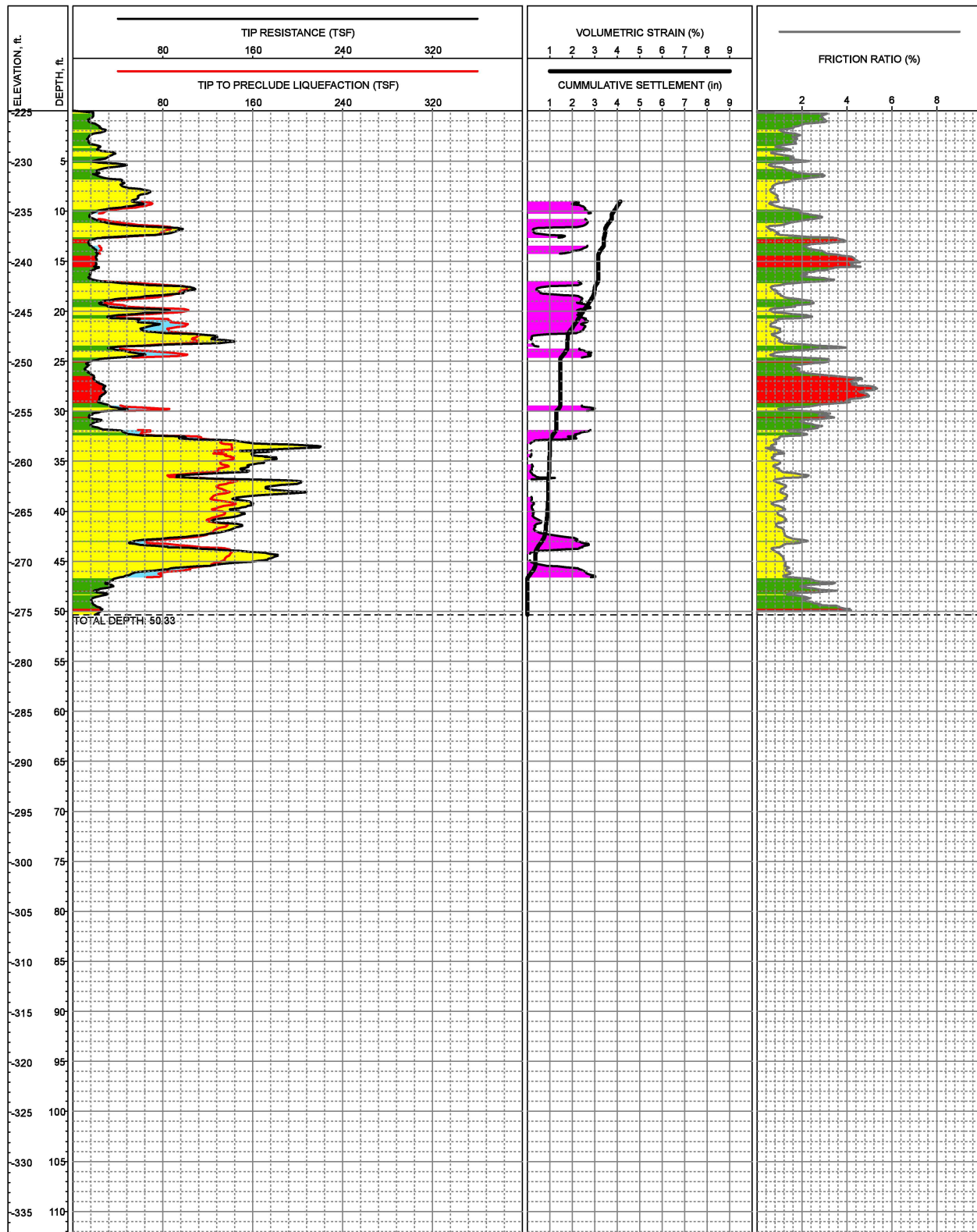


DOCKETED	
Docket Number:	23-AFC-02
Project Title:	Elmore North Geothermal Project (ENGP)
TN #:	252490-11
Document Title:	Elmore North Geothermal Project Data Request Response Set 1 Part 11
Description:	N/A
Filer:	Jerry Salamy
Organization:	Jacobs
Submitter Role:	Applicant Consultant
Submission Date:	10/2/2023 7:50:34 PM
Docketed Date:	10/3/2023

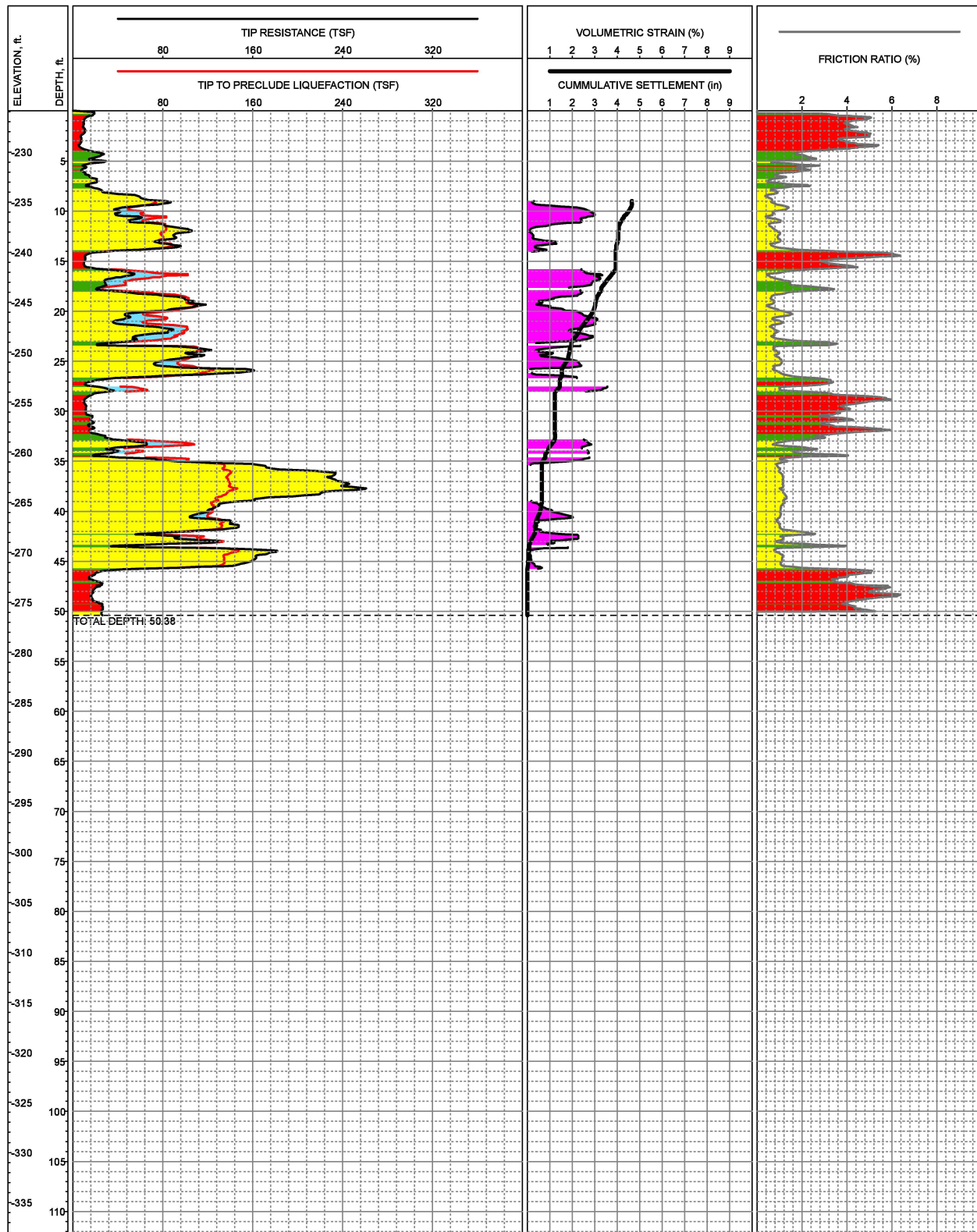


LOCATION: E6,752,247, N2,003,460, CA State Plane, Zone 6, NAD83, Feet
SURFACE EL: -224.9ft +/- (NAVD88)
COMPLETION DEPTH: 50.33ft
TESTDATE: 10/8/2008

EXPLORATION METHOD: Cone Penetrometer
PERFORMED BY: Kehoe Testing & Engineering
REVIEWED BY: Jon Everett

LIQUEFACTION LOG OF CPT NO: C-120
P.G.A. = 0.40g and $M_w = 6.5$
Black Rock Units 1, 2 & 3
Calipatria, California

FIGURE C-21



LOCATION: E6,752,168, N2,004,311, CA State Plane, Zone 6, NAD83, Feet
SURFACE EL: -225.9ft +/- (NAVD88)
COMPLETION DEPTH: 50.38ft
TESTDATE: 10/8/2008

EXPLORATION METHOD: Cone Penetrometer
PERFORMED BY: Kehoe Testing & Engineering
REVIEWED BY: Jon Everett

LIQUEFACTION LOG OF CPT NO: C-121
P.G.A. = 0.40g and $M_w = 6.5$
Black Rock Units 1, 2 & 3
Calipatria, California

FIGURE C-22

ENGP Attachment DRR 61 County Concurrence Letter





Imperial County Planning & Development Services Planning / Building

Jim Minnick
DIRECTOR

September 28, 2023

Mr. Eric Veerkamp
California Energy Commission
715 P Street
Sacramento, CA 95814

Imperial County Response to Data Request Set 1 (TN #252098) for the Elmore North Geothermal Project (23-AFC-02)

Dear Mr. Eric Veerkamp:

In response to the California Energy Commission (CEC) Staff's Data Requests Set 1 for the Elmore North Geothermal Project (ENGP) (23-AFC-02), this letter is intended to clarify Imperial County's (County) perspective on the potential project. Specifically, this letter addresses applicability of County development standards on the project's ancillary components and the County's perspective on potential findings for issuance of Conditional Use Permits (CUP).

Applicability of Development Standards on Ancillary Components

ENGP Data Request #61 requests information on how the development of each ancillary facility is consistent with the development standards for each site's zoning designation. Ancillary facilities for the project include aboveground and underground production and injection wells, aboveground production and injection pipelines, generation tie-lines (transmission lines and poles), underground freshwater supply lines, and temporary laydown yards, parking areas, borrow pits, and construction camps.

The wells (includes production and injection), aboveground pipelines (includes production and injection), and construction camps require County review and approval of a Conditional Use Permit (CUP). During the CUP process, the County will determine applicable development standards (if any), including setbacks and maximum structure height, for the wells, pipelines, and construction camps. The County will require consistency with applicable development standards prior to the issuance of a CUP or as conditions of approval.

The generation interconnection transmission line (gen-tie) is under jurisdiction of the Imperial Irrigation District and is not subject to County development standards. The freshwater supply lines and connections are located underground and are not subject to County development standards. Due to the temporary nature of laydown yards, parking areas, and borrow pits, development standards are not applicable.

Potential to Make Required Findings for Issuance of CUPs

ENGP Data Request #62 requests information on how the development of each project element, which would require a CUP if reviewed by the County, would meet the findings required for issuance of a CUP.

The ENGP components which would be subject to a CUP, if reviewed by the County, include the following:

- Primary powerplant: Per Section 90509.02 of the County's Land Use Ordinance, major geothermal projects are permitted as conditional uses.
- Production and injection wells and production and injection pipelines: Per Section 90509.02 and 90507.02 of the County's Land Use Ordinance, mineral extraction and resource extraction are permitted as conditional uses.
- Temporary laydown yards and parking areas: Per Section 90509.02 and 90518.02 of the County's Land Use Ordinance, temporary contractor storage yards are permitted as conditional uses.
- Temporary construction camps: Per Section 90509.02 and 90518.02 of the County's Land Use Ordinance, labor camps are permitted as conditional uses.
- Temporary borrow pits: Per Section 90509.02 and 90507.02 of the County's Land Use Ordinance, mineral extraction and resource extraction are permitted as conditional uses.

