

# SONARDYNE FIELD ENGINEERING REPORT

Ranger 2 / HPT Install and CASIUS  
WHOI  
Charleston, SC



CLIENT: WHOI

VESSEL: Neil Armstrong

CLIENT REP: Robbie Laird

LOCATION: Charleston, SC

DATE: (1<sup>st</sup> Visit) 01/04/16 – 01/08/16 (2<sup>nd</sup> Visit) 02/05/16 – 02/17/16

SONARDYNE ENGINEER: Kyle Warren

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### 1. Summary Overview:

A Sonardyne Engineer was requested on board the Neil Armstrong, for the first visit, to install a Ranger 2 system and HPT 7000. The second visit was to wire in the input/outputs to the system and conduct a CASIUS calibration.

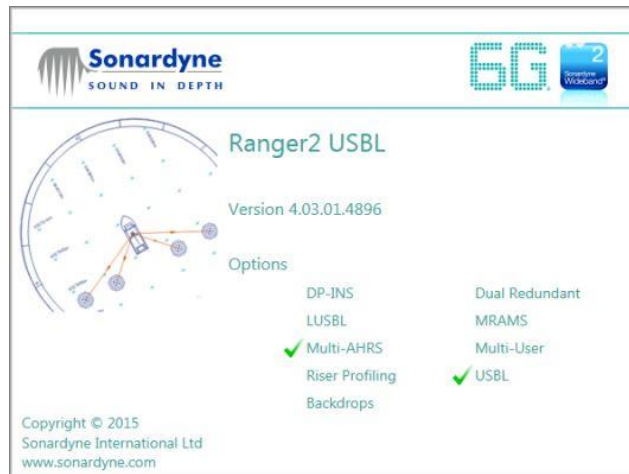
### 2. Field Activity

Sonardyne Equipment

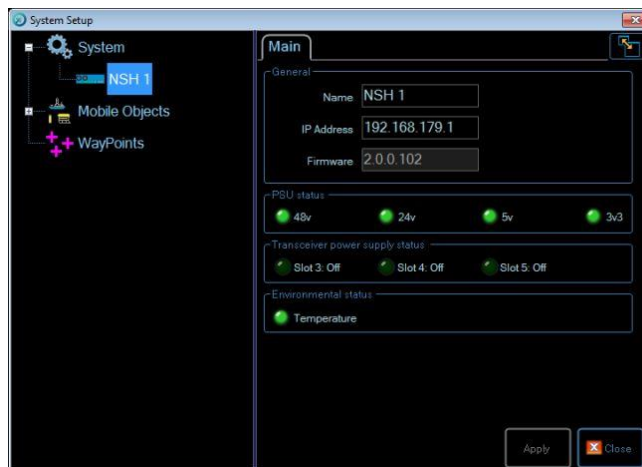
Item #	Description	Firmware/Software	Serial #	Qty
1	Navigation PC Win 7	4.03.01	293373-002	1
2	Navigation Sensor Hub	2.0.0.102	294001-003	1
3	HPT 7000	3.05.01.07	293029-002	1
4	WMT	3.05.00.05	292388-001	1

#### Topside

- The Ranger 2 PC and NSH were installed in the rack.
- The Ranger 2 software was upgrade to 4.03.01



