Surveyor's Report

Orange, Osceola & Everglades Wells

NMI Project No. 1078.008

Report Date: November 7th, 2007

Submittal: Two of Two

(Update S65AMW)

Prepared for:

South Florida Water Management District

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OVERVIEW OF THE PROJECT

PURPOSE

The purpose of the Orange, Osceola & Everglades Wells Project is to establish vertical control marks near each monitoring well. The monitoring wells are divided into two groups. The first group is located in Orange and Osceola Counties. They are near established benchmarks which enabled us to utilize standard level runs to determine the elevations on those wells. The second group is located in remote areas of the Everglades. The remoteness of these wells meant that GPS observations were the only way to establish elevations on them. Also, due to the terrain, the Everglades sites were only accessible by helicopter.

The first group of wells in this project also further tests the application of Federal Geodetic Control Subcommittee (FGCS) Second-Order, Class II leveling procedures with Third-Order equipment. The goal of this hybrid pairing of procedures and equipment is to produce leveling measurements that will be acceptable to the National Geodetic Survey (NGS) and used in future vertical adjustments throughout the District.

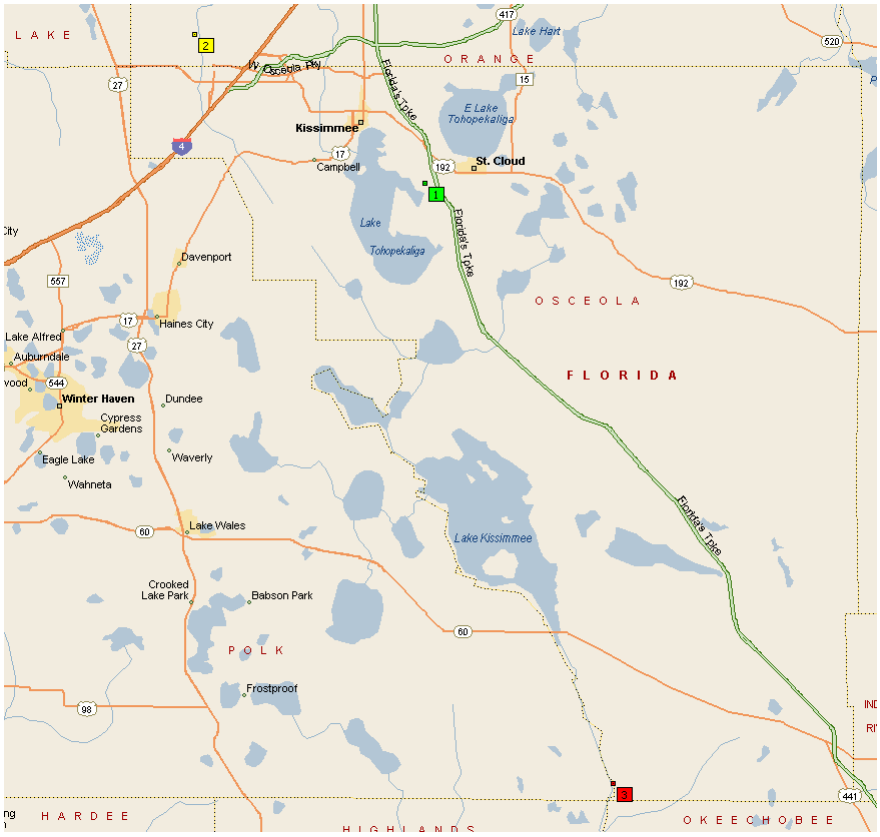
This project utilizes uncalibrated "off-the-shelf" fiberglass level rods. Such rods are not currently approved by NGS for precise leveling (Second-Order Class II and above) for three primary reasons:

1. The fiberglass material used to construct the rods is less dimensionally stable than rods constructed of Invar metal.
2. The fiberglass rods are not individually calibrated by the manufacturer to identify scale errors across the length of the rod.
3. The fiberglass rods are a three-section snap-together style that will, over time, wear at the connection points creating error in measurements on the top two sections.

While these limitations make the rods unsuitable for the extreme precision required in First-Order and Second-Order, Class I leveling, it is the hypothesis of this project that such rods can deliver Second-Order, Class II precisions. Fiberglass rods are commonly used by surveyors today. In contrast, Invar level rods are expensive and specialized equipment only used by surveyors working on the highest precision vertical control surveys. By demonstrating that fiberglass level rods such as those used in this project are suitable for Second-Order, Class II leveling the District will benefit from the increased number of consultants using these rods. As a result, more level lines run within the District should meet NGS's requirements for inclusion in future vertical adjustments, further refining the elevation models used for water control.

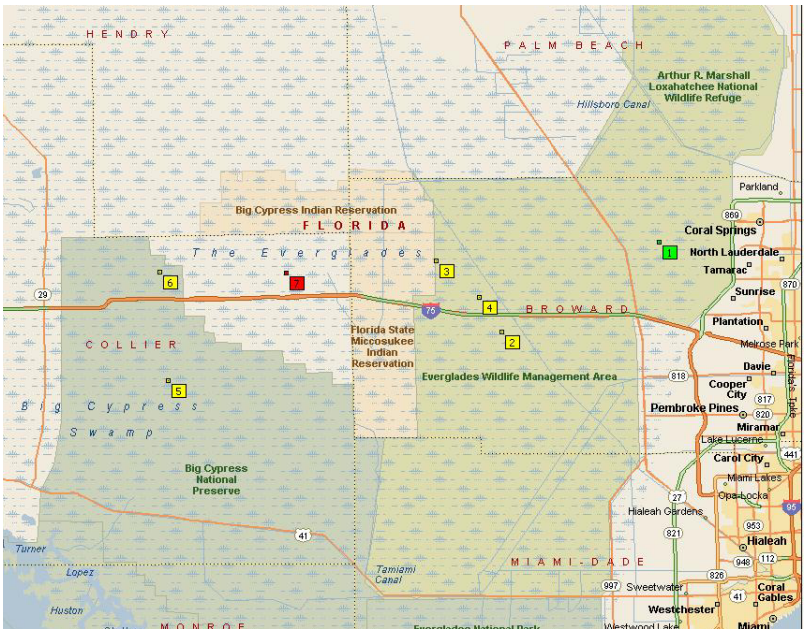
LOCATION OF PROJECT

The project is located in Orange and Osceola Counties. Following is a map and legend.



1. C31GFS
2. REDYCK
3. S65AMW

The remainder of the project is located in the Everglades.
Following is a map and legend of that area:



1. 2A300
2. 3A09
3. 3A11
4. 3A12
5. BCA16
6. BCA17
7. BCA18

ITEMS DELIVERED TO THE CLIENT

The following items are delivered to the client with this report. Neither the report nor the items listed below are complete without the other.

1. Paper and electronic copy of field notes
2. Paper and electronic copy of all computation sheets
3. CORPSMET file for each site
4. Paper and electronic copy of site photographs
5. Paper copy of South Florida Water Management District Benchmark Description
6. Paper and electronic copy of NGS Blue Book submittal

VERTICAL DATUM FOR THE PROJECT

The vertical datum for the project is the North American Vertical Datum of 1988. For correlation with older data sets, the elevations of the benchmarks are also shown in the National Geodetic Vertical Datum (NGVD) of 1929. The NGVD 29 elevations were derived using data provided by the South Florida Water Management District in a file named "NGVD29.ABS" when applicable, otherwise NGS superseded values were used. The linear unit for all elevations is the meter unless otherwise stated.

