T2 UES, Inc.

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SURVEYOR'S REPORT

USGS Wells Phase 4

USGS Station No:	281429081290501
Station Name:	OSF-14
Prepared For:	South Florida Water Management District
Work Order No:	4600004161-WO5
Report Date:	September 1, 2020

TABLE OF CONTENTS

SURVEYOR'S REPORT

According to the:
STATE OF FLORIDA
Standards of Practice
CHAPTER 472.027 Florida Statutes
Chapter 5J-17.050 through 5J-17.052, Florida Administrative Code

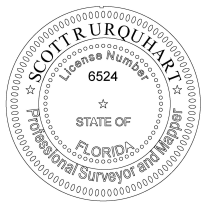
This report and copies thereof are not valid without the signature and original raised seal of a Florida Licensed Surveyor and Mapper. **This report is not valid without the digital files referenced in this report.**

Additions or deletions to the report by other than the signing party are prohibited without written consent of the signing party.

All field work was performed by:

T2 UES, Inc., LB00008336
5670 Zip Drive
Fort Myers, Florida 33905
Phone: (239) 277-0722 Fax: (239) 277-7179
Scott Urquhart, PSM 6524 (Surveyor and Mapper in Responsible Charge)

I hereby certify that as a duly registered Florida Professional Surveyor and Mapper, I have prepared this Report for the specific purpose of providing the **South Florida Water Management District** with the information as outlined. This report is not complete without the referenced information being available during an examination of said Report. I further certify that the precision achieved and the care taken in collecting the data to formulate this Report are adequate for the purpose of the assignment and that the standards set forth in Chapter 5J-17.050 through 5J-17.052 of the Florida Administrative Code have been met.



Digitally signed by Scott R. Urquhart, P.S.M.
Date: 2020.09.29 14:26:35 -04'00'

Scott Urquhart
Professional Surveyor & Mapper
Florida Certificate No. 6524

(For the firm – LB 8336)

Date Signed

PURPOSE OF SURVEY AND PROJECT OVERVIEW

The specific purpose of this survey is establish North American Vertical Datum of 1988 (NAVD88) elevations for United States Geological Survey (USGS) well site **OSF-14**, provide a site benchmark and additional well data as follows:

- Establish an elevation on the USGS measuring mark on top of the well(s) at each site.
- Stamp a District provided aluminum tag with the appropriate data in the appropriate spaces on the tag. Including the Corpscon 6.0.1 vertical offset value from NGVD1929 to NAVD1988.
- Establish a North American Datum 83/11 (or higher) State Plane Coordinate on the benchmark and the well head.
- Provide an NAVD88 elevation on each of the USGS benchmarks (in the USGS Reports noted as “Reference Marks” or “RM’s”) recovered at the site.
- Take a typical ground shot near the well.
- Take an elevation shot on all four (4) corners of the concrete well pad.
- Measure the well diameter to determine the casing material (i.e. PVC), include a picture with a ruler on it and state and show in the report.
- Determine distance to the water table inside the well (DTW) (measurement from the well measuring point, along with time and date).Measure the well head size whether it is a manhole or surface casing.
- Complete the standard District benchmark form for each control monument set and submit the form as a .pdf and a .xlsx.

SITE LOCATION

See Page 6 for SFWMD Well Site Form.

PROJECT DATUM

- Horizontal – The project horizontal data is referenced to the North American Datum of 1983, 2011 adjustment, Florida State Plane Coordinate System, East Zone, U.S. Survey Feet.
- Vertical – The project vertical data is referenced to the North American Vertical Datum of 1988 (NAVD88). All data referenced to National Geodetic Vertical Datum of 1929 (NGVD29) was converted utilizing **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.

LEVELING PROCEDURES AND METHODOLOGY

All control leveling for the project was completed utilizing a Leica DNA 03 (serial number 347859) and Leica LS10 digital level (serial number 700874) with barcode level rod. Collimation and adjustment of the instrument was completed prior to leveling. Leveling began on National Geodetic Survey Benchmark Q 628, ran through site benchmark OSF 14 and closed on National Geodetic Survey Benchmark R 628. All leveling was completed in accordance with standard survey practice utilizing conventional third order methods, techniques, and equipment. The overall closure met or exceeded allowable project requirements of 0.02 feet times the square root in miles (0.02*SQRT(miles)).

See page 27 for SFWMD Benchmark Datasheet.

NATIONAL GEODETIC SURVEY ONLINE POSITIONING USER SERVICE (OPUS)

The site-established benchmark was also occupied collecting positional GPS data for a duration of 6.5 hours. This information was then uploaded to the OPUS site for processing. See pages 28-31 for OSF-14 OPUS Report.

DATES OF FIELD DATA COLLECTION

Field survey work by T2 was performed between August 6th and 17th, 2020. Field notes are contained in Field Book 555, pages 36-42 and Field Book 556, pages 26-28.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/19

U.S.G.S. Station Name: OSF-14	U.S.G.S. Station Number: 281429081290501	Agency: T2 UES, Inc.	Date of Field Work: 8-14-2020
Party Chief: REIDER	Field Book: 555; 556	Page(s): **36-42; 26-28**	Report Prepared by: CHAMBLESS

SITE SPECIFIC DATA			
Site Benchmark: OSF-14	Benchmark Elevation(s) *(NAVD88)*: 76.60	Corpscon 6.0.1 Conversion Factor (*NAVD88 to NGVD29*) + 0.95	
Well Reference Elevation (*NAVD88*): 77.77	DTW: 15.40 (08/13/2020 at 8:11 AM)	Ground Elevation *(NAVD88)*: 76.90	Pad Elevation (*NAVD88*): N/A

GEOGRAPHIC DATA		
Section 11	Township 26S	Range 28E
Well Latitude: 28°14'31.09"N	Well Longitude: 81°29'07.60"W	Location Source: RTK GPS
State Plane Coordinates:	Northing (Y) = 1420989.2920'	Easting (X) = 499868.8270'

Notes: NAVD88 – North American Vertical Datum of 1988; NGVD29- National Geodetic Vertical Datum of 1929; 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.

PICTURES

Aerial of Overall Well Site

Not to scale (GoogleEarth product)

Well Site and Well Head

Well: “OSF-14”
Reference Point: N. RIM OF 6” IRON PIPE

Reference Point El. = 77.77 feet NAVD88

Distance to Water = 15.40 feet from reference point (08/13/2020 at 8:11 AM)

New Aluminum Tag

REFERENCE MONUMENTS NOT FOUND

Site Benchmark

Site Benchmark Overall Photo

Site BM:

Latitude: 28°14'30.32" N
Longitude: 81°29'07.35" W
NAVD88 EL = 76.60

Source Benchmarks

NGS Benchmark "Q628" (DI9141)

Latitude: 28°15'19.9" N SCALED
Longitude: 81°28'25.7" W SCALED
NAVD88 EL = 72.08 feet

NGS Benchmark "R628" (AJ6656)

Latitude: 28°15'27.0" N SCALED
Longitude: 81°29'31.2" W SCALED
NAVD88 EL = 68.78 feet

"Q628" Benchmark Datasheet (1 of 2)

DATASHEETS Page 1 of 2

The NGS Data Sheet

See file dsdata.pdf for more information about the datasheet.

```
PROGRAM = datasheet95, VERSION = 8.12.5.7
Starting Datasheet Retrieval...
1        National Geodetic Survey,   Retrieval Date = MAY 19, 2020
 DI9141 ***********************************************************************
 DI9141  DESIGNATION -  Q 628
 DI9141  PID         -  DI9141
 DI9141  STATE/COUNTY-  FL/OSCEOLA
 DI9141  COUNTRY     -  US
 DI9141  USGS QUAD   -  KISSIMMEE (2018)
 DI9141
 DI9141                        *CURRENT SURVEY CONTROL
 DI9141 ______________________________________________________________________
 DI9141* NAD 83(1986) POSITION- 28 15 19.9    (N) 081 28 25.7    (W)    HD_HELD2
 DI9141* NAVD 88 ORTHO HEIGHT -    21.971 (meters)       72.08  (feet) ADJUSTED
 DI9141 ______________________________________________________________________
 DI9141  GEOID HEIGHT    -        -27.712 (meters)                     GEOID18
 DI9141  DYNAMIC HEIGHT  -         21.938 (meters)       71.97  (feet) COMP
 DI9141  MODELED GRAVITY -    979,160.6   (mgal)                       NAVD 88
 DI9141
 DI9141  VERT ORDER      -  FIRST     CLASS II
 DI9141
 DI9141.The horizontal coordinates were established by autonomous hand held GPS
 DI9141.observations and have an estimated accuracy of +/- 10 meters.
 DI9141.
 DI9141.The orthometric height was determined by differential leveling and
 DI9141.adjusted by the NATIONAL GEODETIC SURVEY
 DI9141.in April 2010.
 DI9141
 DI9141.Significant digits in the geoid height do not necessarily reflect accuracy.
 DI9141.GEOID18 height accuracy estimate available here.
 DI9141
 DI9141.Click photographs - Photos may exist for this station.
 DI9141
 DI9141.The dynamic height is computed by dividing the NAVD 88
 DI9141.geopotential number by the normal gravity value computed on the
 DI9141.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 DI9141.degrees latitude (g = 980.6199 gals.).
 DI9141
 DI9141.The modeled gravity was interpolated from observed gravity values.
 DI9141
 DI9141;                   North         East     Units  Estimated Accuracy
 DI9141;SPC FL E     -   434,616.      153,508.      MT  (+/- 10 meters HH2 GPS)
 DI9141
 DI9141_U.S. NATIONAL GRID SPATIAL ADDRESS: 17RMM5352425599(NAD 83)
 DI9141
 DI9141                           SUPERSEDED SURVEY CONTROL
 DI9141
 DI9141.No superseded survey control is available for this station.
 DI9141
 DI9141_MARKER: DD = SURVEY DISK
 DI9141_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
```

DATASHEETS


```
DI9141_STAMPING: Q 628 2005
DI9141_MARK LOGO: FLDEP
DI9141_PROJECTION: FLUSH
DI9141_MAGNETIC: M = MARKER EQUIPPED WITH BAR MAGNET
DI9141_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
DI9141+STABILITY: SURFACE MOTION
DI9141_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
DI9141+SATELLITE: SATELLITE OBSERVATIONS - January 07, 2019
DI9141
DI9141  HISTORY     - Date     Condition        Report By
DI9141  HISTORY     - 20050520 MONUMENTED       FLDEP
DI9141  HISTORY     - 20090909 GOOD             FLDEP
DI9141  HISTORY     - 20190107 GOOD             LOCSUR
DI9141
DI9141                          STATION DESCRIPTION
DI9141
DI9141'DESCRIBED BY FL DEPT OF ENV PRO 2005
DI9141'THE MARK IS ABOUT 5.5 MI (8.8 KM) SOUTHWEST OF KISSIMMEE, 1.0 MI (1.6
DI9141'KM) WEST OF CAMPBELL, IN SECTION 1, TOWNSHIP 26 SOUTH, RANGE 28 EAST.
DI9141'
DI9141'TO REACH THE MARK FROM THE INTERSECTION OF U.S. HIGHWAY 17, 92 SOUTH
DI9141'(JOHN YOUNG PARKWAY) AND U.S. HIGHWAY 192 (VINE STREET) IN KISSIMMEE,
DI9141'GO SOUTH ON U.S. HIGHWAY 17, 92 (JOHN YOUNG PARKWAY) FOR 3.15 MI (5.1
DI9141'KM) TO THE INTERSECTION OF COUNTY ROAD 531 (PLEASANT HILL ROAD,
DI9141'CONTINUE WESTERLY ON U.S. HIGHWAY 17, 92 (ORANGE BLOSSOM TRAIL) FOR
DI9141'2.3 MI (3.7 KM) TO THE JUNCTION OF DOLORES DRIVE ON THE RIGHT AND THE
DI9141'MARK ON THE RIGHT, SET IN THE TOP OF A ROUND CONCRETE MONUMENT FLUSH
DI9141'WITH THE GROUND AND ABOUT LEVEL WITH DOLORES DRIVE.
DI9141'
DI9141'LOCATED 70.0 FT (21.3 M) NORTH OF THE CENTERLINE OF U.S. HIGHWAY 17,
DI9141'92, 35.8 FT (10.9 M) EAST OF THE CENTERLINE OF DOLORES DRIVE, 27.7 FT
DI9141'(8.4 M) NORTH OF A POWER POLE NUMBER 6-23855 (136937, 052546), 15.0 FT
DI9141'(4.6 M) SOUTH-SOUTHEAST OF A POWER POLE NUMBER 6-58586 (136937,
DI9141'052554) WITH FOUR GUY WIRES AN ONE TRANSFORMER ATTACHED, 2.4 FT (0.7
DI9141'M) SOUTH OF THE SOUTHWEST CORNER OF A 6.0 FT (1.8 M) TALL CHAINLINK
DI9141'FENCE WITH THREE STRANDS OF BARBWIRE ON TOP AND 2.3 FT (0.7 M) SOUTH
DI9141'OF A CARSONITE WITNESS POST.
DI9141'
DI9141'NOTE A MAGNET WAS IMBEDDED IN THE GROUND ON THE SOUTH SIDE OF THE
DI9141'MONUMENT.
DI9141
DI9141                          STATION RECOVERY (2009)
DI9141
DI9141'RECOVERY NOTE BY FL DEPT OF ENV PRO 2009 (SVV)
DI9141'RECOVERED AS DESCRIBED.
DI9141
DI9141                          STATION RECOVERY (2019)
DI9141
DI9141'RECOVERY NOTE BY LOCAL SURVEYOR (INDIVIDUAL OR FIRM) 2019 (JKI)
DI9141'RECOVERED IN GOOD CONDITION.

*** retrieval complete.
Elapsed Time = 00:00:02
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DATASHEETS Page 1 of 3

The NGS Data Sheet

See file dsdata.pdf for more information about the datasheet.

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 DI9142  PID         -  DI9142
 DI9142  STATE/COUNTY-  FL/OSCEOLA
 DI9142  COUNTRY     -  US
 DI9142  USGS QUAD   -  KISSIMMEE (2018)
 DI9142
 DI9142                        *CURRENT SURVEY CONTROL
 DI9142  ______________________________________________________________________
 DI9142* NAD 83(1986) POSITION- 28 15 27.0     (N) 081 29 31.2     (W)    HD_HELD2
 DI9142* NAVD 88 ORTHO HEIGHT -     20.964 (meters)        68.78  (feet) ADJUSTED
 DI9142  ______________________________________________________________________
 DI9142  GEOID HEIGHT    -        -27.685 (meters)                       GEOID18
 DI9142  DYNAMIC HEIGHT  -         20.933 (meters)        68.68  (feet) COMP
 DI9142  MODELED GRAVITY -    979,160.8   (mgal)                         NAVD 88
 DI9142
 DI9142  VERT ORDER      -  FIRST     CLASS II
 DI9142
 DI9142.The horizontal coordinates were established by autonomous hand held GPS
 DI9142.observations and have an estimated accuracy of +/- 10 meters.
 DI9142.
 DI9142.The orthometric height was determined by differential leveling and
 DI9142.adjusted by the NATIONAL GEODETIC SURVEY
 DI9142.in April 2010.
 DI9142
 DI9142.No vertical observational check was made to the station.
 DI9142
 DI9142.Significant digits in the geoid height do not necessarily reflect accuracy.
 DI9142.GEOID18 height accuracy estimate available here.
 DI9142
 DI9142.Click photographs - Photos may exist for this station.
 DI9142
 DI9142.The dynamic height is computed by dividing the NAVD 88
 DI9142.geopotential number by the normal gravity value computed on the
 DI9142.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 DI9142.degrees latitude (g = 980.6199 gals.).
 DI9142
 DI9142.The modeled gravity was interpolated from observed gravity values.
 DI9142
 DI9142;                    North         East     Units  Estimated Accuracy
 DI9142;SPC FL E     -   434,842.      151,724.      MT  (+/- 10 meters HH2 GPS)
 DI9142
 DI9142_U.S. NATIONAL GRID SPATIAL ADDRESS: 17RMM5174025825(NAD 83)
 DI9142
 DI9142                           SUPERSEDED SURVEY CONTROL
 DI9142
 DI9142.No superseded survey control is available for this station.
 DI9142
```

