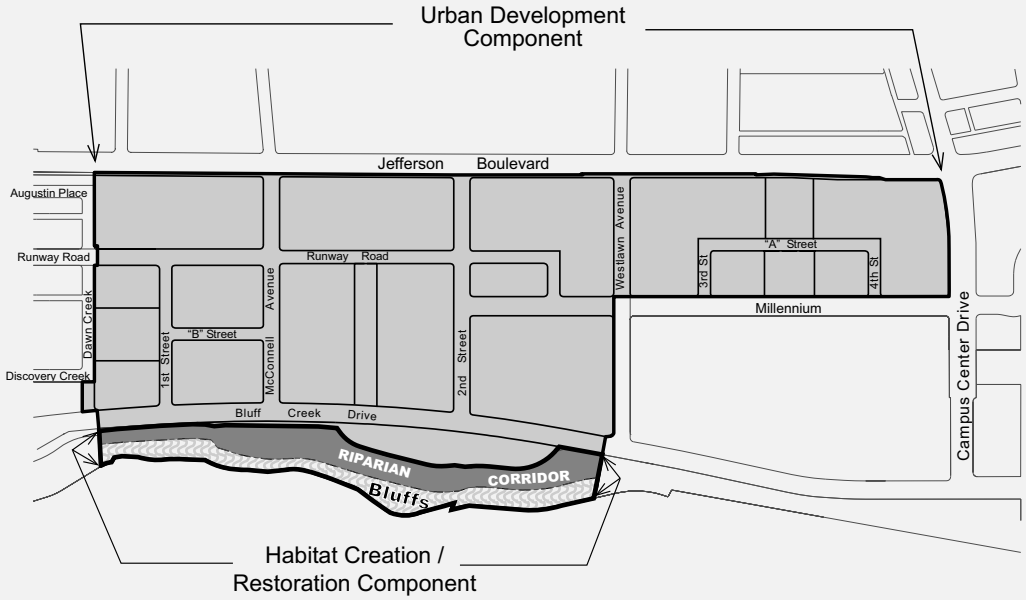
Draft Environmental Impact Report (DEIR)
Village at Playa Vista



Volume VI
Technical Appendix D

D. Earth (Cont.)

City of Los Angeles/EIR No. ENV-2002-6129-EIR

2003

State Clearinghouse No. 2002111065

DRAFT

ENVIRONMENTAL IMPACT REPORT (EIR)

VILLAGE AT PLAYA VISTA

TECHNICAL APPENDICES

VOLUME VI

APPENDIX D:

EARTH TECHNICAL APPENDIX

(CONTINUED)

City of Los Angeles
EIR No. ENV-2002-6129-EIR

State Clearinghouse
No. 2002111065

2003

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APPENDIX D-7:
GROUP DELTA CONSULTANTS, INC., LETTER TO PLAYA CAPITAL LLC RE: "SUBSIDENCE EVALUATION REVIEW," JULY 12, 2000

GROUP DELTA CONSULTANTS

Certified MBE

Geotechnical Engineering
Geology
Hydrogeology
Coastal Engineering
Hydrology
Hydraulics
Environmental Engineering

July 12, 2000

Playa Capital LLC
12555 W. Jefferson Blvd., Suite 300
Los Angeles, California 90066

JUL 14 2000

Attention: **Mr. David Nelson**

Subject: **Subsidence Evaluation Review**
Playa Vista Development
Playa Del Rey, California

Dear Mr. Nelson:

You have requested Group Delta Consultants, Inc. to review historical subsidence in the vicinity of the Playa Vista project, which occurred during the 1930s. In addition, you have requested Group Delta to evaluate the current levels of subsidence in the vicinity of the Playa Vista project. Based on our review of survey data maintained by the City of Los Angeles and new survey data obtained by Psomas and Associates, it appears that there were very minor changes in elevation in the vicinity of the Playa Vista project. Further, given the very low rate of movement (settlement or heave) that has occurred within recent time since 1974, we believe that the recommendations which previously have been incorporated in the foundation and structural systems for buildings at Playa Vista are sufficient to accommodate the very low levels of regional movements. We do not recommend any additional requirements for construction of structures within the Playa Vista project.

Bulletin of the Seismological Society of America (Pre-1939)

We have reviewed the Bulletin of the Seismological Society of America (BSSA) Volume 29, Number 2, dated 1939, published as a professional paper titled, "Some Recent Changes of Elevation in the Los Angeles Basin of Southern California and Their Significance." The article discusses, in part, the Venice-Playa Del Rey Subsiding Area. The analysis is based on leveling lines performed along the sand spit between Forty-First Avenue and Fifty-Third Avenue (approximately from present Jib Street to Yawl Street) west of Lincoln Boulevard during the years from 1925 through 1937. A map showing the area is attached as Exhibit 1. This sand spit was on the average 600 feet wide in aerial view and 15 feet in elevation above sea level. The initial leveling line was established as a United States Geodetic Survey precise-leveling line in 1925. The City of Los Angeles re-leveled the line with a precise-level survey in 1937. During the time from 1925 to 1937, the area along the sand spit settled at an average rate of 0.07 feet per year with a maximum of about 0.96 feet in the twelve-year period from 1925 to 1937. This maximum settlement occurred at the intersection of Forty-Second Avenue and

92 Argonaut, Suite 120 ▲ Aliso Viejo, California 92656-4121 ▲ (949) 609-1020 *voice* ▲ (949) 609-1030 *fax*
Torrance, California ▲ (310) 320-5100 San Diego, California ▲ (858) 573-1777
www.GroupDelta.com

Trolleyway in the Venice Beach area. Exhibit 1 shows the areas of subsidence referred to in the article. Since the leveling survey was initiated in 1925, there is no information regarding subsidence prior to 1925. However, the paper argues that these rates of subsidence did not occur for long periods of time before 1925.

The BSSA paper explores the causative factors related to the subsidence. The paper argues that if the subsidence is not related to diastrophic movement, it seems probable the sinking is due to either lowering of groundwater or to the extraction of oil, water, and gas from the Playa del Rey oil field.

The paper reports that artesian wells in the area declined sometime within the years of 1904 and 1932. This suggests that subsidence may have been the result of sediment compaction due to ground water withdrawal. The BSSA paper further suggests that the depletion of the artesian water with the accompanying compaction of the acquifers might well account for some subsidence in the marshy areas east of the sand spit, it is unlikely to be the cause of subsidence in the sand spit area.

The BSSA paper concludes that the most probable cause of subsidence of the Venice-Playa del Rey area is a local movement due to development of the oil field. Another article published in *Science in the University*, titled Subsidence and Elevation in the Los Angeles, 1944, summarizes the 1939 BSSA paper.

California Division of Oil and Gas Report (1925-1970)

The California Division of Oil and Gas (DOG) Sixtieth Annual Report 1974 evaluated the subsidence of the Playa Del Rey Oil and Gas Field from 1925 to 1970. The oil field consists of the Venice area and the Del Rey Hills area as shown in Exhibit 1. In the Venice area of the Playa Del Rey Oil Field, oil and gas production from 1925 through 1944 reduced the reservoir pressure from 1,900 psi to 100 psi. This period represented the period of maximum oil and gas production from the Playa Del Rey Oil and Gas Field. Based on a composite record of three bench marks, as shown in Exhibit 2, the DOG reports that during the period from 1925 to 1970, a maximum cumulative subsidence of 1.75 feet occurred in the aerial extent in the Venice area of the Playa Del Rey Oil and Gas Field.