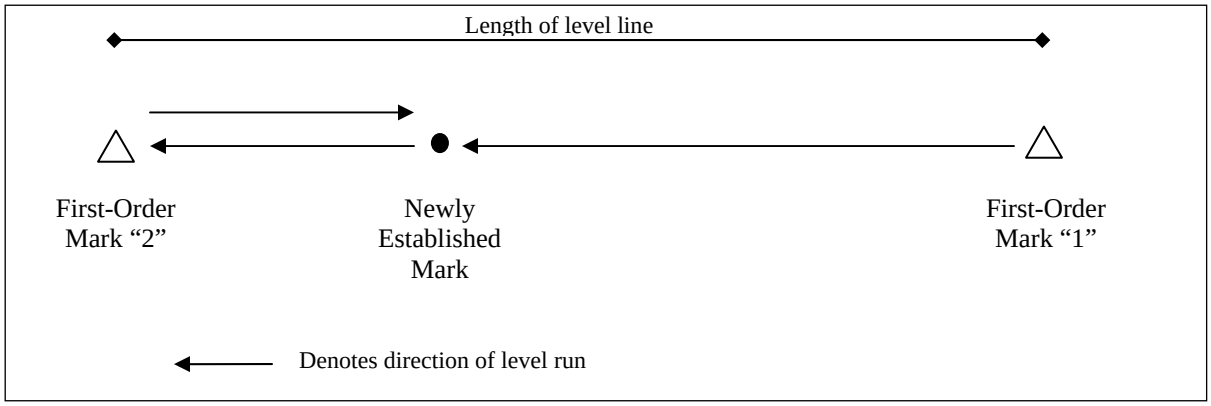
LEVELING METHODS

CONFIGURATION OF LEVEL RUNS

The leveling for the project was performed in accordance with the Federal Geodetic Control Subcommittee standard for Second-Order, Class II geodetic leveling. A brief description of the procedures used follows.

For each level line, two existing First or Second Order vertical marks were used. The run was started at one of the First or Second Order marks and continued through the newly established mark near the structure and closed on the second First or Second Order vertical mark. The run was then looped back from the second First or Second Order mark to the newly established mark (see Figure 1 below).

Figure 1 Typical Level Run Pattern



The FGCS maximum allowable misclosure for this type of run is eight millimeters multiplied by the length of the line in kilometers.

EQUIPMENT USED

All leveling during the project was performed with a Leica DNA03 digital level and Leica three-section, fiberglass bar-code level rods. Information and technical specification for the Leica DNA03 digital level are available at http://www.leica-geosystems.com.

GPS METHODS

INTRODUCTION

Due to the remote locations of the monuments located in the Everglades, it was decided that GPS observations were the only way to find elevation data on them. It was also determined that the most efficient mode of travel would be by helicopter.

The GPS observations for the project were performed in accordance with the Guidelines for Establishing GPS-Derived Ellipsoidal Heights (National Geodetic Survey Technical Memorandum NOS NGS-58).

GPS observations were conducted over three days:

- Tuesday, July 18th, 2006
- Wednesday, July 19th, 2006
- Thursday, July 27th, 2006

The following instrumentation was used for the GPS observations:

(1) Trimble 4800 receiver/antennas
(2) Trimble 5800 receiver/antenna
(2) Trimble R8 receiver/antennas

DATA PROCESSING

Data Acquisition

Data was downloaded from receivers to a desktop computer through the Trimble Geomatics Office software, version 1.63 (TGO).

Data Quality

The quality of the data was checked using the Timeline feature in the TGO software. Areas of the data that showed cycle slips were disabled. Due to minor problems with baseline processing, the Signal-to-Noise Ratio (SNR) was investigated for each satellite during each observation. Areas of data that had high SNR were removed before processing the baselines.

Baseline Processing

Baselines were processed using TGO. For each session, (n-1) baselines were selected that produced fixed integer solutions with the lowest possible RMS values.

Adjustment

The ADJUST software package from NGS was used for the network adjustment. The B-file, G-file and Serfil were exported from TGO. Initial positions and ellipsoidal heights of new marks were supplied in the creation of the B-file. Both the B-file and G-file were checked using the file-checking utilities that are a part of the ADJUST software package. The B-file was edited to conform to the structure and data content necessary to remove any errors found in the file-checking utilities. This included using NAVD88 as the vertical datum and GEOID03 for the geoid.

After all files were checked and found to be satisfactory, a minimally-constrained adjustment was performed with no weighting applied. The ellipsoid and orthometric heights of the non-fixed control points were then checked against their published values. When these heights did not correlate well with the published values, they were removed from the adjustment. This was the case with the NGS benchmark FCE 3932.

Using the standard deviation of unit weight from the first minimally-constrained adjustment, standard errors were scaled using the MODGEE program. A second minimally-constrained adjustment was performed with satisfactory results.

For the constrained horizontal adjustment, the published horizontal position and orthometric height for the control stations were fixed. The modified G-file, using the scaled standard errors, was used for this adjustment. The network adjustment was performed and no major shifts in position were found.

A minimally-constrained vertical adjustment was performed, with the horizontal position and orthometric height of a single control station being fixed. Again, the scaled G-file was used for this vertical adjustment. The orthometric heights of the non-fixed control points were checked against their published values.

A fully-constrained vertical adjustment was then performed with the published horizontal position and orthometric height of all accepted control stations being fixed.

Lastly, a final minimally-constrained adjustment with accuracies was performed, with little change in the statistics.

Although no major shifts in position were found in any of the networks following the adjustment in ADJUST, the residuals were unusually high in the adjustment results. This is most likely due to multi-path from the solar panel at each well location. When the networks were adjusted in TGO, the residuals were within tolerance. However, NGS will only accept adjustments that come from the ADJUST software. Since those residuals are out of tolerance, they are not acceptable for blue booking. The confidence in the elevations reported is still high since the different adjustment programs agreed very well on the final elevations.

C31GFS	Elevation:	**56.76 ft**	(NAVD 88)	57.70 ft	(NGVD 29)
Bench Mark 1:	G 512	67.81 ft	(NAVD 88)	68.75 ft	(NGVD 29)
Bench Mark 2:	F 512	61.30 ft	(NAVD 88)	62.24 ft	(NGVD 29)
Monitoring Well:	C31GFS	61.82 ft	(NAVD 88)	62.76 ft	(NGVD 29)
Ground Elevation:	C31GFS	56.96 ft	(NAVD 88)	57.90 ft	(NGVD 29)
Length of Run:	3.60 km				
Max Allowable Misclosure:	15 mm				
Actual Misclosure:	2 mm				

To Reach C31GFS:

FROM THE INTERSECTION OF KISSIMMEE PARK ROAD AND NEPTUNE ROAD. GO WEST ON NEPTUNE ROAD FOR 0.6 MILES TO BRIDGE FOR C-31 CANAL. GO SOUTH ON EAST LEVEE ROAD ON C-31 CANAL FOR +/- 125 FEET TO LOCKED SFWMD GATE (NEED K2 KEY). CONTINUE SOUTH ON EAST LEVEE ROAD FOR 1.4 MILES TO MARK ON RIGHT. MARK IS 8.7 FEET EAST OF EAST EDGE OF WOODEN PLATFORM FOR STILLING WELL C31GFS, 28.1 FEET EAST OF STILLING WELL C31GFS (ALUM. CORRUGATED PIPE), 84.95 FEET WEST OF BARB WIRE FENCE. SET MAGENT 1 FOOT NORTH OF MARK.

REDYCK	Elevation:	**98.15 ft**	(NAVD 88)	99.09 ft	(NGVD 29)
Bench Mark 1:	H 629	119.09 ft	(NAVD 88)	120.04 ft	(NGVD 29)
Bench Mark 2:	G 629	118.87 ft	(NAVD 88)	119.81 ft	(NGVD 29)
Monitoring Well:	REDYCK (GW1)	100.60 ft	(NAVD 88)	101.54 ft	(NGVD 29)
Monitoring Well:	REDYCK (GW2)	102.70 ft	(NAVD 88)	103.64 ft	(NGVD 29)
Concrete Pad:	REDYCK	98.27 ft	(NAVD 88)	99.21 ft	(NGVD 28)
Ground Elevation:	REDYCK	98.24 ft	(NAVD 88)	99.18 ft	(NGVD 29)
Length of Run:	5.60 km				
Max Allowable Misclosure:	18 mm				
Actual Misclosure:	0 mm				

To Reach REDYCK:

FROM THE INTERSECTION OF BEAR ISLAND ROAD AND FLORDIAN WAY. GO SOUTH ON BEAR ISLAND ROAD FOR 1.1 MILES TO DISNEY WATER AND WASTE WATER PLANT ENTRANCE ROAD. CONTINUE SOUTH ON UTILITY ROAD FOR 0.15 MILES. MAKE LEFT ON UTILITY ROAD AND GO EAST FOR +/-125 FEET. MAKE RIGHT ON UTILITY ROAD AND GO SOUTH FOR +/- 50 FEET. MAKE LEFT ON PARKING LOT ROAD AND GO EAST FOR +/- 150 FEET TO MARK.
MARK IS 9.3 FEET WEST OF MONITORING WELL GW2, 50.2 FEET SOUTH OF A METAL LIGHT POLE, 33.0 FEET EAST OF A SECOND METAL LIGHT POLE, 57.4 FEET NORTH OF THE NORTHEAST CORNER OF A CONCRETE DRAINAGE CULVERT. SET MAGNET 1 FOOT NORTH OF MARK.