DATASHEETS Page 2 of 3

```
DI9142_MARKER: F = FLANGE-ENCASED ROD
DI9142_SETTING: 49 = STAINLESS STEEL ROD W/O SLEEVE (10 FT.+)
DI9142_STAMPING: R 628 2005
DI9142_MARK LOGO: NGS
DI9142_PROJECTION: RECESSED 3 CENTIMETERS
DI9142_MAGNETIC: M = MARKER EQUIPPED WITH BAR MAGNET
DI9142_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
DI9142_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
DI9142+SATELLITE: SATELLITE OBSERVATIONS - January 07, 2019
DI9142_ROD/PIPE-DEPTH: 20.8 meters
DI9142
DI9142  HISTORY     - Date     Condition        Report By
DI9142  HISTORY     - 20050520 MONUMENTED       FLDEP
DI9142  HISTORY     - 20090909 GOOD             FLDEP
DI9142  HISTORY     - 20190107 GOOD             LOCSUR
DI9142
DI9142                          STATION DESCRIPTION
DI9142
DI9142'DESCRIBED BY FL DEPT OF ENV PRO 2005
DI9142'THE MARK IS ABOUT 6.6 MI (10.6 KM) SOUTHWEST OF KISSIMMEE, 2.1 MI (3.4
DI9142'KM) WEST OF CAMPBELL, IN SECTION 3, TOWNSHIP 26 SOUTH, RANGE 28 EAST.
DI9142'
DI9142'TO REACH THE MARK FROM THE INTERSECTION OF U.S. HIGHWAY 17, 92 SOUTH
DI9142'(JOHN YOUNG PARKWAY) AND U.S. HIGHWAY 192 (VINE STREET) IN KISSIMMEE,
DI9142'GO SOUTH ON U.S. HIGHWAY 17, 92 (JOHN YOUNG PARKWAY) FOR 3.15 MI (5.1
DI9142'KM) TO THE INTERSECTION OF COUNTY ROAD 531 (PLEASANT HILL ROAD),
DI9142'CONTINUE WESTERLY ON U.S. HIGHWAY 17, 92 (ORANGE BLOSSOM TRAIL) FOR
DI9142'3.1 MI (5.0 KM) TO THE INTERSECTION OF POINCIANA BOULEVARD, CONTINUE
DI9142'WESTERLY ON 17, 92 (ORANGE BLOSSOM TRAIL) FOR 0.35 TO THE INTERSECTION
DI9142'OF THE RAILROAD TRACKS AND THE MARK ON THE RIGHT.  THE MARK CAN BE
DI9142'REACHED FROM THE JUNCTION OF U.S. HIGHWAY 17, 92 (ORANGE BLOSSOM
DI9142'TRAIL) AND TALLAHASSEE BOULEVARD IN INTERCESSION CITY, GO EASTERLY ON
DI9142'U.S. HIGHWAY 17, 92 (BLOSSOM) FOR 1.1 MI (1.8 KM) TO THE INTERSECTION
DI9142'OF THE RAILROAD TRACKS AND THE MARK ON THE LEFT, A STAINLESS STEEL ROD
DI9142'DRIVEN TO REFUSAL AT A DEPTH OF 68.3 FT (20.8 M) WITH A NGS LOGO CAP
DI9142'RECESSED 0.1 FT (0.0 M) BELOW THE LEVEL OF THE GROUND AND ABOUT LEVEL
DI9142'WITH U.S. HIGHWAY 17, 92 EASTBOUND LANES, THE DATUM POINT IS RECESSED
DI9142'0.4 FT (0.1 M) BELOW THE LEVEL OF THE NGS LOGO CAP.
DI9142'
DI9142'LOCATED 133.0 FT (40.5 M) SOUTH OF THE APPROXIMATE CENTERLINE OF A
DI9142'DRIVE TO BUILDING NUMBER 24, 128.0 FT (39.0 M) NORTH OF THE NORTH EDGE
DI9142'OF THE PAVEMENT OF U.S. HIGHWAY 17, 92, 97.5 FT (29.7 M) NORTH OF THE
DI9142'NORTHWEST CORNER OF A SMALL RAILROAD BUILDING NUMBER 622952-B (4.0 FT
DI9142'BY 6.0 FT), 22.7 FT (6.9 M) EAST OF THE EAST RAIL OF THE RAILROAD
DI9142'TRACKS, 13.5 FT (4.1 M) NORTH OF SPRINT CABLE BOX NUMBER 125038, 3.6
DI9142'FT (1.1 M) NORTH OF THE SOUTHWEST CORNER OF A 10.0 FT (3.0 M) TALL
DI9142'CHAINLINK FENCE AND 0.8 FT (0.2 M) WEST OF A CARSONITE WITNESS POST
DI9142'NOTE A MAGNET WAS PLACED INSIDE OF THE NGS LOGO CAP.
DI9142'
DI9142'NOTE ACCESS TO THE DATUM POINT IS HAD THROUGH A 5-INCH (13 CM) NGS
DI9142'LOGO CAP.
DI9142
DI9142                          STATION RECOVERY (2009)
DI9142
DI9142'RECOVERY NOTE BY FL DEPT OF ENV PRO 2009 (SVV)
DI9142'RECOVERED AS DESCRIBED.
DI9142
DI9142                          STATION RECOVERY (2019)
DI9142
DI9142'RECOVERY NOTE BY LOCAL SURVEYOR (INDIVIDUAL OR FIRM) 2019 (JKI)
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"R628" Benchmark Datasheet (3 of 3)

DATASHEETS Page 3 of 3

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DI9142'RECOVERED IN GOOD CONDITION.

*** retrieval complete.
Elapsed Time = 00:00:02
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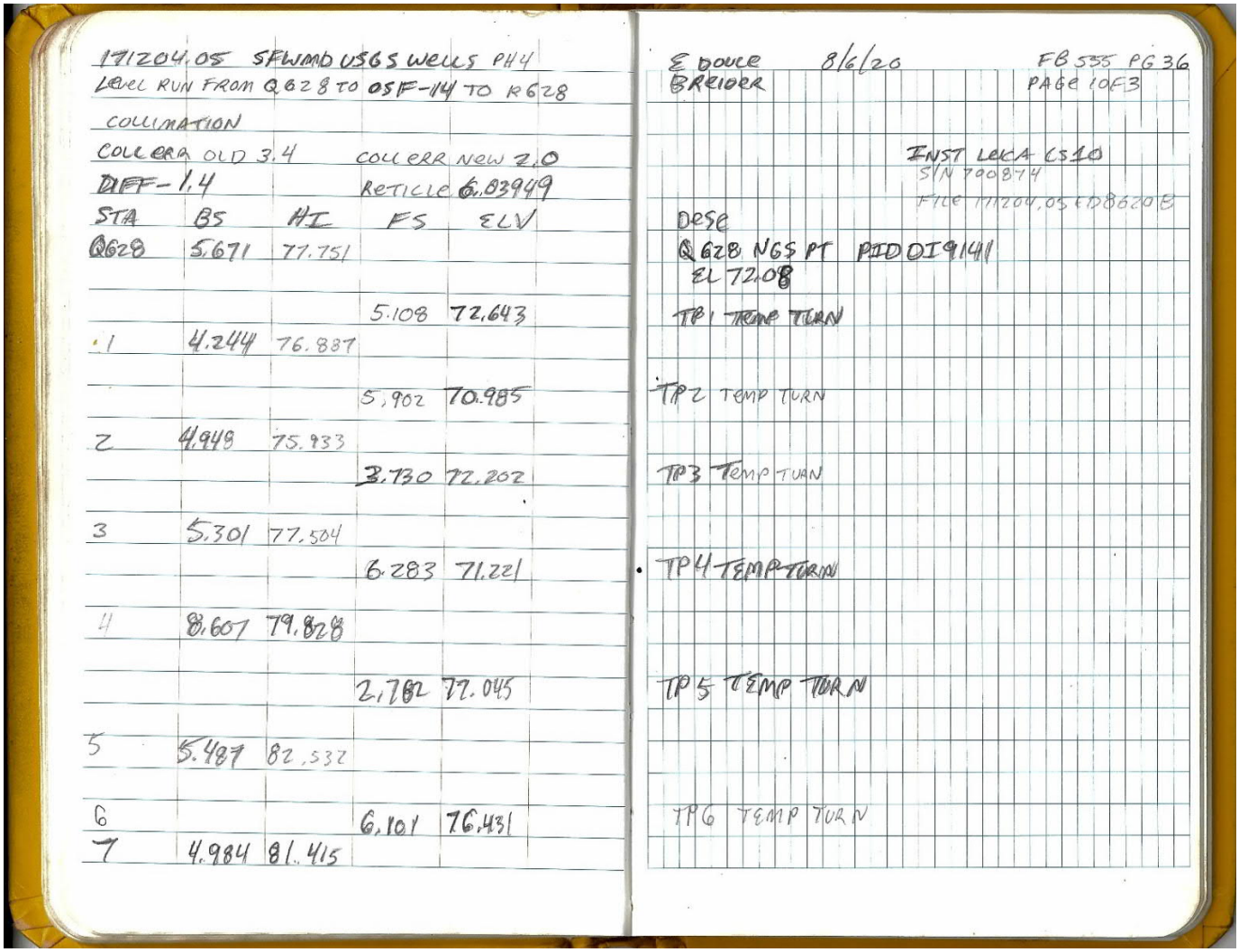
https://www.ngs.noaa.gov/cgi-bin/ds_mark.prl?PidBox=DI9142 5/19/2020

Field Notes (1 of 10)



171204.05 SFWMD USGS WELLS PH4
LEVEL RUN FROM Q628 TO 05F-14 TO R628
COLLIMATION
COLLERR OLD 3.4 COLLERR NEW 2.0
DIFF-1.4 RETICLE 6.03949

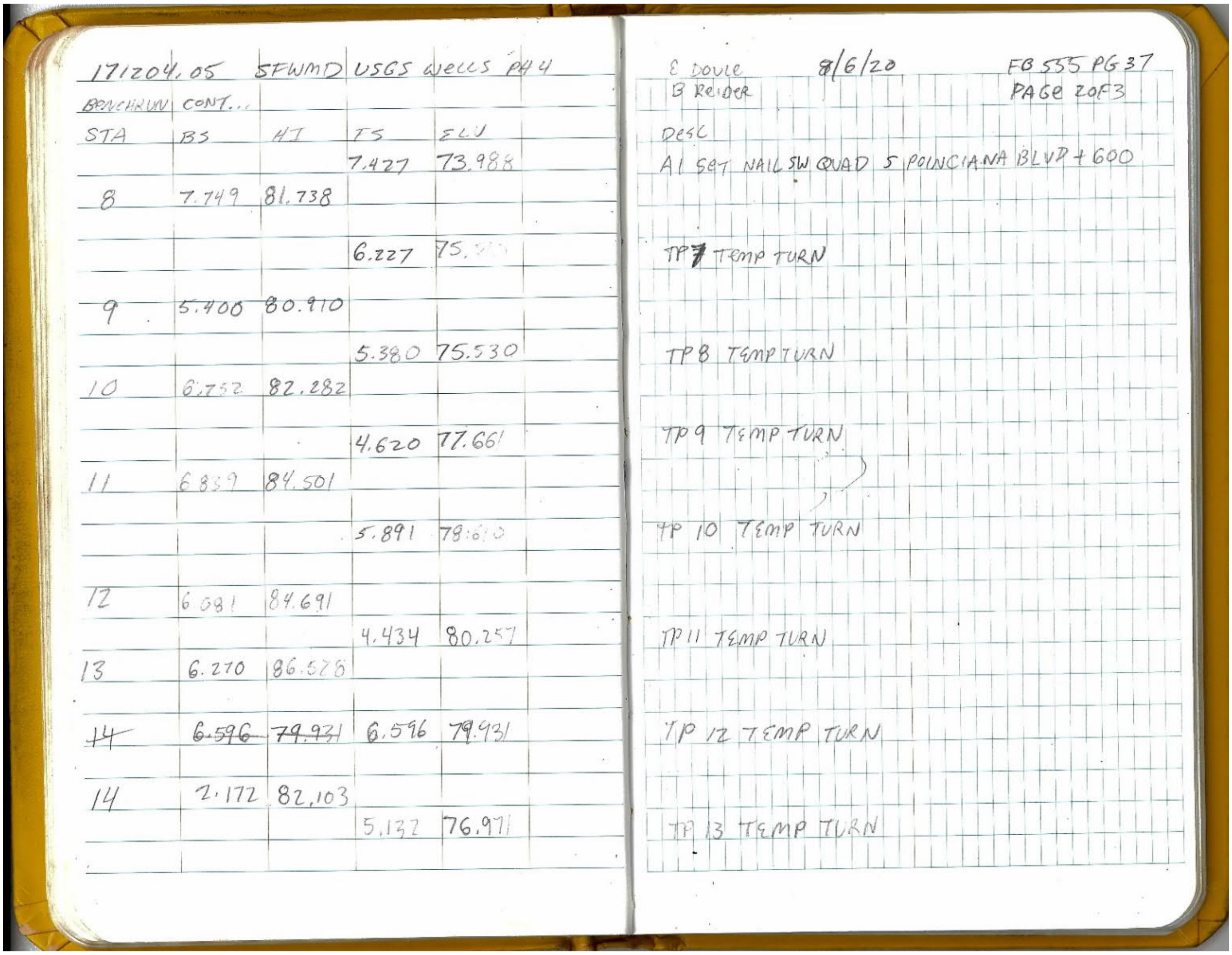
STA	BS	HI	FS	ELV
Q628	5.671	77.751		
			5.108	72.643
1	4.244	76.887		
			5.902	70.985
2	4.949	75.933		
			3.730	72.202
3	5.301	77.504		
			6.283	71.221
4	8.607	79.828		
			2.782	77.045
5	5.487	82.532		
6			6.101	76.431
7	4.984	81.415		

E DOUCE 8/6/20 FB 535 PG 36
BRRIDER PAGE 1 OF 3

INST LEICA CS10
S/N 790874
FILE 171204.05.DB620B

DESC
Q628 NGS PT PID DI9141
EL 72.08
TP1 TEMP TURN
TP2 TEMP TURN
TP3 TEMP TURN
TP4 TEMP TURN
TP5 TEMP TURN
TP6 TEMP TURN

Field Notes (2 of 10)



171204.05 SFWMD USGS WELLS PH 4

BENCHRUN CONT...

STA	BS	HI	FS	ELV
			7.427	73.988
8	7.749	81.738		
			6.227	75.[illegible]
9	5.400	80.910		
			5.380	75.530
10	6.752	82.282		
			4.620	77.661
11	6.839	84.501		
			5.891	78.610
12	6.081	84.691		
			4.434	80.257
