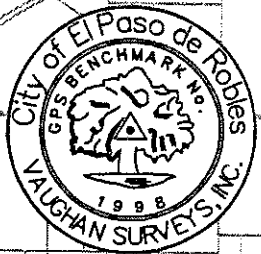
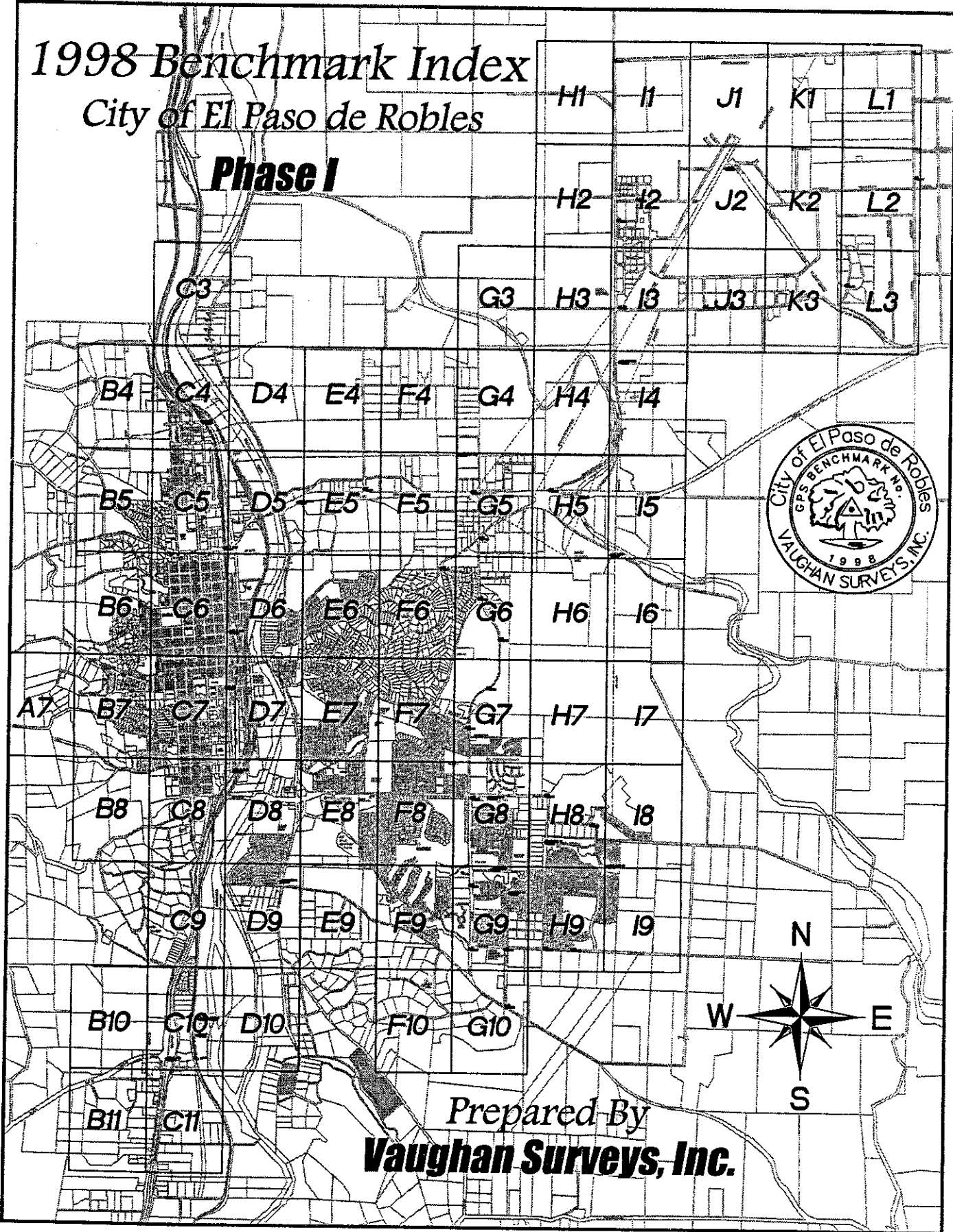


1998 Benchmark Index

City of El Paso de Robles

Phase I



Prepared By
Vaughan Surveys, Inc.

Introduction

In late spring / early summer of 1998 the City of El Paso de Robles hired Vaughan Surveys, Inc. as a consultant to assist in providing the City a new Vertical Control Network or Master Benchmark Plan. It was determined that at the present time a precise differential level network would not be cost effective for the City, however, it may be desired at some future stage. In lieu of a precise level network, it was proposed that GPS measurements be made to approximately 14 existing City Wells and approximately 30 new or existing benchmarks around the easterly portion of the City of El Paso de Robles. The GPS survey would tie to a minimum of five existing National Geodetic Survey (NGS) Benchmarks.

NGS Control

During reconnaissance it was determined that six first order NGS benchmarks along the U.S. Highway 101 – Union Pacific Railroad corridor would be suitable for either direct GPS measurement or eccentric measurements. Two second or third order Cal-Trans benchmarks along State Highway 46 were also found and incorporated into the network. In addition one second order NGS benchmark was used along Union Road east of Barney Schwartz Park.

Monumentation

Existing monumentation was used where practical, however, where sturdy concrete curbs or concrete structures existed, a new aluminum disk monument was drilled and placed as a new benchmark. The new benchmarks were stamped and numbered with the designations as shown in this report.

GPS Measurements

In August of 1998, GPS measurements were made to all points in the network and to all existing benchmarks to be tied to. All GPS measurements were tied to the California High Precision Geodetic Network (HPGN). All points were occupied at least twice for redundancy and were measured during times of acceptable satellite geometry (PDOP less than 4). Fast Static methods were used allowing occupation times of approximately eight minutes per point.

Adjustment

Upon completion of the GPS fieldwork all data was downloaded and GPS baseline vectors were processed. These vectors were then incorporated into a least squares adjustment software package and a one-point free adjustment was performed. By ties to the HPGN we were able to establish precise Geographic coordinates for all points in the survey which would allow for the calculation of estimated Geoid Heights using Geoid96. Geoid Heights were determined for all points in the network and the network was reprocessed to compare preliminary values with published values for the existing NGS and Cal-Trans benchmark control. All points used fit existing control for the free adjustment within 1 - 2 centimeters so it was determined that the existing NGS control would be suitable for fixing the network. After fixing the network NAVD88 benchmarks, the network was again reprocessed and values were determined as shown in the report. The network was processed using the metric values. NAVD88 U.S. Survey foot values were then calculated for all points in the network.

NGVD29 Values

NGS no longer adjusts or publishes NGVD29 elevations. In order to obtain NGVD29 values you must convert from NAVD88 using NGS software program known as VERTCON. This program was used to determine approximate NGVD29 elevations for all points in the network. NGVD29 values as shown should be used sparingly and at the user's own risk as there is no guarantee by NGS or the consultant that these values are correct.

Future Phases

The plan developed by Vaughan Surveys was to establish benchmarks in phases, eventually covering the entire City limits. Additional Phases should and must tie to Phase 1 for checks and possible readjustments as necessary. This network should suffice for the majority of Engineering and Surveying related projects anticipated by the City for many years to come.



Benchmark Index Listing

El Paso de Robles Phase I Benchmarks

Prepared by Vaughan Surveys, Inc.

Map Grid	Latitude	Longitude	Benchmark ID	Elevation (Feet)
	35-34-29N	120-43-51W	BM Y707	929.79
C10	35-35-23N	120-41-46W	BM M 1450	757.01
C10	35-35-30N	120-41-32W	TBIRD17	736.12
C10	35-35-36N	120-41-26W	TBIRD10	721.95
C10	35-35-36N	120-41-31W	TBIRD13	730.45
C4	35-39-06N	120-41-32W	BM 692	694.35
C5/D5	35-38-24N	120-41-21W	BM T 1095	720.94
C7/D7	35-37-33N	120-41-19W	BM L24	731.55
D5	35-38-39N	120-40-48W	HPGN 05 ML	737.36
D6	35-37-51N	120-41-21W	BM B 1451	713.68
D8	35-37-06N	120-41-17W	BM M 1095	731.37
D9	35-36-26N	120-40-53W	BORCHERDT 5	747.68
E5	35-38-43N	120-40-20W	12	781.56
F6	35-38-14N	120-39-46W	17	830.8
G10	35-35-44N	120-39-16W	28	847.79
G5	35-38-25N	120-39-28W	16	837.06
G5	35-38-41N	120-39-32W	13	804.56
G5	35-38-54N	120-39-38W	11 BUTTERFIELD	798.73
G6	35-37-48N	120-39-20W	19	907.76
G6	35-38-03N	120-39-29W	18	848.86
G7	35-37-20N	120-39-34W	21	827.55
G7	35-37-33N	120-39-26W	20	858.33
G8	35-36-56N	120-39-25W	SHERWOOD 6	814.67
G8	35-36-56N	120-39-32W	30	811.76
G8/G9	35-36-31N	120-39-24W	SHERWOOD 9	806.38
G9	35-36-03N	120-39-33W	29	817.47
G9	35-36-04N	120-39-16W	27	832.82
G9	35-36-23N	120-39-16W	OSBORNE 14	810.95

Map Grid	Latitude	Longitude	Benchmark ID	Elevation (Feet)
G9	35-36-25N	120-39-33W	26	802.36
H5	35-38-41N	120-38-58W	14	778.28
H8	35-36-41N	120-39-01W	SHERWOOD 11	817.62
H8	35-36-47N	120-38-43W	23	834.93
H8	35-36-57N	120-39-01W	22	828.03
H9	35-36-04N	120-38-48W	24	849.82
H9	35-36-04N	120-39-00W	25	826.38
I1	35-41-18N	120-38-27W	1	776.03
I2	35-40-19N	120-38-26W	8	800.31
I2	35-40-26N	120-38-19W	7	801.23
I3	35-39-47N	120-38-26W	9 FOX	810.66
I4	35-39-28N	120-38-25W	10 DRYCREEK	754.73
I5	35-38-22N	120-38-33W	15 BARNEY	757.47
I8	35-36-31N	120-38-33W	ROYAL OAKS 20	837.53
J2	35-40-38N	120-37-40W	APB2	809.17
J3	35-39-47N	120-37-39W	5	826.31
J3	35-39-47N	120-37-49W	6	821.24
L1	35-41-20N	120-36-20W	2	825.29
L2	35-40-35N	120-36-20W	3	821.95
L3	35-39-56N	120-36-48W	4	843.27