REDYCK

Nick Miller, Inc.
Date of Photo: June 12, 2006
View: Looking at the well REDYCK facing south

REDYCK

Nick Miller, Inc.
Date of Photo: June 12, 2006
View: Close-up of the west well (GW2) showing the contractor's markings

REDYCK

Nick Miller, Inc.
Date of Photo: June 12, 2006
View: Close-up of the east well (GW1) showing the contractor's markings

REDYCK

Nick Miller, Inc.
Date of Photo: June 12, 2006
View: Looking at the REDYCK benchmark facing south

REDYCK

Nick Miller, Inc.
Date of Photo: June 12, 2006
View: A top view of the REDYCK benchmark

BENCH RUN

1078.008 SCAND

H629 → G629

	+	H.I.	−	ELEV.
1	0.5072		2.9028	
	57.7		57.4	
2	0.5303		2.4862	
	42.8		43.2	
3	1.7123		1.9612	
	69.4		68.9	
4	2.0963		1.0129	
	67.0		67.3	
5	1.9166		0.6085	
	61.4		60.5	
6	2.8738		~~0.5478~~ 0.5476	
	40.5		37.3	
7	~~2.8907~~		~~1.6162~~	
	62.2		68.2	
8	0.9341		2.5256	
	63.99		64.2	
9	1.0483		1.6847	
	67.5		67.2	

J. SZWEWSKI P TUES. JUNE 13 2006

G. RAGER JR K

N. KHAN 9

8 51

DESC.

H 629

I.R. SET ON EAST SIDE OF DIRT ROAD.

BENCH RUN

1078.008 SKWMD

	+	H.I.	-	FIELD
10	1.5522 [67.0]		1.0606 [65.0]	
11	1.6476 [68.6]		1.9641 [68.6]	
12	1.2115 [67.0]		1.3930 [67.5]	
13	1.9278 [68.4]		1.2520 [68.1]	
14	1.6098 [19.9]		1.7664 [18.3]	

J. SZUCKINSKI 9 GWES. JUNE 13 2006

G. BAKER III 7

N. KHAN 9

8, 52

DESC.

IR. SET ON EAST SIDE OF DIRT ROAD

" " " "

" " " "

" " " "

" " " "

IR SET WEST SIDE OF DIRT ROAD

~~IR SET WEST SIDE OF DIRT ROAD~~ GGZ9

TOTAL DIST: 1.6449 KM

TOLERANCE: 10.26 mm

DIFF: 0.66 mm

BENCH RUN

1078.008 SCWMD

G629 → REDYCK 2

+	H.I.	−	ELEV.	
	1.5570	37.78826		36.23126m
1	[69.4]		2.0088	
			[69.2]	35.77946
	1.3025	37.08196		
2	[68.7]		1.4310	
			[68.6]	35.65096
	2.0738	37.72476		
3	[68.2]		1.2968	
			[68.7]	36.42796
	1.0866	37.51456		
4	[68.4]		1.5999	
			[67.5]	35.91466
	0.9686	36.88326		
5	[66.6]		2.5450	
			[66.3]	34.33826
	0.9560	35.29426		
6	[68.5]		1.8069	
			[68.1]	33.48736
	[illegible]	34.91846		
7	[illegible]		1.7610	
			[68.4]	33.15746
	1.5825	34.73996		
8	[67.5]		1.4358	
			[67.7]	33.30416
	1.5018	34.80596		
9	[68.0]		1.7273	
			[67.6]	33.07866
	0.9395	34.01816		
10	[68.6]		1.9801	32.03806
			[68.6]	

J. SZULEWSKI P — TUES. JUNE 13 2006

G. RAGER III ⊼ — 8.53

N. KHAN P

DESC.

G629

I.R. SET WEST SIDE OF DIRT ROAD

I.R. SET IN MEDIAN OF Y92

BENCH RUN

1078.008 SFWMD

G629 → REDYCK Z (CONT.)

	+	H.I.	−	ELEV
	0.7771			
11	[65.1]	32.81516	1.7699	
			[65.4]	31.04526
	1.1022			
12	[68.5]	32.14746	1.3314	
			[67.6]	30.81606
	~~1.2005~~			
13	[68.18]		~~1.4099~~	
			[67.6]	
	1.2004			
14	[68.2]	32.01646	1.3799	
			[67.6]	30.63656
	0.9745			
15	[67.9]	31.61106	1.7196	
			[67.7]	29.89146
	2.0046			
16	[66.1]	31.89606	1.4588	
			[66.3]	30.43726
	[illegible]4398			
17	[[illegible]]	31.87706	1.7023	
			[68.95]	30.17476
	[illegible]7441			
18	[26.1]	31.91886	2.0235	
			[32.4]	29.89536
	1.9000			
19	[17.4]	31.79536	1.8787	
			[15.5]	29.91666
	[ ]			
			[ ]	

J. SZULEWSKI TUES JUNE 13, 2006

G. RAGGETT III

N. KHAN

8.54

DESC

I.R. SET IN MEDIAN OF 192

" " "

" " "

" " "

" " " } CODE ZZ

" " "

" " "

" " "

" " "

" " "

" " "

" " "

" " "

" " "

" " "

" " "

REDYCK-Z

BENCH RUN

1078.008

SCHMID

REDYCK 2 → G629

	+	H.I.	−	ELEV.
	1.7330			29.9167
1	66.1		1.4003	
			66.5	
	1.5905			
2	60.4		1.3850	
			60.9	
	1.0025			
3	66.5		1.4845	
			66.1	
	2.0395			
4	64.3		1.4081	
			63.8	
	1.0275			
	65.6		1.3966	
			66.6	
	1.5302			
	68.6		0.7745	
			67.2	
	1.8053			
	67.5		0.9867	
			67.5	
	2.0761			
	66.4		1.3253	
			67.3	
	1.8630			
	68.9		1.6063	
			67.7	
	1.3144			
	67.7		1.3174	
			67.2	

J. SZULEWSKI 9

G. RADER III

N. KHAN 9

TUES. JUNE 13 2006

8.55

DESC.

REDYCK 2

I.R. SET IN MEDIAN OF 192

BENCH RUN

1078.008

REDYCK 2 → G629 (CONT.)

+	H.I.	−	ELEV.
1.6803			
67.6			
		1.3598	
		68.6	
1.7749			
67.6			
		0.5688	
		66.1	
2.3624			
63.7			
		1.3485	
		66.2	
1.8549			
69.0			
		1.2823	
		69.0	
0.9772			
68.2			
		1.9048	
		67.0	
1.6947			
67.0			
		1.2500	
		67.0	
1.9479			
59.7			
1.2647			
		56.3	
15.100			
11.9			
		1.8500	
		10.4	
[ ]		[ ]	
[ ]		[ ]	

J. SZUKENSKI P TUES. JUNE 13 2006

G. ROGER III T

N. KHAN P

8, 86

DESC.