13	6.270	86.528		
~~14~~	~~6.596~~	~~79.931~~	6.596	79.931
14	2.172	82.103		
			5.132	76.971

E DOYLE 8/6/20 FB 555 PG 37

B REIDER PAGE 2 OF 3

DESC

A1 SET NAIL SW QUAD S POINCIANA BLVD + 600

TP7 TEMP TURN

TP8 TEMP TURN

TP9 TEMP TURN

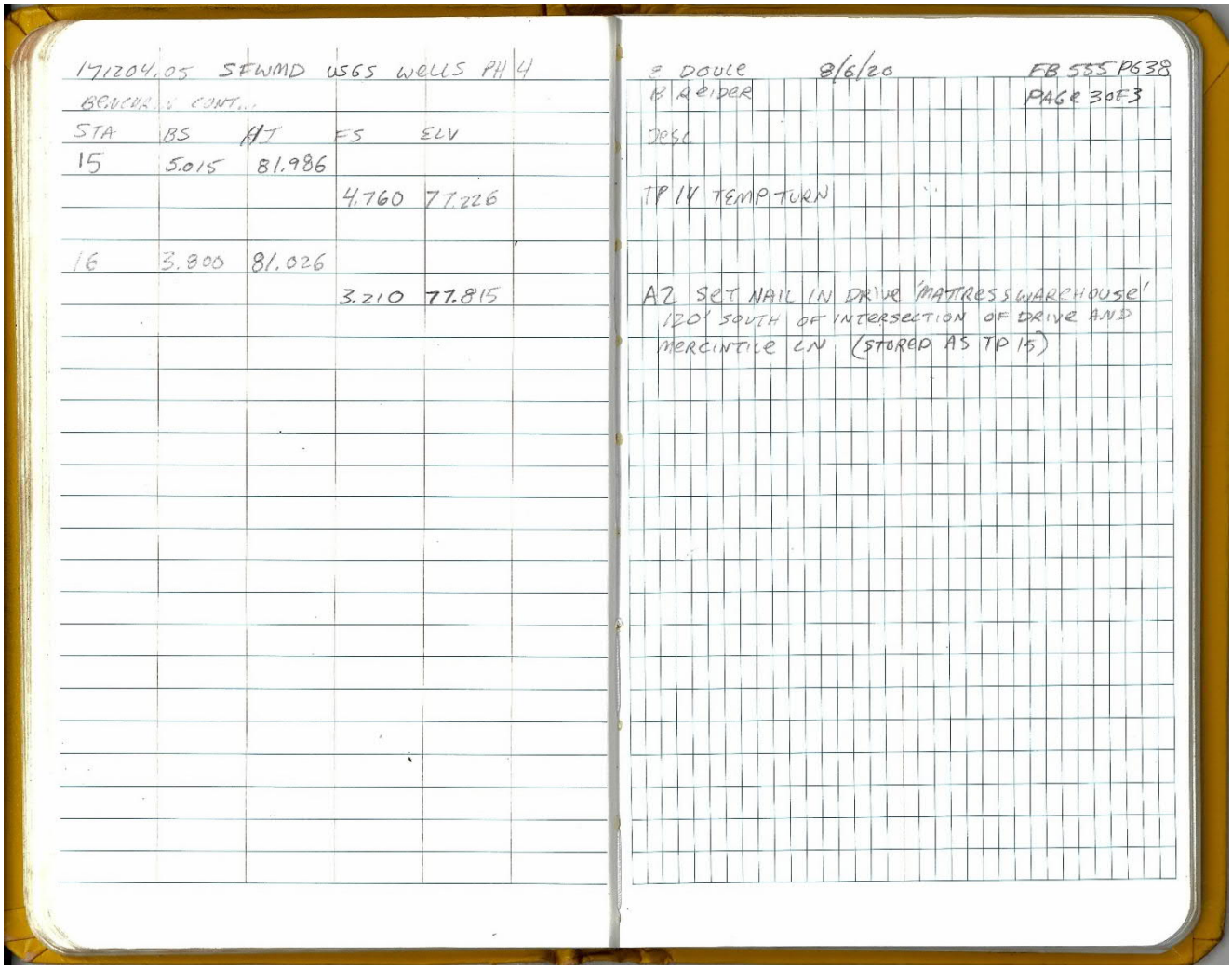
TP 10 TEMP TURN

TP11 TEMP TURN

TP 12 TEMP TURN

TP 13 TEMP TURN

Field Notes (3 of 10)



171204.05 SFWMD USGS WELLS PH 4

BENCH: V CONT...

STA	BS	HI	FS	ELV
15	5.015	81.986		
			4.760	77.226
16	3.800	81.026		
			3.210	77.815

= DOULE 8/6/20 FB 535 P638

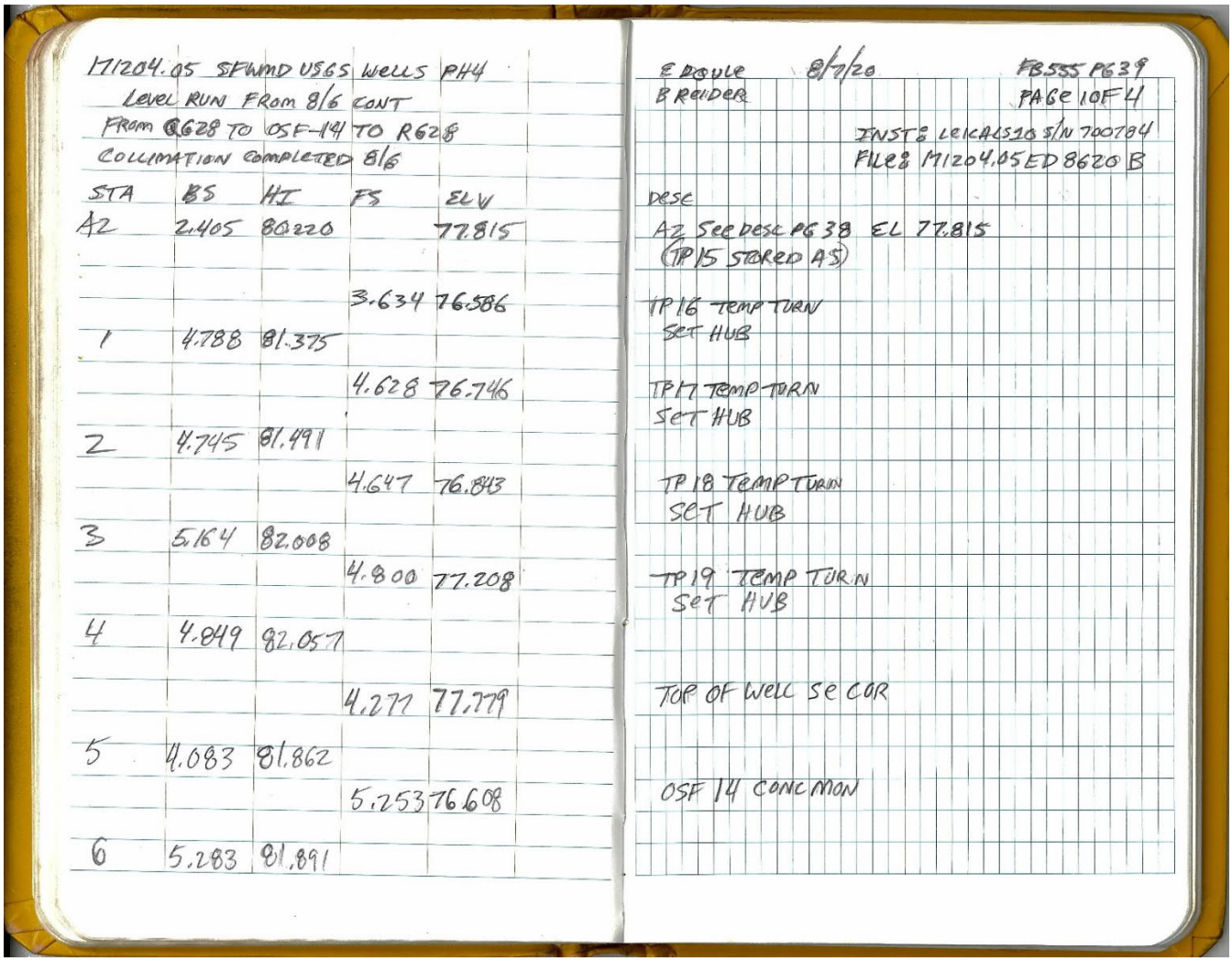
@ RIDER PAGE 3 OF 3

DESC

TP IV TEMP TURN

AZ SET NAIL IN DRIVE 'MATTRESS WAREHOUSE' 120' SOUTH OF INTERSECTION OF DRIVE AND MERCANTILE LN. (STORED AS TP 15)

Field Notes (4 of 10)



M1204.05 SFWMD USGS WELLS PH4
LEVEL RUN FROM 8/6 CONT
FROM R628 TO OSF-14 TO R628
COLLIMATION COMPLETED 8/6

STA	BS	HI	FS	ELV
A2	2.405	80.220		77.815
			3.634	76.586
1	4.788	81.375		
			4.628	76.746
2	4.745	81.491		
			4.647	76.843
3	5.164	82.008		
			4.800	77.208
4	4.849	82.057		
			4.277	77.779
5	4.083	81.862		
			5.253	76.608
6	5.283	81.891		

E DOYLE 8/7/20 FB555 PG39
B RAIDER PAGE 1 OF 4

INST @ LEICA TS16 S/N 700784
FILE @ M1204.05 ED 8620 B

DESC

A2 SEE DESC PG 38 EL 77.815
(TP15 STORED AS)

TP16 TEMP TURN
SET HUB

TP17 TEMP TURN
SET HUB

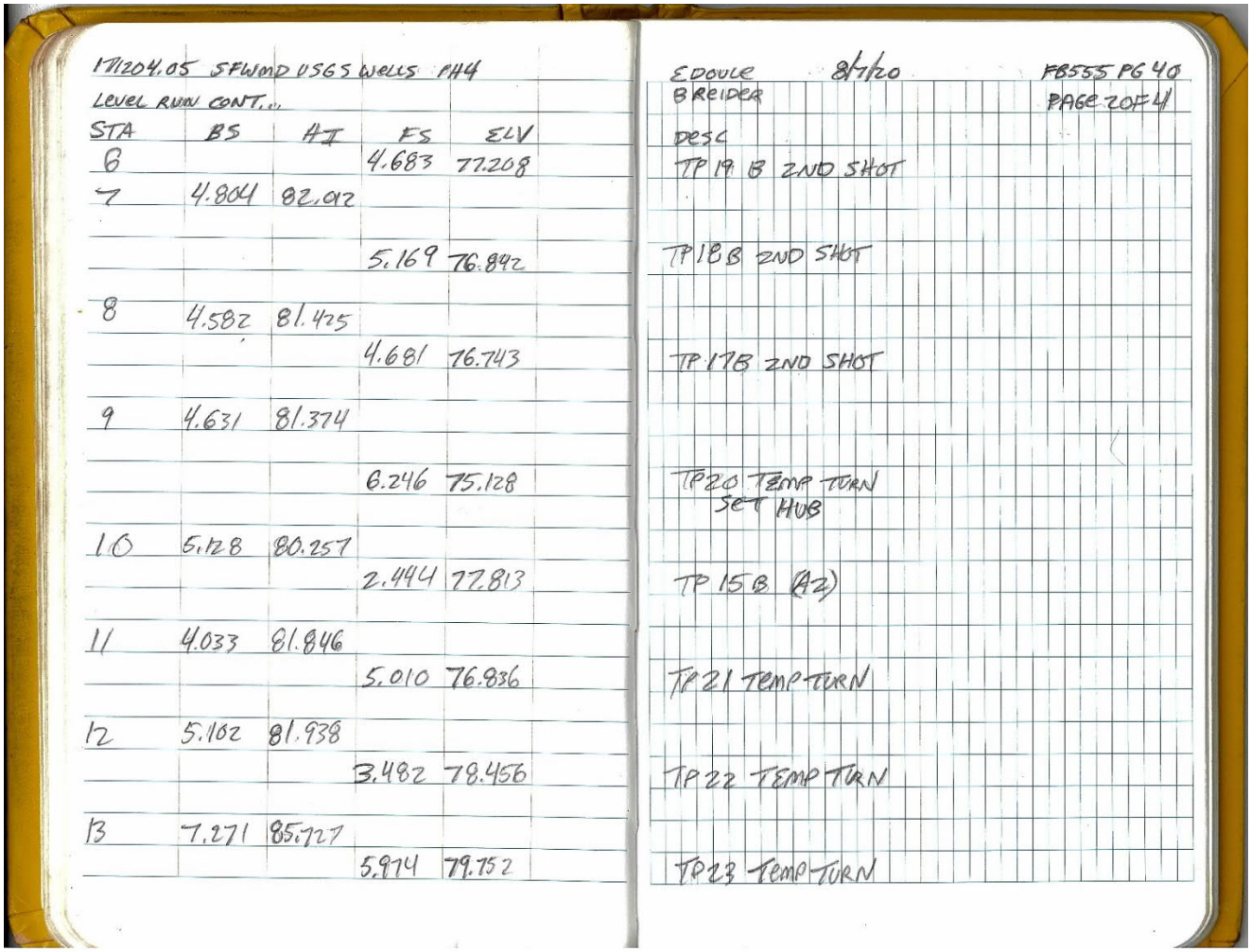
TP18 TEMP TURN
SET HUB

TP19 TEMP TURN
SET HUB

TOP OF WELL SE COR

OSF 14 CONC MON

Field Notes (5 of 10)



17I204.05 SFWMD USGS WELLS PH4
LEVEL RUN CONT...

STA	BS	HI	FS	ELV
6			4.683	77.208
7	4.804	82.012		
			5.169	76.842
8	4.582	81.425		
			4.681	76.743
9	4.631	81.374		
			6.246	75.128
10	5.128	80.257		
			2.444	77.813
11	4.033	81.846		
			5.010	76.836
12	5.102	81.938		
			3.482	78.456
13	7.271	85.727		
			5.974	79.752

EDOULE 8/7/20 FB555 PG 40
BREIDER PAGE 20F 41

DESC

TP 19 B 2ND SHOT

TP 18 B 2ND SHOT

TP 17 B 2ND SHOT

TP 20 TEMP TURN
SET HUB

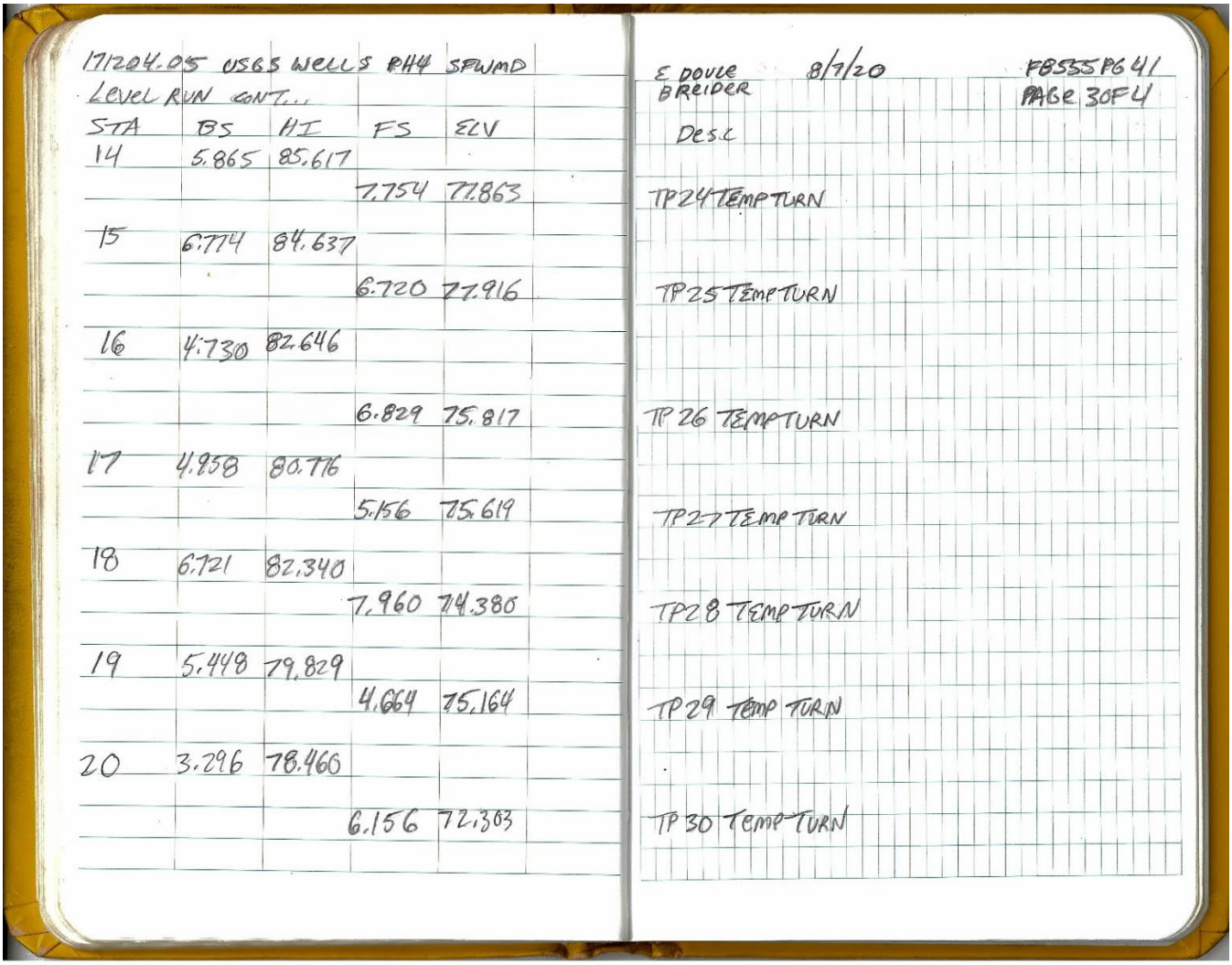
TP 15 B (AZ)

TP 21 TEMP TURN

TP 22 TEMP TURN

TP 23 TEMP TURN

Field Notes (6 of 10)



171204.05 USGS WELLS PH4 SFWMD
LEVEL RUN CONT...

STA	BS	HI	FS	ELV
14	5.865	85.617		
			7.754	77.863
15	6.774	84.637		
			6.720	77.916
16	4.730	82.646		
			6.829	75.817
17	4.958	80.776		
			5.156	75.619
18	6.721	82.340		
			7.960	74.380
19	5.448	79.829		
			4.664	75.164
20	3.296	78.460		
			6.156	72.303

E DOVLE 8/7/20 FB555 PG 41
BREIDER PAGE 30F 4

Desc

TP24 TEMP TURN

TP25 TEMP TURN

TP26 TEMP TURN

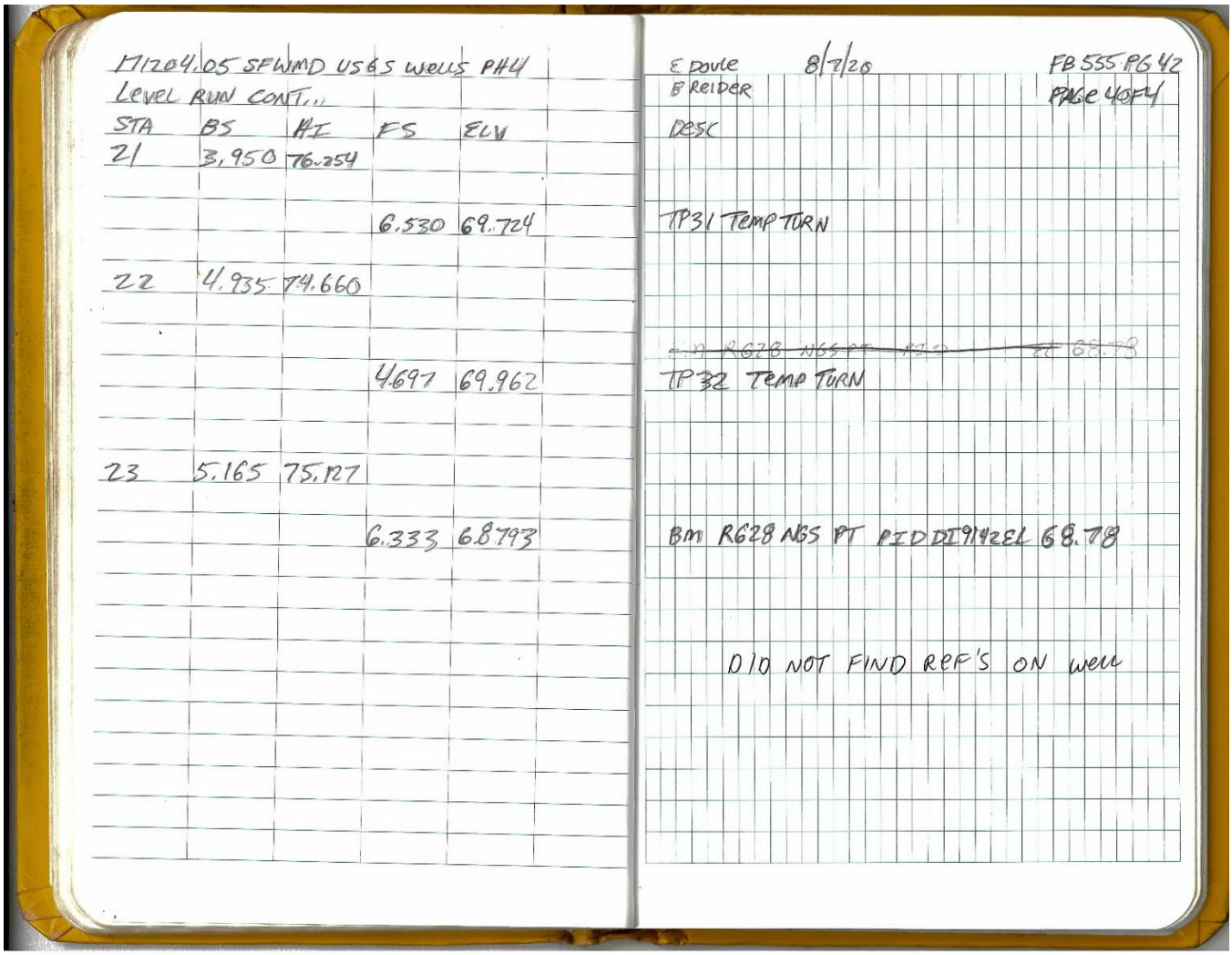
TP27 TEMP TURN

TP28 TEMP TURN

TP29 TEMP TURN

TP30 TEMP TURN

Field Notes (7 of 10)



M1204.05 SFWMD USGS WELLS PH4
LEVEL RUN CONT.,,

STA	BS	HI	FS	ELV
21	3.950	76.254		
			6.530	69.724
22	4.935	74.660		
			4.697	69.962
23	5.165	75.127		
			6.333	68.793

E Doyle 8/7/20 FB 555 PG 42
B Reider PAGE 4 OF 4
DESC

TP31 TEMP TURN

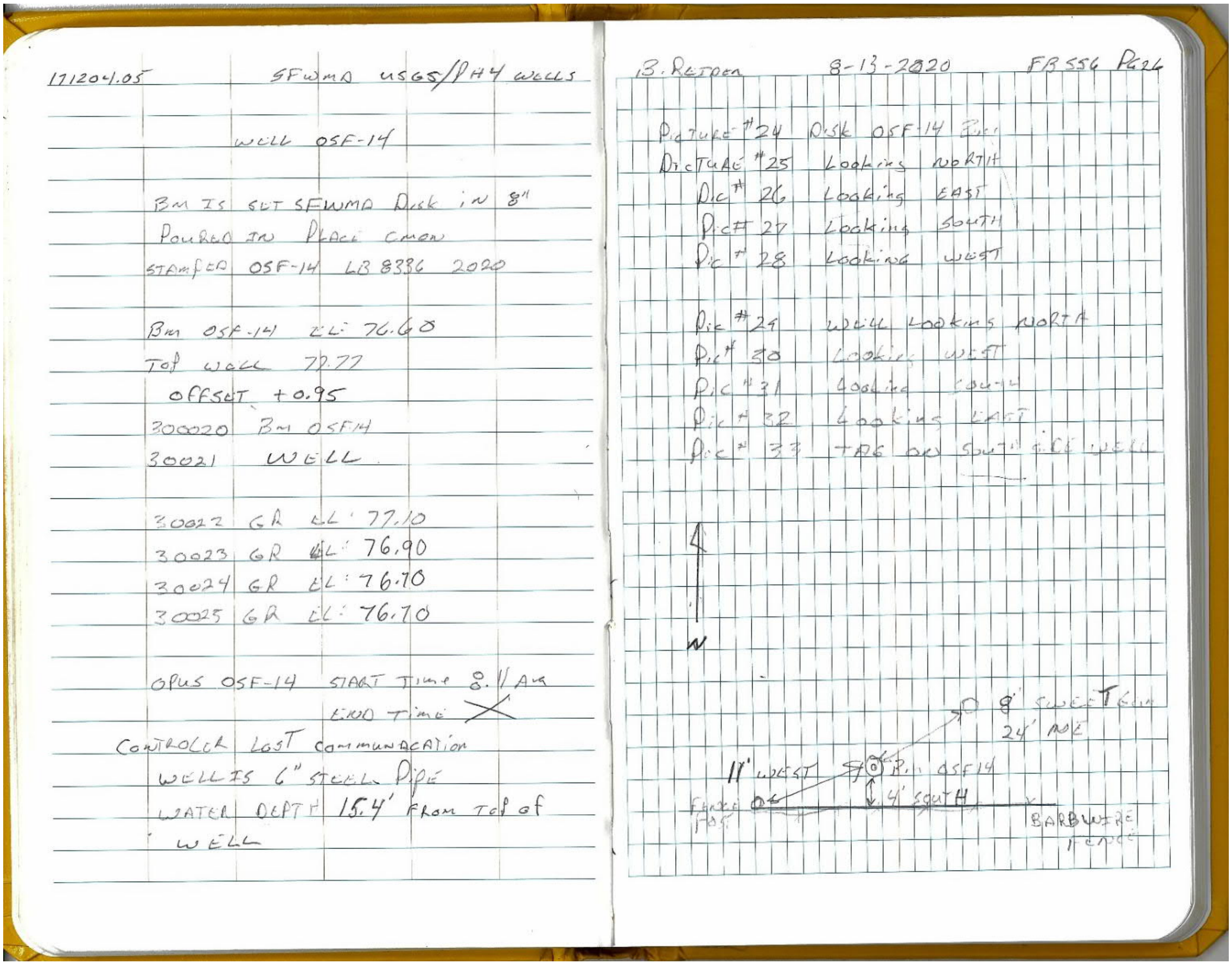
~~BM RG28 NGS PT PID DI914 EL 68.78~~

TP32 TEMP TURN

BM RG28 NGS PT PID DI914 EL 68.78

DID NOT FIND REF'S ON WELL

Field Notes (8 of 10)



171204.05 SFWMA USGS/PH4 WELLS

WELL OSF-14

BM IS SET SFWMD Disk IN 8"
POURED IN PLACE CMON
STAMPED OSF-14 LB 8336 2020

BM OSF-14 EL: 76.60
TOP WELL 77.77
OFFSET +0.95
300020 BM OSF14
30021 WELL

30022 GR EL: 77.10
30023 GR EL: 76.90
30024 GR EL: 76.70
30025 GR EL: 76.70

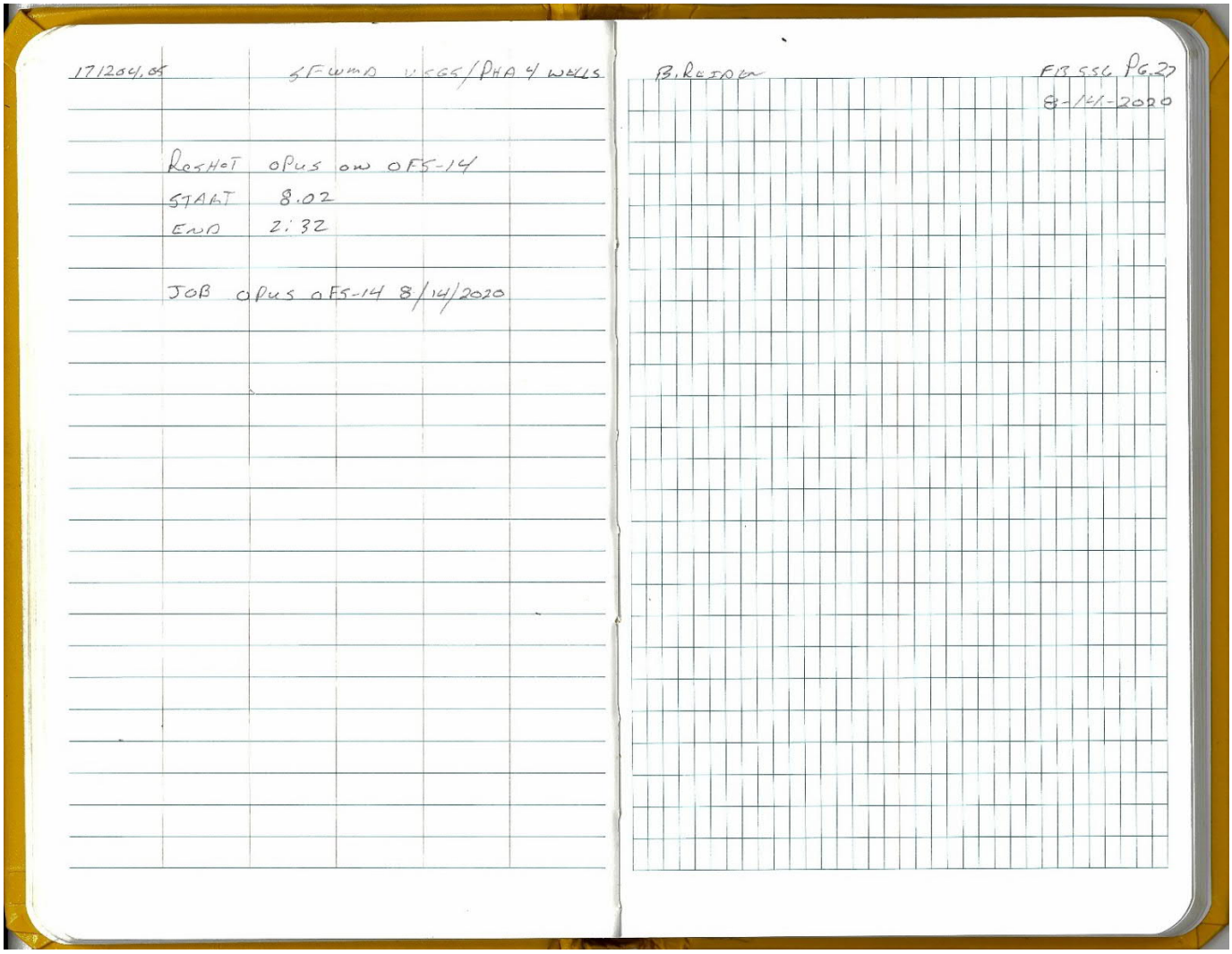
OPUS OSF-14 START TIME 8:11 AM
END TIME X
CONTROLLER LOST COMMUNICATION
WELL IS 6" STEEL PIPE
WATER DEPTH 15.4' FROM TOP OF
WELL

B. RETDEN 8-13-2020 FB 556 PG 24

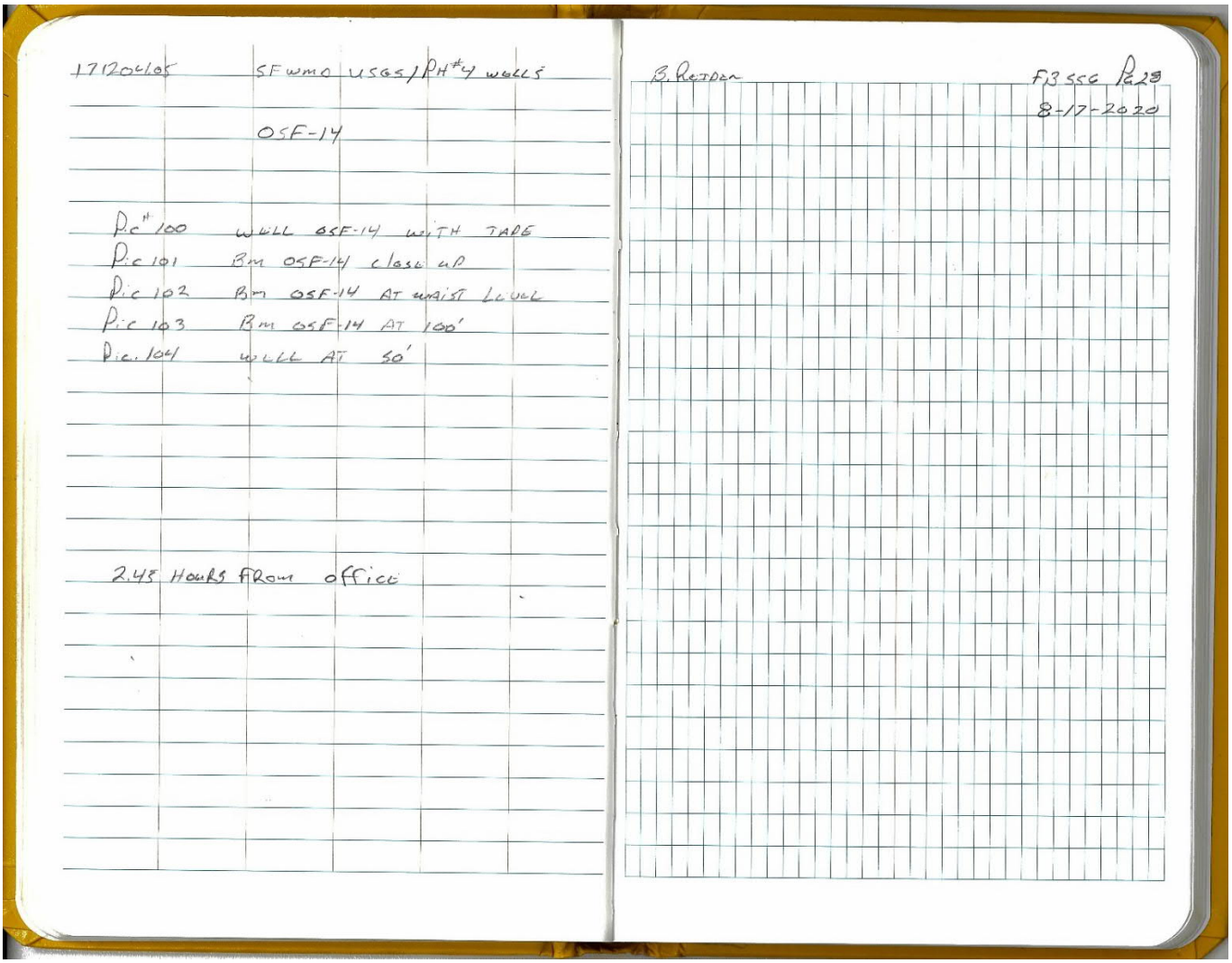
PICTURE #24 DISK OSF-14
PICTURE #25 LOOKING NORTH
PIC # 26 LOOKING EAST
PIC # 27 LOOKING SOUTH
PIC # 28 LOOKING WEST

PIC # 29 WELL LOOKING NORTH
PIC # 30 LOOKING WEST
PIC # 31 LOOKING SOUTH
PIC # 32 LOOKING EAST
PIC # 33 TAG ON SOUTH SIDE WELL

Field Notes (9 of 10)



Field Notes (10 of 10)



South Florida Water Management District Benchmark Datasheet

Designation: OSF 14	Project Name: USGS PHASE 4 WELLS	Type: V	State Plane Zone: FL East
Stamping: OSF 14 LB 8336 2020	Field Book Name: 555; 556	Field Book Page: 39-42, 26-27	
Established By: T2ues	Recovered By:	Recovery Date:	
Surveyor: REIDER	Established Date: 08/13/20	Status: New	

GEOGRAPHIC POSITION INFORMATION

Section: 11	Township: 26S	Range: 28E	
County: OSCEOLA	Quadrangle: LAKE TOHOPEKALIGA	Quad Index: 3412	NGS Source BM(s): Q 628, R 628
NAD83 Adj. Year: 2011	Vertical Datum: NAVD1988	Horizontal Datum: NAD1983	NGS PID(s): DI9141, DI9142
NAVD88 Elevation (feet): 76.601	NGVD29 Elevation (feet): 77.551	2022 Elevation:	NGS NAVD88 Elev (ft): 72.08, 68.78
NAVD88 Class:	NGVD29 Class:	Other Elevation:	NGS NAVD88 Elev (m): 21.971, 20.964