The subsidence contours from the DOG report are shown in Exhibit 3 and represent the subsidence between 1937 and1970. As discussed in the BSSA paper a subsidence of up to 0.96 ft occurred in the Venice area between 1925 and 1937. The total cumulative subsidence number is generally consistent with the contours shown in Exhibit 3 (1937-1970) and the subsidence reported in the BSSA report for the period 1925-1937.

Between 1964 and 1970, DOG reported a rate of subsidence of 0.34-inch per year in the Venice area of the Playa Del Rey Oil Field. DOG also reported minor

subsidence along the Ballona Creek at a rate of 0.25-inch per year from 1935 through 1970. The DOG concluded in its report that the subsidence along the Ballona Creek area was attributable to ground water withdrawal. The subsidence in the Venice area was attributed to oil field fluids production and regional groundwater extractions. The graph of production from the oil field and subsidence since 1920s indicates that as the production leveled off in 1960-1970, the subsidence rate became low (Exhibit 2). The paper concludes that at the present time (1974), because of the extremely low rate of subsidence, subsidence is not a problem in the Playa Del Rey area.

Comparison with Wilmington - Long Beach Area

Long Beach - Wilmington area has undergone significant subsidence related to large-scale oil production from the Wilmington field. Subsidence was first noted in 1941 at the Long Beach Naval shipyard during construction of Dry Dock No. 1 when surveyors found that they could not check elevations of established benchmarks. During the 1950's and early 1960's the shipyard was threatened with inundation by the sea due to subsidence. A bowl shaped depression of the ground developed and was centered at the east end of Terminal Island just north of Dry Dock No. 1. Maximum subsidence at the center of the bowl exceeded 29 ft by 1970. In order to arrest the subsidence, pilot water flooding was begun in 1953 and full-scale re-pressurization was underway by 1960. Survey data by Long Beach Division of Oil Properties indicate that rates of subsidence were greatly reduced and direction of movement was reversed in many cases.

The Long Beach Division of Oil Properties maintains a water injection program to maintain the surface as close as possible to its present elevation. The amount of injection is based on the volume of oil/gas removed during normal production. When subsidence, or rebound, exceeds 0.05 feet, the injection program is modified to minimize movement.

Recent Measurements

Group Delta has conducted a review of leveling (survey) records in the Playa Del Rey area. These records were obtained from the Department of Public Works of the City of Los Angeles. The Department of Public Works provides leveling records (survey data) for many areas of the City including the Playa Del Rey area. Attached as Exhibit 4 is a table of survey records for the Playa Del Rey area. The locations of the bench marks are plotted in Exhibit 5. These records demonstrate that the subsidence in the area between the period from 1955 to 1970 ranged between 0.2 feet and 0.32 feet. This data is consistent with the DOG (1974) data, Exhibit 2, which indicates a movement of about 0.3 feet occurred between 1955 and 1970. From about 1970 to 1985 survey records of the City (Exhibit 6) showed minor amounts of heave and settlement in the project area.

To verify the current elevations, the benchmarks that the City of Los Angeles has maintained were re-leveled. Psomas and Associates, a registered survey firm, was retained to resurvey all 1985 benchmarks. Four of the bench marks have been destroyed. However, on June 19, 2000, Psomas was able to locate and resurvey six bench marks in the area for which data are available from 1980 to 1985. These data are plotted in Exhibits 6-11. In all cases, from 1980 to 2000, the elevations increased slightly, with the maximum increase of 1.61 inch (0.137 ft) and a range of 0.19 in. to 1.61 inches.

Conclusion

Based on our review of the historical and recent survey data, it is our opinion that historical subsidence in the Playa del Rey oil field and the project area resulted primarily from oil field and groundwater withdrawal activities. The magnitude of the subsidence in the Playa del Rey Oil field is much smaller than that measured for the Long Beach – Wilmington area (1.75 ft vs 29 ft). There is no data to suggest that regional subsidence of the magnitude reported before 1970 has caused any significant distress to structures. Limited data on comparison of City of Los Angeles bench marks in the area indicates that since 1970s the subsidence has been arrested and some heave may have occurred. There is no data to suggest that subsidence has occurred in the vicinity of the Playa Vista project since 1980. Based on the minor changes in elevation (subsidence or heave) that might be occurring, we believe that the current recommendations for foundation systems and structural systems are appropriate and we do not recommend any changes to these recommendations.

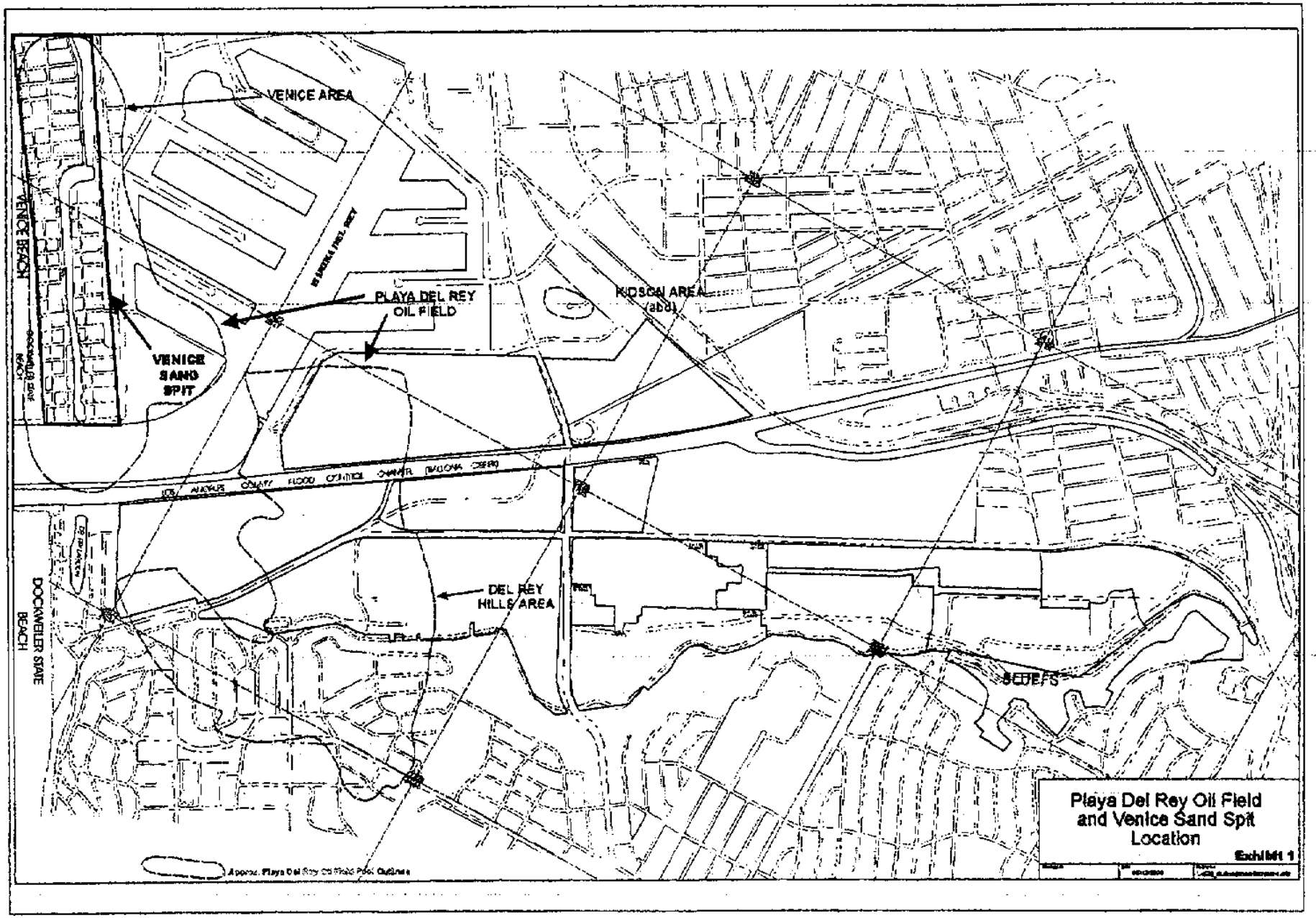
The following exhibits are attached and complete this summary report.