I.R. SET ON MEDIAN ON 192

I.R. SET ON WEST SIDE OF DIRT ROAD

I.R. SET ON EAST SIDE OF DIRT ROAD

G629

TOTAL DIST: 2240.87 (m)

```
Identification_Information:
        Citation:
                Citation_Information:
                        Originator: Nick Miller, Inc.(comp.)
                        Originator: Stephen M. Gordon, PSM(ed.)
                        Publication_Date: 20060628
                        Publication_Time: Unknown
                        Title: S.F.W.M.D. Monitoring Well REDYCK
                        Edition: 1
                        Publication_Information:
                                Publication_Place: West Palm Beach, FL
                                Publisher: South Florida Water Management District
        Description:
                Abstract:
                        South Florida Water Management District Monitoring Well
                        REDYCK.
                Purpose:
                        To determine as built dimensions relative to NAVD 88 and
                        NGVD 29 vertical datum
        Time_Period_of_Content:
                Time_Period_Information:
                        Single_Date/Time:
                                Calendar_Date: 20060628
                Currentness_Reference: Publication Date
        Status:
                Progress: Complete
                Maintenance_and_Update_Frequency: Unknown
        Spatial_Domain:
                Bounding_Coordinates:
                        West_Bounding_Coordinate: -081D 37M 06.0S
                        East_Bounding_Coordinate: -081D 35M 15.9S
                        North_Bounding_Coordinate: +28D 23M 10.0S
                        South_Bounding_Coordinate: +28D 22M 21.0S
        Keywords:
                Theme:
                        Theme_Keyword_Thesaurus: Tri - Service Spatial Data Standard
                        Theme_Keyword: Improvement
                        Theme_Keyword: Geodedic/Cadastral
                Place:
                        Place_Keyword_Thesaurus: None
                        Place_Keyword: S.F.W.M.D. Monitoring Well REDYCK
                        Place_Keyword: Sec. 23, Twp. 24 S., Rge. 27 E
                        Place_Keyword: Orange County, Florida
                        Place_Keyword_Thesaurus: Geographic Names Information System
                        Place_Keyword: Florida
                        Place_Keyword: Orange County
                        Place_Keyword: Windermere
        Access_Constraints: None
        Use_Constraints: None
        Point_of_Contact:
                Contact_Information:
                        Contact_Person_Primary:
                                Contact_Person: Howard Ehmke
                                Contact_Organization: South Florida Water Management
District
                        Contact_Position: Project Manager
                        Contact_Address:
                                Address_Type: mailing and physical address
                                Address: 3301 Gun Club Road
                                City: West Palm Beach
                                State_or_Province: Florida
                                Postal_Code: 33406
                                Country: USA
```

Contact_Voice_Telephone: 561-682-6672
Contact_Electronic_Mail_Address: hehmke@sfwmd.gov

Data_Quality_Information:
Attribute_Accuracy:
Attribute_Accuracy_Report: N/A
Logical_Consistency_Report:
Horizontal data was established using mapping grade GPS equipment. Vertical data was established using NGS control points H 629 & G 629. Coordinates are in the Florida State Plane Coordinate System, East Zone, NAD 83/90. Elevations are in the NAVD 88 and the NGVD 29.
Completeness_Report:
Horizontal location taken at site benchmark
Lat. +28D 22M 43.7S
Long. -081D 35M 16.0S
N 1,470,885 ft
E 467,160 ft
Site Benchmark.
"REDYCK" is a South Florida Water Management District (SFWMD) aluminum disk set in concrete.
TO REACH THE MARK FROM THE INTERSECTION OF BEAR ISLAND ROAD AND FLORDIAN WAY. GO SOUTH ON BEAR ISLAND ROAD FOR 1.1 MILES TO DISNEY WATER AND WASTE WATER PLANT ENTRANCE ROAD. CONTINUE SOUTH ON UTILITY ROAD FOR 0.15 MILES. MAKE LEFT ON UTILITY ROAD AND GO EAST FOR +/-125 FEET. MAKE RIGHT ON UTILITY ROAD AND GO SOUTH FOR +/- 50 FEET. MAKE LEFT ON PARKING LOT ROAD AND GO EAST FOR +/- 150 FEET TO MARK.
MARK IS 9.3 FEET WEST OF MONITORING WELL GW2, 50.2 FEET SOUTH OF A METAL LIGHT POLE, 33.0 FEET EAST OF A SECOND METAL LIGHT POLE, 57.4 FEET NORTH OF THE NORTHEAST CORNER OF A CONCRETE DRAINAGE CULVERT. SET MAGNET 1 FOOT NORTH OF MARK.
Benchmark Elevation is 98.15 feet (NAVD 88).
Well Elevation (REDYCK GW1) is 100.60 feet (NAVD 88) as observed at the existing reference mark for the well which is a black mark at the top of a PVC pipe at the center of the recorder box floor.
Well Elevation (REDYCK GW2) is 102.70 feet (NAVD 88) as observed at the existing reference mark for the well which is a black mark at the top of a PVC pipe at the center of the recorder box floor.
Concrete pad elevation is 98.27 feet (NAVD 88).
Ground Elevation is 98.24 feet (NAVD 88).
NGVD 29 minus NAVD 88 equals 0.942 feet. ~~The NGVD 1929 value was taken from the NGS adjustment of the CERP Geodetic Vertical Control Network for benchmark G 629.~~ The datum difference taken from the FLDEP original level run L26791.ABS & the NGVD29.ABS files
Vertical Control used G 629 El. 36.231 (m) (NAVD 88) El. 36.518 (m) (NGVD 29), H 629 El. 36.300 (m) (NAVD 88) El. 36.587 (m) (NGVD 29).

G629
36.23126m NAVD88
36.51826m NGVD29
0.287m (0.9416')
H629
36.29997 NAVD88
36.58697 NGVD29
0.287m (0.9416')

Positional_Accuracy:
Horizontal_Positional_Accuracy:
Horizontal_Positional_Accuracy_Report:
The horizontal position of Site Benchmark "REDYCK" was established using a mapping grade GPS receiver (Trimble Pro XR in accordance with the Florida Minimum Technical Standards (Chapter 61G17-6, Florida Administrative Code).

```
                        Quantitative_Horizontal_Positional_Accuracy_Assessment:
                                Horizontal_Positional_Accuracy_Value: 3 to 5 meters
                                Horizontal_Positional_Accuracy_Explanation: The
intended positional accuracy for this survey is 3 to 5 meters more or less.
                Vertical_Positional_Accuracy:
                        Vertical_Positional_Accuracy_Report:
                                A level line was run originating on benchmark H 629
                                and terminating at benchmark G 629 with an allowable
                                error of 8mm times the square root of the distance
                                leveled (in kilometers).
                        Quantitative_Vertical_Positional_Accuracy_Assessment:
                                Vertical_Positional_Accuracy_Value: 0.000m
                                Vertical_Positional_Accuracy_Explanation: NAVD 88
level loop, 0.000m closure in 5.60 km, max. allowed 0.018m.
        Lineage:
                Process_Step:
                        Process_Description:
                                The horizontal work was performed using a Trimble
                                Pro XR GPS receiver (mapping grade). The level
                                loop was run with a Leica DNA03 digital level.
                        Process_Date: 20060620
Metadata_Reference_Information:
        Metadata_Date: 20060628
        Metadata_Contact:
                Contact_Information:
                        Contact_Person_Primary:
                                Contact_Person: Stephen M. Gordon
                                Contact_Organization: Nick Miller, Inc.
                        Contact_Position: Project Surveyor
                        Contact_Address:
                                Address_Type: mailing and physical address
                                Address: 2560 RCA Blvd., Suite 105
                                City: Palm Beach Gardens
                                State_or_Province: Florida
                                Postal_Code: 33410
                                Country: USA
                        Contact_Voice_Telephone: 561-627-5200
                        Contact_Facsimile_Telephone: 561-627-0983
                        Contact_Electronic_Mail_Address: sgordon@nickmillerinc.com
        Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial
Metadata
        Metadata_Standard_Version: 2.0
        Metadata_Time_Convention: Local time
        Metadata_Access_Constraints: South Florida Water Management District
controls access.
        Metadata_Use_Constraints: Per South Florida Water Management District
        Metadata_Security_Information:
                Metadata_Security_Handling_Description: None
                Metadata_Security_Classification: Unclassified
                Metadata_Security_Classification_System: Structure
```

```
Identification_Information:
        Citation:
                Citation_Information:
                        Originator: Nick Miller, Inc.(comp.)
                        Originator: Stephen M. Gordon, PSM(ed.)
                        Publication_Date: 20060628
                        Publication_Time: Unknown
                        Title: S.F.W.M.D. Monitoring Well REDYCK2
                        Edition: 1
                        Publication_Information:
                                Publication_Place: West Palm Beach, FL
                                Publisher: South Florida Water Management District
        Description:
                Abstract:
                        South Florida Water Management District Monitoring Well
                        REDYCK2.
                Purpose:
                        To determine as built dimensions relative to NAVD 88 and
                        NGVD 29 vertical datum
        Time_Period_of_Content:
                Time_Period_Information:
                        Single_Date/Time:
                                Calendar_Date: 20060628
                Currentness_Reference: Publication Date
        Status:
                Progress: Complete
                Maintenance_and_Update_Frequency: Unknown
        Spatial_Domain:
                Bounding_Coordinates:
                        West_Bounding_Coordinate: -081D 37M 06.0S
                        East_Bounding_Coordinate: -081D 35M 15.9S
                        North_Bounding_Coordinate: +28D 23M 10.0S
                        South_Bounding_Coordinate: +28D 22M 21.0S
        Keywords:
                Theme:
                        Theme_Keyword_Thesaurus: Tri - Service Spatial Data Standard
                        Theme_Keyword: Improvement
                        Theme_Keyword: Geodedic/Cadastral
                Place:
                        Place_Keyword_Thesaurus: None
                        Place_Keyword: S.F.W.M.D. Monitoring Well REDYCK2
                        Place_Keyword: Sec. 27, Twp. 24 S., Rge. 27 E
                        Place_Keyword: Orange County, Florida
                        Place_Keyword_Thesaurus: Geographic Names Information System
                        Place_Keyword: Florida
                        Place_Keyword: Orange County
                        Place_Keyword: Windermere
        Access_Constraints: None
        Use_Constraints: None
        Point_of_Contact:
                Contact_Information:
                        Contact_Person_Primary:
                                Contact_Person: Howard Ehmke
                                Contact_Organization: South Florida Water Management
District
                        Contact_Position: Project Manager
                        Contact_Address:
                                Address_Type: mailing and physical address
                                Address: 3301 Gun Club Road
                                City: West Palm Beach
                                State_or_Province: Florida
                                Postal_Code: 33406
                                Country: USA
```