NAVD88 Order: 3RD	NGVD29 Order:	Other Elevation Type:	NGS 2022 Elev (ft):

CORPSCON 6.0.1 CONVERSION FACTOR (NAVD88 TO NGVD29): (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.)

Vertical Datum Offset: + 0.95	Actual NGS Elevation or ngvd29.txt file:	OPUS Ortho Height: 23.341(m)	
Northing (Y) (feet): 1420910.646	Easting (X) (feet): 499890.496	Source of Latitude & Longitude: OPUS SOLUTION	
Latitude: 28 DD°	14 MM'	30.31541 SS"	Longitude: 81 DD° 29 MM' 7.35515 SS"
Latitude (Decimal Degrees): 28.24175428			Longitude (Decimal Degrees): -81.48537643

RECOVERY DATA

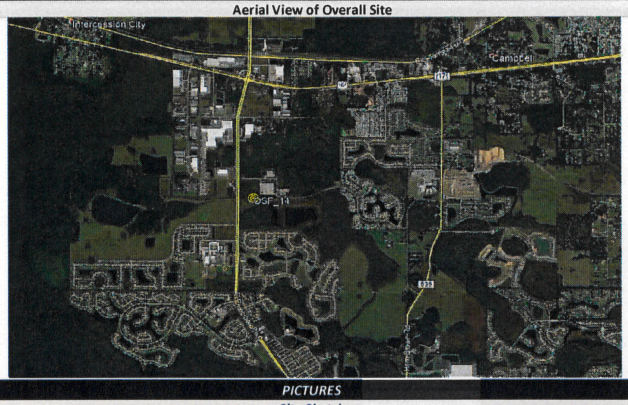
How to Reach:	FROM THE PHYSICAL INTERSECTION OF S POINCIANA BLVD AND S ORANGE BLOSSOM TRAIL, GO SOUTH ALONG S POINCIANA BLVD FOR 0.8 OF A MILE TO THE INTERSECTION OF MERCANTILE LN AND S POINCIANA BLVD, PROCEED EAST ALONG MERCANTILE LN FOR 0.17 OF A MILE TO THE FIRST ASPHALT DRIVE ON THE SOUTH SIDE OF MERCANTILE LN, THENCE PROCEED SOUTH APPROXIMATELY 190 FEET TO A CHAINLINK GATE, FROM THE GATE PUSH ON WEST INTO THE VEGETATION APPROXIMATELY 50 FEET TO THE BEGINGING OF A FOOT PATH, THENCE ADVANCE SOUTH ALONG SAID PATH FOR APPROXIMATELY 725 FEET TO THE MARK. BENCHMARK OSF 14 IS A SFWMD DISK SET IN A 1 1/2 INCH PIPE WITH A 10 INCH CONCRETE COLLAR 24 FEET SOUTHWEST OF AN 8 INCH SWEET GUM TREE, 11 FEET NORTHEAST OF A BARBEDWIRE FENCE POST AND 4 FEET NORTH OF SAID BARBEDWIRE FENCE.
Description/Notes:	

Notable Landmarks:

Other Source Benchmarks:

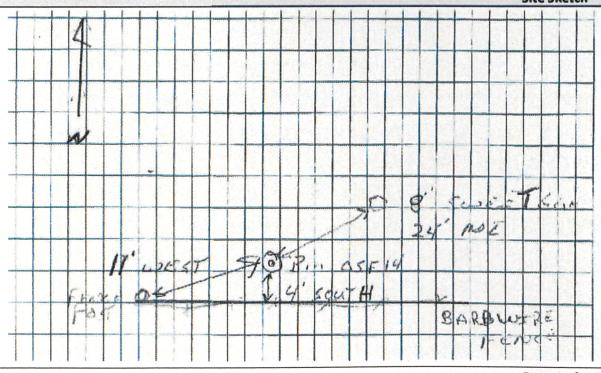
PICTURES

Aerial View of Overall Site



PICTURES

Site Sketch



Haywood, Joshua

From: opus <opus@ngs.noaa.gov>
Sent: Monday, August 24, 2020 1:12 PM
To: Haywood, Joshua
Subject: OPUS solution : 33322271.20o OP1598289018123

FILE: 33322271.20o OP1598289018123

NGS OPUS SOLUTION REPORT
==========

All computed coordinate accuracies are listed as peak-to-peak values.
For additional information:
https://can01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.ngs.noaa.gov%2FOPUS%2Fabout.jsp%23accuracy&data=02%7C01%7Cjosh.haywood%40t2ue.com%7Cd1df5ef91f564f44cb4c08d84850df60%7Ce64791d699864645a1a068c1175eda41%7C1%7C0%7C637338859475333895&sdata=rx6B3yZiJjQlvlYfLsdO3CRmJx2tyyqdeXZbwWl9P2M%3D&reserved=0

USER: josh.haywood@t2ue.com DATE: August 24, 2020
RINEX FILE: 3332227m.20o TIME: 17:12:14 UTC

SOFTWARE: page5 1801.18 master93.pl 160321 START: 2020/08/14 12:02:00
EPHEMERIS: igr21185.eph [rapid] STOP: 2020/08/14 17:11:00
NAV FILE: brdc2270.20n OBS USED: 12072 / 13216 : 91%
ANT NAME: TRMR8S NONE # FIXED AMB: 76 / 86 : 88%
ARP HEIGHT: 2.000 OVERALL RMS: 0.019(m)

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) ITRF2014 (EPOCH:2020.6191)

X:	832564.762(m)	0.011(m)	832563.920(m)	0.011(m)
Y:	-5561111.254(m)	0.015(m)	-5561109.694(m)	0.015(m)
Z:	3000132.152(m)	0.004(m)	3000131.992(m)	0.004(m)

LAT:	28 14 30.31541	0.007(m)	28 14 30.33647	0.007(m)
E LON:	278 30 52.64485	0.011(m)	278 30 52.62275	0.011(m)
W LON:	81 29 7.35515	0.011(m)	81 29 7.37725	0.011(m)
EL HGT:	-4.338(m)	0.015(m)	-5.883(m)	0.015(m)
ORTHO HGT:	23.341(m)	0.053(m)	[NAVD88 (Computed using GEOID18)]	

	UTM COORDINATES (UTM (Zone 17))	STATE PLANE COORDINATES (SPC (0901 FL E))
Northing (Y) [meters]	3124078.643	433094.431
Easting (X) [meters]	452383.180	152366.928
Convergence [degrees]	-0.22968056	-0.22968056
Point Scale	0.99962798	0.99996917
Combined Factor	0.99962866	0.99996985

US NATIONAL GRID DESIGNATOR: 17RMM5238324078(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
DF5773	ORMD ORMOND BEACH CORS ARP	N291753.469	W0810632.013	122720.5
DQ7965	FLWE WEDGEFIELD FL CORS ARP	N282626.477	W0810533.176	44380.1
DG9757	DLND DELAND CORS ARP	N290322.897	W0811547.480	92858.4

NEAREST NGS PUBLISHED CONTROL POINT

AK5370	J 354	N281517.000	W0812837.000	1658.4

BASE STATION INFORMATION

STATION NAME: ormd a 2 (Ormond Beach; Ormond Beach, Florida, U.S.A.)
MONUMENT: 49527S001

XYZ	860375.6967	-5499831.8460	3102756.7698	MON @ 2010.0000 (M)
XYZ	-0.0118	-0.0002	0.0022	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	0.0001	-0.0008	0.1242	ARP TO L1 PHASE CENTER (M)
NEU	-0.0000	-0.0008	0.1337	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1252	-0.0021	0.0235	VEL TIMES 10.6193 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	0.0160	-0.1071	0.0609	ARP TO L1 PHASE CENTER
XYZ	860375.5875	-5499831.9552	3102756.8542	L1 PHS CEN @ 2020.6191
XYZ	0.0000	-0.0000	0.0000	+ XYZ ADJUSTMENTS

XYZ 860375.5875 -5499831.9552 3102756.8542 NEW L1 PHS CEN @ 2020.6191
XYZ 860375.5715 -5499831.8481 3102756.7933 NEW ARP @ 2020.6191
XYZ 860375.5715 -5499831.8481 3102756.7933 NEW MON @ 2020.6191
