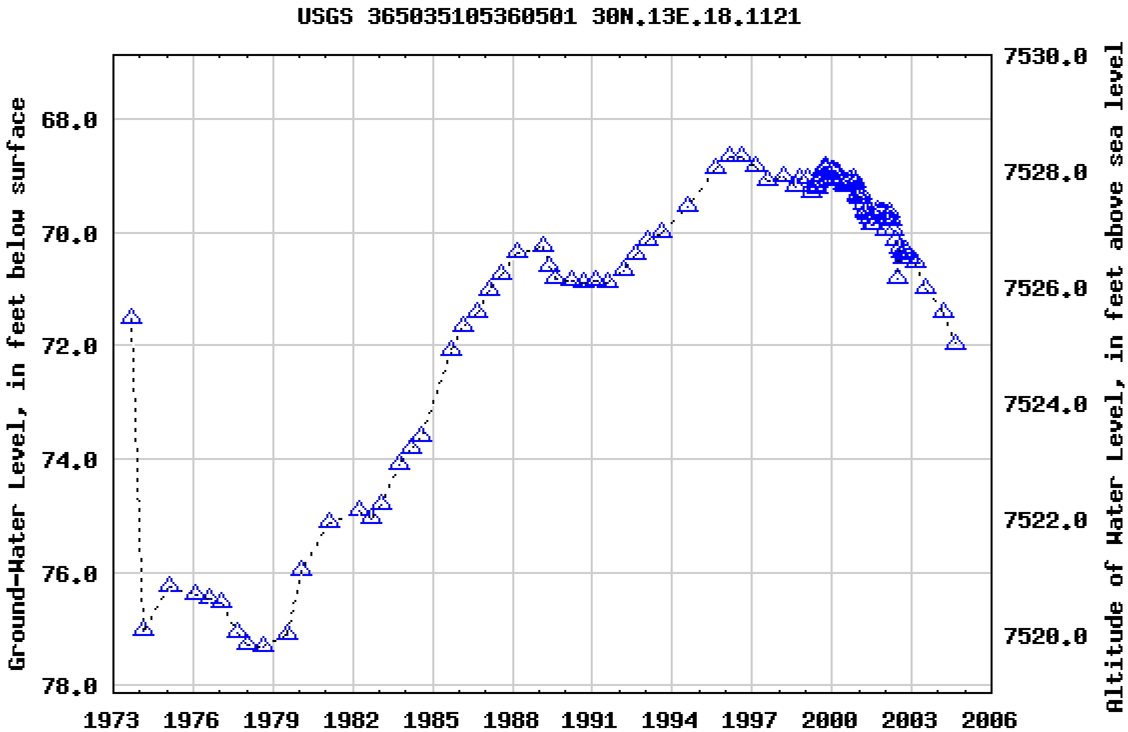
Taos County, New Mexico
Hydrologic Unit Code 13020101
Latitude 36°49'18", Longitude 105°36'13" NAD27
Gage datum 7,627.00 feet above sea level NGVD29
The depth of the well is 417 feet below land surface.
The depth of the hole is 417 feet below land surface.
This well is completed in ALLUVIUM,BOLSON DEPOSITS AND OTHER SURFACE DEPOSITS (110AVMB)



Breaks in the plot represent a gap of at least one calendar year between two consecutive points.