Contact_Voice_Telephone: 561-682-6672
Contact_Electronic_Mail_Address: hehmke@sfwmd.gov
Data_Quality_Information:
Attribute_Accuracy:
Attribute_Accuracy_Report: N/A
Logical_Consistency_Report:
Horizontal data was established using mapping grade GPS equipment. Vertical data was established using NGS control points H 629 & G 629. Coordinates are in the Florida State Plane Coordinate System, East Zone, NAD 83/90. Elevations are in the NAVD 88 and the NGVD 29.
Completeness_Report:
Horizontal location taken at site benchmark
Lat. +28D 22M 32.6S
Long. -081D 35M 58.0S
N 1,469,783 ft
E 463,406 ft
Site Benchmark.
"REDYCK2" is a South Florida Water Management District (SFWMD) aluminum disk set in concrete.
TO REACH THE MARK FROM FROM THE INTERSECTION OF WESTERN WAY AND BEAR ISLAND ROAD. GO WEST ON WESTERN WAY FOR 0.4 MILES TO MARK ON RIGHT. MARK IS 45.25 FEET EAST OF NORTHEAST CORNER OF STORM BASIN. 27.0 FEET NORTH OF THE CENTERLINE OF WESTERN WAY (WESTBOUND), 111.4 FEET NORTHEAST OF METAL LIGHT POLE (WW36), 101.0 FEET NORTHWEST OF METAL LIGHT POLE (WW37).
SET MAGNET 1 FOOT NORTH OF MARK.
Benchmark Elevation is 103.50 feet (NAVD 88).
Well Elevation (REDYCK GW1) is 100.60 feet (NAVD 88) as observed at the existing reference mark for the well which is a black mark at the top of a PVC pipe at the center of the recorder box floor.
Well Elevation (REDYCK GW2) is 102.70 feet (NAVD 88) as observed at the existing reference mark for the well which is a black mark at the top of a PVC pipe at the center of the recorder box floor.
Concrete Pad Elevation is 98.27 feet (NAVD 88).
Ground Elevation is 98.24 feet (NAVD 88).
NGVD 29 minus NAVD 88 equals 0.942 feet. The NGVD 1929 value was taken from the NGS adjustment of the CERP Geodetic Vertical Control Network for benchmark G 629.
Vertical Control used G 629 El. 36.231 (m) (NAVD 88) El. 36.518 (m) (NGVD 29), H 629 El. 36.300 (m) (NAVD 88) El. 36.587 (m) (NGVD 29).
Positional_Accuracy:
Horizontal_Positional_Accuracy:
Horizontal_Positional_Accuracy_Report:
The horizontal position of Site Benchmark "REDYCK2" was established using a mapping grade GPS receiver (Trimble Pro XR in accordance with the Florida Minimum
Technical Standards (Chapter 61G17-6, Florida Administrative Code).
Quantitative_Horizontal_Positional_Accuracy_Assessment:
Horizontal_Positional_Accuracy_Value: 3 to 5 meters
Horizontal_Positional_Accuracy_Explanation: The intended positional accuracy for this survey is 3 to 5 meters more or less.
Vertical_Positional_Accuracy:
Vertical_Positional_Accuracy_Report:

```
                        A level line was run originating on benchmark H 629
                        and terminating at benchmark G 629 with an allowable
                        error of 8mm times the square root of the distance
                        leveled (in kilometers).
                Quantitative_Vertical_Positional_Accuracy_Assessment:
                        Vertical_Positional_Accuracy_Value: 0.000m
                        Vertical_Positional_Accuracy_Explanation: NAVD 88
level loop, 0.000m closure in 5.60 km, max. allowed 0.018m.
        Lineage:
                Process_Step:
                        Process_Description:
                        The horizontal work was performed using a Trimble
                        Pro XR GPS receiver (mapping grade). The level
                        loop was run with a Leica DNA03 digital level.
                        Process_Date: 20060620
Metadata_Reference_Information:
        Metadata_Date: 20060628
        Metadata_Contact:
                Contact_Information:
                        Contact_Person_Primary:
                                Contact_Person: Stephen M. Gordon
                                Contact_Organization: Nick Miller, Inc.
                        Contact_Position: Project Surveyor
                        Contact_Address:
                                Address_Type: mailing and physical address
                                Address: 2560 RCA Blvd., Suite 105
                                City: Palm Beach Gardens
                                State_or_Province: Florida
                                Postal_Code: 33410
                                Country: USA
                        Contact_Voice_Telephone: 561-627-5200
                        Contact_Facsimile_Telephone: 561-627-0983
                        Contact_Electronic_Mail_Address: sgordon@nickmillerinc.com
        Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial
Metadata
        Metadata_Standard_Version: 2.0
        Metadata_Time_Convention: Local time
        Metadata_Access_Constraints: South Florida Water Management District
controls access.
        Metadata_Use_Constraints: Per South Florida Water Management District
        Metadata_Security_Information:
                Metadata_Security_Handling_Description: None
                Metadata_Security_Classification: Unclassified
                Metadata_Security_Classification_System: Structure
```

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 4/01

COUNTY ORANGE	**PROJECT Hydrology – Orange, Osceola & Everglades Wells**	**DESIGNATION REDYCK 2006**
SECTION 23	**TOWNSHIP 24 SOUTH**	**RANGE 27 EAST**

GEOGRAPHIC INDEX OF QUAD

Established by Nick Miller Inc. **Recovered by**	**NAME OF QUADRANGLE** **WINDERMERE**
SURVEYOR Stephen M. Gordon **DATE** 06/12/2006	**FIELD BOOK** 11 **PAGE** 41

HORIZONTAL DATUM: **1927** (**1983**) **Other**_____ (circle one) ZONE (**E**) or **W**

STATE PLANE COORDINATES	**E 467,160 ft**	**N 1,470,885 ft**
LATITUDE: N 28.37880°	**LONGITUDE: W 81.58779°**	
VERTICAL DATUM: MSL **1929** (**1988**) **Other** _____ (circle one)		**EL. 98.15 ft**
VERTICAL DATUM: MSL (**1929**) **1988 Other** _____ (circle one)		**EL. 99.09 ft**