LLH 29 17 53.49195 278 53 27.96469 -19.7389 NEW L1 PHS CEN @ 2020.6191
LLH 29 17 53.49195 278 53 27.96472 -19.8632 NEW ARP @ 2020.6191
LLH 29 17 53.49195 278 53 27.96472 -19.8632 NEW MON @ 2020.6191

STATION NAME: flwe a 1 (Wedgefield FL; Wedgefield, Florida USA)
MONUMENT: NO DOMES NUMBER
XYZ 869051.4451 -5544931.6701 3019536.5503 MON @ 2010.0000 (M)
XYZ -0.0120 -0.0006 0.0021 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU 0.0014 -0.0002 0.0880 ARP TO L1 PHASE CENTER (M)
NEU 0.0006 0.0002 0.0812 ARP TO L2 PHASE CENTER (M)
XYZ -0.1274 -0.0064 0.0223 VEL TIMES 10.6193 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0116 -0.0759 0.0432 ARP TO L1 PHASE CENTER
XYZ 869051.3293 -5544931.7523 3019536.6158 L1 PHS CEN @ 2020.6191
XYZ 0.0000 0.0000 0.0000 + XYZ ADJUSTMENTS
XYZ 869051.3293 -5544931.7523 3019536.6158 NEW L1 PHS CEN @ 2020.6191
XYZ 869051.3177 -5544931.6765 3019536.5726 NEW ARP @ 2020.6191
XYZ 869051.3177 -5544931.6765 3019536.5726 NEW MON @ 2020.6191
LLH 28 26 26.49884 278 54 26.80195 -4.9993 NEW L1 PHS CEN @ 2020.6191
LLH 28 26 26.49880 278 54 26.80196 -5.0873 NEW ARP @ 2020.6191
LLH 28 26 26.49880 278 54 26.80196 -5.0873 NEW MON @ 2020.6191

STATION NAME: dlnd a 3 (DELAND; Deland, Florida, U.S.A.)
MONUMENT: NO DOMES NUMBER
XYZ 847548.9489 -5515060.4257 3079363.2140 MON @ 2010.0000 (M)
XYZ -0.0120 0.0012 0.0015 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU 0.0001 -0.0008 0.1242 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 -0.0008 0.1337 ARP TO L2 PHASE CENTER (M)
XYZ -0.1279 0.0127 0.0162 VEL TIMES 10.6193 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0157 -0.1074 0.0605 ARP TO L1 PHASE CENTER
XYZ 847548.8368 -5515060.5204 3079363.2907 L1 PHS CEN @ 2020.6191
XYZ 0.0000 -0.0000 -0.0000 + XYZ ADJUSTMENTS
XYZ 847548.8368 -5515060.5204 3079363.2907 NEW L1 PHS CEN @ 2020.6191
XYZ 847548.8211 -5515060.4130 3079363.2302 NEW ARP @ 2020.6191
XYZ 847548.8211 -5515060.4130 3079363.2302 NEW MON @ 2020.6191
LLH 29 3 22.91916 278 44 12.49708 -1.1443 NEW L1 PHS CEN @ 2020.6191
LLH 29 3 22.91915 278 44 12.49711 -1.2685 NEW ARP @ 2020.6191
LLH 29 3 22.91915 278 44 12.49711 -1.2685 NEW MON @ 2020.6191

REMOTE STATION INFORMATION

STATION NAME: 3332 1
MONUMENT: NO DOMES NUMBER
XYZ 832563.6929 -5561109.8956 3000131.9781 MON @ 2020.6189 (M)
NEU -0.0012 0.0011 2.0000 MON TO ARP (M)
NEU 0.0012 -0.0011 0.0827 ARP TO L1 PHASE CENTER (M)
NEU -0.0003 -0.0009 0.0713 ARP TO L2 PHASE CENTER (M)
XYZ 0.2621 -1.7429 0.9453 MON TO ARP
XYZ 0.0096 -0.0716 0.0402 ARP TO L1 PHASE CENTER
XYZ 832563.9646 -5561111.7102 3000132.9636 L1 PHS CEN @ 2020.6191

BASELINE NAME: ormd 3332
XYZ 0.2320 0.2046 0.0165 + XYZ ADJUSTMENTS
XYZ 832564.1966 -5561111.5056 3000132.9801 NEW L1 PHS CEN @ 2020.6191
XYZ 832564.1870 -5561111.4339 3000132.9400 NEW ARP @ 2020.6191
XYZ 832563.9249 -5561109.6910 3000131.9946 NEW MON @ 2020.6191
LLH 28 14 30.33658 278 30 52.62296 -3.8012 NEW L1 PHS CEN @ 2020.6191
LLH 28 14 30.33654 278 30 52.62300 -3.8838 NEW ARP @ 2020.6191
LLH 28 14 30.33658 278 30 52.62296 -5.8839 NEW MON @ 2020.6191

BASELINE NAME: flwe 3332
XYZ 0.2211 0.2074 0.0123 + XYZ ADJUSTMENTS
XYZ 832564.1857 -5561111.5028 3000132.9759 NEW L1 PHS CEN @ 2020.6191
XYZ 832564.1761 -5561111.4311 3000132.9357 NEW ARP @ 2020.6191
XYZ 832563.9140 -5561109.6882 3000131.9904 NEW MON @ 2020.6191
LLH 28 14 30.33652 278 30 52.62257 -3.8070 NEW L1 PHS CEN @ 2020.6191
LLH 28 14 30.33648 278 30 52.62262 -3.8897 NEW ARP @ 2020.6191
LLH 28 14 30.33652 278 30 52.62257 -5.8897 NEW MON @ 2020.6191

BASELINE NAME: dlnd 3332
XYZ 0.2285 0.1923 0.0144 + XYZ ADJUSTMENTS
XYZ 832564.1930 -5561111.5178 3000132.9780 NEW L1 PHS CEN @ 2020.6191
XYZ 832564.1834 -5561111.4462 3000132.9378 NEW ARP @ 2020.6191
XYZ 832563.9214 -5561109.7033 3000131.9925 NEW MON @ 2020.6191
LLH 28 14 30.33634 278 30 52.62276 -3.7919 NEW L1 PHS CEN @ 2020.6191
LLH 28 14 30.33630 278 30 52.62280 -3.8746 NEW ARP @ 2020.6191
LLH 28 14 30.33634 278 30 52.62276 -5.8746 NEW MON @ 2020.6191

G-FILES

Axx2020 814 20 814
B2020 81412 1 20 8141711 1 page5 v1801.18IGS 132 1 2 27NGS 2020 824IFDDPX
IITRF2014_2118 IGS 20200809
C00090004 278116466 7 612778429 38 1026247987 20 X2270A3332X2270AORMD
D 1 2 -6531071 1 3 6843207 2 3 -8603692

Axx2020 814 20 814
B2020 81412 1 20 8141711 1 page5 v1801.18IGS 132 1 2 27NGS 2020 824IFDDPX
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Axx2020 814 20 814
B2020 81412 1 20 8141711 1 page5 v1801.18IGS 132 1 2 27NGS 2020 824IFDDPX
IITRF2014_2118 IGS 20200809
C00090003 149848997 7 460492903 33 792312377 17 X2270A3332X2270ADLND
D 1 2 -7066333 1 3 6761160 2 3 -8740469

POST-FIT RMS BY SATELLITE VS. BASELINE