- The NSH firmware was updated to 2.0.0.102



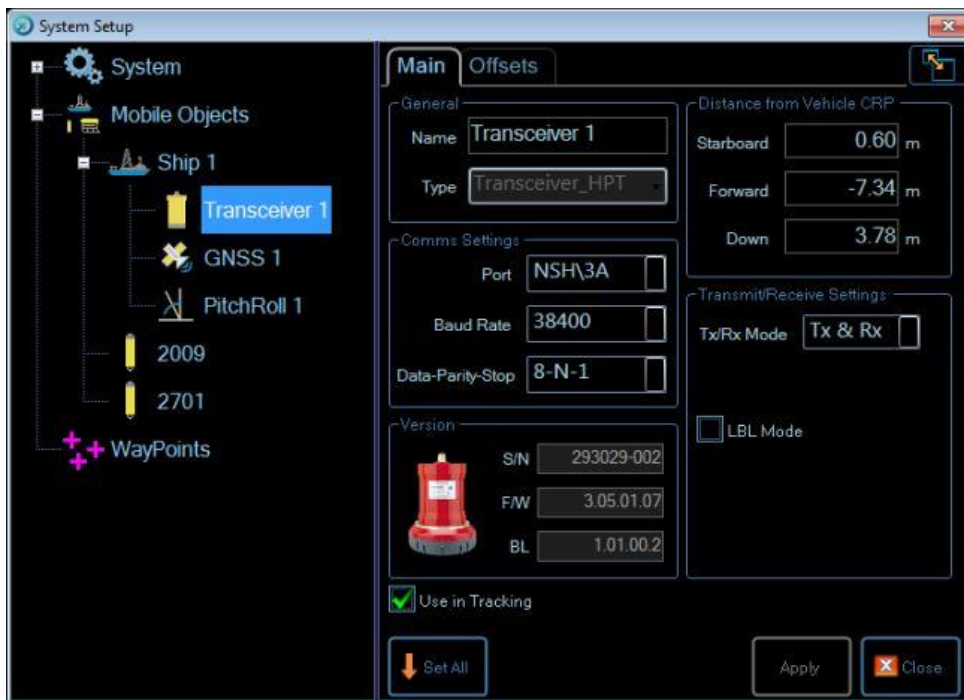
## Subsea

- The HPT was installed on a Kongsberg pole.

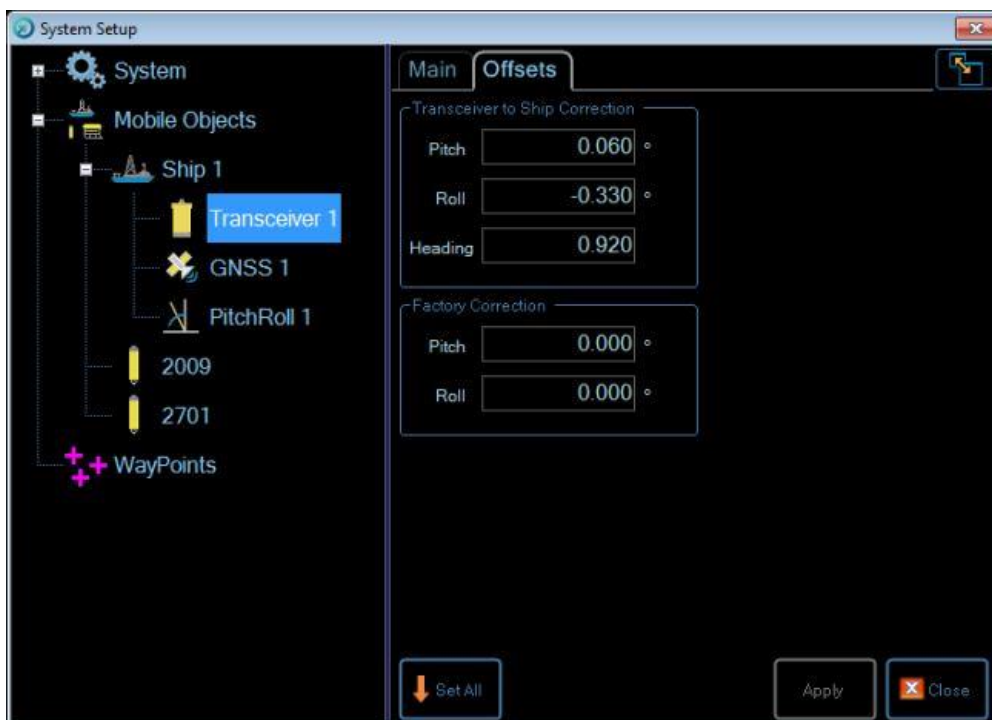


- The Sonardyne flange had to be modified to allow for the Kongsberg anti-vibration cable to be attached.
- A hole was drilled between the second and third bolt holes from the FWD mark.
- An M10 x 1.5mm tap was used to thread the hole.