CONTROL ACCURACY: HORIZONTAL 1 2 3 (SUB-METER) (circle one) **VERTICAL 1 2 (3)**

DESCRIPTION

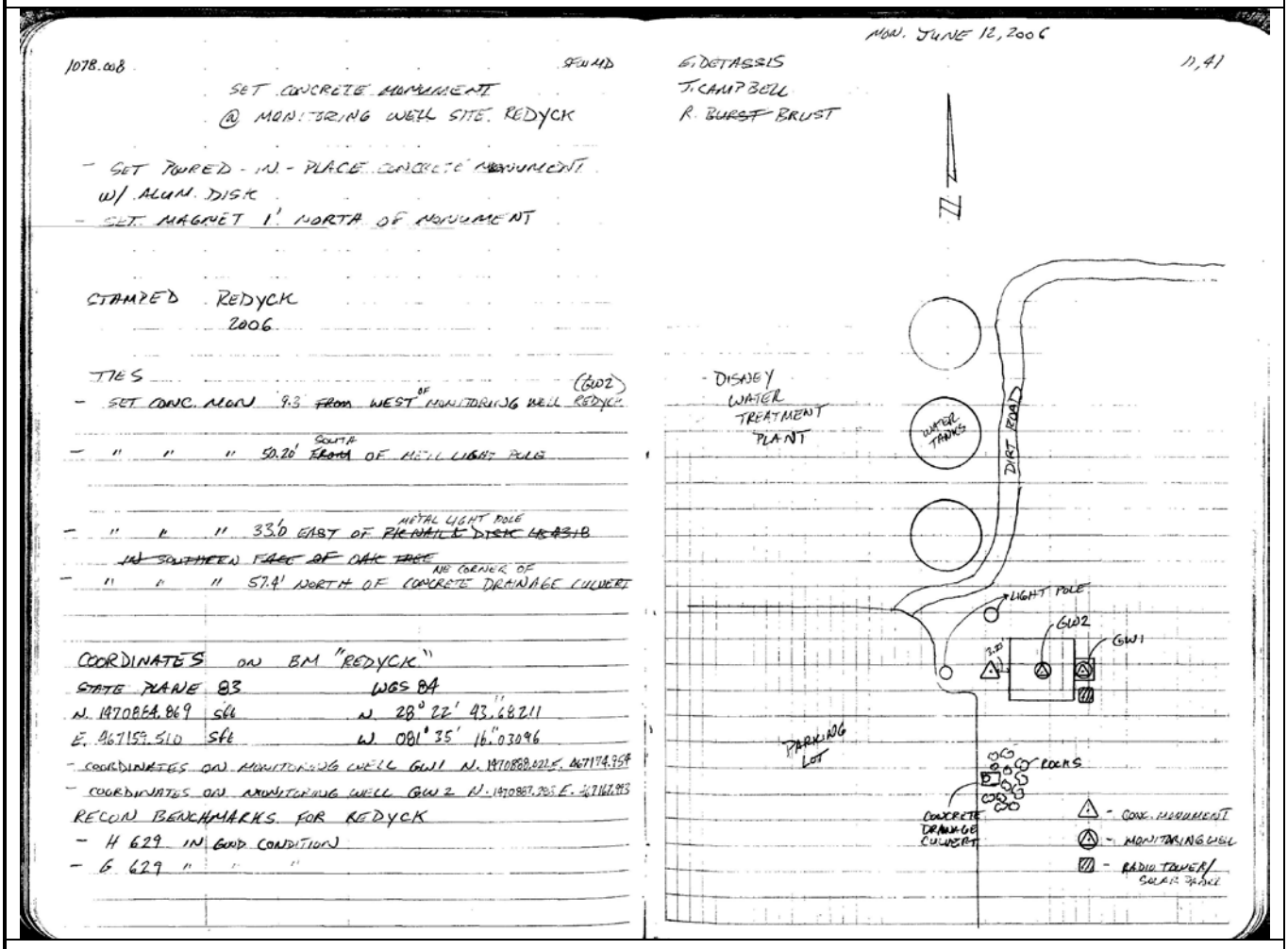
To Reach:

FROM THE INTERSECTION OF BEAR ISLAND ROAD AND FLORIDIAN WAY. GO SOUTH ON BEAR ISLAND ROAD FOR 1.1 MILES TO DISNEY WATER AND WASTE WATER PLANT ENTRANCE ROAD. CONTINUE SOUTH ON UTILITY ROAD FOR 0.15 MILES. MAKE LEFT ON UTILITY ROAD AND GO EAST FOR +/-125 FEET. MAKE RIGHT ON UTILITY ROAD AND GO SOUTH FOR +/- 50 FEET. MAKE LEFT ON PARKING LOT ROAD AND GO EAST FOR +/- 150 FEET TO MARK.
MARK IS 9.3 FEET WEST OF MONITORING WELL GW2, 50.2 FEET SOUTH OF A METAL LIGHT POLE, 33.0 FEET EAST OF A SECOND METAL LIGHT POLE, 57.4 FEET NORTH OF THE NORTHEAST CORNER OF A CONCRETE DRAINAGE CULVERT. SET MAGNET 1 FOOT NORTH OF MARK.

Benchmarks Used: H 629 & G 629

Notable Land marks:

SKETCH


MON. JUNE 12, 2006
1078.008
SFWMD
G. DETASSIS
J. CAMPBELL
R. BURST BRUST
11,41
SET CONCRETE MONUMENT
@ MONITORING WELL SITE: REDYCK
- SET POURED-IN-PLACE CONCRETE MONUMENT W/ ALUM. DISK
- SET MAGNET 1' NORTH OF MONUMENT
STAMPED REDYCK 2006
TIES
- SET CONC. MON 9.3 FROM WEST OF MONITORING WELL REDYCK (GW2)
- " " " 50.20' SOUTH FROM OF METAL LIGHT POLE
- " " " 33.0 EAST OF METAL LIGHT POLE PERMALOC DISK STAMPED IN SOUTHERN FACE OF OAK TREE
- " " " 57.9' NORTH OF NE CORNER OF CONCRETE DRAINAGE CULVERT
COORDINATES ON BM "REDYCK"
STATE PLANE 83 WGS 84
N. 1470864.869 SFL N 26° 22' 43.68211"
E. 967159.510 SFL W 081° 35' 16.03096"
- COORDINATES ON MONITORING WELL GW1 N. 1470858.021 E. 967174.958
- COORDINATES ON MONITORING WELL GW2 N. 1470867.705 E. 967167.993
RECON BENCHMARKS FOR REDYCK
- H 629 IN GOOD CONDITION
- G 629 " " "
N
DISNEY WATER TREATMENT PLANT
WATER TANKS
DIRT ROAD
LIGHT POLE
GW2
GW1
PARKING LOT
PALMS
CONCRETE DRAINAGE CULVERT
- CONC. MONUMENT
- MONITORING WELL
- RADIO TOWER/ SOLAR PANEL