```
      OVERALL   01   02   03   05   06   07   09   11
ormd-3332| 0.021 0.027 0.019 0.024 0.025 0.018 0.032 0.037   ...
        12   13   17   19   22   24   25   28   29
ormd-3332| 0.024   ... 0.013   ... 0.031 0.025 0.020 0.015   ...
        30
ormd-3332| 0.020

      OVERALL   01   02   03   05   06   07   09   11
flwe-3332| 0.018 0.023 0.016 0.027 0.017 0.013 0.016 0.026 0.020
        12   13   17   19   22   24   25   28   29
flwe-3332| 0.019   ... 0.014   ... 0.024 0.024 0.026 0.015   ...
        30
flwe-3332| 0.014

      OVERALL   01   02   03   05   06   07   09   11
dlnd-3332| 0.018 0.022 0.017 0.024 0.019 0.014 0.020 0.029 0.032
        12   13   17   19   22   24   25   28   29
dlnd-3332| 0.023   ... 0.012   ... 0.030 0.030 0.023 0.012   ...
        30
dlnd-3332| 0.014
```

OBS BY SATELLITE VS. BASELINE

```
      OVERALL   01   02   03   05   06   07   09   11
ormd-3332| 3835   117   494   275   260   608   94   99   ...
        12   13   17   19   22   24   25   28   29
ormd-3332|  312   ...   557   ...   157   67   141   439   ...
        30
ormd-3332|  215
      OVERALL   01   02   03   05   06   07   09   11
flwe-3332| 4198   143   494   306   288   608   94   173   26
        12   13   17   19   22   24   25   28   29
flwe-3332|  312   ...   604   ...   132   195   138   470   ...
        30
flwe-3332|  215
      OVERALL   01   02   03   05   06   07   09   11
dlnd-3332| 4039   146   494   302   274   608   90   103   26
        12   13   17   19   22   24   25   28   29
dlnd-3332|  287   ...   606   ...   142   174   128   449   ...
        30
dlnd-3332|  210
```

ITRF position of 3332 as determined by individual baselines

	X	Y	Z
ormd	832563.925	-5561109.691	3000131.995
flwe	832563.914	-5561109.688	3000131.990
dlnd	832563.921	-5561109.703	3000131.993

Residuals of position determined by individual baselines from the final position

	X	Y	Z	East	North	Up	
ormd	0.005	0.003	0.002	0.005	0.003	-0.001	
flwe	-0.006	0.006	-0.002	-0.005	0.001	-0.007	
dlnd	0.001	-0.009	0.000	-0.000	-0.004	0.008	

Covariance Matrix for the xyz OPUS Position (meters^2).

0.0000003600	-0.0000000978	0.0000000517
-0.0000000978	0.0000083956	-0.0000003841
0.0000000517	-0.0000003841	0.0000021644

Covariance Matrix for the enu OPUS Position (meters^2).

0.0000005075	0.0000005048	-0.0000009584

0.0000005048 0.0000031906 -0.0000023108
-0.0000009584 -0.0000023108 0.0000072219

Horizontal network accuracy = 0.00361 meters.
Vertical network accuracy = 0.00527 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD_83(2011)(EPOCH:2010.0000).

	Xa(m)	Ya(m)	Za(m)	
ORMD	860376.41709	-5499833.40048	3102756.94186	2010.00
FLWE	869052.16310	-5544933.23543	3019536.72788	2010.00
DLND	847549.66841	-5515061.98181	3079363.38792	2010.00

Position of reference station monument in NAD_83(2011)(EPOCH:2010.0000).

	Xr(m)	Yr(m)	Zr(m)	
ORMD	860376.41709	-5499833.40048	3102756.94186	2010.00
FLWE	869052.16310	-5544933.23543	3019536.72788	2010.00
DLND	847549.66841	-5515061.98181	3079363.38792	2010.00

Velocity of reference station monument in NAD_83(2011)(EPOCH:2010.0000).

	Vx (m/yr)	Vy (m/yr)	Vz (m/yr)
ORMD	0.00169	0.00081	-0.00084
FLWE	0.00120	0.00039	-0.00096
DLND	0.00141	0.00220	-0.00149

Vectors from unknown station monument to reference station monument
in NAD_83(2011)(EPOCH:2010.0000).

	Xr-X= DX(m)	Yr-Y= DY(m)	Zr-Z= DZ(m)	
ORMD	27811.65509	61277.85352	102624.78986	2010.00
FLWE	36487.40110	16178.01857	19404.57588	2010.00
DLND	14984.90641	46049.27219	79231.23592	2010.00

STATE PLANE COORDINATES - U.S. Survey Foot
SPC (0901 FL E)
Northing (Y) [feet] 1420910.646
Easting (X) [feet] 499890.496
Convergence [degrees] -0.22968056
Point Scale 0.99996917
Combined Factor 0.99996985

********** New Reference Frame Preview **********

We are replacing the nation's NAD 83 and NAVD 88 datums, to improve access and accuracy of the National Spatial Reference System. More at https://can01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fgeodesy.noaa.gov%2Fdatums%2Fnewdatums%2F&data=02%7C01%7Cjosh.haywood%40t2ue.com%7Cd1df5ef91f564f44cb4c08d84850df60%7Ce64791d699864645a1a068c1175eda41%7C1%7C0%7C637338859475333895&sdata=3RGmHLNFMHOnNgEzxmmiTRmRbdg%2F45lmv8yDbKV9vnA%3D&reserved=0

Below are approximate coordinates for this solution in the new frames:

APPROX ORTHO HGT: 23.315 (m) [PROTOTYPE (Computed using xGeoid19B,GRS80,ITRF2014)]

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