USGS 365035105360501 30N.13E.18.1121

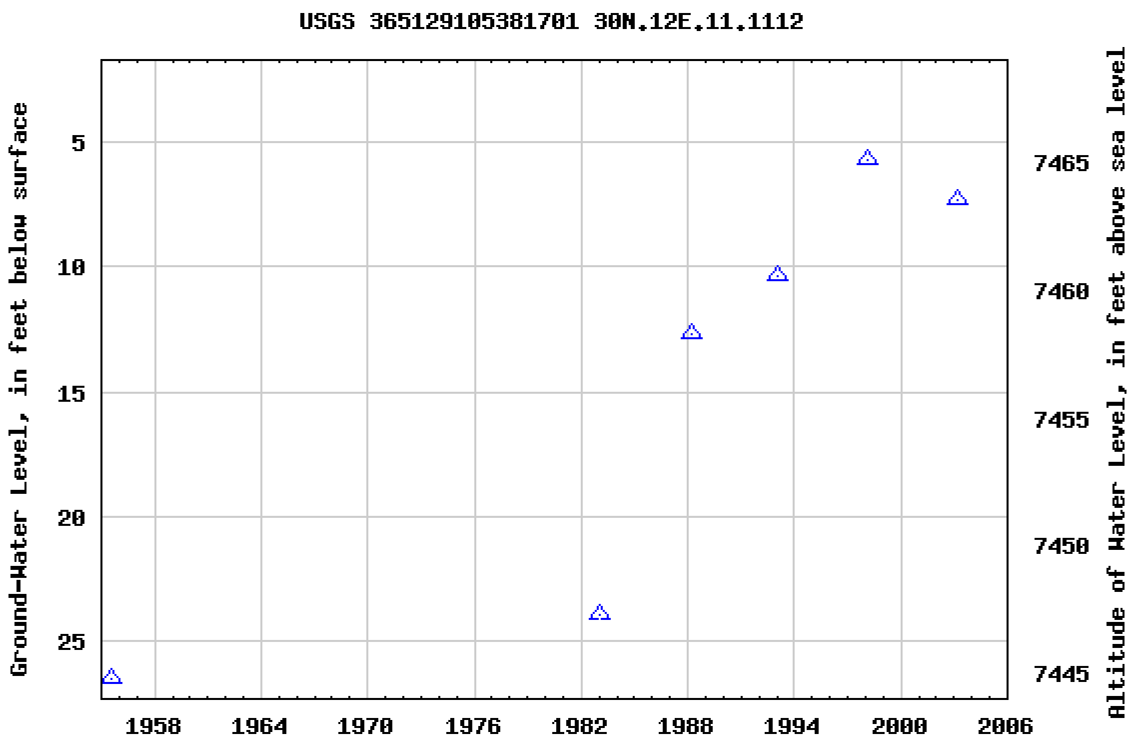
Taos County, New Mexico
Hydrologic Unit Code 13020101
Latitude 36°50'35", Longitude 105°36'05" NAD27
Gage datum 7,597.00 feet above sea level NGVD29
The depth of the well is 500.0 feet below land surface.
This well is completed in ALLUVIUM,BOLSON DEPOSITS AND OTHER SURFACE DEPOSITS (110AVMB)



Breaks in the plot represent a gap of at least one calendar year between two consecutive points.

USGS 365129105381701 30N.12E.11.1112

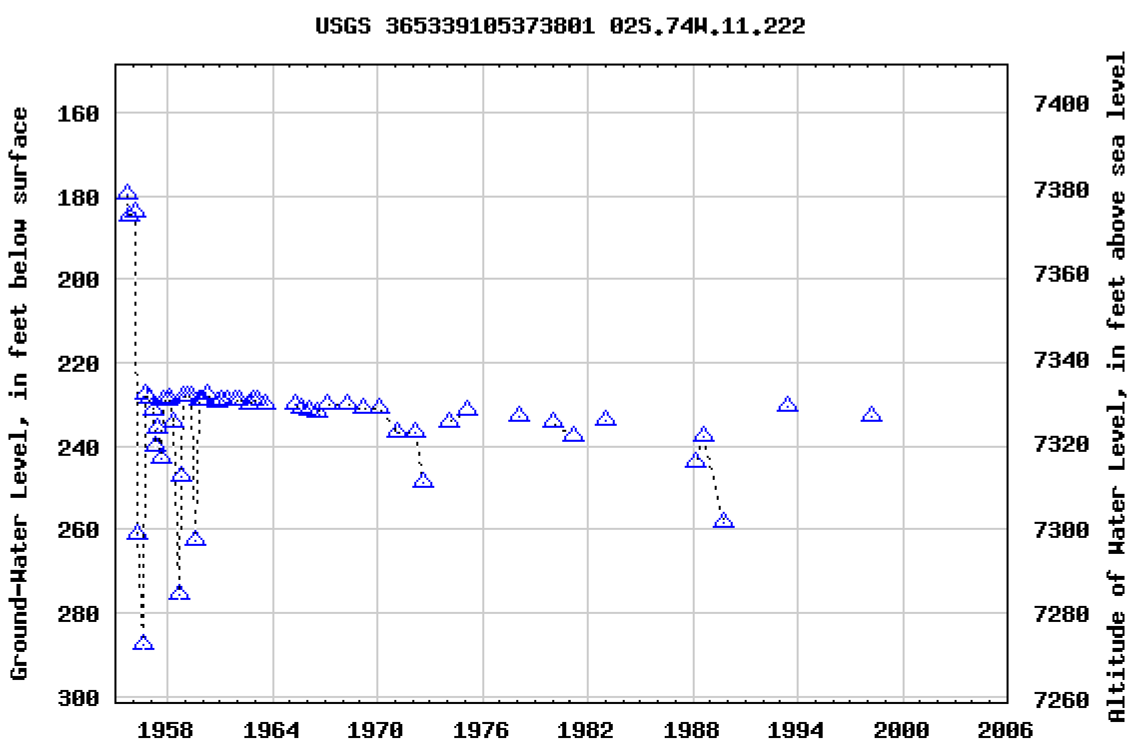
Taos County, New Mexico
Hydrologic Unit Code 13020101
Latitude 36°51'29", Longitude 105°38'17" NAD27
Gage datum 7,471.00 feet above sea level NGVD29
The depth of the well is 170 feet below land surface.
The depth of the hole is 170 feet below land surface.
This well is completed in ALLUVIUM,BOLSON DEPOSITS AND OTHER SURFACE DEPOSITS (110AVMB)



Breaks in the plot represent a gap of at least one calendar year between two consecutive points.

USGS 365339105373801 02S.74W.11.222

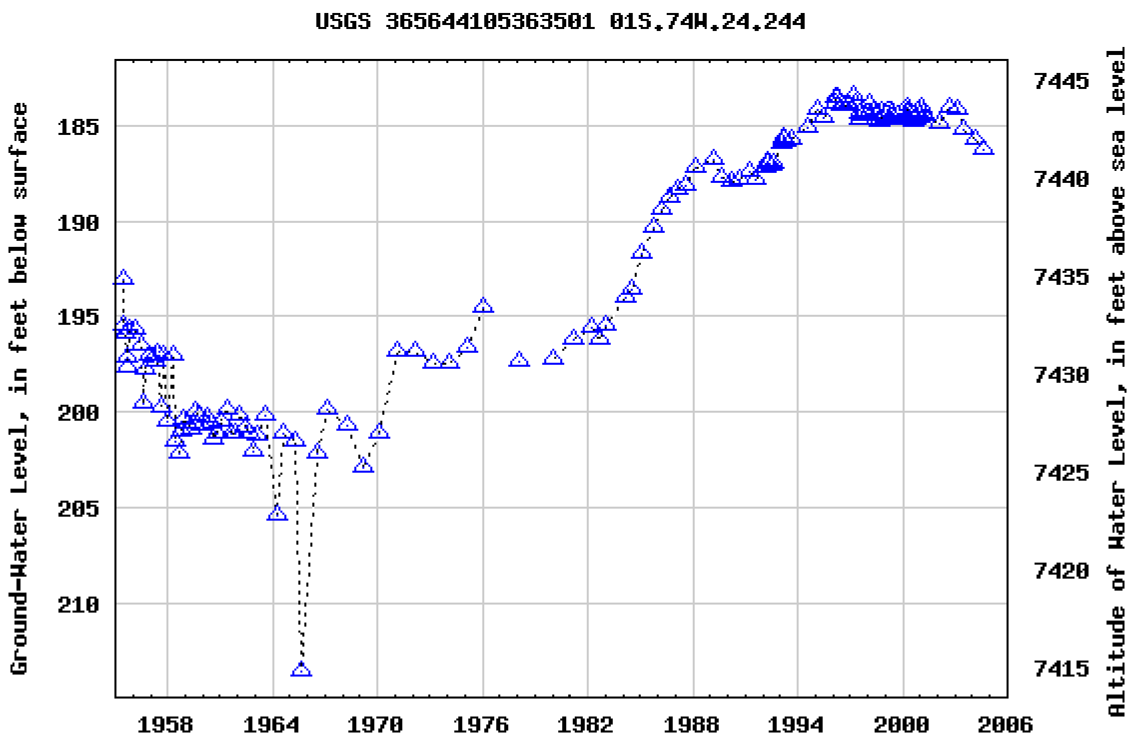
Taos County, New Mexico
Hydrologic Unit Code 13020101
Latitude 36°53'39", Longitude 105°37'38" NAD27
Gage datum 7,559 feet above sea level NGVD29
The depth of the well is 0,435.0 feet below land surface.
This well is completed in ALLUVIUM,BOLSON DEPOSITS AND OTHER SURFACE DEPOSITS (110AVMB)



Breaks in the plot represent a gap of at least one calendar year between two consecutive points.

USGS 365644105363501 01S.74W.24.244

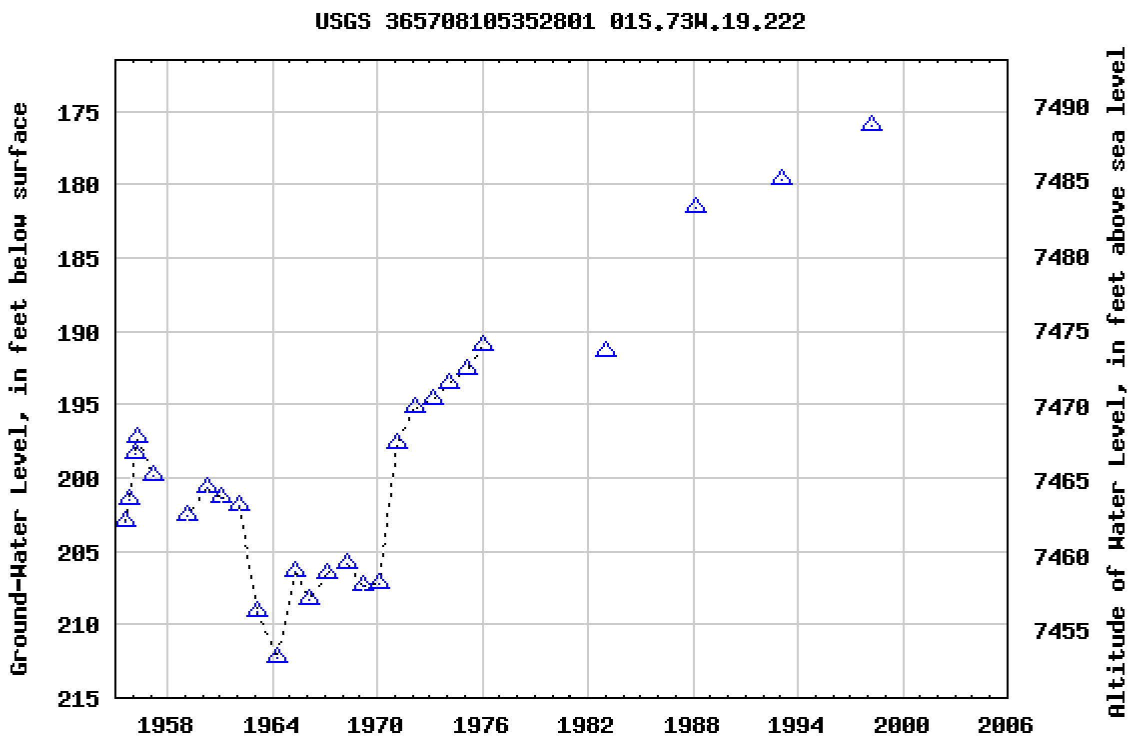
Taos County, New Mexico
Hydrologic Unit Code 13020101
Latitude 36°56'44", Longitude 105°36'35" NAD27
Gage datum 7,628 feet above sea level NGVD29
The depth of the well is 0,270.0 feet below land surface.
This well is completed in ALLUVIUM,BOLSON DEPOSITS AND OTHER SURFACE DEPOSITS (110AVMB)



Breaks in the plot represent a gap of at least one calendar year between two consecutive points.

USGS 365708105352801 01S.73W.19.222

Taos County, New Mexico
Hydrologic Unit Code 13020101
Latitude 36°57'08", Longitude 105°35'28" NAD27
Gage datum 7,665 feet above sea level NGVD29
The depth of the well is 0,420.0 feet below land surface.
This well is completed in ALLUVIUM,BOLSON DEPOSITS AND OTHER SURFACE DEPOSITS (110AVMB)



Breaks in the plot represent a gap of at least one calendar year between two consecutive points.

Ground water for New Mexico: Water Levels
http://waterdata.usgs.gov/nm/nwis/gwlevels?

Retrieved on 2005-08-09 11:52:06 EDT
Department of the Interior, U.S. Geological Survey
USGS Water Resources of New Mexico
Privacy Statement || Disclaimer || Accessibility || FOIA
7.3 4.6 nadww01

Appendix E5

Water Quality Information

Appendix E5. Total Maximum Daily Load Status of Streams in the Taos Water Planning Region

Waterbody Name (Basin, Segment) Evaluated or Monitored Support Status Assessment Unit ID	Affected Reach (mi or ac)	Probable Sources of Impairment	TMDL Schedule Date	Probable Causes of Impairment	Uses Not Fully Supported [a]	Acute Public Health Concern
HUC 13010002, Alamosa-Trinchera						
None of the Alamosa-Trinchera listed reaches are inside the Taos Region						
HUC 13020101, Upper Rio Grande						
Agua Caliente (Rio Grande to headwaters) Monitored Fully supported NM-2120.A_430	5.14					
Bernardin Lake Monitored Not assessed NM-9000.B_013	2.0				None	
Bitter Creek (Red River to headwaters) Monitored Partially supported NM-2120.A_705	8.32	Acid mine drainage Highway/road/bridge runoff (non-construction related) Natural sources Other recreational pollution sources Surface mining	2004	Aluminum Sedimentation/siltation	HQCWF	
Bull Creek Lake Monitored Not assessed NM-9000.B_023	2.0				None	

Sources: NMED, 2002, 2004b, 2004c, 2006c

[a] CWF = Cold water fishery
MCWF= Marginal coldwater fishery
WWF = Warmwater fishery

[b] TMDL established as part of the Upper Rio Grande TMDL, Part 1, in December 2004 (NMED, 2004b)

[c] TMDL established as part of the Upper Rio Grande TMDL, Part 2, in April 2005 (NMED, 2005b)

[d] TMDL established as part of the Rio Hondo Watershed TMDLs in June 2005 (NMED, 2005c)

TMDL = Total maximum daily load
NPDES = National Pollutant Discharge Elimination System
mi = Miles (used for streams)
ac = Acres (used for lakes and reservoirs)
--- = TMDL not yet submitted

Appendix E5. Total Maximum Daily Load Status of Streams in the Taos Water Planning Region

Waterbody Name (Basin, Segment) Evaluated or Monitored Support Status Assessment Unit ID	Affected Reach (mi or ac)	Probable Sources of Impairment	TMDL Schedule Date	Probable Causes of Impairment	Uses Not Fully Supported [a]	Acute Public Health Concern
Cabrestro Creek (Red River to headwaters) Monitored Fully supported NM-2120.A_701	17.28				None	
Cabrestro Lake Monitored Fully supported NM-2120.B_20	15.66				None	
Casias Creek (Costilla Reservoir to headwaters) Monitored Fully supported NM-2120.A_831	7.37				None	
Chamisal Creek (above Embudo Creek except Picuris Pueblo) Monitored Fully supported NM-2120.A_402	8.5				None	
Columbine Creek (Red River to headwaters) Monitored Fully supported NM-2120.A_702	4.69				None	

Sources: NMED, 2002, 2004b, 2004c, 2006c

[a] CWF = Cold water fishery
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Comanche Creek (Costilla Creek to Little Costilla Creek) Monitored Partially supported NM-2120.A_827	10.3	Rangeland grazing	2004 [b]	Temperature, water	HQCWF	No
Cordova Creek (Costilla Creek to headwaters) Monitored Partially supported NM-2120.A_823	5.61	Habitat modification Highway/road/bridge runoff (non-construction related) Loss of riparian habitat Other recreational pollution sources Streambank modifications/ destabilization	1999	Total phosphorus (de-list letter) Sedimentation/siltation Turbidity	HQCWF	No
Costilla Creek (CO border to diversion above Costilla) Monitored Partially supported NM-2120.A_810	3.52			Low flow alterations	HQCWF	No
Costilla Creek (Comanche Creek to Costilla Dam) Monitored Fully supported NM-2120.A_830	4.36				None	

Sources: NMED, 2002, 2004b, 2004c, 2006c

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Costilla Creek (Diversion above Costilla to Comanche Creek) Monitored Partially supported NM-2120.A_820	17.59	Rangeland grazing	2004 [b]	Temperature, water	HQCWF	No
Costilla Creek (Rio Grande to CO border) Monitored Partially supported NM-2120.A_800	2.61			Low flow alterations	HQCWF	No
Costilla Reservoir Monitored Not assessed NM-2120.B_00	340.08					
Cow Lake Monitored Not assessed NM-2120.B_40	2.0					
Eagle Rock Lake Monitored Fully supported NM-2120.B_10	3.0					

Sources: NMED, 2002, 2004b, 2004c, 2006c

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Waterbody Name (Basin, Segment) Evaluated or Monitored Support Status Assessment Unit ID	Affected Reach (mi or ac)	Probable Sources of Impairment	TMDL Schedule Date	Probable Causes of Impairment	Uses Not Fully Supported [a]	Acute Public Health Concern
Elk Lake Monitored Not assessed NM-9000.B_039	2.0					
Embudo Creek (Canada de Ojo Sarco to Picurus Pueblo bnd) Monitored Partially supported NM-2111_40	5.0	Source unknown	2005	Benthic-macroinvertebrate bioassessments (streams)	MCWF WWF	No
Embudo Creek (Rio Grande to Canada de Ojo Sarco) Monitored Partially supported NM-2111_41	6.2	Channelization Dredging (e.g., for navigation channels) Loss of riparian habitat Natural sources Off-road vehicles Rangeland grazing Site clearance (land development or redevelopment) Streambank modifications/ destabilization	2005 [c]	Sedimentation/siltation Turbidity	MCWF WWF	No
Fawn Lake (East) Monitored Fully supported NM-2120.B_60	1.0				None	

Sources: NMED, 2002, 2004b, 2004c, 2006c

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Appendix E5. Total Maximum Daily Load Status of Streams in the Taos Water Planning Region

Waterbody Name (Basin, Segment) Evaluated or Monitored Support Status Assessment Unit ID	Affected Reach (mi or ac)	Probable Sources of Impairment	TMDL Schedule Date	Probable Causes of Impairment	Uses Not Fully Supported [a]	Acute Public Health Concern
Fawn Lake (West) Monitored Fully supported NM-2120.B_61	1.0				None	
Goose Creek (Red River to headwaters) Monitored Not assessed NM-2120.A_711	5.11					
Goose Lake Monitored Partially supported NM-2120.B_12	5.95	Loss of riparian habitat Other recreational pollution sources Rangeland grazing Streambank modifications/ destabilization	2017	Nutrient/ eutrophication biological indicators Sedimentation/siltation	HQCWF	No
Heart Lake Monitored Not assessed NM-2120.B_70	4.34					
Horseshoe Lake Monitored Fully supported NM-2120.B_90	6.92					

Sources: NMED, 2002, 2004b, 2004c, 2006c

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Appendix E5. Total Maximum Daily Load Status of Streams in the Taos Water Planning Region

Waterbody Name (Basin, Segment) Evaluated or Monitored Support Status Assessment Unit ID	Affected Reach (mi or ac)	Probable Sources of Impairment	TMDL Schedule Date	Probable Causes of Impairment	Uses Not Fully Supported [a]	Acute Public Health Concern
Horseshoe Lake (Alamitos) Monitored Not assessed NM-2120.B_25	7.89					
Indian Lake Monitored Not assessed NM-2120.B_35	3.0					
La Cueva Lake Monitored Not assessed NM-2120.B_45	2.0					
Lake Fork Creek (Rio Hondo to headwaters) Monitored Fully supported NM-2120.A_606	2.15					
Latir Creek (Costilla Creek to headwaters) Monitored Fully supported NM-2120.A_824	5.57					

Sources: NMED, 2002, 2004b, 2004c, 2006c

[a] CWF = Cold water fishery
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Waterbody Name (Basin, Segment) Evaluated or Monitored Support Status Assessment Unit ID	Affected Reach (mi or ac)	Probable Sources of Impairment	TMDL Schedule Date	Probable Causes of Impairment	Uses Not Fully Supported [a]	Acute Public Health Concern
Lost Lake Monitored Fully supported NM-2120.B_13	6.0					
Mallette Creek (Red River to headwaters) Monitored Fully supported NM-2120.A_704	4.25					
Nat Lake II Monitored Not assessed NM-9000.B_087	2.0					
Nat Lake IV Monitored Not assessed NM-9000.B_088	1.5					
Pioneer Creek (Red River to headwaters) Monitored Partially supported NM-2120.A_703	4.89		2004 de-list letter for sedimentation/ siltation	Turbidity	HQCWF	

Sources: NMED, 2002, 2004b, 2004c, 2006c

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Waterbody Name (Basin, Segment) Evaluated or Monitored Support Status Assessment Unit ID	Affected Reach (mi or ac)	Probable Sources of Impairment	TMDL Schedule Date	Probable Causes of Impairment	Uses Not Fully Supported [a]	Acute Public Health Concern
Pioneer Lake Monitored Not assessed NM-2120.B_97	2.0					No
Placer Creek (Red River to headwaters) Monitored Partially supported NM-2120.A_706	2.75	Habitat modification other than hydromodification Loss of riparian habitat Natural sources Placer mining	2004 (Al draft; de-list for sedimentation/ siltation)	Aluminum	HQCWF	No
Red River (East Fork) Monitored Fully supported NM-2120.A_715	5.98					
Red River (Middle Fork) Monitored Fully supported NM-2120.A_714	2.84					
Red River (Placer Creek to headwaters) Monitored Partially supported NM-2120.A_710	5.63	Highway/road/bridge runoff (non-construction related) Impacts from abandoned mine lands (inactive) Mill tailings Mine tailings Natural sources	2004	Aluminum	HQCWF	No

Sources: NMED, 2002, 2004b, 2004c, 2006c

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Waterbody Name (Basin, Segment) Evaluated or Monitored Support Status Assessment Unit ID	Affected Reach (mi or ac)	Probable Sources of Impairment	TMDL Schedule Date	Probable Causes of Impairment	Uses Not Fully Supported [a]	Acute Public Health Concern
Red River (Rio Grande to Placer Creek) Monitored Partially supported NM-2119_10	20.59	Highway/road/bridge runoff (non-construction related) Impacts from abandoned mine lands (inactive) Mill tailings Mine tailings Natural sources	2004	Aluminum Ambient bioassays - chronic aquatic toxicity Sediment bioassays - chronic toxicity freshwater	CWF	No
Red River (West Fork) Monitored Not assessed NM-2120.A_713	1.4					
Rio Chiquito (Picuris Pueblo bnd to headwaters) Monitored Partially supported NM-2120.A_421	9.7	Natural sources Source unknown	2005	Turbidity	HQCWF	No
Rio Chiquito (Rio Grande del Rancho to headwaters) Monitored Fully supported NM-2120.A_502	17.3					None

Sources: NMED, 2002, 2004b, 2004c, 2006c

[a] CWF = Cold water fishery
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Waterbody Name (Basin, Segment) Evaluated or Monitored Support Status Assessment Unit ID	Affected Reach (mi or ac)	Probable Sources of Impairment	TMDL Schedule Date	Probable Causes of Impairment	Uses Not Fully Supported [a]	Acute Public Health Concern
Rio Fernando de Taos (Rio Pueblo de Taos to headwaters) Monitored Partially supported NM-2120.A_512	21.6	Highway/road/bridge runoff (non-construction related) Irrigated crop production Natural sources Other recreational pollution sources Rangeland grazing Source unknown Streambank modification/ destabilization	2004 [b]	Specific conductance Temperature, water	HQCWF	No
Rio Grande (Embudo Creek to Rio Pueblo de Taos) Monitored Fully supported NM-2111_12	15.0					
Rio Grande (non-pueblo Santa Clara to Embudo Creek) Monitored Partially supported NM-2111_10	14.8	Highway/road/bridge runoff (non-construction related) Irrigated crop production Loss of riparian habitat Natural sources Rangeland grazing	2007	Benthic-macroinvertebrate bioassessments (streams) Turbidity [c]	MCWF WWF	No
Rio Grande (Red River to NM/CO border) Monitored Partially supported NM-2119_05	27.75	Flow alterations from water diversions Habitat modification other than hydromodification Loss of riparian habitat Other recreational pollution sources Watershed runoff following forest fire	2010 2004 [b]	pH Temperature, water	CWF	No

Sources: NMED, 2002, 2004b, 2004c, 2006c

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Rio Grande (Rio Pueblo de Taos to Red River) Monitored Fully supported NM-2119_00	23.35					
Rio Grande del Rancho (Highway 518 to headwaters) Monitored Fully supported NM-2120.A_500	13.5					
Rio Grande del Rancho (Rio Pueblo de Taos to Highway 518) Monitored Partially supported NM-2120.A_501	11.5	Flow alterations from water diversions Habitat modification other than hydromodification Highways, roads, bridges, infrastructure (new construction) Natural sources Streambank modifications/ destabilization	2004 [b]	Specific conductance	HQCWF	No
Rio Hondo (Lake Fork Creek to headwaters) Monitored Not assessed NM-2120.A_607	1.7					

Sources: NMED, 2002, 2004b, 2004c, 2006c

[a] CWF = Cold water fishery
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Rio Hondo (Rio Grande to USFS bnd) Monitored Partially supported NM-2120.A_600	8.5	Highway/road/bridge runoff (non-construction related) Rangeland grazing Streambank modifications/ destabilization	2004 [b]	Temperature, water	HQCWF	No
Rio Hondo (South Fork Rio Hondo to Lake Fork Creek) Monitored Fully supported NM-2120.A_602	3.88			Total phosphorus [d] Total nitrogen [d]		
Rio Hondo (USFS bnd to South Fork Rio Hondo) Monitored Fully supported NM-2120.A_601	4.43					
Rio Pueblo (Picuris Pueblo bnd to headwaters) Monitored Partially supported NM-2120.A_410	18.5	Loss of riparian habitat Other recreational pollution sources Rangeland grazing Streambank modification/ destabilization	2005	Benthic-macroinvertebrate bioassessments (streams)	HQCWF	No

Sources: NMED, 2002, 2004b, 2004c, 2006c

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Rio Pueblo de Taos (Arroyo del Alamo to Rio Grande del Rancho) Monitored Partially supported NM-2119_30	1.2	Crop production (crop land or dry land) Highway/road/bridge runoff (non-construction related) Highways, roads, bridges, infrastructure (new construction) Rangeland grazing	2004 [b] 2004 [b]	Sedimentation/siltation Temperature, water	CWF	No
Rio Pueblo de Taos (Rio Grande del Rancho to Taos Pueblo bnd) Monitored Partially supported NM-2120.A_511	2.8	Habitat modification other than hydromodification Loss of riparian habitat Rangeland grazing Source unknown	2004 2004 [b]	Specific conductance Temperature, water	HQCWF	No
Rio Pueblo de Taos (Rio Grande to Arroyo del Alamo) Monitored Partially supported NM-2119_20	6.4	Flow alterations from water diversions Habitat modification other than hydromodification Other recreational pollution sources Rangeland grazing	2004 [b]	Temperature, water	CWF	No
Rio Quemado (Rio Arriba bnd to headwaters) Not monitored Not assessed NM-2120.A_120	11.1					
Rio Santa Barbara (East Fork) Monitored Not assessed NM-2120.A_424	5.5					

Sources: NMED, 2002, 2004b, 2004c, 2006c

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Rio Santa Barbara (Picuris Pueblo bnd to USFS bnd) Monitored Partially supported NM-2120.A_419	7.39	Loss of Riparian Habitat Rangeland Grazing Site Clearance (Land Development or Redevelopment) Source Unknown Streambank Modifications/ Destabilization	2004 2004 [c]	Benthic-Macroinvertebrate Bioassessments (Streams) Turbidity	HQCWF	No
Rio Santa Barbara (USFS bnd to confluence of E and W forks) Monitored Fully supported NM-2120.A_420	4.0					
Rio Santa Barbara (West Fork) Monitored Not assessed NM-2120.A_422	5.58					
Rito de la Olla (Rio Grande del Rancho to headwaters) Monitored Fully supported NM-2120.A_503	13.59					
Romero Lake Monitored Not assessed NM-2120.B_05	2.0					

Sources: NMED, 2002, 2004b, 2004c, 2006c

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San Cristobal Creek (Rio Grande to headwaters) Monitored Fully supported NM-2120.A_680	9.64					
San Leonardo Lake Monitored Not assessed NM-2120.B_14	3.49					
Sanchez Canyon (Costilla Creek to headwaters) Monitored Fully assessed NM-2120.A_822	5.98					
Serpent Lake Monitored Not assessed NM-2120.B_95	3.0					
South Fork Lake Monitored Not assessed NM-2120.B_58	2.0					

Sources: NMED, 2002, 2004b, 2004c, 2006c

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Trampas Creek (Rio Embudo to headwaters) Monitored Fully supported NM-2120.A_401	16.8					
Trampas Lake (East) Monitored Not assessed NM-2120.B_86	6.0					
Trampas Lake (West) Monitored Not assessed NM-2120.B_85	4.0					
Ute Creek (Costilla Creek to headwaters) Monitored Fully supported NM-2120.A_821	7.01					
Williams Lake Monitored Fully supported NM-2120.B_75	7.88					
HUC 13020102, Rio Chama						
None of the Rio Chama listed reaches are inside the Taos Region						

Sources: NMED, 2002, 2004b, 2004c, 2006c

[a] CWF = Cold water fishery
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