The NGS Data Sheet

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

```
PROGRAM = datasheet95, VERSION = 8.7
1        National Geodetic Survey,   Retrieval Date = JULY 21, 2015
 DI9177 ***********************************************************************
 DI9177  DESIGNATION -  G 629
 DI9177  PID         -  DI9177
 DI9177  STATE/COUNTY-  FL/ORANGE
 DI9177  COUNTRY     -  US
 DI9177  USGS QUAD   -  INTERCESSION CITY (1985)
 DI9177
 DI9177                        *CURRENT SURVEY CONTROL
 DI9177  ______________________________________________________________________
 DI9177* NAD 83(1986) POSITION- 28 22 22.     (N) 081 36 57.     (W)    SCALED
 DI9177* NAVD 88 ORTHO HEIGHT -    36.238 (meters)      118.89  (feet) ADJUSTED
 DI9177  ______________________________________________________________________
 DI9177  GEOID HEIGHT    -        -27.48  (meters)                     GEOID12B
 DI9177  DYNAMIC HEIGHT  -         36.184 (meters)      118.71  (feet) COMP
 DI9177  MODELED GRAVITY -    979,175.9   (mgal)                       NAVD 88
 DI9177
 DI9177  VERT ORDER      -  FIRST     CLASS II
 DI9177
 DI9177.The horizontal coordinates were scaled from a topographic map and have
 DI9177.an estimated accuracy of +/- 6 seconds.
 DI9177.
 DI9177.The orthometric height was determined by differential leveling and
 DI9177.adjusted by the NATIONAL GEODETIC SURVEY
 DI9177.in April 2010.
 DI9177
 DI9177.Photographs are available for this station.
 DI9177
 DI9177.The dynamic height is computed by dividing the NAVD 88
 DI9177.geopotential number by the normal gravity value computed on the
 DI9177.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 DI9177.degrees latitude (g = 980.6199 gals.).
 DI9177
 DI9177.The modeled gravity was interpolated from observed gravity values.
 DI9177
 DI9177;                    North         East     Units  Estimated Accuracy
 DI9177;SPC FL E     -   447,670.      139,640.      MT  (+/- 180 meters Scaled)
 DI9177
 DI9177                          SUPERSEDED SURVEY CONTROL
 DI9177
 DI9177.No superseded survey control is available for this station.
 DI9177
 DI9177_U.S. NATIONAL GRID SPATIAL ADDRESS: 17RMM396386(NAD 83)
 DI9177
 DI9177_MARKER: F = FLANGE-ENCASED ROD
 DI9177_SETTING: 49 = STAINLESS STEEL ROD W/O SLEEVE (10 FT.+)
 DI9177_STAMPING: G 629 2005
 DI9177_MARK LOGO: NGS
 DI9177_PROJECTION: FLUSH
 DI9177_MAGNETIC: M = MARKER EQUIPPED WITH BAR MAGNET
 DI9177_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
 DI9177_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
 DI9177+SATELLITE: SATELLITE OBSERVATIONS - May 06, 2005
 DI9177_ROD/PIPE-DEPTH: 17.1 meters
 DI9177
 DI9177  HISTORY     - Date     Condition        Report By
```

```
DI9177  HISTORY     - 20050506 MONUMENTED       FLDEP
DI9177
DI9177                          STATION DESCRIPTION
DI9177
DI9177'DESCRIBED BY FL DEPT OF ENV PRO 2005
DI9177'THE MARK IS ABOUT 16.0 MI (25.7 KM) NORTHWEST OF KISSIMMEE, 14.0 MI
DI9177'(22.5 KM) SOUTH OF WINTER GARDEN, IN SECTION 28, TOWNSHIP 24 SOUTH,
DI9177'RANGE 27 EAST.
DI9177'
DI9177'TO REACH THE MARK FROM THE INTERSECTION OF U.S. HIGHWAY 27 OVERPASS
DI9177'AND U.S. HIGHWAY 192 ABOUT 15.0 MI (24.1 KM) SOUTH OF CLERMONT, GO
DI9177'EAST ON U.S. HIGHWAY 192 FOR 1.55 MI (2.5 KM) TO THE JUNCTION OF
DI9177'COUNTY ROAD 545 ON THE LEFT, TURN LEFT ON COUNTY ROAD 545 (AVALON
DI9177'ROAD) AND GO NORTH FOR 1.0 MI (1.6 KM) TO THE JUNCTION OF HARTZOG ROAD
DI9177'ON THE RIGHT, TURN RIGHT ON HARTZOG ROAD AND GO EAST AND NORTH FOR 2.7
DI9177'MI (4.3 KM) TO THE MARK ON THE LEFT, A STAINLESS STEEL ROD DRIVEN TO
DI9177'REFUSAL AT A DEPTH OF 56.1 FT (17.1 M) WITH A NGS LOGO CAP RECESSED
DI9177'0.2 FT (0.1 M) BELOW THE LEVEL OF THE GROUND AND ABOUT 0.5 FT (0.2 M)
DI9177'BELOW THE LEVEL OF HARTZOG ROAD, THE DATUM POINT IS RECESSED 0.6 FT
DI9177'(0.2 M) BELOW THE LEVEL OF THE NGS LOGO CAP.
DI9177'
DI9177'LOCATED 26.0 FT (7.9 M) WEST OF THE APPROXIMATE CENTERLINE OF HARTZOG
DI9177'ROAD, 9.7 FT (3.0 M) SOUTH OF A SPRINT CABLE BOX NUMBER 67786, 9.0 FT
DI9177'(2.7 M) SOUTH OF A POWER POLE NUMBER 900530 WITH ONE LIGHT AND ONE GUY
DI9177'WIRE ATTACHED AND 1.3 FT (0.4 M) EAST OF A CARSONITE WITNESS POST.
DI9177'
DI9177'NOTE A MAGNET WAS PLACED INSIDE OF THE NGS LOGO CAP.
DI9177'
DI9177'NOTE ACCESS TO THE DATUM POINT IS HAD THROUGH A 5-INCH (13 CM) NGS
DI9177'LOGO CAP.

*** retrieval complete.
Elapsed Time = 00:00:01
```

The NGS Data Sheet

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

```
PROGRAM = datasheet95, VERSION = 8.7
1        National Geodetic Survey,   Retrieval Date = JULY 21, 2015
 DI9157 ***********************************************************************
 DI9157  DESIGNATION -  H 629
 DI9157  PID         -  DI9157
 DI9157  STATE/COUNTY-  FL/ORANGE
 DI9157  COUNTRY     -  US
 DI9157  USGS QUAD   -  WINDERMERE (1980)
 DI9157
 DI9157                        *CURRENT SURVEY CONTROL
 DI9157  ______________________________________________________________________
 DI9157* NAD 83(1986) POSITION- 28 23 11.     (N) 081 37 05.     (W)    SCALED
 DI9157* NAVD 88 ORTHO HEIGHT -    36.305 (meters)      119.11  (feet) ADJUSTED
 DI9157  ______________________________________________________________________
 DI9157  GEOID HEIGHT    -        -27.47  (meters)                     GEOID12B
 DI9157  DYNAMIC HEIGHT  -         36.252 (meters)      118.94  (feet) COMP
 DI9157  MODELED GRAVITY -    979,178.2   (mgal)                       NAVD 88
 DI9157
 DI9157  VERT ORDER      -  FIRST     CLASS II
 DI9157
 DI9157.The horizontal coordinates were scaled from a topographic map and have
 DI9157.an estimated accuracy of +/- 6 seconds.
 DI9157.
 DI9157.The orthometric height was determined by differential leveling and
 DI9157.adjusted by the NATIONAL GEODETIC SURVEY
 DI9157.in April 2010.
 DI9157
 DI9157.Photographs are available for this station.
 DI9157
 DI9157.The dynamic height is computed by dividing the NAVD 88
 DI9157.geopotential number by the normal gravity value computed on the
 DI9157.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 DI9157.degrees latitude (g = 980.6199 gals.).
 DI9157
 DI9157.The modeled gravity was interpolated from observed gravity values.
 DI9157
 DI9157;                    North         East     Units  Estimated Accuracy
 DI9157;SPC FL E     -   449,180.      139,430.      MT  (+/- 180 meters Scaled)
 DI9157
 DI9157                          SUPERSEDED SURVEY CONTROL
 DI9157
 DI9157.No superseded survey control is available for this station.
 DI9157
 DI9157_U.S. NATIONAL GRID SPATIAL ADDRESS: 17RMM394401(NAD 83)
 DI9157
 DI9157_MARKER: DD = SURVEY DISK
 DI9157_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
 DI9157_STAMPING: H 629 2005
 DI9157_MARK LOGO: FLDEP
 DI9157_PROJECTION: FLUSH
 DI9157_MAGNETIC: M = MARKER EQUIPPED WITH BAR MAGNET
 DI9157_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
 DI9157+STABILITY: SURFACE MOTION
 DI9157_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
 DI9157+SATELLITE: SATELLITE OBSERVATIONS - May 06, 2005
 DI9157
 DI9157  HISTORY     - Date     Condition        Report By
```