```
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390...+0000000000000004 391.27+0000000000000001
*110002+0000000000000002 32...7+0000000000325945 332.27+0000000000049972
390...+0000000000000003 391.27+0000000000000000
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390...+0000000000000004 391.27+0000000000000002
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Project File Data		Coordinate System	
Name:	J:\2017\171204.05 - SFWMD USGS Phase 4 Wells\TBC\OSF 14.vce	Name:	Default
Size:	54 KB	Datum:	WGS 1984
Modified:	8/12/2020 1:57:28 PM (UTC:-4)	Zone:	Default
Time zone:	Eastern Standard Time	Geoid:	
Reference number:		Vertical datum:	
Description:		Calibrated site:	
Comment 1:			
Comment 2:			
Comment 3:			

Level Report

Imported file: M_171204.05ED8620B.GSI
Instrument:
Creation option: Delta elevations
Description usage: Feature codes

Run - 0002 Raw Observations

Standard error per kilometer of double leveling: 0.00230 ft
Standard error per turn/station setup: 0.00000 ft
Raw Misclosure: 0.01376 ft
Σ BS Distances: 9348.250 ft
Σ FS Distances: 9272.731 ft
Run Length: 18620.981 ft
Reduction: Adjusted Values

Create	Point ID	BS	HI	IS	FS	Δ Elevation	Raw Elevation	Correction	Adj. Elevation	Type	Distance	Description
✓	Q628	✓ 5.67139 ft	77.75124 ft			0.00000 ft	72.07986 ft	0.00000 ft	72.07986 ft	Benchmark	15.193 ft	
✓	TP1				✓ 5.10829 ft	0.56310 ft	72.64295 ft	-0.00003 ft	72.64293 ft	Computed	21.503 ft	
	TP1	✓ 4.24409 ft	76.88705 ft								342.474 ft	
✓	TP2				✓ 5.90219 ft	-1.65810 ft	70.98486 ft	-0.00054 ft	70.98432 ft	Computed	348.273 ft	
	TP2	✓ 4.94869 ft	75.93355 ft								348.647 ft	
✓	TP3				✓ 3.73089 ft	1.21780 ft	72.20266 ft	-0.00105 ft	72.20160 ft	Computed	350.098 ft	
	TP3	✓ 5.30139 ft	77.50404 ft								348.147 ft	
✓	TP4				✓ 6.28309 ft	-0.98170 ft	71.22096 ft	-0.00157 ft	71.21939 ft	Computed	350.342 ft	
	TP4	✓ 8.60708 ft	79.82804 ft								348.487 ft	
✓	TP5				✓ 2.78299 ft	5.82409 ft	77.04505 ft	-0.00208 ft	77.04296 ft	Computed	346.278 ft	
	TP5	✓ 5.48769 ft	82.53273 ft								348.318 ft	
✓	TP6				✓ 6.10169 ft	-0.61400 ft	76.43105 ft	-0.00259 ft	76.42845 ft	Computed	342.172 ft	
	TP6	✓ 4.98469 ft	81.41574 ft								353.025 ft	
✓	A1				✓ 7.42749 ft	-2.44280 ft	73.98825 ft	-0.00307 ft	73.98518 ft	Computed	293.410 ft	
	A1	✓ 7.74988 ft	81.73814 ft								346.543 ft	
✓	TP7				✓ 6.22799 ft	1.52190 ft	75.51015 ft	-0.00358 ft	75.50657 ft	Computed	336.277 ft	
	TP7	✓ 5.40069 ft	80.91084 ft								357.879 ft	
✓	TP8				✓ 5.38059 ft	0.02010 ft	75.53025 ft	-0.00409 ft	75.52615 ft	Computed	342.486 ft	
	TP8	✓ 6.75229 ft	82.28254 ft								334.525 ft	
✓	TP9				✓ 4.62079 ft	2.13150 ft	77.66174 ft	-0.00460 ft	77.65715 ft	Computed	348.944 ft	
	TP9	✓ 6.83979 ft	84.50153 ft								346.147 ft	
✓	TP10				✓ 5.89109 ft	0.94870 ft	78.61044 ft	-0.00511 ft	78.60533 ft	Computed	347.266 ft	
	TP10	✓ 6.08119 ft	84.69163 ft								347.617 ft	
✓	TP11				✓ 4.43449 ft	1.64670 ft	80.25714 ft	-0.00563 ft	80.25151 ft	Computed	347.683 ft	
	TP11	✓ 6.27089 ft	86.52803 ft								326.273 ft	
✓	TP12				✓ 6.59689 ft	-0.32600 ft	79.93114 ft	-0.00610 ft	79.92504 ft	Computed	314.061 ft	
	TP12	✓ 2.17230 ft	82.10344 ft								298.836 ft	
✓	TP13				✓ 5.13209 ft	-2.95979 ft	76.97135 ft	-0.00654 ft	76.96481 ft	Computed	294.687 ft	
	TP13	✓ 5.01529 ft	81.98664 ft								304.622 ft	
✓	TP14				✓ 4.76059 ft	0.25470 ft	77.22605 ft	-0.00697 ft	77.21907 ft	Computed	282.456 ft	
	TP14	✓ 3.80029 ft	81.02634 ft								126.483 ft	
✓	TP15				✓ 3.21079 ft	0.58950 ft	77.81554 ft	-0.00714 ft	77.80840 ft	Computed	104.781 ft	
	TP15	✓ 2.40530 ft	80.22084 ft								116.711 ft	
✓	TP16				✓ 3.63409 ft	-1.22880 ft	76.58675 ft	-0.00729 ft	76.57946 ft	Computed	80.872 ft	
	TP16	✓ 4.78819 ft	81.37494 ft								82.592 ft	
✓	TP17				✓ 4.62889 ft	0.15930 ft	76.74605 ft	-0.00741 ft	76.73864 ft	Computed	78.080 ft	
	TP17	✓ 4.74569 ft	81.49174 ft								98.357 ft	
✓	TP18				✓ 4.64789 ft	0.09780 ft	76.84385 ft	-0.00754 ft	76.83631 ft	Computed	76.466 ft	
	TP18	✓ 5.16459 ft	82.00844 ft								59.445 ft	
✓	TP19				✓ 4.80049 ft	0.36410 ft	77.20795 ft	-0.00764 ft	77.20031 ft	Computed	74.954 ft	
	TP19	✓ 4.84899 ft	82.05694 ft								71.748 ft	
✓	TOP OF WELL				✓ 4.27789 ft	0.57110 ft	77.77904 ft	-0.00772 ft	77.77133 ft	Computed	39.617 ft	
	TOP OF WELL	✓ 4.08329 ft	81.86234 ft								39.995 ft	