- The HPT Firmware was upgraded to version 3.05.01.07. The bootloader was already up to date.
- The offsets were derived from measurements shot in by Kongsberg.



- Conducted a CASIUS calibration. For results see 'System Tests'.
- The HPT Pitch, Roll, and Heading offsets were derived from the CASIUS calibration and entered into the software.



## Telegram

- A 418BCD telegram is being sent to the DP Desk. It is setup to allow for the vessel to track a single beacon both stationary and mobile.
- An ATSASCI1 telegram is being sent out as well for networking purposes.



The screenshot shows the 'Output Telegram Editor' window with two columns of configuration. The left column is for 'ATSASCI1' and the right column is for '418BCD1'. Each column has two rows of settings, one for 'Ship 1' and one for '2009'. The 'ATSASCI1' settings include 'Enable' (checked), 'Index' (0), 'Frame of Reference' (2009), 'Orientation' (North Up), and 'Source' (Raw). The '418BCD1' settings include 'Enable' (checked), 'Index' (0), 'Frame of Reference' (2009), 'Orientation' (North Up), 'Source' (Raw), and a 'Mobility' dropdown set to 'Mobile'. At the bottom right, there are 'Add', 'OK', and 'Cancel' buttons.

Telegram Name	Type	Port	Ship	Enable	Index	Frame of Reference	Orientation	Source	Mobility
ATSASCI1	ATSASCI1	NSH17A	Ship 1	<input checked="" type="checkbox"/>	0	2009	North Up	Raw	
ATSASCI1	ATSASCI1	NSH17A	2009	<input checked="" type="checkbox"/>	1	Ship 1	Bow Up	Raw	
418BCD1	418BCD	NSH18A	Ship 1	<input checked="" type="checkbox"/>	0	2009	North Up	Raw	Mobile
418BCD1	418BCD	NSH18A	2009	<input checked="" type="checkbox"/>	1	Ship 1	Bow Up	Raw	Mobile

3. System Tests

CASIUS

# CASIUS Calibration Report



Vessel: Ship 1 Device No: Date/Time: 11 February 2016 06:46:48  
 Tcvt=Transceiver 1; Beacon=2701; GPS=GNSS 1; Heading=PitchRoll 1 [Corrections(P:0,R:0,H:0)]; Attitude=PitchRoll 1 [Corrections(P:0,R:0,H:0)]

Settings:

Initial Estimates for BoxIn	
Transceiver depth offset	3.781m
Transceiver depth	3.781m
Antenna starboard offset	-6.791m
Antenna forward offset	-8.828m
Antenna height offset	21.855m

Transceiver & Beacon	
Transceiver Index	11
Beacon Name	2701
Turn Around Time	120.0ms

Depth Aiding	
Boresight Angle Limit	22.0°
Depth Difference Limit	1.0m

Error Estimates for BoxIn	
DGPS lags USBL	0.00s
Range measurement	0.2m
Range gate	1.0m
DGPS position	2.0m
Beacon position	30.0m
Beacon depth	5.0m
Sound velocity	15.0m/s
Transceiver depth	0.5m
Transceiver offset	0.0m

Transceiver Attitude Calculation Inputs	
Angle Gate	2.0°
Known Heading Correction	n/a

Values Used During Data Collection	
Transceiver Pitch Correction	0.00°
Transceiver Roll Correction	0.00°
Transceiver Heading Correction	0.00°
Sound Velocity	1509.0m/s

Results:

Beacon BoxIn	Beacon Eastings	Beacon Northings	Beacon Depth	Sound Velocity	Transceiver Starboard Offset	Transceiver Forward Offset
Before	285127.70m	3394083.90m	1681.80m	1509.00m/s	0.60m	-7.34m
Calculated	285127.69m	3394083.91m	1684.07m	1511.40m/s	0.60m	-7.34m
Calculated Accuracy	0.05m	0.05m	0.27m	0.15m/s	0.00m	0.00m

Transceiver Attitude	Pitch Correction	Roll Correction	Heading Correction
Before	0.00°	0.00°	0.00°
Calculated	0.06°	-0.33°	0.92°
Calculated Accuracy	0.00°	0.00°	0.02°

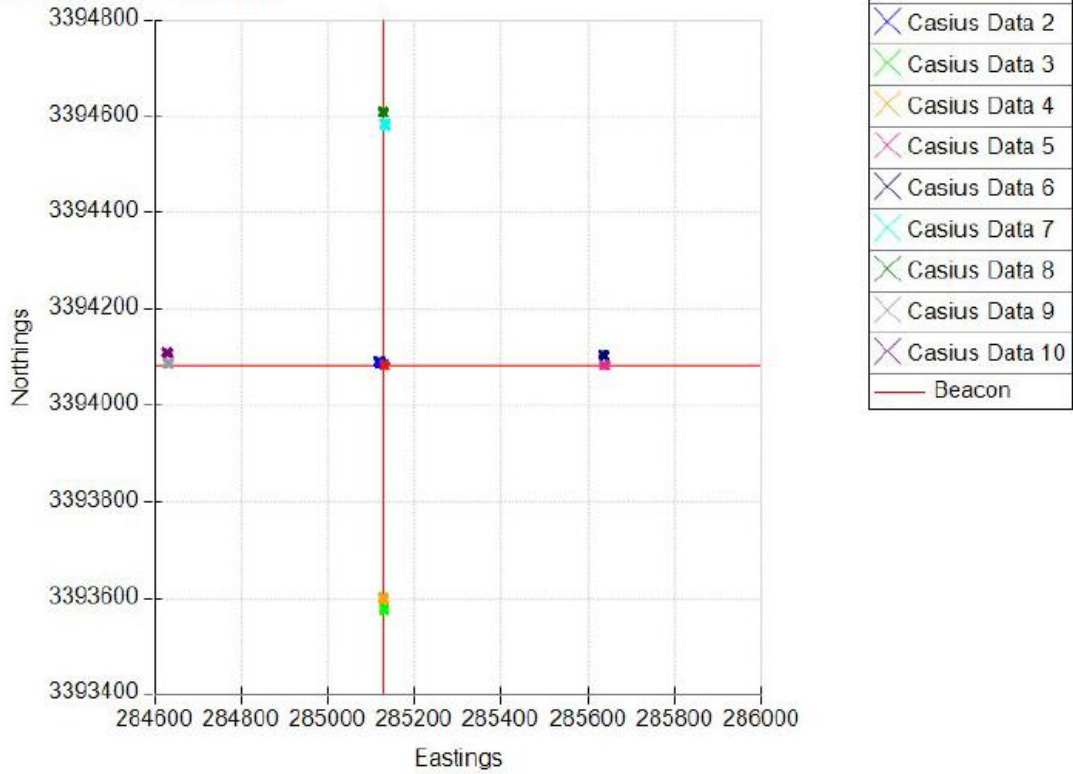
Statistics:

	Before CASIUS (distance)	After CASIUS (distance)	Before CASIUS (% depth)	After CASIUS (% depth)
39.4% Beacon Positions (1 sigma)	10.9m	3.1m	0.65	0.18
50.0% Beacon Positions (CEP)	12.6m	3.9m	0.75	0.23
63.2% Beacon Positions (1 Drms)	14.7m	5.2m	0.87	0.31
86.5% Beacon Positions (2 sigma)	19.9m	12.1m	1.18	0.72
98.2% Beacon Positions (2 Drms)	44.9m	42.4m	2.67	2.52

General:

	Beacon BoxIn	Transceiver Attitude
Number of Iterations	2	2
Number of Fixes Used	1495	1494
Number Depth Aided		0
Average weighted residuals	0.008	0.382

### Vessel Track

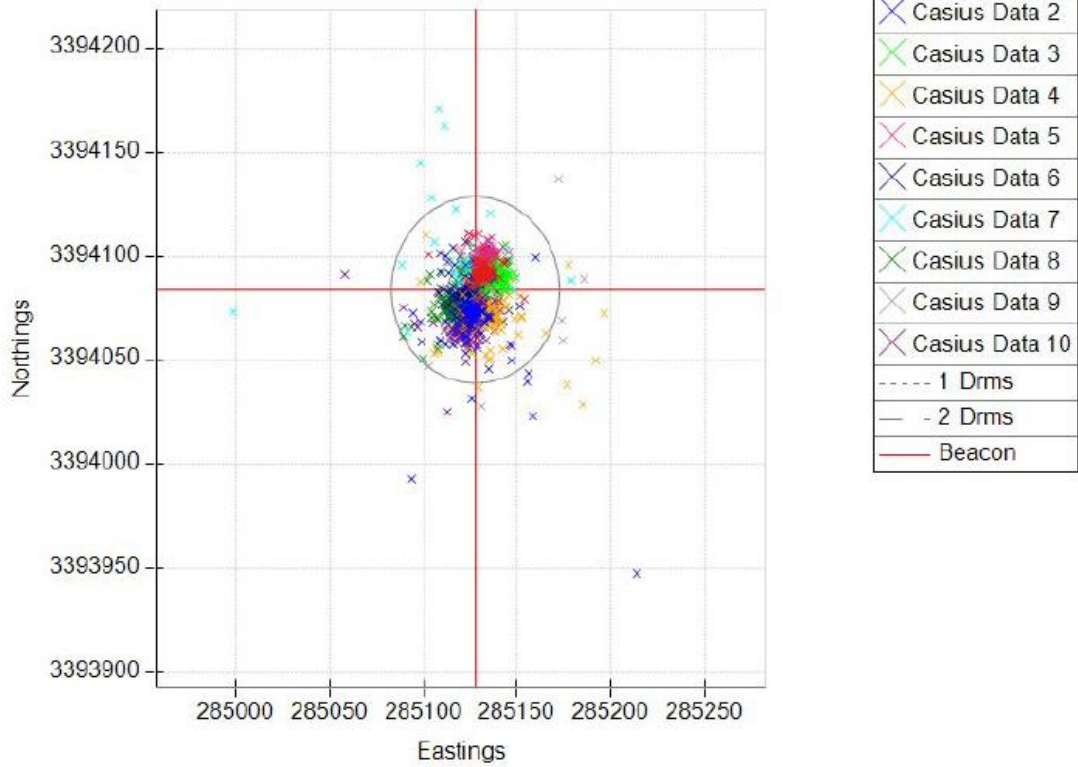


Data used:

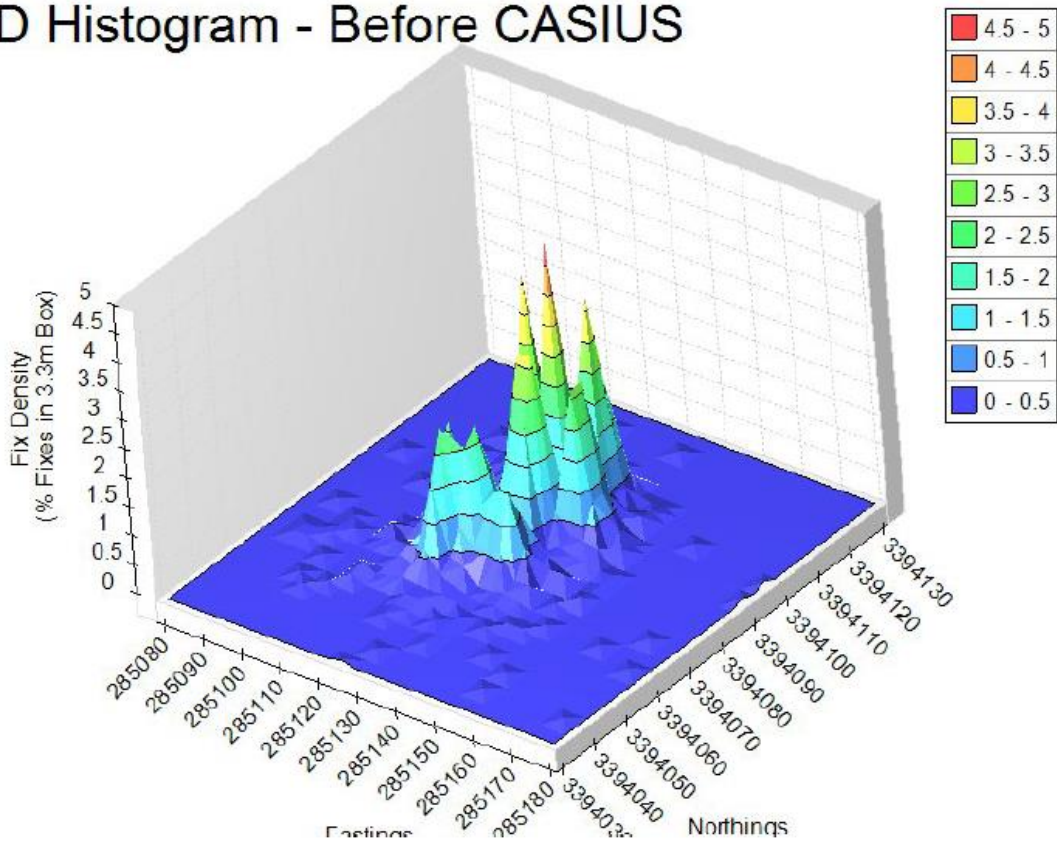
Name	Filename	Start	End	#Acoustic	#Position
Casius Data 1	n/a	11/02/2016 06:46:48	11/02/2016 06:54:12	149	888
Casius Data 2	n/a	11/02/2016 07:25:44	11/02/2016 07:33:08	150	889
Casius Data 3	n/a	11/02/2016 08:28:53	11/02/2016 08:36:21	150	896
Casius Data 4	n/a	11/02/2016 09:03:07	11/02/2016 09:12:25	150	1116
Casius Data 5	n/a	11/02/2016 09:47:16	11/02/2016 09:54:47	149	902
Casius Data 6	n/a	11/02/2016 10:22:02	11/02/2016 10:29:45	150	925
Casius Data 7	n/a	11/02/2016 10:58:17	11/02/2016 11:06:37	150	1000
Casius Data 8	n/a	11/02/2016 11:25:05	11/02/2016 11:32:33	150	897
Casius Data 9	n/a	11/02/2016 11:55:15	11/02/2016 12:03:15	150	960
Casius Data 10	n/a	11/02/2016 12:18:44	11/02/2016 12:26:21	150	914



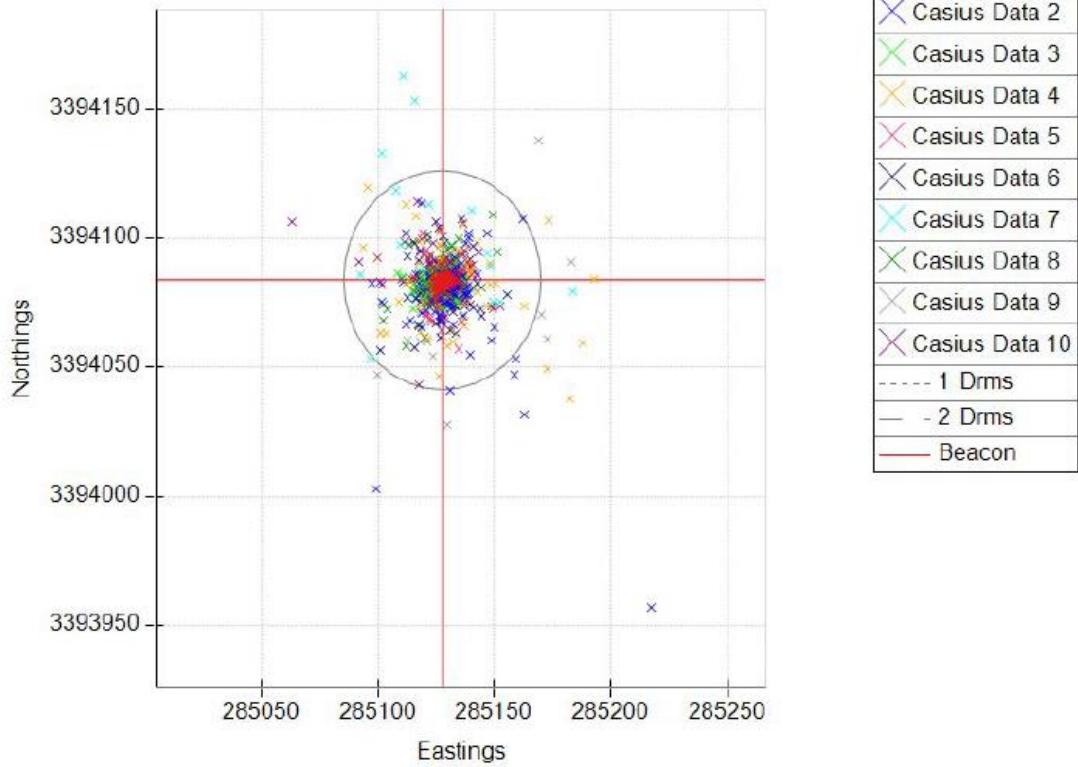
## 2D Scatter - Before CASIUS



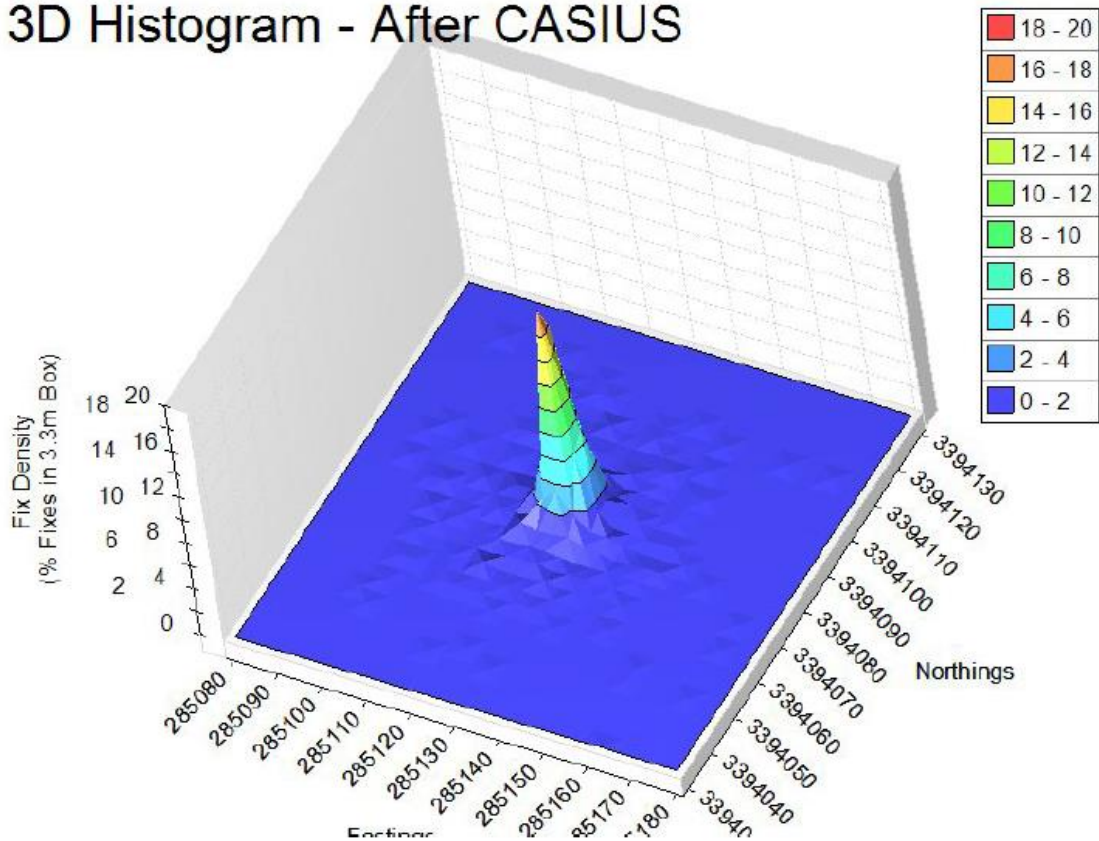
## 3D Histogram - Before CASIUS



## 2D Scatter - After CASIUS

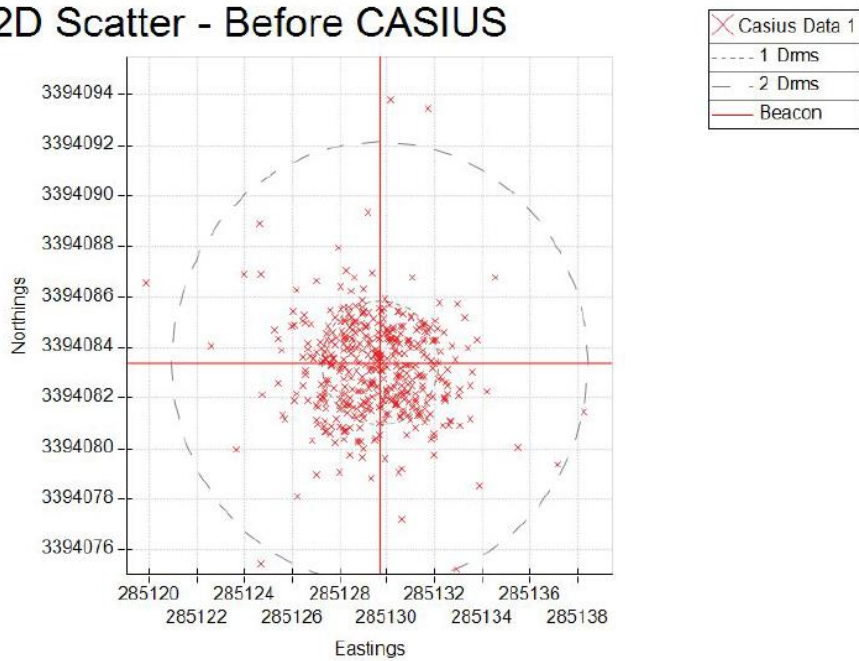


## 3D Histogram - After CASIUS



**Spin Test**

**2D Scatter - Before CASIUS**



**4. Additional Information**

**Wiring**

NSH Port	#	Color	Function
3A - TCVR- 485 38400	1	Brown	RS485-
	2	White	RS485+
	3	Green/Yellow	Signal Ground
	4	Blue/Pink	0V
	5	Red	+48v
	6	Screen	Screen
8A-DPTEL-418BCD 9600	7	Red	+Tx
	8	Black	-Tx
6A-GPS/TimeSync- GGA/ZDA 9600		DB9 brought over from another Junction box.	
6B-PitchRoll1 - EM3000 9600		DB9 brought over from another Junction box.	
7A-ATSASCI11- 9600		DB9 sent to another cabinet.	
10A-1PPS- BNC		BNC brought over from GPS receiver.	



**5. Pending Issues**

NONE

**6. Timesheets**