DI9157 HISTORY - 20050506 MONUMENTED FLDEP
DI9157
DI9157 STATION DESCRIPTION
DI9157
DI9157'DESCRIBED BY FL DEPT OF ENV PRO 2005
DI9157'THE MARK IS ABOUT 17.0 MI (27.4 KM) NORTH WEST OF KISSIMMEE, 12.0 MI
DI9157'(19.3 KM) SOUTH OF WINTER GARDEN, IN SECTION 21, TOWNSHIP 24 SOUTH,
DI9157'RANGE 27 EAST.
DI9157'
DI9157'TO REACH THE MARK FROM THE INTERSECTION OF U.S. HIGHWAY 27 OVERPASS
DI9157'AND U.S. HIGHWAY 192 ABOUT 15.0 MI (24.1 KM) SOUTH OF CLERMONT, GO
DI9157'EAST ON U.S. HIGHWAY 192 FOR 1.55 MI (2.5 KM) TO THE JUNCTION OF
DI9157'COUNTY ROAD 545 ON THE LEFT, TURN LEFT ON COUNTY ROAD 545 (AVALON
DI9157'ROAD) AND GO NORTH FOR 1.0 MI (1.6 KM) TO THE JUNCTION OF HARTZOG ROAD
DI9157'ON THE RIGHT, TURN RIGHT ON HARTZOG ROAD AND GO EAST AND NORTH FOR
DI9157'3.65 MI (5.9 KM) TO THE MARK ON THE LEFT, SET IN THE TOP OF A ROUND
DI9157'CONCRETE MONUMENT FLUSH WITH THE GROUND AND ABOUT LEVEL WITH HARTZOG
DI9157'ROAD.
DI9157'
DI9157'LOCATED 57.5 FT (17.5 M) SOUTHWEST OF THE APPROXIMATE CENTERLINE OF
DI9157'HARTZOG ROAD, 21.0 FT (6.4 M) SOUTHEAST OF A DOUBLE METAL GATE, 19.0
DI9157'FT (5.8 M) SOUTHEAST OF THE APPROXIMATE CENTERLINE OF AN ENTRANCE TO
DI9157'AN EFFLUENT DISPOSAL FACILITY (BASING NUMBER 27-31).
DI9157'
DI9157'NOTE A MAGNET WAS IMBEDDED IN THE GROUND ON THE SOUTH SIDE OF THE
DI9157'MONUMENT.

*** retrieval complete.
Elapsed Time = 00:00:01

Windows Abstra Version 2.3 -- Jan 1, 2004 Tue Jun 20 10:59:10 2006

-*- FIELD ABSTRACT -*-

060613-060614 HGZ L10788 8.0 MM ORDER 2 CLASS 2 PAGE 1

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
EVERGLADES AND ORLANDO AREA WELLS
ESTABLISH THIRD-ORDER ELEVATIONS ON MONITORING WELL REDYCK

FROM I / TO C	START	F/B	DIST TOTAL (KM)	ELEV DIFF (MT)		-(F+B) TOTAL (MM)	MEAN DIFF FLD ELEV (MT)
0629 H629							36.30000
0629 H629 1	6130850	F	1.65	-0.06930	*	0.00	-0.06930
0630 G629			1.65			0.00	36.23070
0630 G629 1	6131125	F	2.26	-6.31566	*	-0.14	-6.31573
0631 REDYCK 1	6131600	B	2.27	6.31580	*		
			3.90			-0.14	29.91497
0631 REDYCK 2	6141125	F	1.71	1.63385	*	-4.77	1.63147
0632 REDYCK 2 2	6141500	B	1.70	-1.62908	*		
	SL 1		5.60			-4.91	31.54644

ELEVATION REJECTION AND ERROR CODES

C - section elevation difference was rejected for cause
ie. *43* record rejection code set to "F"
R - section elevation difference was rejected by Halperin rejection algorithm
@ - section elevation difference does not include refraction correction
* - section elevation difference does not include rod correction

INSTRUMENT CODE	INSTRUMENT	RODS	
1	243 - 332854	396 - 333	396 - 444
2	243 - 331132	396 - 111	396 - 222

LEVEL LINE SECTION RUNNING TREE

0629
0630
0631 (0632

FROM	TO	N. LATITUDE	W. LONGITUDE	FIELD DISTANCE	VS. COMPUTED	
	0629	282310	0813706	0.00	0.00	
0629	0630	282221	0813658	1.65	1.52	
0630	0631	282243	0813516	2.26	2.86	**
0631	0632	282232	0813557	1.70	1.17	**

Windows Abstra Version 2.3 -- Jan 1, 2004 -- Tue Jun 20 10:59:10 2006

SECTION FROM	TO	E R R O R M E S S A G E S
0630	0631	*** Computed distance exceeds field distance by more than 0.35 KM!
0631	0632	*** Field distance exceeds computed distance by more than 0.50 KM!

U.S DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL GEODETIC SURVEY

Charles W. Challstrom
Director

PROJECT REPORT
Second Order Class II Leveling and Mark Setting

May 2006

Ronnie L. Taylor
National Geodetic Survey, NOAA
National Ocean Service Advisor, Florida

PROJECT TITLE

Orange & Osceola County Wells

LINE TITLE FOR **L26803**

ESTABLISH BENCH MARKS NEAR WELLS IN ORANGE COUNTY
STARTING HEIGHT IS BASED ON NAVD 88 HEIGHTS.
NOTE: COLLIMATION STORED IN ELECTRONIC INSTRUMENT.
NOTE: LATITUDE AND LONGITUDE WAS OBTAINED FROM
SUB-METER GPS OBSERVATIONS.

JOB CODE **AA**

2560 rca boulevard, suite 105 • palm beach gardens, florida 33410-3335 • ph: 561.627.5200 • fax: 561.627.0983
1933 commonwealth lane • tallahassee, florida 32303-3196 • ph: 850.222.0599 • fax: 850.222.4255
email: info@nickmillerinc.com • web: www.nickmillerinc.com

NICK MILLER, INC.

PROJECT REPORT

I. INTRODUCTION

A. Authority

Bench Mark Setting and Leveling along this level route was authorized by a contract between the South Florida Water Management District and Nick Miller Incorporated.

B. Purpose

The purpose of this leveling project was to establish precise NAVD 88 heights near existing Ground Water Monitoring Wells for use by the South Florida Water Management District and the citizens of the State of Florida.

II. PROJECT AREA

A. Locality

This project is located in Orange County, Florida.

B. Terrain

The terrain is flat to rolling.

C. Specifications

FGCS Specifications and Procedures to Incorporate Electronic Digital/Bar-Code Leveling Systems were followed.

D. Monumentation

Monuments are set in concrete with a South Florida Water Management survey disk. A Magnetic device was either placed in or near the monuments. Please see descriptions for magnetic placements.

E. Instrumentation

Two LEICA DNA03 Electronic Digital Level Instruments were used along with two sets of LEICA Digital/Bar-Code Leveling Rods.

III. COMMENTS

A. Reconnaissance

See the To-Reach Descriptions included, for a clear access to all L26803 Stations.

B. Specifications

There were no deviations from the FGCS Specifications and Procedures to Incorporate Electronic Digital/Bar-Code Leveling Systems.

C. Route

The leveling route varied for each leveling part.

STARTING ELEVATION BASED ON NAVD 88 HEIGHTS PUBLISHED FROM THE NGS DATABASE. NOTE: COLLIMATION STORED IN ELECTRONIC INSTRUMENT. NOTE: LATITUDE AND LONGITUDE WAS DERIVED FROM NGS DATA SHEETS AND GPS SUB-METER OBSERVATIONS

These are all new second order, class 2 level runs by Nick Miller, Inc.

D. Problems

There was no NGS control near REDYCK. However, the South Florida Water Management District had completed a new bench run through the area (L26791) and two of those benchmarks were held as control for this survey.

IV. Closures

Loop closures were computed and are included in the package for L26803.

A. Status

All records will be kept at Nick Miller, Inc. For information on these records please contact Stephen M. Gordon at (561)627-5200.

For question concerning the collection or processing of this data please call Ronnie L. Taylor or Randy Wegner at (850)245-2606.

B. Attachments

The following are included in this package:

Hardcopy of the ABS & BOK files and Quad Maps

Disk containing the following data files is attached to the front of the folder containing the ABS, and BOK Files:

- DSC
- BLU
- HGZ
- ABS
- BOK
- LST RAW
- BACKUP.GSI
- BACKUP.RAW (RAW DATA UNTOUCHED)
- PHOTO'S
- LST