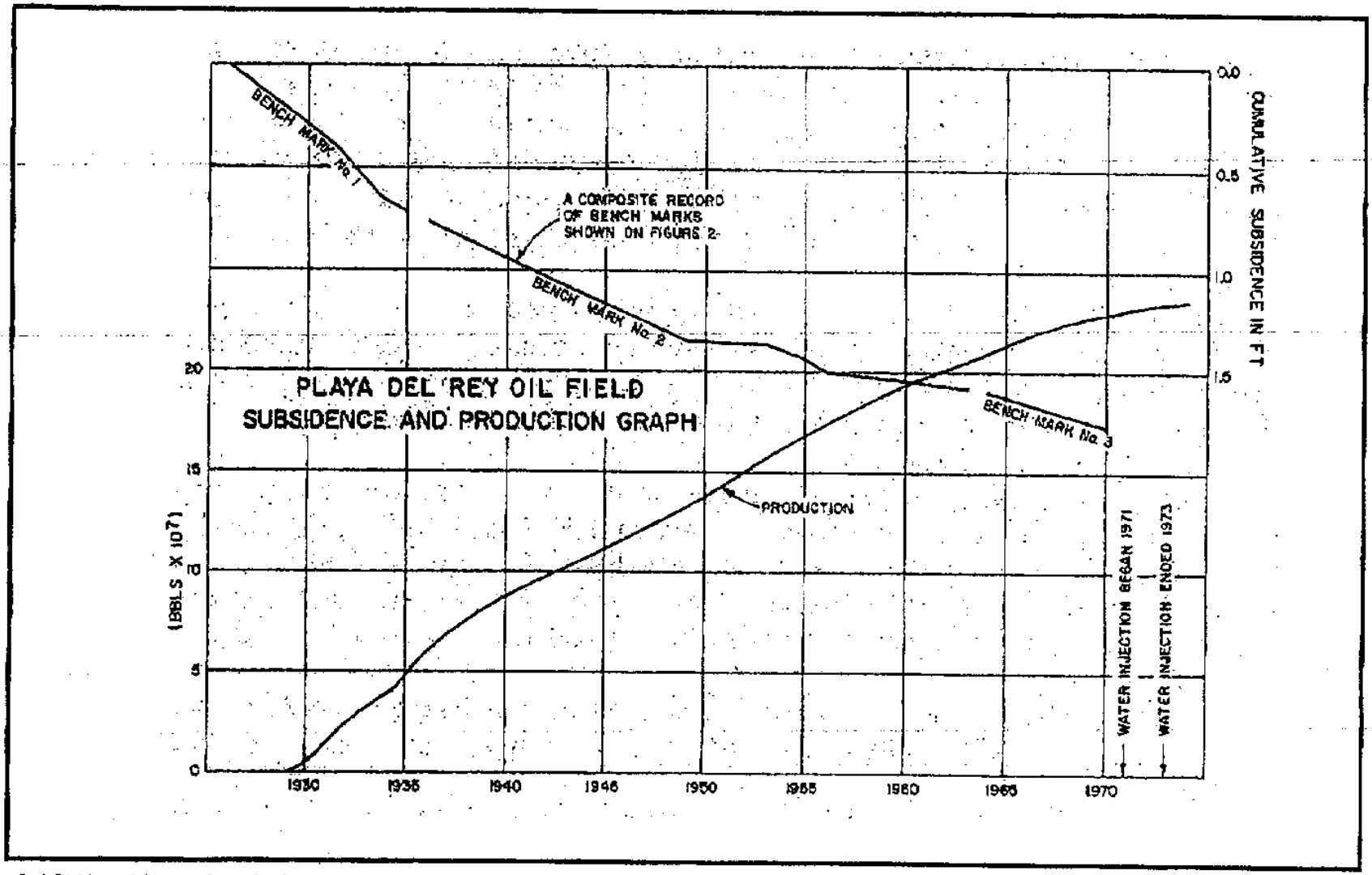
Exhibit 1	Sand Spit Location
Exhibit 2	Playa del Rey Oil Field Subsidence and Production Graph
Exhibit 3	Subsidence between 1937 and 1974
Exhibit 4	City of Los Angeles Bench Mark Data
Exhibit 5	Location of City of Los Angeles Bench Marks
Exhibit 6	Settlement Data Between 1970 and 2000, Location C
Exhibit 7	Settlement Data Between 1970 and 2000, Location H
Exhibit 8	Settlement Data Between 1970 and 2000, Location I
Exhibit 9	Settlement Data Between 1970 and 2000, Location J
Exhibit 10	Settlement Data Between 1970 and 2000, Location Pso-1
Exhibit 11	Settlement Data Between 1970 and 2000, Location Pso-2

If you have any questions pertaining to the summary, please do not hesitate to contact Group Delta Consultants, Inc. at (310) 320-5100 or 949-609-1020.

Respectfully submitted,
GROUP DELTA CONSULTANTS, INC.

Kul Bhushan, Ph. D., G.E.
President


VENICE AREA
VENICE BEACH
PLAYA DEL REY OIL FIELD
KIDSCAN AREA (abd)
VENICE SAND SPIT
DEL REY HILLS AREA
DOCKWEILER STATE BEACH
JETTIES
Playa Del Rey Oil Field and Venice Sand Spit Location
Exhibit 1



Ref. Division of Oil and Gas 60th Annual Report, 1974

GDC Project No. L-232

Playa del Rey Oil Field Subsidence and Production Graph

Exhibit 2

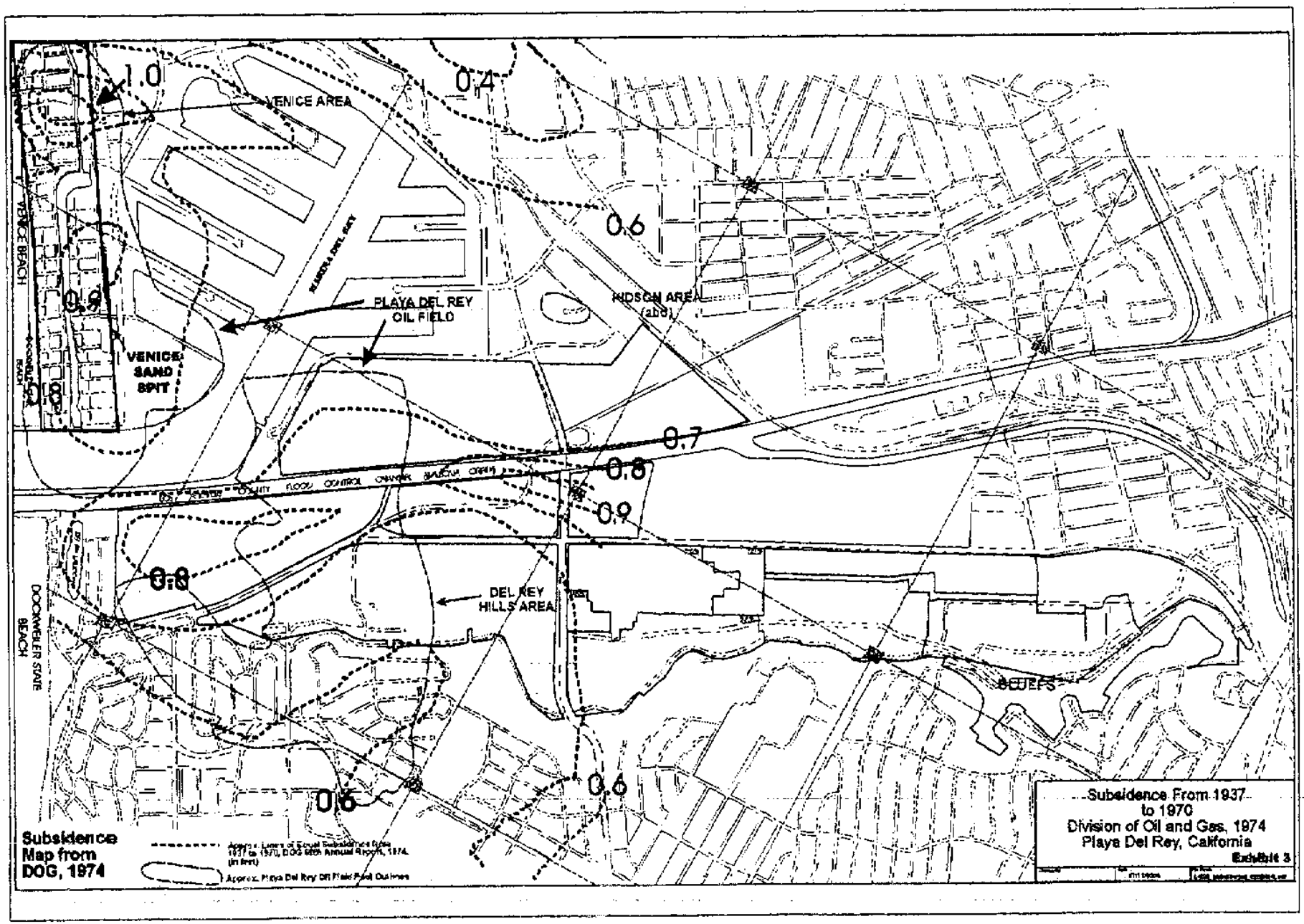

1.0
0.4
VENICE AREA
0.6
0.9
PLAYA DEL REY
OIL FIELD
HIDSON AREA
(abd)
VENICE
SAND
SPIT
0.8
0.7
0.8
0.9
0.8
DEL REY
HILLS AREA
DOCKWEILER STATE
BEACH
BLUFFS
0.6
0.6
Subsidence
Map from
DOG, 1974
Subsidence From 1937
to 1970
Division of Oil and Gas, 1974
Playa Del Rey, California
Exhibit 3

Exhibit 4

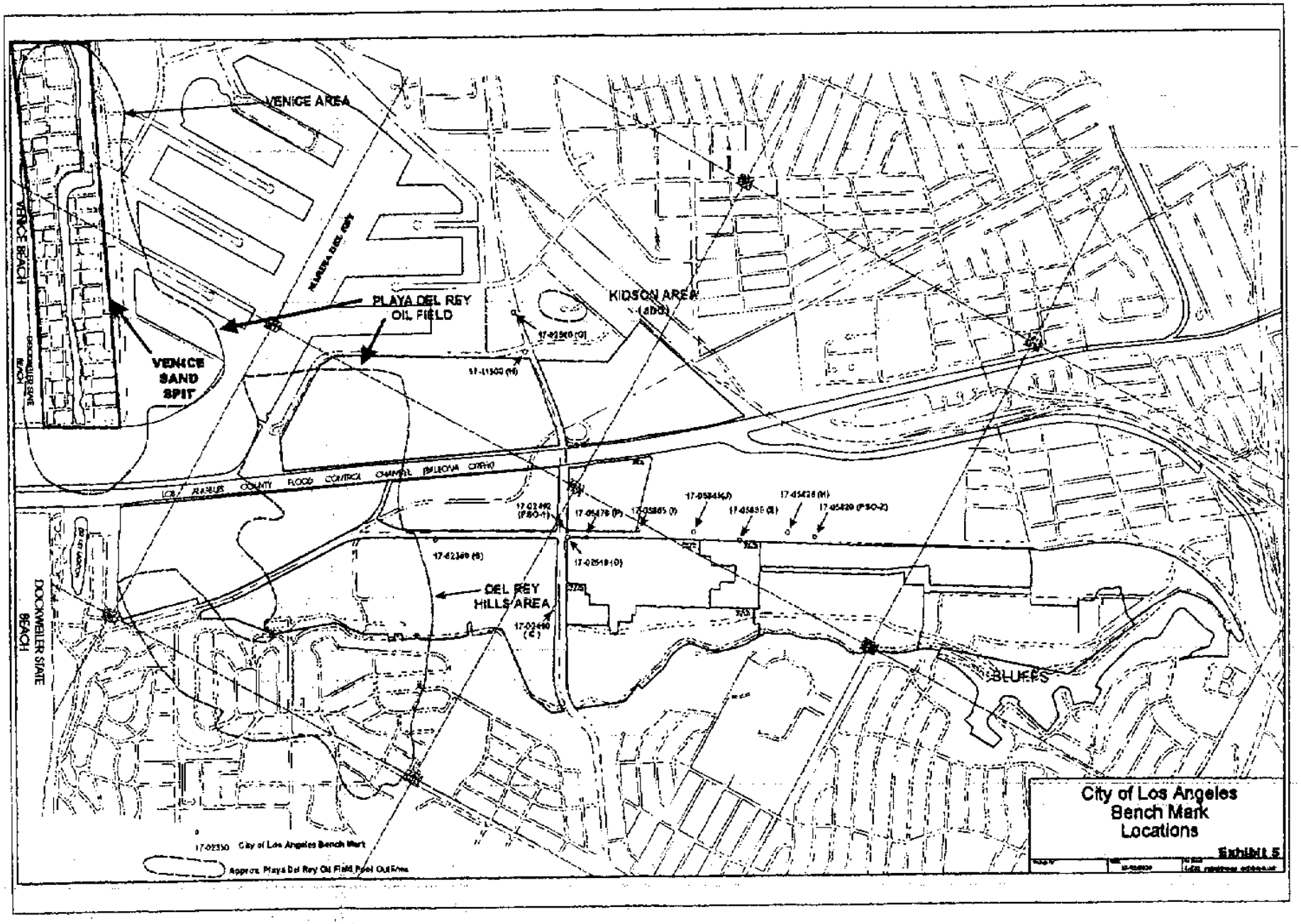
Playa Vista
Group Delta - Bench Mark Data

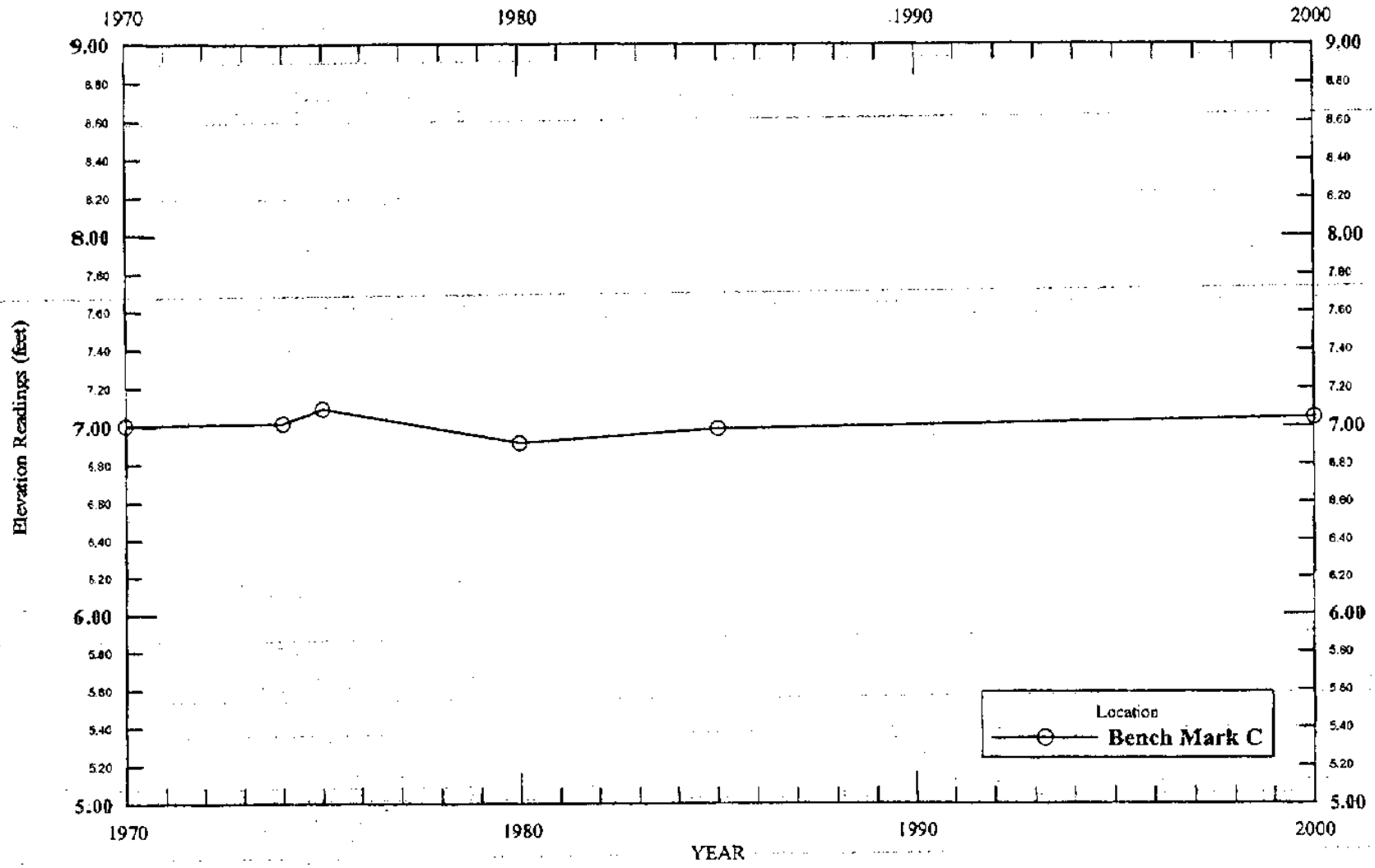
BM Letter	City of LA BM No	Status	Current Adj	Psomas Elevation	Diff Pso-1985	1985 Adj - feet	1980 Adj - feet	1975 Adj - feet	1974s Adj - feet	1974p Adj - feet	1970 Adj - feet	1958 Adj - feet	1958p Adj - feet	1963 Adj - feet	1960 Adj - feet	1956 Adj - feet	1955 Adj - feet	1953 Adj - feet
A	17-02810		1974	Not Shot						14.639	14.650		14.691	14.784	14.826			
B	17-02350	Gone 1972									4.577		4.616	4.721	4.772	4.825		
C	17-02490		1985	7.046	0.057	6.988	6.913	7.094		7.017	7.003							
D	17-02610	Gone 1968												6.752	6.814	6.864	6.921	6.964
E	17-05830	Gone 1972									9.160		9.217	9.393	9.467	9.508		
F	17-05870	Gone 1970									7.930		7.988	8.096	8.153	8.203		
G	17-02560		1975	Not Shot				6.570	6.457	6.486	6.506	6.545						
H	17-11600		1985	6.964	0.024	6.940	6.848	3.030	6.918	6.948								
I	17-05865		1985	12.764	0.018	12.746	12.694	12.883	12.783	12.823								
J	17-05845		1985	12.342	0.055	12.287	12.208	12.389	12.290	12.317								
K	17-05828		1985	Gone		13.963	13.957	14.154	14.072	14.096								
PSO-1	17-02492		1985	11.841	0.000	11.841	11.911	12.008	11.908	11.949								
PSO-2	17-05820		1985	12.424	0.039	12.385	12.310	12.506	12.423	12.463								

Note: 1) Psomas elevation was derived by holding the elevation of bench mark 17-02492, 1985 adjustment, Elev = 11.841 feet
2) Bench mark 17-05828 was shot in lieu of bench mark 17-05628, which is gone
3) Bench mark 17-02610, located at the Marina Freeway and Lincoln Boulevard, was not shot
4) Bench mark 17-02560, located at the centerline of Lincoln Boulevard, was not shot

PROFESSIONAL LAND SURVEYOR
JOHN CHAPPELL
No. 7200
Exp. 11-31-05
STATE OF CALIFORNIA

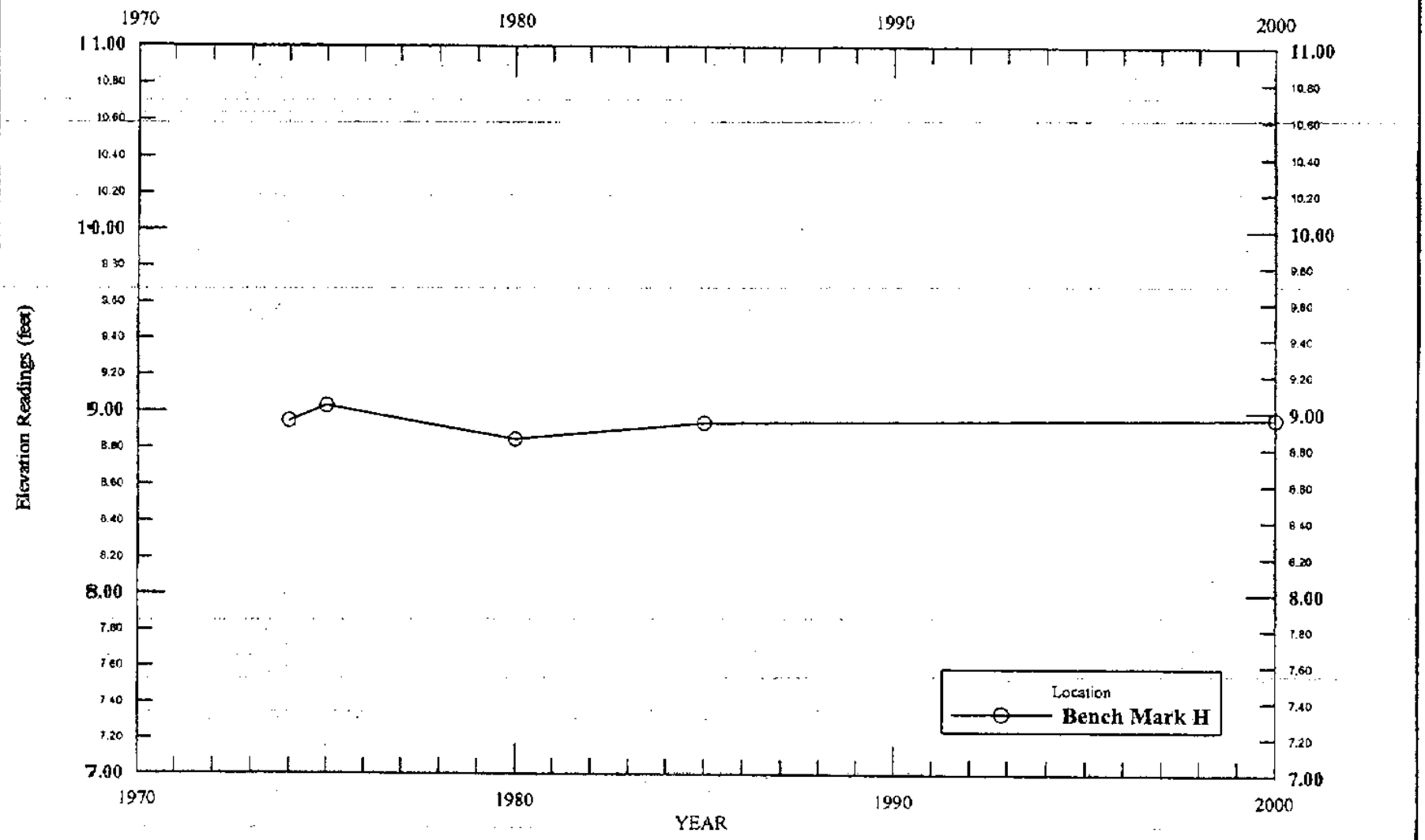
BM_LIST.xls
6/21/00


VENICE AREA
VENICE BEACH
MARINA DEL REY
PLAYA DEL REY OIL FIELD
KIDSON AREA
VENICE SAND SPIT
LOS ANGELES COUNTY FLOOD CONTROL CHANNEL (BALLONA CREEK)
DEL REY HILLS AREA
DOCKWEILER STATE BEACH
BLUFFS
City of Los Angeles Bench Mark
Approx. Playa Del Rey Oil Field Pool Outlines
City of Los Angeles Bench Mark Locations
Exhibit 5



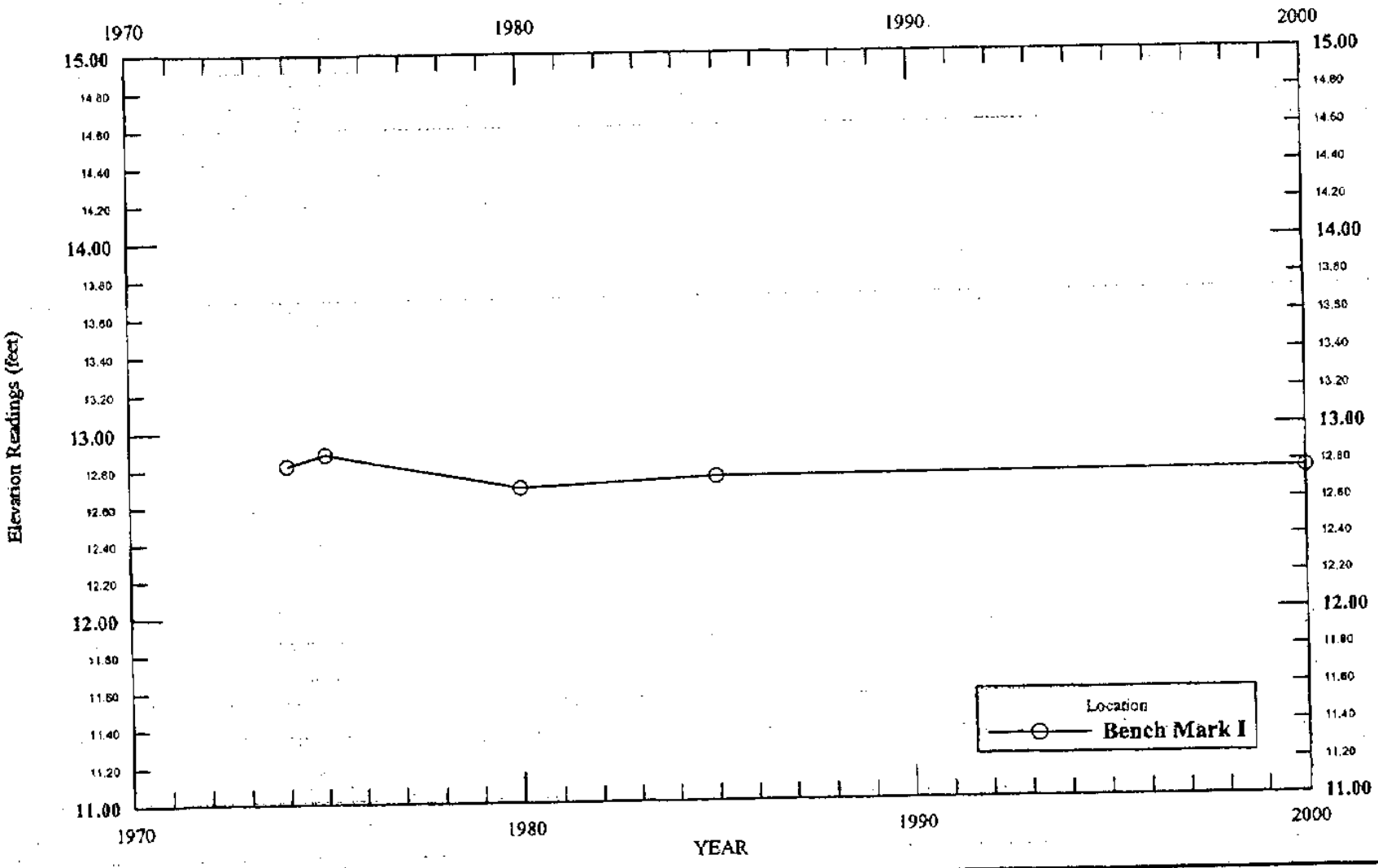
Group Delta Consultants, Inc.	**BENCH MARK DATA BETWEEN 1970 AND 2000 - Bench Mark C** **PLAYA VISTA TRACTS 49104-01, 49104-02, & 49104-03**	**Exhibit 6**

PLAYA-BMDATA-C.GRF



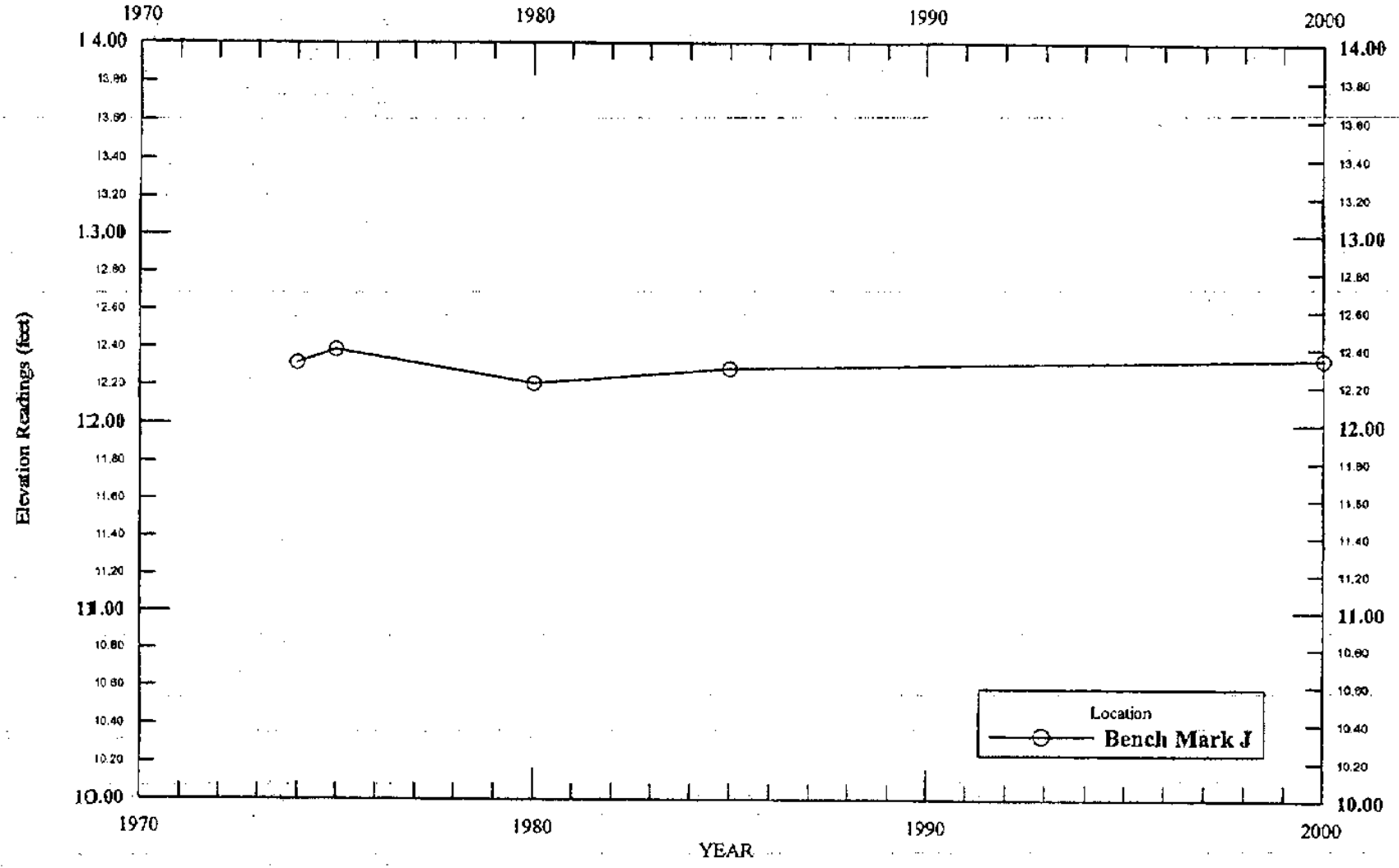
Group Delta Consultants, Inc.	**BENCH MARK DATA BETWEEN 1970 AND 2000 - Bench Mark H** **PLAYA VISTA TRACTS 49104-01, 49104-02, & 49104-03**	**Exhibit 7**

PLAYA-BMDATA-H.GRF



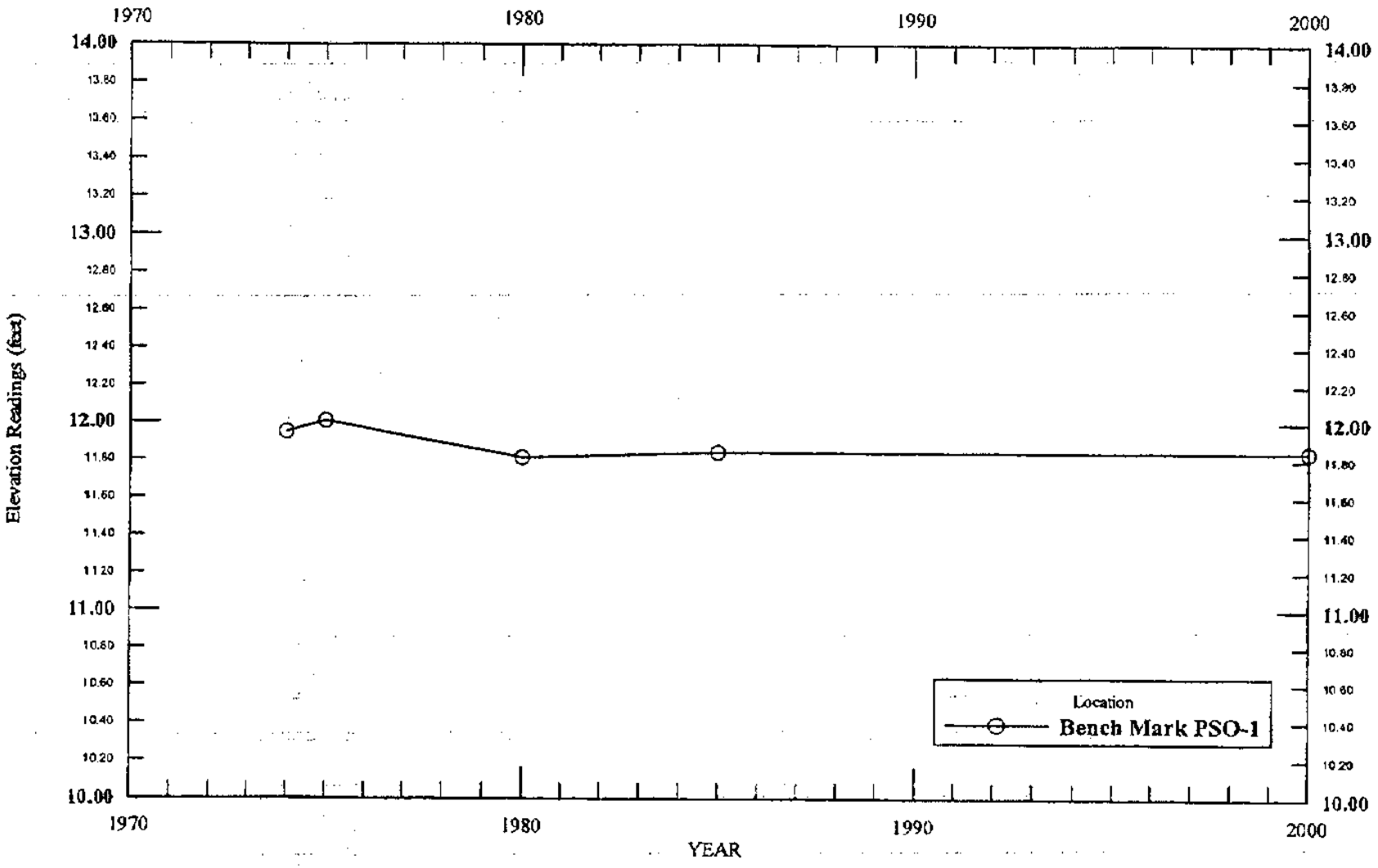
Group Delta Consultants, Inc.	**BENCH MARK DATA BETWEEN 1970 AND 2000 - Bench Mark I** **PLAYA VISTA TRACTS 49104-01, 49104-02, & 49104-03**	**Exhibit 8**

PLAYA-BMDATA-LGRP



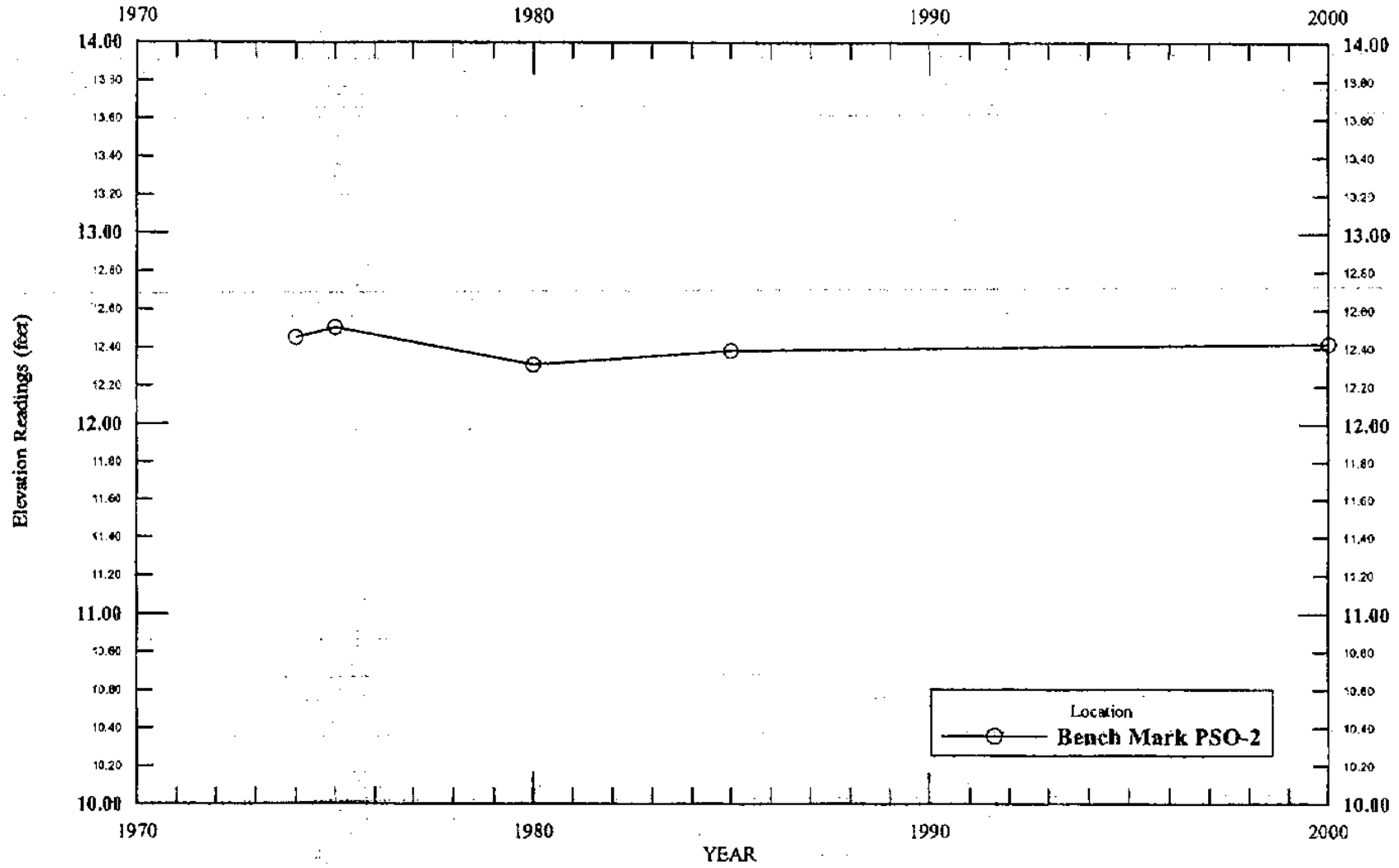
Group Delta Consultants, Inc.	**BENCH MARK DATA BETWEEN 1970 AND 2000 - Bench Mark J** **PLAYA VISTA TRACTS 49104-01, 49104-02, & 49104-03**	**Exhibit 9**

PLAYA-BMDATA-2.GRF



Group Delta Consultants, Inc.	**BENCH MARK DATA BETWEEN 1970 AND 2000 - Bench Mark PSO-1** **PLAYA VISTA TRACTS 49104-01, 49104-02, & 49104-03**	**Exhibit 10**

PLAYA-BMDATA-PSO1.GRF



Group Delta Consultants, Inc.	**BENCH MARK DATA BETWEEN 1970 AND 2000 - Bench Mark PSO-2** **PLAYA VISTA TRACTS 49104-01, 49104-02, & 49104-03**	**Exhibit 11**

PLAYA-BMDATA-PSO2.GRF