✓	BM OSF14				✓ 5.25369 ft	-1.17040 ft	76.60865 ft	-0.00779 ft	76.60085 ft	Computed	59.836 ft	
	BM OSF14	✓ 5.28299 ft	81.89164 ft								59.767 ft	
✓	TP19B				✓ 4.68339 ft	0.59960 ft	77.20825 ft	-0.00789 ft	77.20036 ft	Computed	72.008 ft	
	TP19B	✓ 4.80419 ft	82.01244 ft								60.978 ft	
✓	TP18B				✓ 5.16959 ft	-0.36540 ft	76.84285 ft	-0.00799 ft	76.83486 ft	Computed	73.818 ft	
	TP18B	✓ 4.58279 ft	81.42564 ft								76.599 ft	
✓	TP17B				✓ 4.68189 ft	-0.09910 ft	76.74375 ft	-0.00812 ft	76.73563 ft	Computed	98.654 ft	
	TP17B	✓ 4.63099 ft	81.37474 ft								124.790 ft	
✓	TP20				✓ 6.24659 ft	-1.61560 ft	75.12815 ft	-0.00830 ft	75.11985 ft	Computed	117.508 ft	
	TP20	✓ 5.12889 ft	80.25704 ft								42.991 ft	
✓	TP15B				✓ 2.44400 ft	2.68489 ft	77.81304 ft	-0.00838 ft	77.80466 ft	Computed	74.556 ft	
	TP15B	✓ 4.03339 ft	81.84644 ft								144.106 ft	
✓	TP21				✓ 5.01029 ft	-0.97690 ft	76.83615 ft	-0.00860 ft	76.82755 ft	Computed	146.233 ft	
	TP21	✓ 5.10259 ft	81.93874 ft								348.788 ft	
✓	TP22				✓ 3.48259 ft	1.62000 ft	78.45614 ft	-0.00910 ft	78.44705 ft	Computed	324.132 ft	
	TP22	✓ 7.27129 ft	85.72743 ft								348.409 ft	
✓	TP23				✓ 5.97499 ft	1.29630 ft	79.75244 ft	-0.00961 ft	79.74283 ft	Computed	348.915 ft	
	TP23	✓ 5.86529 ft	85.61773 ft								347.275 ft	
✓	TP24				✓ 7.75498 ft	-1.88970 ft	77.86274 ft	-0.01012 ft	77.85262 ft	Computed	345.524 ft	
	TP24	✓ 6.77409 ft	84.63683 ft								347.253 ft	
✓	TP25				✓ 6.72039 ft	0.05370 ft	77.91644 ft	-0.01064 ft	77.90581 ft	Computed	348.612 ft	
	TP25	✓ 4.73009 ft	82.64653 ft								349.403 ft	
✓	TP26				✓ 6.82939 ft	-2.09930 ft	75.81715 ft	-0.01115 ft	75.80599 ft	Computed	347.987 ft	
	TP26	✓ 4.95889 ft	80.77604 ft								349.671 ft	
✓	TP27				✓ 5.15659 ft	-0.19770 ft	75.61945 ft	-0.01167 ft	75.60778 ft	Computed	352.010 ft	
	TP27	✓ 6.72109 ft	82.34054 ft								333.893 ft	
✓	TP28				✓ 7.96068 ft	-1.23960 ft	74.37985 ft	-0.01217 ft	74.36768 ft	Computed	343.276 ft	
	TP28	✓ 5.44899 ft	79.82884 ft								190.403 ft	
✓	TP29				✓ 4.66459 ft	0.78440 ft	75.16425 ft	-0.01246 ft	75.15179 ft	Computed	199.194 ft	
	TP29	✓ 3.29619 ft	78.46044 ft								344.701 ft	
✓	TP30				✓ 6.15679 ft	-2.86059 ft	72.30366 ft	-0.01297 ft	72.29068 ft	Computed	347.207 ft	
	TP30	✓ 3.95089 ft	76.25455 ft								354.492 ft	
✓	TP31				✓ 6.53059 ft	-2.57969 ft	69.72396 ft	-0.01348 ft	69.71048 ft	Computed	336.961 ft	
	TP31	✓ 4.93579 ft	74.65975 ft								131.676 ft	
✓	TP32				✓ 4.69799 ft	0.23780 ft	69.96176 ft	-0.01370 ft	69.94806 ft	Computed	159.564 ft	
	TP32	✓ 5.16549 ft	75.12725 ft								30.992 ft	
✓	R628				✓ 6.33349 ft	-1.16800 ft	68.79376 ft	-0.01376 ft	68.78000 ft	Benchmark	56.030 ft	

Run - 0002 (N4) Reduced Observations

Observation	Status	Raw Δ Elevation	Correction	Final Δ Elevation	Setups	Length	Σ BS Readings	Σ FS Readings	Std. Error
Q628-TP1 (E43)	Enabled	0.56310 ft	-0.00003 ft	0.56307 ft	1	36.695 ft	5.67139 ft	5.10829 ft	0.00024 ft
TP1-TP2 (E44)	Enabled	-1.65810 ft	-0.00051 ft	-1.65861 ft	1	690.747 ft	4.24409 ft	5.90219 ft	0.00105 ft
TP2-TP3 (E45)	Enabled	1.21780 ft	-0.00052 ft	1.21728 ft	1	698.745 ft	4.94869 ft	3.73089 ft	0.00106 ft
TP3-TP4 (E46)	Enabled	-0.98170 ft	-0.00052 ft	-0.98221 ft	1	698.489 ft	5.30139 ft	6.28309 ft	0.00106 ft
TP4-TP5 (E47)	Enabled	5.82409 ft	-0.00051 ft	5.82357 ft	1	694.765 ft	8.60708 ft	2.78299 ft	0.00106 ft
TP5-TP6 (E48)	Enabled	-0.61400 ft	-0.00051 ft	-0.61451 ft	1	690.490 ft	5.48769 ft	6.10169 ft	0.00105 ft
TP6-A1 (E49)	Enabled	-2.44280 ft	-0.00048 ft	-2.44327 ft	1	646.435 ft	4.98469 ft	7.42749 ft	0.00102 ft
A1-TP7 (E50)	Enabled	1.52190 ft	-0.00050 ft	1.52139 ft	1	682.820 ft	7.74988 ft	6.22799 ft	0.00105 ft
TP7-TP8 (E51)	Enabled	0.02010 ft	-0.00052 ft	0.01958 ft	1	700.365 ft	5.40069 ft	5.38059 ft	0.00106 ft
TP8-TP9 (E52)	Enabled	2.13150 ft	-0.00051 ft	2.13099 ft	1	683.468 ft	6.75229 ft	4.62079 ft	0.00105 ft
TP9-TP10 (E53)	Enabled	0.94870 ft	-0.00051 ft	0.94819 ft	1	693.413 ft	6.83979 ft	5.89109 ft	0.00106 ft
TP10-TP11 (E54)	Enabled	1.64670 ft	-0.00051 ft	1.64618 ft	1	695.300 ft	6.08119 ft	4.43449 ft	0.00106 ft
TP11-TP12 (E55)	Enabled	-0.32600 ft	-0.00047 ft	-0.32647 ft	1	640.334 ft	6.27089 ft	6.59689 ft	0.00101 ft
TP12-TP13 (E56)	Enabled	-2.95979 ft	-0.00044 ft	-2.96023 ft	1	593.523 ft	2.17230 ft	5.13209 ft	0.00098 ft
TP13-TP14 (E57)	Enabled	0.25470 ft	-0.00043 ft	0.25427 ft	1	587.078 ft	5.01529 ft	4.76059 ft	0.00097 ft
TP14-TP15 (E58)	Enabled	0.58950 ft	-0.00017 ft	0.58933 ft	1	231.264 ft	3.80029 ft	3.21079 ft	0.00061 ft
TP15-TP16 (E59)	Enabled	-1.22880 ft	-0.00015 ft	-1.22894 ft	1	197.583 ft	2.40530 ft	3.63409 ft	0.00056 ft
TP16-TP17 (E60)	Enabled	0.15930 ft	-0.00012 ft	0.15918 ft	1	160.672 ft	4.78819 ft	4.62889 ft	0.00051 ft
TP17-TP18 (E61)	Enabled	0.09780 ft	-0.00013 ft	0.09767 ft	1	174.822 ft	4.74569 ft	4.64789 ft	0.00053 ft
TP18-TP19 (E62)	Enabled	0.36410 ft	-0.00010 ft	0.36400 ft	1	134.400 ft	5.16459 ft	4.80049 ft	0.00046 ft
TP19-TOP OF WELL (E63)	Enabled	0.57110 ft	-0.00008 ft	0.57102 ft	1	111.365 ft	4.84899 ft	4.27789 ft	0.00042 ft
TOP OF WELL-BM OSF14 (E64)	Enabled	-1.17040 ft	-0.00007 ft	-1.17047 ft	1	99.831 ft	4.08329 ft	5.25369 ft	0.00040 ft
BM OSF14-TP19B (E65)	Enabled	0.59960 ft	-0.00010 ft	0.59950 ft	1	131.775 ft	5.28299 ft	4.68339 ft	0.00046 ft
TP19B-TP18B (E66)	Enabled	-0.36540 ft	-0.00010 ft	-0.36550 ft	1	134.796 ft	4.80419 ft	5.16959 ft	0.00047 ft
TP18B-TP17B (E67)	Enabled	-0.09910 ft	-0.00013 ft	-0.09923 ft	1	175.253 ft	4.58279 ft	4.68189 ft	0.00053 ft
TP17B-TP20 (E68)	Enabled	-1.61560 ft	-0.00018 ft	-1.61578 ft	1	242.298 ft	4.63099 ft	6.24659 ft	0.00062 ft
TP20-TP15B (E69)	Enabled	2.68489 ft	-0.00009 ft	2.68481 ft	1	117.547 ft	5.12889 ft	2.44400 ft	0.00043 ft
TP15B-TP21 (E70)	Enabled	-0.97690 ft	-0.00021 ft	-0.97711 ft	1	290.339 ft	4.03339 ft	5.01029 ft	0.00068 ft
TP21-TP22 (E71)	Enabled	1.62000 ft	-0.00050 ft	1.61950 ft	1	672.920 ft	5.10259 ft	3.48259 ft	0.00104 ft
TP22-TP23 (E72)	Enabled	1.29630 ft	-0.00052 ft	1.29578 ft	1	697.324 ft	7.27129 ft	5.97499 ft	0.00106 ft
	Enabled	-1.88970 ft	-0.00051 ft	-1.89021 ft	1	692.799 ft	5.86529 ft	7.75498 ft	0.00106 ft

TP23-TP24 (E73)									
TP24-TP25 (E74)	Enabled	0.05370 ft	-0.00051 ft	0.05319 ft	1	695.865 ft	6.77409 ft	6.72039 ft	0.00106 ft
TP25-TP26 (E75)	Enabled	-2.09930 ft	-0.00052 ft	-2.09981 ft	1	697.390 ft	4.73009 ft	6.82939 ft	0.00106 ft
TP26-TP27 (E76)	Enabled	-0.19770 ft	-0.00052 ft	-0.19822 ft	1	701.681 ft	4.95889 ft	5.15659 ft	0.00106 ft
TP27-TP28 (E77)	Enabled	-1.23960 ft	-0.00050 ft	-1.24010 ft	1	677.168 ft	6.72109 ft	7.96068 ft	0.00104 ft
TP28-TP29 (E78)	Enabled	0.78440 ft	-0.00029 ft	0.78411 ft	1	389.597 ft	5.44899 ft	4.66459 ft	0.00079 ft
TP29-TP30 (E79)	Enabled	-2.86059 ft	-0.00051 ft	-2.86111 ft	1	691.908 ft	3.29619 ft	6.15679 ft	0.00105 ft
TP30-TP31 (E80)	Enabled	-2.57969 ft	-0.00051 ft	-2.58021 ft	1	691.454 ft	3.95089 ft	6.53059 ft	0.00105 ft
TP31-TP32 (E81)	Enabled	0.23780 ft	-0.00022 ft	0.23758 ft	1	291.240 ft	4.93579 ft	4.69799 ft	0.00068 ft
TP32-R628 (E82)	Enabled	-1.16800 ft	-0.00006 ft	-1.16806 ft	1	87.022 ft	5.16549 ft	6.33349 ft	0.00037 ft

Run - 0002 (N4) Reduced Coordinates

Point ID	Status	Elevation
Q628	Enabled	72.07986 ft
R628	Enabled	68.78000 ft

Office

Project

13 August 2020

INPUT	OUTPUT
State Plane, NAD83	State Plane, NAD83
0901 - Florida East, U.S. Feet	0901 - Florida East, U.S. Feet
Vertical - NAVD88, U.S. Feet	Vertical - NGVD29 (Vertcon94), U.S. Feet

OSF-14-BENCHMARK

1/1

Northing/Y:	1420910.680	**Northing/Y:**	1420910.680
Easting/X:	499890.514	**Easting/X:**	499890.514
Elevation/Z:	76.60	**Elevation/Z:**	77.548
Convergence:	-0 13 46.85153	**Convergence:**	-0 13 46.85153
Scale Factor:	0.999969169	**Scale Factor:**	0.999969169
Combined Factor:	0.999969842	**Combined Factor:**	0.999969797

Grid Shift (U.S. ft.): X/Easting = 0.0, Y/Northing = 0.0

Remark: