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SURVEYOR'S REPORT

Specific Purpose Survey of the United States Geological Survey Well **PB 1639** in Palm Beach County, Florida

Prepared for:

South Florida Water Management District

3301 Gun Club Road West Palm Beach, Florida 33406

Prepared by: **Peter Andersen, PSM, Vice President** Florida Professional Surveyor and Mapper License Number 5199 State of Florida

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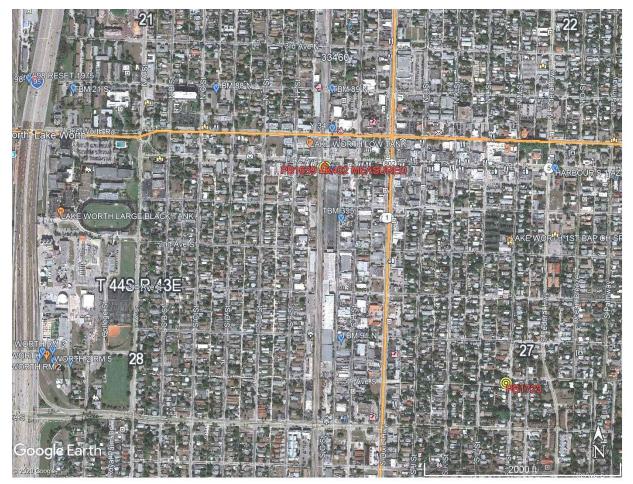
PURPOSE



The Purpose of this survey is to set an Elevation Referenced Mark (Benchmark) using the guidelines for a National Geodetic Survey (NGS), Class "C" concrete monument and to establish a North American Vertical Datum of 1988 (NAVD 88) on said Benchmark and on an additional Reference Point with a Brass Plate, both at United States Geological Survey Well **"PB 1639"**.

LOCATION OF PROJECT

The United States Geological Survey Well **"PB 1639"** is located in the Section 28, Township 44 South, Range 43 East, Palm Beach County, Florida.



General Location (Not to Scale)



PROJECT VERTICAL DATUM

The project vertical datum is the North American Vertical Datum (NAVD) of 1988.

To convert the NAVD 88 elevation to the National Geodetic Vertical Datum (NGVD) of 1929 at **Station PB 1639 add 1.535.** These values are based on Corpscon 6.0.1, a U.S. Army Corps of Engineers, Engineering Research and Development Center Windows based program to convert coordinates and elevations between datums using the updated vertcon05.txt and the vertcone.05 files supplied by the U.S Army Corps of Engineers. South Atlantic Division, Jacksonville, Florida.

PROJECT HORIZONTAL DATUM

The project horizontal datum is the State Plane Coordinate System, Florida East Zone, North American Datum 83, adjustment of 2011.

LEVELING METHODS

The leveling for this project was performed in accordance with standard survey practice using conventional third order methods, techniques and equipment.

The allowable error on this project meets or exceeds closures as required by SFWMD (.02 √ miles) per executed SOW for 4600003703 WO07. National Geodetic Survey (NGS) monument "K 402" (NGSPID AD8035) is located approximately 25 feet from USDA Well PB 1639 and will be used for site benchmark.

GPS METHODS

Latitude and longitude for the New Benchmark "K 402" were established by observing a 4.5 hour Static Sessions on March 25, 2020 using a Trimble 5700 dual frequency receiver S/N 0220381397. The data from these sessions was sent to the NGS "OPUS" site for post processing on May 3, 2020 and the reports were received from the "OPUS" site the same day.



Surveyors' Notes:

1. All measurements herein are in United States Survey feet and decimal thereof, unless otherwise specified.

2. Underground utilities were not located as part of this survey.

3. This survey report or copies thereof are not valid without the original signature and seal of a Florida licensed Surveyor and Mapper.

4. Additions or deletions to this survey report by other than the signing party (or parties) is prohibited without written consent of the signing party (or parties).

5. To convert from NAVD 88 to NGVD 29 add 1.519 feet. This value is based on Corpscon 6.0.1 a U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville Fl.

6. Date of last field work: March 25, 2020, GCY job No. 18-1020-07.

7. SFWMD Data records (on file at the District's headquarters):

A. Electronic Data files:

Miscellaneous picture files

Digital level run

File names: XXXXXX.DAT

B. Conventional reporting

Field Book: 1863 pages 24-26

SURVEYOR'S CERTIFICATION

In my professional opinion this Specific Purpose Survey meets applicable portions of the Standards of Practice set forth by the Florida Board of Professional Surveyors and Mappers in Chapter 5J-17, Florida Administrative Code. This report is prepared for the sole and specific use of the South Florida Water Management District and is not assignable.

March 25, 2020

Last date of Survey



Peter Andersen, PSM, Vice President Florida Professional Surveyor and Mapper License Number 5199 State of Florida GCY, Inc. LB No 4108

NOTE:

This is an electronically signed and sealed document pursuant to Chapter 5J-17.062, Florida Administrative Code. The printed survey map or report or copies thereof are not valid without the original signature and seal of a Florida licensed surveyor or mapper.





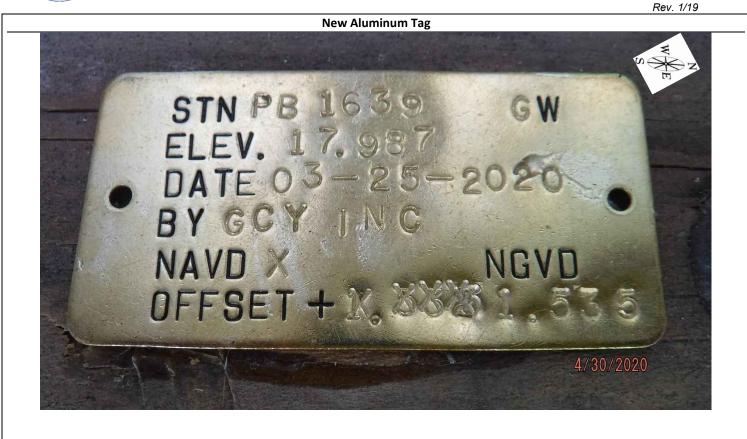
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Not to scale (GoogleEarth product)











Rev. 1/19

USGS RMs - NONE







Rev. 1/19

Source Benchmarks

NO PHOTOS AVAILABLE



Rev. 1/19

"K 402" Benchmark Datasheet (1 OF 3) 5/3/2020 DATASHEETS The NGS Data Sheet See file dsdata.pdf for more information about the datasheet. PROGRAM = datasheet95, VERSION = 8.12.5.7 Starting Datasheet Retrieval... Datasneer net associational Geodetic Survey, Retrieval Date = rmr -1 Retrieval Date = MAY 3, 2020 *********** AD8035 DESIGNATION - K 402 - AD8035 AD8035 PID STATE/COUNTY- FL/PALM BEACH AD8035 AD8035 COUNTRY - US - LAKE WORTH (2018) AD8035 USGS QUAD AD8035 AD8035 *CURRENT SURVEY CONTROL AD8035 AD8035* NAD 83(1986) POSITION- 26 36 56. (N) 080 03 33. SCALED (W) AD8035* NAVD 88 ORTHO HEIGHT -4.780 (meters) 15.68 (feet) ADJUSTED AD8035 GEOID HEIGHT GEOID18 AD8035 -26.283 (meters) AD8035 DYNAMIC HEIGHT -4.773 (meters) 15.66 (feet) COMP AD8035 MODELED GRAVITY -979,112.3 NAVD 88 (mgal) AD8035 AD8035 VERT ORDER - FIRST CLASS II AD8035 AD8035. The horizontal coordinates were scaled from a map and have AD8035.an estimated accuracy of +/- 6 seconds. AD8035. AD8035. The orthometric height was determined by differential leveling and AD8035.adjusted by the NATIONAL GEODETIC SURVEY AD8035.in June 2002. AD8035 AD8035.Significant digits in the geoid height do not necessarily reflect accuracy. AD8035.GEOID18 height accuracy estimate available here. AD8035 AD8035.Click photographs - Photos may exist for this station. AD8035 AD8035.The dynamic height is computed by dividing the NAVD 88 AD8035.geopotential number by the normal gravity value computed on the AD8035.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45 AD8035.degrees latitude (g = 980.6199 gals.). AD8035 AD8035. The modeled gravity was interpolated from observed gravity values. AD8035 AD8035: North East Units Estimated Accuracy MT (+/- 180 meters Scaled) AD8035;SPC FL E 253,160. 293,700. AD8035 AD8035_U.S. NATIONAL GRID SPATIAL ADDRESS: 17RNK936442(NAD 83) AD8035 AD8035 SUPERSEDED SURVEY CONTROL AD8035 AD8035 NAVD 88 (05/20/94) 4.785 15.70 (f) SUPERSEDED 1 2 (m) AD8035 NGVD 29 (09/01/92) 5.248 (m) 17.22 (f) ADJUSTED 1 2 AD8035 AD8035.Superseded values are not recommended for survey control. AD8035 AD8035.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums. AD8035.See file dsdata.pdf to determine how the superseded data were derived. AD8035 AD8035 MARKER: F = FLANGE-ENCASED ROD https://www.ngs.noaa.gov/cgi-bin/ds_mark.prl?PidBox=AD8035 1/3



"K 402" Benchmark Datasheet (2 OF 3) 5/3/2020 DATASHEETS AD8035_SETTING: 49 = STAINLESS STEEL ROD W/O SLEEVE (10 FT.+) AD8035 STAMPING: K 402 1991 AD8035_MARK LOGO: NGS AD8035_PROJECTION: FLUSH AD8035 MAGNETIC: M = MARKER EQUIPPED WITH BAR MAGNET AD8035_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL AD8035_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR AD8035+SATELLITE: SATELLITE OBSERVATIONS - April 21, 2006 AD8035_ROD/PIPE-DEPTH: 13.2 meters AD8035 AD8035 HISTORY Condition - Date Report By AD8035 HISTORY - 1991 MONUMENTED NGS - 20001206 GOOD USPSQD AD8035 HISTORY - 20011221 GOOD USPSOD AD8035 HISTORY AD8035 HISTORY - 20020222 GOOD FLDEP - 20040127 GOOD USPSQD AD8035 HISTORY - 20041117 GOOD AD8035 HISTORY FIDEP AD8035 HISTORY - 20050127 GOOD USPSQD AD8035 HISTORY - 20060421 GOOD USPSQD AD8035 AD8035 STATION DESCRIPTION AD8035 AD8035'DESCRIBED BY NATIONAL GEODETIC SURVEY 1991 AD8035'IN LAKE WORTH, AT THE INTERSECTION OF THE FLORIDA EAST COAST RAILROAD AD8035'AND LAKE AVENUE, 20.5 M (67.3 FT) SOUTH OF AND LEVEL WITH THE AVENUE AD8035'CENTER, 9.1 M (29.9 FT) EAST OF THE NEAR RAIL, 6.9 M (22.6 FT) WEST AD8035'OF THE CENTER OF RAILROAD AVENUE, AND 0.3 M (1.0 FT) SOUTH OF A AD8035'WITNESS POST. NOTE--ACCESS TO THE DATUM POINT IS THROUGH A 5-INCH AD8035'LOGO CAP. AD8035 AD8035 STATION RECOVERY (2000) AD8035 AD8035'RECOVERY NOTE BY US POWER SQUADRON 2000 (AAS) AD8035'RECOVERED IN GOOD CONDITION. AD8035 AD8035 STATION RECOVERY (2001) AD8035 AD8035'RECOVERY NOTE BY US POWER SQUADRON 2001 (AAS) AD8035'RECOVERED IN GOOD CONDITION. AD8035 AD8035 STATION RECOVERY (2002) AD8035 AD8035'RECOVERY NOTE BY FL DEPT OF ENV PRO 2002 (JLM) AD8035'RECOVERED AS DESCRIBED. AD8035 AD8035 STATION RECOVERY (2004) AD8035 AD8035'RECOVERY NOTE BY US POWER SQUADRON 2004 (AAS) AD8035'RECOVERED IN GOOD CONDITION. AD8035 AD8035 STATION RECOVERY (2004) AD8035 AD8035'RECOVERY NOTE BY FL DEPT OF ENV PRO 2004 (JLM) AD8035'RECOVERED IN GOOD CONDITION. AD8035 AD8035'NOTE A MAGNET WAS PLACED INSIDE OF THE NATIONAL GEODETIC SURVEY LOGO AD8035'CAP. AD8035 AD8035 STATION RECOVERY (2005) AD8035 AD8035'RECOVERY NOTE BY US POWER SQUADRON 2005 (AAS) AD8035'RECOVERED IN GOOD CONDITION. AD8035 AD8035 STATION RECOVERY (2006) AD8035 https://www.ngs.noaa.gov/cgi-bin/ds_mark.prl?PidBox=AD8035 23





Rev. 1/19 // K402" Benchmark Datasheet (3 OF 3) SXXXXX DATASHEETS AD80935'RECOVERY IN GOOD CONDITION. *** retrieval complete. Elapsed Time = 00:00:01



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Bate: Tresmole 5700 Us 1 5.26' STERT: 10:50 END: 15:20	
<u>μτ</u> : 5.25' <u>5πωπ</u> : 10:50 Euro' 15:20	-
ЦГ : 5.20° ВТЕКТ : 10:50 Емь: 15:20	
Бтелт: 10:50 Емо: 15:20	
END' 15:20	
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Aerial View of Overall Site	Other Source Benchmarks:							
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Site Sketch				PICTURES				

Page 1 of 1

FILE: 13970850.t01 OP1588525880467

NGS OPUS SOLUTION REPORT

All computed coordinate accuracies are listed as peak-to-peak values. For additional information: <u>https://www.ngs.noaa.gov/OPUS/about.jsp#accuracy</u>

USER: petea@gcyinc.com	DATE: May 03, 2020
RINEX FILE: 13970850.200	TIME: 17:15:15 UTC

 SOFTWARE: page5 1801.18 master96.pl 160321
 START: 2020/03/25 14:08:00

 EPHEMERIS: igs20983.eph [precise]
 STOP: 2020/03/25 18:42:00

 NAV FILE: brdc0850.20n
 OBS USED: 10845 / 11713 : 93%

 ANT NAME: TRM39105.00
 NONE
 # FIXED AMB: 60 / 65 : 92%

 ARP HEIGHT: 1.585
 OVERALL RMS: 0.017(m)

REF FRAME: NAD_83(2011)(EPOCH:2010.0000)

ITRF2014 (EPOCH:2020.2314)

X:	985023.827(m) 0.004(m)	985022.999(m) 0.004(m)
Y:	-5620402.970(m) 0.003(m)	-5620401.381(m) 0.003(m)
Z:	2840209.314(m) 0.010(m)	2840209.151(m) 0.010(m)

LAT: 263	6 56.79475	0.011(m)	26 36 56.81488	0.011(m)
E LON: 279	56 26.23204	0.004(m)	279 56 26.21249	0.004(m)
W LON: 80	3 33.76796	0.004(m)	80 3 33.78751	0.004(m)
EL HGT:	-21.548(m)	0.002(m)	-23.148(m)	0.002(m)
ORTHO HGT:	4.735(r	n) 0.050(m)	[NAVD88 (Compu	ted using GEOID18)]

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 17) SPC (0901 FL E) Northing (Y) [meters] 2944224.473 253178.875 Easting (X) [meters] 593641.407 293673.368 Convergence [degrees] 0.42143333 0.42143333 Point Scale 0.99970826 1.00004947 **Combined Factor** 0.99971164 1.00005286

US NATIONAL GRID DESIGNATOR: 17RNK9364144224(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDI	E DISTANCE(1	n)
DF922	5 ZMA1 MIAMI WAAS 1 0	CORS ARP	N254928.585 W	/0801909.066	91417.7
DP685	9 FLF1 FL FOUNDATION	1 CORS ARP	N253655.240 V	W0802309.913	115552.0
DE913	8 OKCB OKEECHOBEE C	CORS ARP	N271557.715 V	V0805119.181	106951.1

NEAREST NGS PUBLISHED CONTROL POINT AD8035 K 402 N263656.000 W0800333.000 32.4

Palm City

28 April 2020

INPUT

Geographic, flhpgn - Florida HPGN Vertical - NAVD88, U.S. Feet

OUTPUT

State Plane, filhpgn - Florida HPGN 0901 - Florida East, U.S. Feet Vertical - NGVD29 (Custom), U.S. Feet

PB 1639

Latitude: 26 36 56.8 Longitude: 080 03 33.8 Elevation/Z: 0 1/1 Northing/Y: 830638.200 Easting/X: 963490.462 Elevation/Z: 1.535 Convergence: 0 25 17.14625 Scale Factor: 1.000049467 Combined Factor: 1.000053515