In order to issue CUPs, the County would need to make the following findings, pursuant to Section 90203.09 of the County's Land Use Ordinance:

- A. The proposed use is consistent with the goals and policies of the adopted county general plan;
- B. The proposed use is consistent with the purpose of the zone or sub-zone within which the use will be located;
- C. The proposed use is listed as a use within the zone or sub-zone or is found to be similar to a listed conditional use according to the procedures of Section 90203.10;
- D. The proposed use meets the minimum requirements of this title applicable to the use and complies with all applicable laws, ordinances and regulations of the county of Imperial and the state of California;
- E. The proposed use will not be detrimental to the health, safety, and welfare of the public or to the property and residents in the vicinity;
- F. The proposed use does not violate any other law or ordinance;
- G. The proposed use is not granting a special privilege.

A high-level informal review indicates the following:

Finding A: There are no initial concerns regarding significant inconsistencies with the projects and the goals and policies of the adopted general plan.

Finding B: As shown in the bullet list above, the proposed uses appear to generally align with uses identified in the County's Land Use Ordinance as permitted conditional uses. If the proposed uses are consistent with the permitted conditional uses identified in the code, the proposed uses would be consistent with the purpose of the zone designation which they are located in.

Finding C: As shown in the bullet list above, the proposed uses appear to generally align with uses identified in the County's Land Use Ordinance as permitted conditional uses.

Finding D: The project does not appear to be inconsistent with applicable laws, ordinances, and regulations of the County or State.

Finding E: There are no initial concerns with the proposed uses being detrimental to the health, safety, and welfare of the public or to the property and residents in the vicinity.

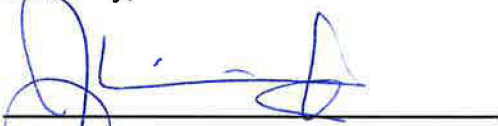
Finding F: The proposed uses do not appear to violate any other law or ordinance.

Finding G: The project is similar to other existing geothermal powerplants in the area. There are no initial concerns regarding the granting of a special privilege if a CUP is issued.

In summary, based upon the information we have reviewed to date, we are presently aware of no facts that would prevent the County from issuing CUP(s) for the elements of the projects that would require a CUP if reviewed by the County. However, this is an informal and non-binding opinion. It is critical to note that the County would require formal review to determine if the required findings, set forth in Section 90203.09 of the County's Land Use Ordinance, can be made for each instance.

If the County's perspective on these land use issues requires further clarification, please feel free to contact me at 442-265-1736 or via email jimminnick@co.imperial.ca.us.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Jim Minnick', is written over a horizontal line.

Jim Minnick, Director
Imperial County Planning & Development Services

CC: Michael Abraham, AICP, Planning & Development Assistant Director

Diana Robinson, Planning Division Manager

Files: 10.102;10.101;10.104

S:\AllUsers\APN\020\100\038\CUP23-0015\CUP23-0015 Elmore North CEC County Letter 09.28.23.docx

ENGP Attachment DRR 69 Construction Health Risk Assessment



Native files for Attachment DRR 69 have been provided separately and are available upon request.

ENGP Attachment DRR 81 Raw Traffic Count Data



County of Imperial
N/S: SR-111
E/W: Sinclair Road
Weather: Clear

File Name : 01_CIM_111_Sinc Wed AM
Site Code : 23022885
Start Date : 10/5/2022
Page No : 1

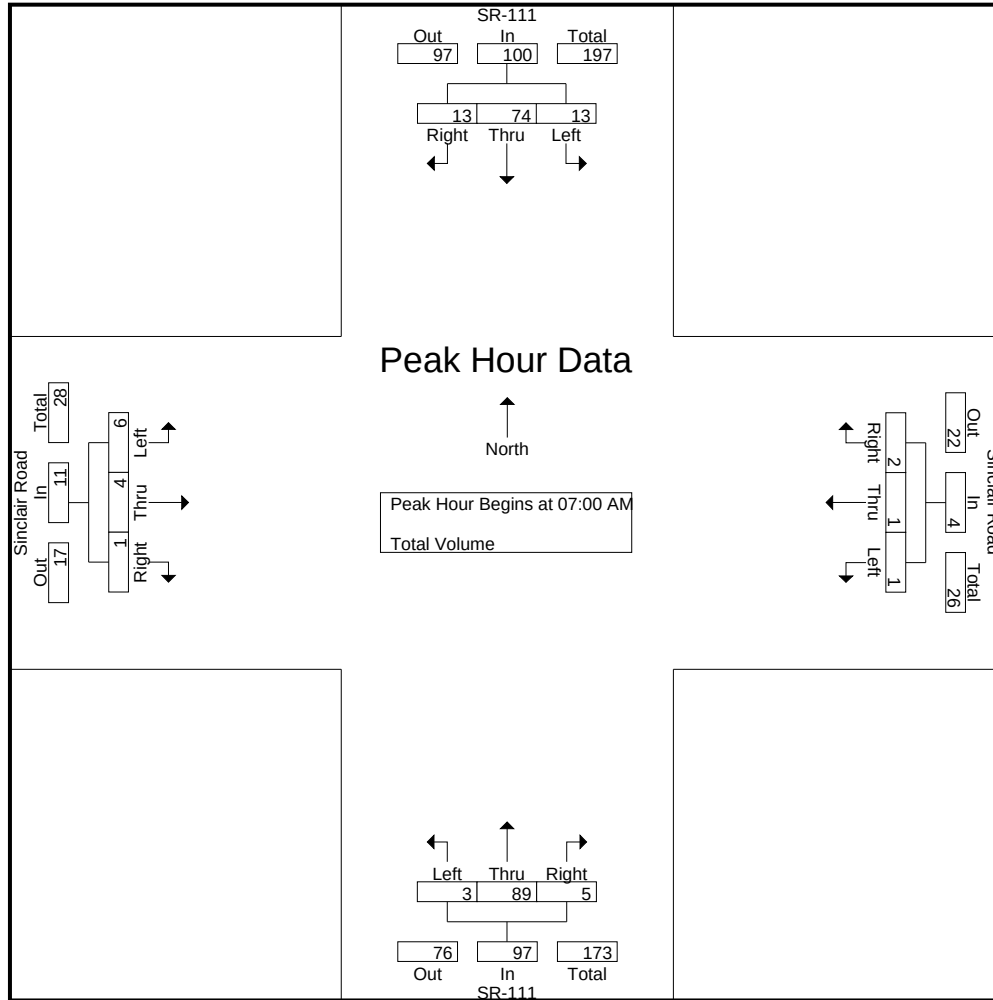
Groups Printed- Total Volume

	SR-111 Southbound				Sinclair Road Westbound				SR-111 Northbound				Sinclair Road Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
05:00 AM	1	3	1	5	0	0	0	0	0	21	0	21	0	0	1	1	27
05:15 AM	1	4	0	5	0	0	0	0	1	16	0	17	1	0	2	3	25
05:30 AM	6	6	3	15	0	0	0	0	3	27	0	30	0	1	1	2	47
05:45 AM	3	6	5	14	0	0	0	0	8	21	1	30	2	0	1	3	47
Total	11	19	9	39	0	0	0	0	12	85	1	98	3	1	5	9	146
06:00 AM	3	21	3	27	0	0	0	0	2	11	0	13	0	0	1	1	41
06:15 AM	1	18	1	20	0	0	0	0	1	15	0	16	2	0	0	2	38
06:30 AM	3	17	1	21	0	2	1	3	1	16	0	17	1	0	0	1	42
06:45 AM	5	11	0	16	0	0	0	0	1	23	0	24	2	0	1	3	43
Total	12	67	5	84	0	2	1	3	5	65	0	70	5	0	2	7	164
07:00 AM	4	13	3	20	0	0	1	1	0	14	1	15	4	2	0	6	42
07:15 AM	2	21	5	28	0	0	0	0	3	23	0	26	1	1	1	3	57
07:30 AM	3	21	4	28	0	0	0	0	0	27	1	28	0	1	0	1	57
07:45 AM	4	19	1	24	1	1	1	3	0	25	3	28	1	0	0	1	56
Total	13	74	13	100	1	1	2	4	3	89	5	97	6	4	1	11	212
Grand Total	36	160	27	223	1	3	3	7	20	239	6	265	14	5	8	27	522
Apprch %	16.1	71.7	12.1		14.3	42.9	42.9		7.5	90.2	2.3		51.9	18.5	29.6		
Total %	6.9	30.7	5.2	42.7	0.2	0.6	0.6	1.3	3.8	45.8	1.1	50.8	2.7	1	1.5	5.2	

	SR-111 Southbound				Sinclair Road Westbound				SR-111 Northbound				Sinclair Road Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 05:00 AM to 07:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	4	13	3	20	0	0	1	1	0	14	1	15	4	2	0	6	42
07:15 AM	2	21	5	28	0	0	0	0	3	23	0	26	1	1	1	3	57
07:30 AM	3	21	4	28	0	0	0	0	0	27	1	28	0	1	0	1	57
07:45 AM	4	19	1	24	1	1	1	3	0	25	3	28	1	0	0	1	56
Total Volume	13	74	13	100	1	1	2	4	3	89	5	97	6	4	1	11	212
% App. Total	13	74	13		25	25	50		3.1	91.8	5.2		54.5	36.4	9.1		
PHF	.813	.881	.650	.893	.250	.250	.500	.333	.250	.824	.417	.866	.375	.500	.250	.458	.930

County of Imperial
N/S: SR-111
E/W: Sinclair Road
Weather: Clear

File Name : 01_CIM_111_Sinc Wed AM
Site Code : 23022885
Start Date : 10/5/2022
Page No : 2



Peak Hour Analysis From 05:00 AM to 07:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:00 AM				06:15 AM				05:00 AM				06:30 AM			
+0 mins.	4	13	3	20	0	0	0	0	0	21	0	21	1	0	0	1
+15 mins.	2	21	5	28	0	2	1	3	1	16	0	17	2	0	1	3
+30 mins.	3	21	4	28	0	0	0	0	3	27	0	30	4	2	0	6
+45 mins.	4	19	1	24	0	0	1	1	8	21	1	30	1	1	1	3
Total Volume	13	74	13	100	0	2	2	4	12	85	1	98	8	3	2	13
% App. Total	13	74	13		0	50	50		12.2	86.7	1		61.5	23.1	15.4	
PHF	.813	.881	.650	.893	.000	.250	.500	.333	.375	.787	.250	.817	.500	.375	.500	.542

County of Imperial
N/S: SR-111
E/W: Sinclair Road
Weather: Clear

File Name : 01_CIM_111_Sinc Wed PM
Site Code : 23022885
Start Date : 10/5/2022
Page No : 1

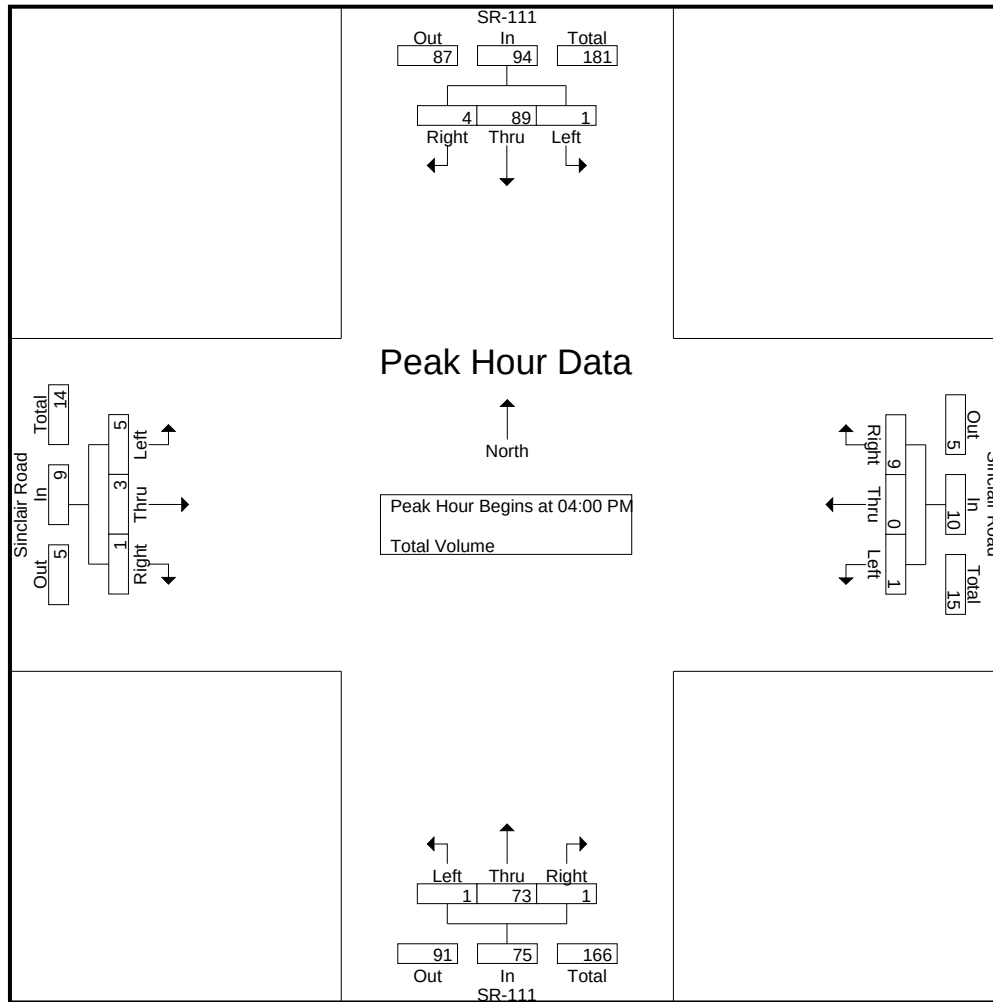
Groups Printed- Total Volume

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Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:00 PM	0	34	1	35	1	0	2	3	0	22	0	22	0	0	1	1	61
04:15 PM	1	20	1	22	0	0	2	2	0	16	0	16	1	0	0	1	41
04:30 PM	0	21	2	23	0	0	2	2	1	23	0	24	3	2	0	5	54
04:45 PM	0	14	0	14	0	0	3	3	0	12	1	13	1	1	0	2	32
Total	1	89	4	94	1	0	9	10	1	73	1	75	5	3	1	9	188
05:00 PM	0	19	2	21	0	2	0	2	0	18	0	18	3	0	0	3	44
05:15 PM	0	13	1	14	0	1	0	1	1	22	0	23	2	0	1	3	41
05:30 PM	0	13	0	13	0	0	0	0	0	22	0	22	1	1	2	4	39
05:45 PM	0	12	0	12	0	0	0	0	0	12	0	12	1	0	1	2	26
Total	0	57	3	60	0	3	0	3	1	74	0	75	7	1	4	12	150
06:00 PM	0	15	2	17	0	0	1	1	0	16	0	16	0	0	1	1	35
06:15 PM	0	21	0	21	0	0	0	0	0	21	0	21	0	1	0	1	43
06:30 PM	1	20	1	22	0	0	0	0	0	15	0	15	1	0	0	1	38
06:45 PM	0	11	1	12	0	0	1	1	0	8	0	8	0	0	0	0	21
Total	1	67	4	72	0	0	2	2	0	60	0	60	1	1	1	3	137
07:00 PM	0	11	1	12	0	0	0	0	1	10	0	11	0	0	1	1	24
07:15 PM	0	16	3	19	0	0	0	0	0	11	0	11	0	0	0	0	30
07:30 PM	0	5	1	6	1	0	0	1	0	12	0	12	2	0	0	2	21
07:45 PM	0	8	0	8	0	0	0	0	0	10	0	10	0	0	0	0	18
Total	0	40	5	45	1	0	0	1	1	43	0	44	2	0	1	3	93
Grand Total	2	253	16	271	2	3	11	16	3	250	1	254	15	5	7	27	568
Apprch %	0.7	93.4	5.9		12.5	18.8	68.8		1.2	98.4	0.4		55.6	18.5	25.9		
Total %	0.4	44.5	2.8	47.7	0.4	0.5	1.9	2.8	0.5	44	0.2	44.7	2.6	0.9	1.2	4.8	

	SR-111 Southbound				Sinclair Road Westbound				SR-111 Northbound				Sinclair Road Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 07:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	34	1	35	1	0	2	3	0	22	0	22	0	0	1	1	61
04:15 PM	1	20	1	22	0	0	2	2	0	16	0	16	1	0	0	1	41
04:30 PM	0	21	2	23	0	0	2	2	1	23	0	24	3	2	0	5	54
04:45 PM	0	14	0	14	0	0	3	3	0	12	1	13	1	1	0	2	32
Total Volume	1	89	4	94	1	0	9	10	1	73	1	75	5	3	1	9	188
% App. Total	1.1	94.7	4.3		10	0	90		1.3	97.3	1.3		55.6	33.3	11.1		
PHF	.250	.654	.500	.671	.250	.000	.750	.833	.250	.793	.250	.781	.417	.375	.250	.450	.770

County of Imperial
N/S: SR-111
E/W: Sinclair Road
Weather: Clear

File Name : 01_CIM_111_Sinc Wed PM
Site Code : 23022885
Start Date : 10/5/2022
Page No : 2



Peak Hour Analysis From 04:00 PM to 07:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:00 PM				04:00 PM				04:30 PM				04:30 PM			
+0 mins.	0	34	1	35	1	0	2	3	1	23	0	24	3	2	0	5
+15 mins.	1	20	1	22	0	0	2	2	0	12	1	13	1	1	0	2
+30 mins.	0	21	2	23	0	0	2	2	0	18	0	18	3	0	0	3
+45 mins.	0	14	0	14	0	0	3	3	1	22	0	23	2	0	1	3
Total Volume	1	89	4	94	1	0	9	10	2	75	1	78	9	3	1	13
% App. Total	1.1	94.7	4.3		10	0	90		2.6	96.2	1.3		69.2	23.1	7.7	
PHF	.250	.654	.500	.671	.250	.000	.750	.833	.500	.815	.250	.813	.750	.375	.250	.650

County of Imperial
N/S: SR-111
E/W: Sinclair Road
Weather: Clear

File Name : 01_CIM_111_Sinc Thu AM
Site Code : 23022885
Start Date : 10/6/2022
Page No : 1

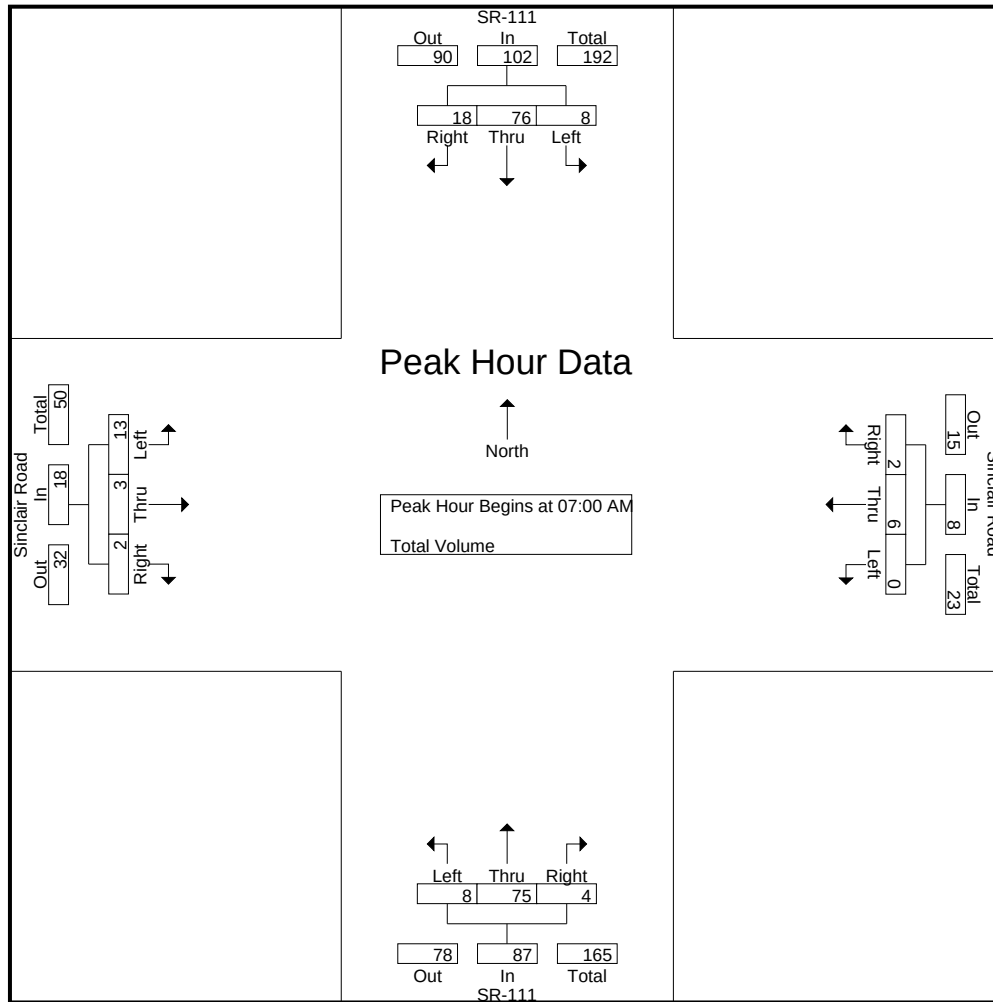
Groups Printed- Total Volume

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Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
05:00 AM	0	7	1	8	0	0	0	0	0	13	1	14	0	0	1	1	23
05:15 AM	3	3	1	7	0	0	1	1	1	15	0	16	0	0	2	2	26
05:30 AM	2	4	3	9	0	0	0	0	2	25	0	27	1	0	0	1	37
05:45 AM	2	12	4	18	0	1	0	1	0	21	0	21	0	0	0	0	40
Total	7	26	9	42	0	1	1	2	3	74	1	78	1	0	3	4	126
06:00 AM	3	16	1	20	0	0	0	0	2	22	0	24	0	0	2	2	46
06:15 AM	1	14	1	16	0	1	0	1	0	30	0	30	2	2	0	4	51
06:30 AM	0	21	3	24	0	0	0	0	0	22	0	22	1	0	1	2	48
06:45 AM	3	13	2	18	0	0	1	1	1	18	0	19	0	2	1	3	41
Total	7	64	7	78	0	1	1	2	3	92	0	95	3	4	4	11	186
07:00 AM	0	20	6	26	0	1	0	1	0	15	0	15	2	0	0	2	44
07:15 AM	0	12	6	18	0	0	1	1	3	22	2	27	4	2	1	7	53
07:30 AM	2	20	3	25	0	2	1	3	3	21	0	24	3	1	0	4	56
07:45 AM	6	24	3	33	0	3	0	3	2	17	2	21	4	0	1	5	62
Total	8	76	18	102	0	6	2	8	8	75	4	87	13	3	2	18	215
Grand Total	22	166	34	222	0	8	4	12	14	241	5	260	17	7	9	33	527
Apprch %	9.9	74.8	15.3		0	66.7	33.3		5.4	92.7	1.9		51.5	21.2	27.3		
Total %	4.2	31.5	6.5	42.1	0	1.5	0.8	2.3	2.7	45.7	0.9	49.3	3.2	1.3	1.7	6.3	

	SR-111 Southbound				Sinclair Road Westbound				SR-111 Northbound				Sinclair Road Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 05:00 AM to 07:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	0	20	6	26	0	1	0	1	0	15	0	15	2	0	0	2	44
07:15 AM	0	12	6	18	0	0	1	1	3	22	2	27	4	2	1	7	53
07:30 AM	2	20	3	25	0	2	1	3	3	21	0	24	3	1	0	4	56
07:45 AM	6	24	3	33	0	3	0	3	2	17	2	21	4	0	1	5	62
Total Volume	8	76	18	102	0	6	2	8	8	75	4	87	13	3	2	18	215
% App. Total	7.8	74.5	17.6		0	75	25		9.2	86.2	4.6		72.2	16.7	11.1		
PHF	.333	.792	.750	.773	.000	.500	.500	.667	.667	.852	.500	.806	.813	.375	.500	.643	.867

County of Imperial
N/S: SR-111
E/W: Sinclair Road
Weather: Clear

File Name : 01_CIM_111_Sinc Thu AM
Site Code : 23022885
Start Date : 10/6/2022
Page No : 2



Peak Hour Analysis From 05:00 AM to 07:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:00 AM				07:00 AM				05:30 AM				07:00 AM			
+0 mins.	0	20	6	26	0	1	0	1	2	25	0	27	2	0	0	2
+15 mins.	0	12	6	18	0	0	1	1	0	21	0	21	4	2	1	7
+30 mins.	2	20	3	25	0	2	1	3	2	22	0	24	3	1	0	4
+45 mins.	6	24	3	33	0	3	0	3	0	30	0	30	4	0	1	5
Total Volume	8	76	18	102	0	6	2	8	4	98	0	102	13	3	2	18
% App. Total	7.8	74.5	17.6		0	75	25		3.9	96.1	0		72.2	16.7	11.1	
PHF	.333	.792	.750	.773	.000	.500	.500	.667	.500	.817	.000	.850	.813	.375	.500	.643

County of Imperial
N/S: SR-111
E/W: Sinclair Road
Weather: Clear

File Name : 01_CIM_111_Sinc Thu PM
Site Code : 23022885
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Page No : 1

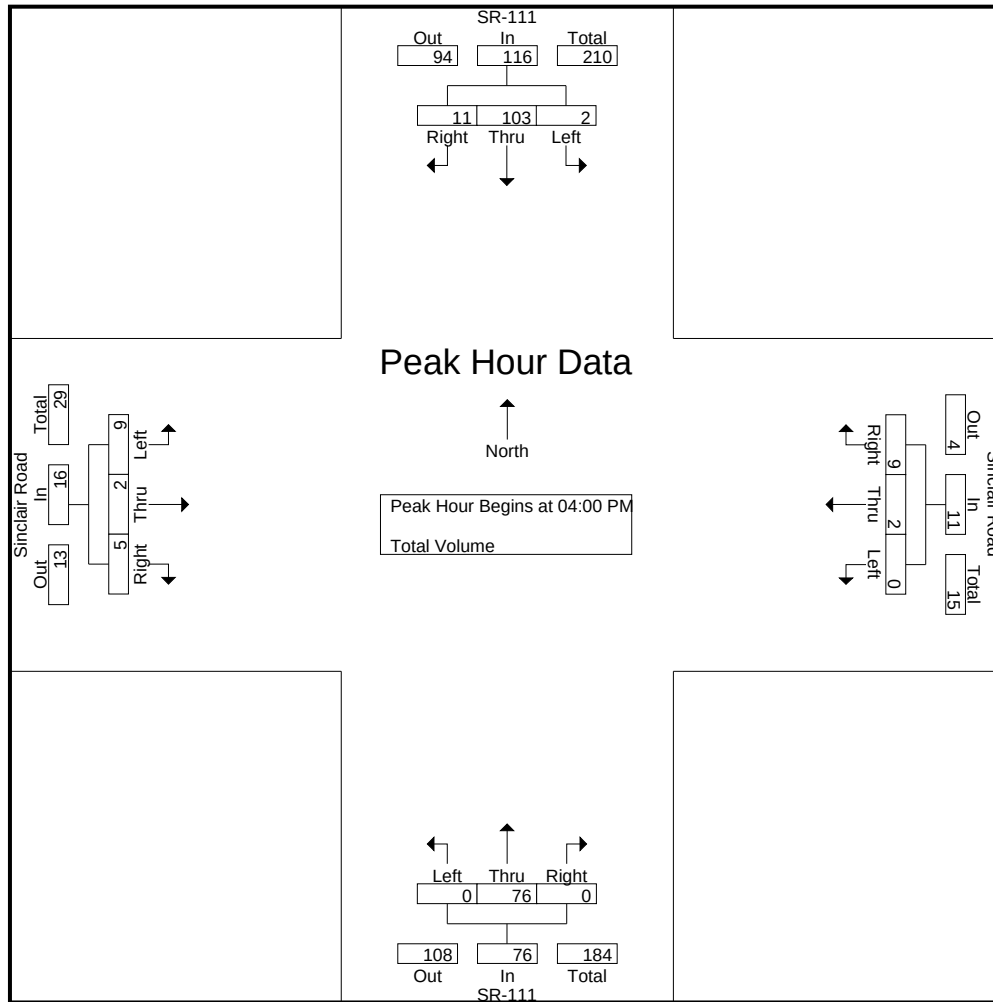
Groups Printed- Total Volume

	SR-111 Southbound				Sinclair Road Westbound				SR-111 Northbound				Sinclair Road Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:00 PM	1	29	3	33	0	0	1	1	0	22	0	22	3	0	3	6	62
04:15 PM	1	30	6	37	0	1	4	5	0	9	0	9	3	0	0	3	54
04:30 PM	0	27	2	29	0	0	3	3	0	21	0	21	3	2	1	6	59
04:45 PM	0	17	0	17	0	1	1	2	0	24	0	24	0	0	1	1	44
Total	2	103	11	116	0	2	9	11	0	76	0	76	9	2	5	16	219
05:00 PM	0	30	1	31	0	0	1	1	2	21	0	23	4	0	0	4	59
05:15 PM	0	10	1	11	0	2	1	3	0	27	0	27	1	0	0	1	42
05:30 PM	0	15	1	16	0	0	0	0	0	13	0	13	0	0	1	1	30
05:45 PM	0	21	1	22	0	1	0	1	0	6	0	6	0	0	0	0	29
Total	0	76	4	80	0	3	2	5	2	67	0	69	5	0	1	6	160
06:00 PM	0	32	0	32	0	0	2	2	0	20	0	20	0	1	0	1	55
06:15 PM	0	19	0	19	0	0	0	0	0	12	0	12	0	0	2	2	33
06:30 PM	0	17	1	18	0	0	0	0	0	11	0	11	2	0	0	2	31
06:45 PM	0	10	1	11	0	0	1	1	0	9	0	9	0	0	2	2	23
Total	0	78	2	80	0	0	3	3	0	52	0	52	2	1	4	7	142
07:00 PM	0	12	1	13	0	0	0	0	0	10	0	10	0	2	0	2	25
07:15 PM	0	10	1	11	0	0	0	0	0	20	0	20	0	0	0	0	31
07:30 PM	0	14	1	15	1	0	1	2	0	11	0	11	0	0	0	0	28
07:45 PM	0	7	0	7	0	0	0	0	0	16	0	16	0	0	0	0	23
Total	0	43	3	46	1	0	1	2	0	57	0	57	0	2	0	2	107
Grand Total	2	300	20	322	1	5	15	21	2	252	0	254	16	5	10	31	628
Apprch %	0.6	93.2	6.2		4.8	23.8	71.4		0.8	99.2	0		51.6	16.1	32.3		
Total %	0.3	47.8	3.2	51.3	0.2	0.8	2.4	3.3	0.3	40.1	0	40.4	2.5	0.8	1.6	4.9	

	SR-111 Southbound				Sinclair Road Westbound				SR-111 Northbound				Sinclair Road Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 07:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	1	29	3	33	0	0	1	1	0	22	0	22	3	0	3	6	62
04:15 PM	1	30	6	37	0	1	4	5	0	9	0	9	3	0	0	3	54
04:30 PM	0	27	2	29	0	0	3	3	0	21	0	21	3	2	1	6	59
04:45 PM	0	17	0	17	0	1	1	2	0	24	0	24	0	0	1	1	44
Total Volume	2	103	11	116	0	2	9	11	0	76	0	76	9	2	5	16	219
% App. Total	1.7	88.8	9.5		0	18.2	81.8		0	100	0		56.2	12.5	31.2		
PHF	.500	.858	.458	.784	.000	.500	.563	.550	.000	.792	.000	.792	.750	.250	.417	.667	.883

County of Imperial
N/S: SR-111
E/W: Sinclair Road
Weather: Clear

File Name : 01_CIM_111_Sinc Thu PM
Site Code : 23022885
Start Date : 10/6/2022
Page No : 2



Peak Hour Analysis From 04:00 PM to 07:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:00 PM				04:00 PM				04:30 PM				04:00 PM			
+0 mins.	1	29	3	33	0	0	1	1	0	21	0	21	3	0	3	6
+15 mins.	1	30	6	37	0	1	4	5	0	24	0	24	3	0	0	3
+30 mins.	0	27	2	29	0	0	3	3	2	21	0	23	3	2	1	6
+45 mins.	0	17	0	17	0	1	1	2	0	27	0	27	0	0	1	1
Total Volume	2	103	11	116	0	2	9	11	2	93	0	95	9	2	5	16
% App. Total	1.7	88.8	9.5		0	18.2	81.8		2.1	97.9	0		56.2	12.5	31.2	
PHF	.500	.858	.458	.784	.000	.500	.563	.550	.250	.861	.000	.880	.750	.250	.417	.667

City of Calipatria
N/S: SR-111 (Sorensen Avenue)
E/W: Main Street
Weather: Clear

File Name : 02_CPA_111_Main Wed AM
Site Code : 23022885
Start Date : 10/5/2022
Page No : 1

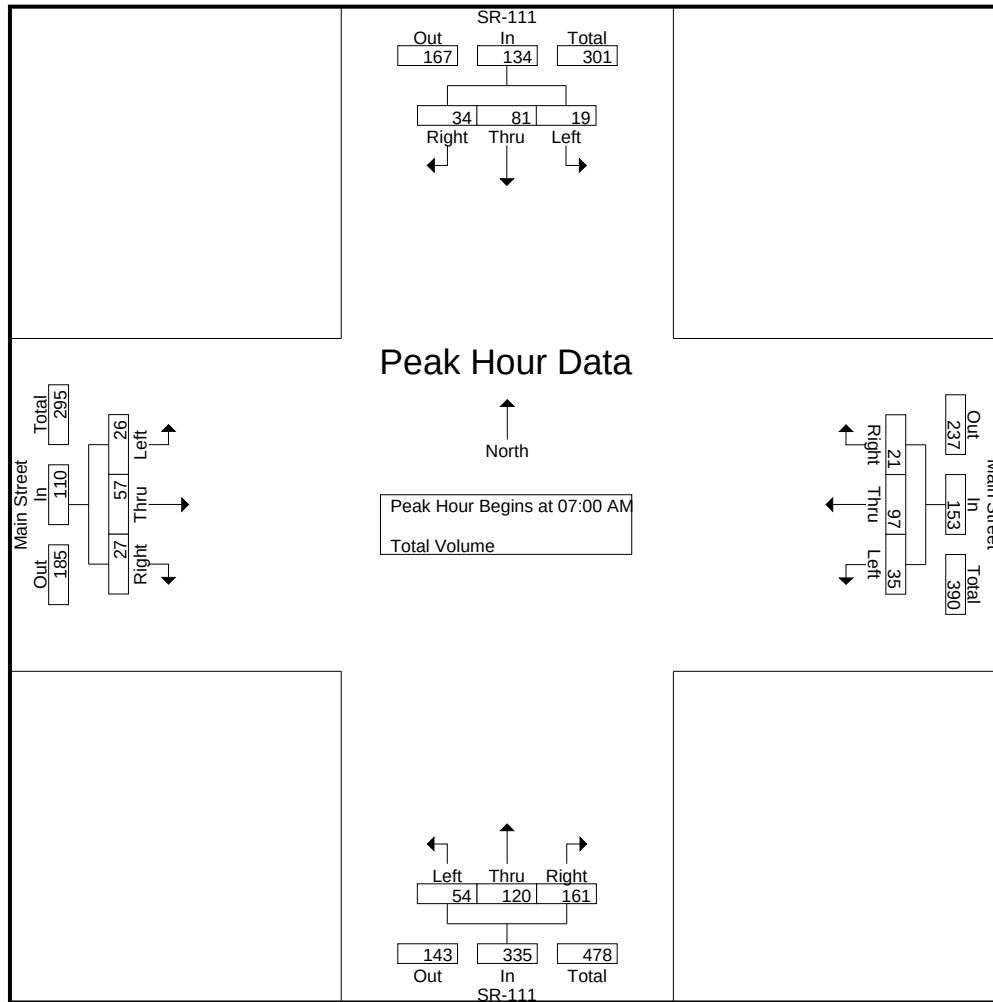
Groups Printed- Total Volume

	SR-111 Southbound				Main Street Westbound				SR-111 Northbound				Main Street Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
05:00 AM	3	5	3	11	6	7	0	13	3	19	14	36	2	4	2	8	68
05:15 AM	5	6	4	15	7	2	1	10	4	20	30	54	3	6	5	14	93
05:30 AM	2	3	3	8	4	13	1	18	14	29	73	116	7	17	4	28	170
05:45 AM	7	4	3	14	11	13	6	30	6	29	47	82	8	21	1	30	156
Total	17	18	13	48	28	35	8	71	27	97	164	288	20	48	12	80	487
06:00 AM	2	15	8	25	37	9	3	49	4	11	11	26	4	7	4	15	115
06:15 AM	2	14	5	21	19	5	2	26	13	19	14	46	6	12	5	23	116
06:30 AM	2	19	5	26	10	8	2	20	16	16	33	65	4	15	3	22	133
06:45 AM	1	11	4	16	6	7	4	17	8	18	58	84	9	14	4	27	144
Total	7	59	22	88	72	29	11	112	41	64	116	221	23	48	16	87	508
07:00 AM	1	16	4	21	10	7	6	23	9	24	29	62	9	7	5	21	127
07:15 AM	3	21	10	34	8	10	4	22	6	24	37	67	4	15	8	27	150
07:30 AM	5	17	12	34	8	25	3	36	14	27	39	80	6	10	4	20	170
07:45 AM	10	27	8	45	9	55	8	72	25	45	56	126	7	25	10	42	285
Total	19	81	34	134	35	97	21	153	54	120	161	335	26	57	27	110	732
Grand Total	43	158	69	270	135	161	40	336	122	281	441	844	69	153	55	277	1727
Apprch %	15.9	58.5	25.6		40.2	47.9	11.9		14.5	33.3	52.3		24.9	55.2	19.9		
Total %	2.5	9.1	4	15.6	7.8	9.3	2.3	19.5	7.1	16.3	25.5	48.9	4	8.9	3.2	16	

	SR-111 Southbound				Main Street Westbound				SR-111 Northbound				Main Street Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 05:00 AM to 07:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	1	16	4	21	10	7	6	23	9	24	29	62	9	7	5	21	127
07:15 AM	3	21	10	34	8	10	4	22	6	24	37	67	4	15	8	27	150
07:30 AM	5	17	12	34	8	25	3	36	14	27	39	80	6	10	4	20	170
07:45 AM	10	27	8	45	9	55	8	72	25	45	56	126	7	25	10	42	285
Total Volume	19	81	34	134	35	97	21	153	54	120	161	335	26	57	27	110	732
% App. Total	14.2	60.4	25.4		22.9	63.4	13.7		16.1	35.8	48.1		23.6	51.8	24.5		
PHF	.475	.750	.708	.744	.875	.441	.656	.531	.540	.667	.719	.665	.722	.570	.675	.655	.642

City of Calipatria
N/S: SR-111 (Sorensen Avenue)
E/W: Main Street
Weather: Clear

File Name : 02_CPA_111_Main Wed AM
Site Code : 23022885
Start Date : 10/5/2022
Page No : 2



Peak Hour Analysis From 05:00 AM to 07:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	07:00 AM				07:00 AM				07:00 AM				07:00 AM			
+0 mins.	1	16	4	21	10	7	6	23	9	24	29	62	9	7	5	21
+15 mins.	3	21	10	34	8	10	4	22	6	24	37	67	4	15	8	27
+30 mins.	5	17	12	34	8	25	3	36	14	27	39	80	6	10	4	20
+45 mins.	10	27	8	45	9	55	8	72	25	45	56	126	7	25	10	42
Total Volume	19	81	34	134	35	97	21	153	54	120	161	335	26	57	27	110
% App. Total	14.2	60.4	25.4		22.9	63.4	13.7		16.1	35.8	48.1		23.6	51.8	24.5	
PHF	.475	.750	.708	.744	.875	.441	.656	.531	.540	.667	.719	.665	.722	.570	.675	.655

City of Calipatria
N/S: SR-111 (Sorensen Avenue)
E/W: Main Street
Weather: Clear

File Name : 02_CPA_111_Main Wed PM
Site Code : 23022885
Start Date : 10/5/2022
Page No : 1

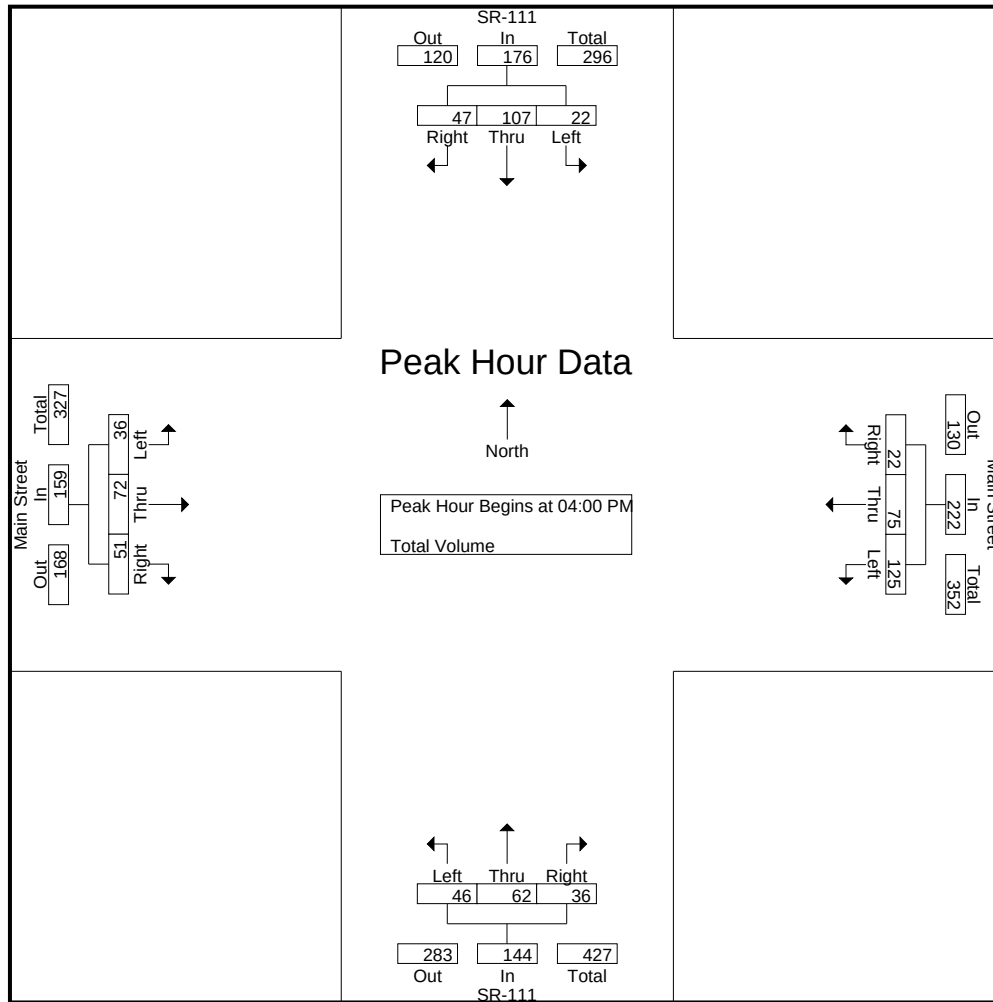
Groups Printed- Total Volume

	SR-111 Southbound				Main Street Westbound				SR-111 Northbound				Main Street Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:00 PM	5	34	16	55	51	21	7	79	10	14	11	35	13	17	11	41	210
04:15 PM	8	29	8	45	22	9	3	34	11	17	3	31	4	15	11	30	140
04:30 PM	6	22	8	36	34	29	9	72	11	16	10	37	9	16	13	38	183
04:45 PM	3	22	15	40	18	16	3	37	14	15	12	41	10	24	16	50	168
Total	22	107	47	176	125	75	22	222	46	62	36	144	36	72	51	159	701
05:00 PM	6	25	8	39	10	5	1	16	14	23	9	46	12	21	20	53	154
05:15 PM	2	25	6	33	15	20	6	41	8	18	6	32	12	10	13	35	141
05:30 PM	4	14	10	28	18	9	8	35	14	18	8	40	17	9	2	28	131
05:45 PM	3	14	4	21	8	17	7	32	11	11	12	34	4	7	3	14	101
Total	15	78	28	121	51	51	22	124	47	70	35	152	45	47	38	130	527
06:00 PM	7	14	7	28	12	15	5	32	11	20	8	39	16	29	9	54	153
06:15 PM	7	16	5	28	4	21	0	25	10	13	9	32	4	13	2	19	104
06:30 PM	7	20	9	36	8	19	5	32	7	9	5	21	9	15	5	29	118
06:45 PM	3	10	6	19	1	18	1	20	7	8	5	20	5	9	6	20	79
Total	24	60	27	111	25	73	11	109	35	50	27	112	34	66	22	122	454
07:00 PM	5	14	3	22	10	15	3	28	7	19	7	33	10	15	8	33	116
07:15 PM	4	11	1	16	14	6	5	25	6	15	8	29	4	12	5	21	91
07:30 PM	4	10	4	18	13	12	4	29	4	18	9	31	1	13	1	15	93
07:45 PM	3	5	2	10	16	8	5	29	7	6	7	20	2	9	2	13	72
Total	16	40	10	66	53	41	17	111	24	58	31	113	17	49	16	82	372
Grand Total	77	285	112	474	254	240	72	566	152	240	129	521	132	234	127	493	2054
Apprch %	16.2	60.1	23.6		44.9	42.4	12.7		29.2	46.1	24.8		26.8	47.5	25.8		
Total %	3.7	13.9	5.5	23.1	12.4	11.7	3.5	27.6	7.4	11.7	6.3	25.4	6.4	11.4	6.2	24	

	SR-111 Southbound				Main Street Westbound				SR-111 Northbound				Main Street Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 07:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	5	34	16	55	51	21	7	79	10	14	11	35	13	17	11	41	210
04:15 PM	8	29	8	45	22	9	3	34	11	17	3	31	4	15	11	30	140
04:30 PM	6	22	8	36	34	29	9	72	11	16	10	37	9	16	13	38	183
04:45 PM	3	22	15	40	18	16	3	37	14	15	12	41	10	24	16	50	168
Total Volume	22	107	47	176	125	75	22	222	46	62	36	144	36	72	51	159	701
% App. Total	12.5	60.8	26.7		56.3	33.8	9.9		31.9	43.1	25		22.6	45.3	32.1		
PHF	.688	.787	.734	.800	.613	.647	.611	.703	.821	.912	.750	.878	.692	.750	.797	.795	.835

City of Calipatria
N/S: SR-111 (Sorensen Avenue)
E/W: Main Street
Weather: Clear

File Name : 02_CPA_111_Main Wed PM
Site Code : 23022885
Start Date : 10/5/2022
Page No : 2



Peak Hour Analysis From 04:00 PM to 07:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:00 PM				04:00 PM				04:45 PM				04:30 PM			
+0 mins.	5	34	16	55	51	21	7	79	14	15	12	41	9	16	13	38
+15 mins.	8	29	8	45	22	9	3	34	14	23	9	46	10	24	16	50
+30 mins.	6	22	8	36	34	29	9	72	8	18	6	32	12	21	20	53
+45 mins.	3	22	15	40	18	16	3	37	14	18	8	40	12	10	13	35
Total Volume	22	107	47	176	125	75	22	222	50	74	35	159	43	71	62	176
% App. Total	12.5	60.8	26.7		56.3	33.8	9.9		31.4	46.5	22		24.4	40.3	35.2	
PHF	.688	.787	.734	.800	.613	.647	.611	.703	.893	.804	.729	.864	.896	.740	.775	.830

City of Calipatria
N/S: SR-111 (Sorensen Avenue)
E/W: Main Street
Weather: Clear

File Name : 02_CPA_111_Main Thu AM
Site Code : 23022885
Start Date : 10/6/2022
Page No : 1

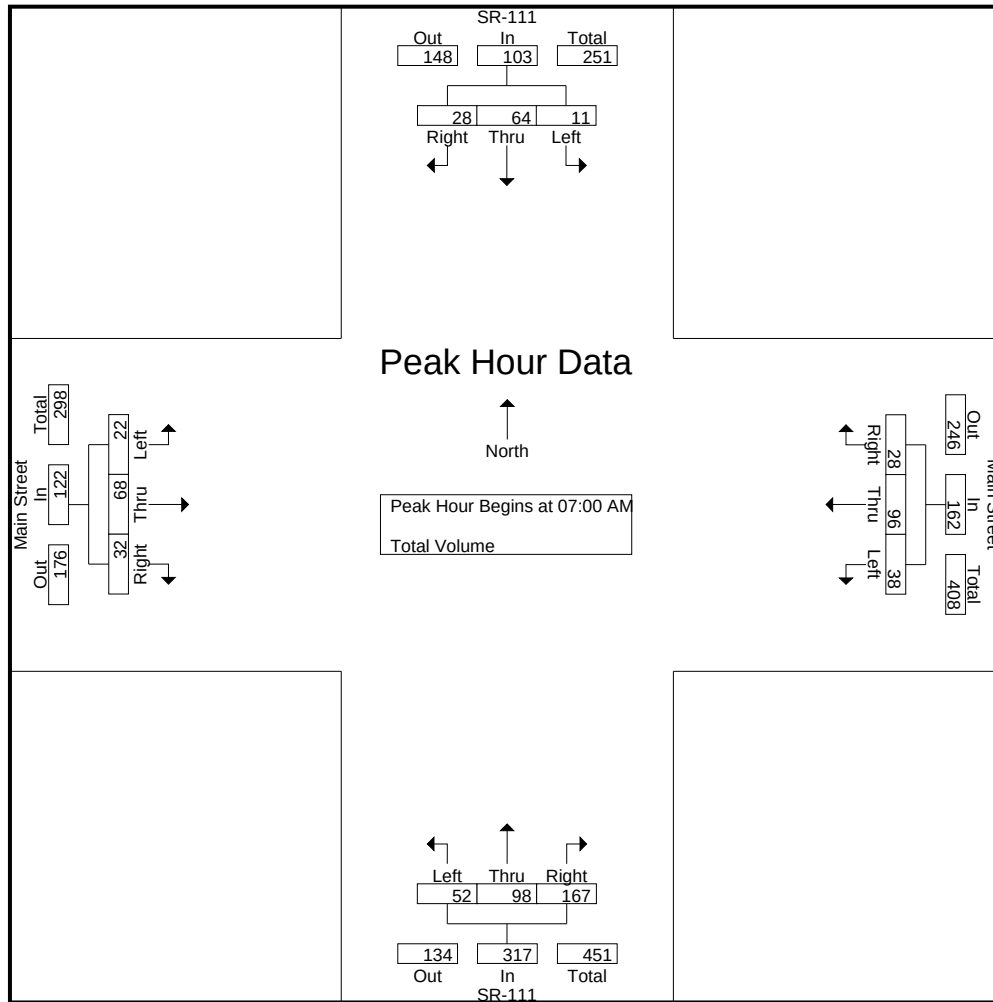
Groups Printed- Total Volume

	SR-111 Southbound				Main Street Westbound				SR-111 Northbound				Main Street Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
05:00 AM	2	9	0	11	7	4	0	11	4	18	12	34	2	9	2	13	69
05:15 AM	5	8	1	14	0	4	1	5	9	18	44	71	4	7	2	13	103
05:30 AM	0	4	3	7	8	8	2	18	11	21	61	93	7	14	0	21	139
05:45 AM	1	8	6	15	18	18	3	39	8	33	40	81	8	15	0	23	158
Total	8	29	10	47	33	34	6	73	32	90	157	279	21	45	4	70	469
06:00 AM	2	15	4	21	19	8	1	28	3	27	11	41	7	9	3	19	109
06:15 AM	4	13	6	23	12	9	3	24	7	18	11	36	6	11	2	19	102
06:30 AM	9	17	7	33	4	3	4	11	10	15	27	52	9	14	1	24	120
06:45 AM	2	13	6	21	8	13	4	25	8	19	60	87	11	11	3	25	158
Total	17	58	23	98	43	33	12	88	28	79	109	216	33	45	9	87	489
07:00 AM	2	12	9	23	6	11	5	22	11	17	19	47	4	6	4	14	106
07:15 AM	3	18	6	27	10	16	11	37	7	24	33	64	7	18	5	30	158
07:30 AM	3	13	8	24	10	17	5	32	9	28	44	81	5	17	11	33	170
07:45 AM	3	21	5	29	12	52	7	71	25	29	71	125	6	27	12	45	270
Total	11	64	28	103	38	96	28	162	52	98	167	317	22	68	32	122	704
Grand Total	36	151	61	248	114	163	46	323	112	267	433	812	76	158	45	279	1662
Apprch %	14.5	60.9	24.6		35.3	50.5	14.2		13.8	32.9	53.3		27.2	56.6	16.1		
Total %	2.2	9.1	3.7	14.9	6.9	9.8	2.8	19.4	6.7	16.1	26.1	48.9	4.6	9.5	2.7	16.8	

	SR-111 Southbound				Main Street Westbound				SR-111 Northbound				Main Street Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 05:00 AM to 07:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	2	12	9	23	6	11	5	22	11	17	19	47	4	6	4	14	106
07:15 AM	3	18	6	27	10	16	11	37	7	24	33	64	7	18	5	30	158
07:30 AM	3	13	8	24	10	17	5	32	9	28	44	81	5	17	11	33	170
07:45 AM	3	21	5	29	12	52	7	71	25	29	71	125	6	27	12	45	270
Total Volume	11	64	28	103	38	96	28	162	52	98	167	317	22	68	32	122	704
% App. Total	10.7	62.1	27.2		23.5	59.3	17.3		16.4	30.9	52.7		18	55.7	26.2		
PHF	.917	.762	.778	.888	.792	.462	.636	.570	.520	.845	.588	.634	.786	.630	.667	.678	.652

City of Calipatria
N/S: SR-111 (Sorensen Avenue)
E/W: Main Street
Weather: Clear

File Name : 02_CPA_111_Main Thu AM
Site Code : 23022885
Start Date : 10/6/2022
Page No : 2



Peak Hour Analysis From 05:00 AM to 07:45 AM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	06:30 AM				07:00 AM				07:00 AM				07:00 AM			
+0 mins.	9	17	7	33	6	11	5	22	11	17	19	47	4	6	4	14
+15 mins.	2	13	6	21	10	16	11	37	7	24	33	64	7	18	5	30
+30 mins.	2	12	9	23	10	17	5	32	9	28	44	81	5	17	11	33
+45 mins.	3	18	6	27	12	52	7	71	25	29	71	125	6	27	12	45
Total Volume	16	60	28	104	38	96	28	162	52	98	167	317	22	68	32	122
% App. Total	15.4	57.7	26.9		23.5	59.3	17.3		16.4	30.9	52.7		18	55.7	26.2	
PHF	.444	.833	.778	.788	.792	.462	.636	.570	.520	.845	.588	.634	.786	.630	.667	.678

City of Calipatria
N/S: SR-111 (Sorensen Avenue)
E/W: Main Street
Weather: Clear

File Name : 02_CPA_111_Main Thu PM
Site Code : 23022885
Start Date : 10/6/2022
Page No : 1

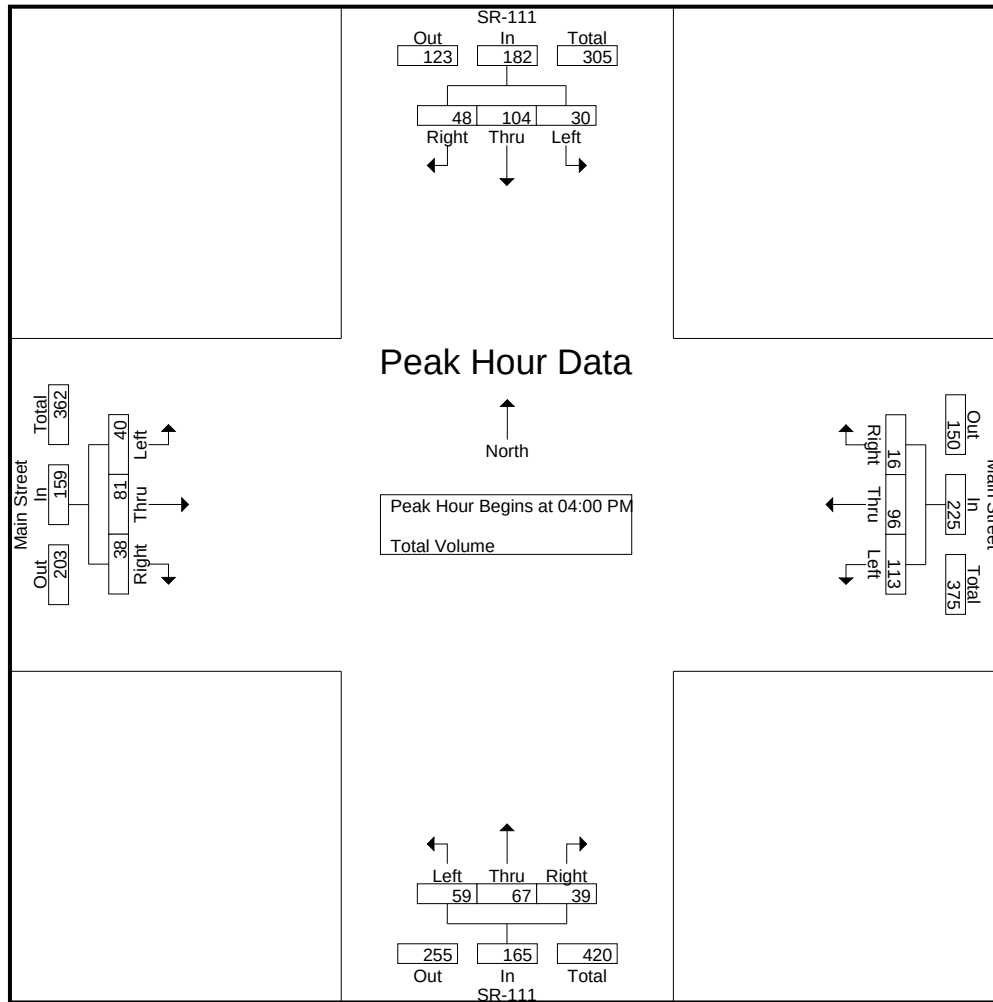
Groups Printed- Total Volume

	SR-111 Southbound				Main Street Westbound				SR-111 Northbound				Main Street Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
04:00 PM	7	37	13	57	55	21	3	79	17	19	15	51	10	16	14	40	227
04:15 PM	9	24	11	44	12	30	5	47	11	18	4	33	7	22	11	40	164
04:30 PM	5	28	10	43	30	29	4	63	12	13	11	36	6	25	6	37	179
04:45 PM	9	15	14	38	16	16	4	36	19	17	9	45	17	18	7	42	161
Total	30	104	48	182	113	96	16	225	59	67	39	165	40	81	38	159	731
05:00 PM	12	24	9	45	14	18	6	38	16	17	16	49	9	18	16	43	175
05:15 PM	3	21	7	31	19	14	5	38	8	12	8	28	10	14	8	32	129
05:30 PM	4	12	6	22	8	18	2	28	7	11	5	23	4	17	10	31	104
05:45 PM	5	15	13	33	13	15	5	33	11	12	8	31	8	15	8	31	128
Total	24	72	35	131	54	65	18	137	42	52	37	131	31	64	42	137	536
06:00 PM	3	25	10	38	13	22	6	41	17	15	7	39	8	22	5	35	153
06:15 PM	4	27	2	33	11	13	4	28	9	14	9	32	8	17	9	34	127
06:30 PM	2	21	6	29	7	13	5	25	6	13	8	27	5	14	4	23	104
06:45 PM	3	17	7	27	8	18	4	30	9	9	3	21	5	18	3	26	104
Total	12	90	25	127	39	66	19	124	41	51	27	119	26	71	21	118	488
07:00 PM	3	20	5	28	8	10	0	18	6	12	15	33	7	12	7	26	105
07:15 PM	3	11	6	20	9	6	4	19	12	10	9	31	15	16	0	31	101
07:30 PM	2	8	4	14	14	8	4	26	6	12	6	24	4	8	4	16	80
07:45 PM	3	8	3	14	4	6	2	12	4	13	5	22	6	6	3	15	63
Total	11	47	18	76	35	30	10	75	28	47	35	110	32	42	14	88	349
Grand Total	77	313	126	516	241	257	63	561	170	217	138	525	129	258	115	502	2104
Apprch %	14.9	60.7	24.4		43	45.8	11.2		32.4	41.3	26.3		25.7	51.4	22.9		
Total %	3.7	14.9	6	24.5	11.5	12.2	3	26.7	8.1	10.3	6.6	25	6.1	12.3	5.5	23.9	

	SR-111 Southbound				Main Street Westbound				SR-111 Northbound				Main Street Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 07:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	7	37	13	57	55	21	3	79	17	19	15	51	10	16	14	40	227
04:15 PM	9	24	11	44	12	30	5	47	11	18	4	33	7	22	11	40	164
04:30 PM	5	28	10	43	30	29	4	63	12	13	11	36	6	25	6	37	179
04:45 PM	9	15	14	38	16	16	4	36	19	17	9	45	17	18	7	42	161
Total Volume	30	104	48	182	113	96	16	225	59	67	39	165	40	81	38	159	731
% App. Total	16.5	57.1	26.4		50.2	42.7	7.1		35.8	40.6	23.6		25.2	50.9	23.9		
PHF	.833	.703	.857	.798	.514	.800	.800	.712	.776	.882	.650	.809	.588	.810	.679	.946	.805

City of Calipatria
N/S: SR-111 (Sorensen Avenue)
E/W: Main Street
Weather: Clear

File Name : 02_CPA_111_Main Thu PM
Site Code : 23022885
Start Date : 10/6/2022
Page No : 2



Peak Hour Analysis From 04:00 PM to 07:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	04:00 PM				04:00 PM				04:00 PM				04:15 PM			
+0 mins.	7	37	13	57	55	21	3	79	17	19	15	51	7	22	11	40
+15 mins.	9	24	11	44	12	30	5	47	11	18	4	33	6	25	6	37
+30 mins.	5	28	10	43	30	29	4	63	12	13	11	36	17	18	7	42
+45 mins.	9	15	14	38	16	16	4	36	19	17	9	45	9	18	16	43
Total Volume	30	104	48	182	113	96	16	225	59	67	39	165	39	83	40	162
% App. Total	16.5	57.1	26.4		50.2	42.7	7.1		35.8	40.6	23.6		24.1	51.2	24.7	
PHF	.833	.703	.857	.798	.514	.800	.800	.712	.776	.882	.650	.809	.574	.830	.625	.942

Counts Unlimited, Inc.

Page 1

County of Imperial
Brandt Road
S/ Sinclair Road
48 Hour Directional Volume Count

PO Box 1178
Corona, CA 92878
Phone: (951) 268-6268
email: counts@countsunlimited.com

CIM002
Site Code: 230-22885

Start Time	10/5/22 Wed	Northbound		Hour Totals		Southbound		Hour Totals		Combined Totals	
		Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		0	0			0	0				
12:15		0	0			0	0				
12:30		0	1			0	1				
12:45		0	1	0	2	0	1	0	2	0	4
01:00		0	0			0	0				
01:15		0	0			0	1				
01:30		0	2			0	1				
01:45		0	5	0	7	0	1	0	3	0	10
02:00		0	0			0	5				
02:15		0	0			0	1				
02:30		0	1			0	0				
02:45		0	1	0	2	0	0	0	6	0	8
03:00		0	0			0	0				
03:15		0	0			0	0				
03:30		0	2			0	2				
03:45		0	0	0	2	0	4	0	6	0	8
04:00		0	1			0	2				
04:15		0	0			1	0				
04:30		0	0			0	1				
04:45		0	0	0	1	2	0	3	3	3	4
05:00		2	0			0	1				
05:15		1	0			0	1				
05:30		1	0			1	1				
05:45		4	0	8	0	0	0	1	3	9	3
06:00		3	0			1	1				
06:15		3	0			0	1				
06:30		0	0			0	0				
06:45		1	0	7	0	1	0	2	2	9	2
07:00		0	0			0	1				
07:15		2	0			1	0				
07:30		0	0			1	2				
07:45		2	0	4	0	0	0	2	3	6	3
08:00		1	0			0	1				
08:15		2	1			0	1				
08:30		1	0			1	0				
08:45		1	0	5	1	2	0	3	2	8	3
09:00		1	0			1	0				
09:15		1	2			0	0				
09:30		2	1			2	0				
09:45		1	0	5	3	2	0	5	0	10	3
10:00		0	0			0	0				
10:15		4	0			1	1				
10:30		2	0			3	0				
10:45		0	0	6	0	3	2	7	3	13	3
11:00		1	0			1	0				
11:15		2	0			0	1				
11:30		2	0			2	0				
11:45		1	0	6	0	1	1	4	2	10	2
Total		41	18	41	18	27	35	27	35	68	53
Combined Total		59		59		62		62		121	
AM Peak	-	05:30	-	-	-	10:15	-	-	-	-	-
Vol.	-	11	-	-	-	8	-	-	-	-	-
P.H.F.		0.688				0.667					
PM Peak	-	-	01:00	-	-	-	01:15	-	-	-	-
Vol.	-	-	7	-	-	-	8	-	-	-	-
P.H.F.			0.350				0.400				
Percentage		69.5%	30.5%			43.5%	56.5%				
ADT/AADT		ADT 121		AADT 121							

Counts Unlimited, Inc.

County of Imperial
Gentry Road
S/ Sinclair Road
48 Hour Directional Volume Count

PO Box 1178
Corona, CA 92878
Phone: (951) 268-6268
email: counts@countsunlimited.com

CIM003
Site Code: 230-22885

Start Time	10/5/22 Wed	Northbound		Hour Totals		Southbound		Hour Totals		Combined Totals	
		Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		0	4			0	4				
12:15		0	7			1	8				
12:30		2	4			2	16				
12:45		1	8	3	23	0	6	3	34	6	57
01:00		0	6			0	3				
01:15		0	7			1	8				
01:30		3	4			2	6				
01:45		0	8	3	25	2	3	5	20	8	45
02:00		0	12			1	8				
02:15		0	10			0	6				
02:30		1	9			0	5				
02:45		0	6	1	37	0	6	1	25	2	62
03:00		0	4			0	4				
03:15		1	6			0	2				
03:30		0	1			3	2				
03:45		2	1	3	12	2	2	5	10	8	22
04:00		1	6			1	1				
04:15		0	2			0	3				
04:30		0	4			1	4				
04:45		1	1	2	13	0	0	2	8	4	21
05:00		0	1			1	0				
05:15		4	1			2	3				
05:30		1	1			0	1				
05:45		6	1	11	4	2	0	5	4	16	8
06:00		5	0			2	0				
06:15		6	1			5	1				
06:30		7	1			17	0				
06:45		6	1	24	3	12	0	36	1	60	4
07:00		6	1			8	1				
07:15		5	1			4	0				
07:30		8	2			8	3				
07:45		6	0	25	4	4	4	24	8	49	12
08:00		10	3			14	3				
08:15		10	4			10	0				
08:30		10	0			10	0				
08:45		12	1	42	8	3	1	37	4	79	12
09:00		7	1			13	2				
09:15		8	0			9	0				
09:30		6	0			8	0				
09:45		4	0	25	1	10	1	40	3	65	4
10:00		9	2			9	0				
10:15		4	1			15	0				
10:30		10	1			5	2				
10:45		12	2	35	6	12	1	41	3	76	9
11:00		4	1			6	1				
11:15		6	1			6	0				
11:30		8	2			5	0				
11:45		10	1	28	5	2	2	19	3	47	8
Total		202	141	202	141	218	123	218	123	420	264
Combined Total		343		343		341		341		684	
AM Peak	-	08:00	-	-	-	06:15	-	-	-	-	-
Vol.	-	42	-	-	-	42	-	-	-	-	-
P.H.F.		0.875				0.618					
PM Peak	-	-	01:45	-	-	-	12:00	-	-	-	-
Vol.	-	-	39	-	-	-	34	-	-	-	-
P.H.F.			0.813				0.531				
Percentage		58.9%	41.1%			63.9%	36.1%				
ADT/AADT		ADT 684		AADT 684							

Counts Unlimited, Inc.

County of Imperial
Highway 111
S/ Sinclair Road
48 Hour Directional Volume Count

PO Box 1178
Corona, CA 92878
Phone: (951) 268-6268
email: counts@countsunlimited.com

CIM001
Site Code: 230-22885

Start Time	10/5/22 Wed	Northbound		Hour Totals		Southbound		Hour Totals		Combined Totals	
		Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		4	24			5	22				
12:15		1	23			2	33				
12:30		1	13			3	20				
12:45		4	21	10	81	1	24	11	99	21	180
01:00		3	20			0	27				
01:15		3	15			1	31				
01:30		0	21			3	19				
01:45		1	31	7	87	2	28	6	105	13	192
02:00		0	22			2	28				
02:15		0	16			0	28				
02:30		2	26			1	31				
02:45		1	13	3	77	1	32	4	119	7	196
03:00		1	30			3	36				
03:15		3	30			2	32				
03:30		1	18			8	25				
03:45		2	23	7	101	3	35	16	128	23	229
04:00		6	22			0	36				
04:15		4	16			2	20				
04:30		7	24			3	21				
04:45		8	13	25	75	7	14	12	91	37	166
05:00		21	18			4	19				
05:15		17	23			6	14				
05:30		30	22			7	15				
05:45		30	12	98	75	7	13	24	61	122	136
06:00		13	16			22	16				
06:15		16	21			18	21				
06:30		17	15			17	20				
06:45		24	8	70	60	12	11	69	68	139	128
07:00		15	11			13	12				
07:15		26	11			22	16				
07:30		28	12			21	6				
07:45		28	10	97	44	20	8	76	42	173	86
08:00		27	13			14	5				
08:15		27	10			22	7				
08:30		32	8			21	2				
08:45		23	5	109	36	24	4	81	18	190	54
09:00		21	7			26	7				
09:15		18	4			21	4				
09:30		19	8			33	5				
09:45		32	7	90	26	18	4	98	20	188	46
10:00		24	4			20	5				
10:15		30	3			21	2				
10:30		20	4			28	2				
10:45		22	7	96	18	15	5	84	14	180	32
11:00		20	7			17	6				
11:15		18	7			23	4				
11:30		28	1			21	5				
11:45		22	6	88	21	20	2	81	17	169	38
Total		700	701	700	701	562	782	562	782	1262	1483
Combined Total		1401		1401		1344		1344		2745	
AM Peak	-	07:45	-	-	-	08:45	-	-	-	-	-
Vol.	-	114	-	-	-	104	-	-	-	-	-
P.H.F.		0.891				0.788					
PM Peak	-	-	03:00	-	-	-	02:30	-	-	-	-
Vol.	-	-	101	-	-	-	131	-	-	-	-
P.H.F.			0.842				0.910				
Percentage		50.0%	50.0%			41.8%	58.2%				

Counts Unlimited, Inc.

County of Imperial
Highway 111
S/ Sinclair Road
48 Hour Directional Volume Count

PO Box 1178
Corona, CA 92878
Phone: (951) 268-6268
email: counts@countsunlimited.com

CIM001
Site Code: 230-22885

Start Time	10/6/22 Thu	Northbound		Hour Totals		Southbound		Hour Totals		Combined Totals	
		Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		2	22			2	29				
12:15		4	27			3	36				
12:30		3	22			1	27				
12:45		7	27	16	98	1	15	7	107	23	205
01:00		4	20			0	24				
01:15		1	17			0	23				
01:30		5	18			1	23				
01:45		1	16	11	71	1	18	2	88	13	159
02:00		3	19			4	30				
02:15		0	24			1	32				
02:30		3	20			1	34				
02:45		1	21	7	84	5	26	11	122	18	206
03:00		1	25			1	24				
03:15		4	23			2	31				
03:30		0	32			5	17				
03:45		6	16	11	96	1	34	9	106	20	202
04:00		3	22			5	32				
04:15		4	9			7	30				
04:30		11	21			4	28				
04:45		13	24	31	76	7	18	23	108	54	184
05:00		14	23			8	30				
05:15		16	27			5	10				
05:30		27	13			4	16				
05:45		21	6	78	69	12	21	29	77	107	146
06:00		24	20			18	32				
06:15		30	12			14	21				
06:30		22	11			22	17				
06:45		19	9	95	52	14	12	68	82	163	134
07:00		15	10			20	12				
07:15		27	20			13	10				
07:30		24	11			20	15				
07:45		21	16	87	57	25	7	78	44	165	101
08:00		21	8			27	9				
08:15		29	3			23	7				
08:30		24	9			29	3				
08:45		29	12	103	32	25	4	104	23	207	55
09:00		30	13			25	7				
09:15		23	10			34	5				
09:30		17	13			21	1				
09:45		29	6	99	42	26	5	106	18	205	60
10:00		18	5			24	5				
10:15		18	1			25	5				
10:30		18	6			24	3				
10:45		22	0	76	12	29	5	102	18	178	30
11:00		15	5			17	1				
11:15		20	5			39	1				
11:30		27	2			23	3				
11:45		26	4	88	16	16	0	95	5	183	21
Total		702	705	702	705	634	798	634	798	1336	1503
Combined Total		1407		1407		1432		1432		2839	
AM Peak	-	08:15	-	-	-	08:30	-	-	-	-	-
Vol.	-	112	-	-	-	113	-	-	-	-	-
P.H.F.		0.933				0.831					
PM Peak	-	-	02:45	-	-	-	03:45	-	-	-	-
Vol.	-	-	101	-	-	-	124	-	-	-	-
P.H.F.			0.789				0.912				
Percentage		49.9%	50.1%			44.3%	55.7%				
ADT/AADT		ADT 2,792	AADT 2,792								

DISTRICT	RTE	RTE_SFX	CNTY	PM_PFX	PM	PM_SFX	DESCRIPTION	BACK_PEAK_HOUR	BACK_PEAK_MADT	BACK_AADT	AHEAD_PEAK_HOUR	AHEAD_PEAK_MADT	AHEAD_AADT
11	078		SD		0.004		OCEANSIDE, JCT. RTE. 5				8200	81000	78000
11	078		SD		0.741		OCEANSIDE, JEFFERSON STREET	9100	122000	1180000	9300	128000	125000
11	078		SD		1.498		OCEANSIDE, EL CAMINO REAL	9300	128000	124000	10800	148000	138000
11	078		SD		3.315		OCEANSIDE, COLLEGE BOULEVARD	10500	144000	138000	10200	131000	128000
11	078		SD		4.384		VISTA, EMERALD DRIVE	10200	131000	128000	10000	137000	128000
11	078		SD		5.944		VISTA, MELROSE DRIVE	10000	137000	128000	10900	141000	123000
11	078		SD		6.940		VISTA, SUNSET DRIVE	10900	141000	123000	11200	146000	128000
11	078		SD		7.710		VISTA, MAR VISTA DRIVE	11200	146000	128000	11100	145000	126000
11	078		SD		9.083		SYCAMORE AVENUE	11100	145000	126000	11000	147000	142000
11	078		SD		10.606		SAN MARCOS,RANCHO SANTA FE	11000	146000	142000	10600	146000	142000
11	078		SD		11.183		SAN MARCOS, LAS POSAS ROAD	10600	145000	142000	10000	142000	141000
11	078		SD		12.134		SAN MARCOS, SAN MARCOS BOULEVARD	10000	142000	141000	11100	169000	167000
11	078		SD		12.911		SAN MARCOS, TWIN OAKS VALLEY ROAD	11100	169000	167000	12800	169000	168000
11	078		SD		14.241		SAN MARCOS, WOODLAND PARKWAY	12800	169000	168000	11200	168000	167000
11	078		SD		15.486		NORDAHL ROAD	11200	168000	167000	11900	172000	168000
11	078		SD	R	16.539		ESCONDIDO, JCT. RTE. 15	11800	171000	168000	6900	92000	86000
11	078		SD	R	17.268		ESCONDIDO, CENTRE CITY PARKWAY	6900	92000	86000	4400	59000	58000
11	078		SD	N	17.680		ESCONDIDO, BROADWAY/LINCOLN PARKWAY	4400	59000	58000	4400	59000	58000
11	078		SD	T	17.678		BROADWAY AND RTE 78	4400	59000	58000	2750	33500	33000
11	078		SD	T	17.822		ESCONDIDO, MISSION AVENUE	2750	33500	33000	2850	34500	34000
11	078		SD	T	18.072		ESCONDIDO, WASHINGTON AVENUE	2850	34500	34000	2650	32000	31500
11	078		SD	T	18.408		ESCONDIDO, HICKORY STREET	2650	32000	31500	1350	15600	15400
11	078		SD	T	19.094		ESCONDIDO ASH STREET	1400	15700	15400	1650	19300	19300
11	078		SD	T	19.271		ESCONDIDO, VALLEY PARKWAY BOULEVARD	1650	19300	19300	1550	17300	17000
11	078		SD	T	19.525		ESCONDIDO, GRAND AVENUE	1550	17300	17000	1400	17000	16800
11	078		SD		19.221		ESCONDIDO, OAK HILL DRIVE/5TH AVENUE	1400	17000	16800	1400	15700	15500
11	078		SD		20.190		17TH AVENUE	1400	15700	15500	1350	15600	15400
11	078		SD		20.640		BEAR VALLEY PARKWAY	1350	15600	15400	1350	16400	16300
11	078		SD		20.950		SUMMIT DRIVE	1350	16400	16300	1000	13400	13300
11	078		SD	R	22.560		CLOVERDALE/SAN PASQUAL ROAD	1000	13400	13300	1300	11900	10200
11	078		SD		23.000		SAN PASQUAL VALLEY ROAD	1200	10700	10200	1200	10700	10200
11	078		SD		24.023		WILD ANIMAL PARK ROAD	1200	10700	10200	840	8400	7300
11	078		SD	R	27.315		BANDY CANYON ROAD	840	8400	7300	1000	10500	9300
11	078		SD		33.050		WEEKEND VILLA ROAD	1000	10500	9300	1000	10800	9700

11	078	SD	34.352	ASH ST	1000	10800	9700	1150	11900	11000
11	078	SD	35.120	OLIVE STREET	1150	11900	11000	850	10700	10400
11	078	SD	35.519	JCT. RTE. 67 SOUTHWEST	850	10700	10400	2000	22000	21100
11	078	SD	35.741	RAMONA, EIGHTH STREET	1950	22000	21100	1650	21000	20700
11	078	SD	35.850	RAMONA, SEVENTH STREET	1650	21000	20700	1400	17000	16800
11	078	SD	35.960	RAMONA, SIXTH STREET	1400	17000	16800	1250	15200	14900
11	078	SD	36.290	RAMONA, THIRD STREET	1250	15200	14900	690	17500	8700
11	078	SD	37.110	MAGNOLIA AVENUE	690	17500	8700	690	7200	7000
11	078	SD	41.960	SUTHERLAND DAM ROAD	690	7200	7000	580	5300	5000
11	078	SD	51.108	WEST JCT. RTE. 79	1100	7200	6000	770	5200	4650
11	078	SD	56.910	PINE HILLS ROAD	780	5300	4650	920	6000	5100
11	078	SD	57.880	JULIAN, MAIN/ WASHINGTON STREETS	920	6000	5100	660	5100	5000
11	078	SD	58.133	EAST JCT. RTE. 79	740	5500	5000	520	4700	4200
11	078	SD	58.640	MANZANITA ROAD	490	4600	4200	280	2700	2450
11	078	SD	59.240	CANYON DRIVE	280	2700	2450	210	1900	1750
11	078	SD	60.273	WYNOLA ROAD	210	1900	1750	150	1450	1350
11	078	SD	69.693	VALLECITOS ROAD	150	1450	1350	140	1300	1250
11	078	SD	70.010	SAN FELIPE ROAD	140	1300	1250	240	2250	1350
11	078	SD	76.840	YAQUI PASS ROAD	250	2350	1350	250	1600	1150
11	078	SD	85.610	BORREGO SPRINGS ROAD	250	1600	1150	340	2250	1600
11	078	SD	95.313	SAN DIEGO/IMPERIAL COUNTY LINE	340	2250	1600			
11	078	IMP	0.000	SAN DIEGO/IMPERIAL COUNTY LINE				300	1500	1200
11	078	IMP	13.169	NORTH JCT. RTE 86	260	1350	1200	260	1300	1200
11	078	IMP R	9.203	SOUTH JCT RTE 86	300	1950	1200	800	10200	9000
11	078	IMP R	10.809	BRANDT RD	780	10400	9000	1100	14000	12200
11	078	IMP R	12.891	JCT 78/111 - WEST	2850	14700	12200	2900	16300	13600
11	078	IMP R	13.897	BEST ROAD	1150	15200	13600	1200	13200	11800
11	078	IMP	15.499	E JCT RTE 78/111	970	13200	11800	510	5200	4550
11	078	IMP	18.651	WEST JCT. RTE. 115	500	4850	4550	450	4500	3700
11	078	IMP	21.023	EAST JCT. RTE. 115	490	4350	3700	360	2500	2100
11	078	IMP	25.927	GREEN ROAD	480	2500	2100	410	2050	1800
11	078	IMP	41.004	GLAMIS	410	2050	1800	440	2100	1900
11	078	IMP	52.348	OGILBY ROAD	440	2100	1900	520	2400	2050
11	078	IMP	80.442	PALO VERDE, FOURTH/MAIN STREETS	550	2600	2150	360	2250	1950
11	078	IMP	80.743	PALO VERDE, IMPERIAL/RIVERSIDE COUNTY LINE	330	2250	1950			
08	078	RIV	0.000	PALO VERDE, IMPERIAL/RIVERSIDE COUNTY LINE				220	1600	1500
08	078	RIV	3.060	32ND AVENUE/PALO VERDE BOULEVARD	220	1600	1500	260	1900	1800
08	078	RIV	6.350	CRANNELLS BOULEVARD/28TH AVENUE	260	1900	1800	240	1950	1700
08	078	RIV	9.352	28TH AVENUE/NEIGHBORS BOULEVARD	240	1950	1700	270	2150	1900
08	078	RIV	10.620	RIPLEY, BROADWAY STREET	270	2150	1900	270	3100	2800
08	078	RIV	16.169	JCT. RTE. 10	270	3100	2800	390	3350	2800
08	078	RIV	16.411	HOBSON WAY F-OLD RTE 10	390	3350	2800			

11	086	IMP	R	0.000	JCT. RTE. 111				620	5800	4850
11	086	IMP		2.077	DOGWOOD ROAD	540	5600	5100	460	4550	4200
11	086	IMP		3.050	WEST HEBER TURN	460	4550	4200	350	3500	3300
11	086	IMP		4.530	MC CABE ROAD	350	3500	3300	630	8200	8100
11	086	IMP		6.006	JCT. RTE. 8	2100	24600	22400	3000	33500	32000
11	086	IMP	L	6.534	EL CENTRO, ROSS AVENUE	3000	33500	32000	2900	31000	30000
11	086	IMP		7.240	EL CENTRO, STATE STREET	2900	31000	30000	2650	30000	29000
11	086	IMP	L	7.308	MAIN STREET	2650	30000	29000	1700	20600	19000
11	086	IMP	L	8.028	EL CENTRO, EIGHTH STREET	1700	20600	19000	1550	18000	17000
11	086	IMP	L	8.525	ADAMS/IMPERIAL AVENUES	1600	18400	17000	2600	31500	28500
11	086	IMP		7.430	EL CENTRO, EUCLID/HOGAR AVENUES	2600	31500	28500	2350	28000	26000
11	086	IMP		7.490	EL CENTRO, WOODWARD AVENUE	2350	28000	26000	2450	29000	26500
11	086	IMP		7.643	SCOTT AVENUE	2450	29000	26500	2450	30500	27500
11	086	IMP		7.930	PICO AVENUE	2450	30500	27500	2450	29000	26500
11	086	IMP		8.180	EL DORADO AVENUE	2450	29000	26500	2000	23700	22100
11	086	IMP		15.320	KEYSTONE ROAD	1300	14500	13800	1300	15800	14000
11	086	IMP		19.190	LEGION ROAD	1350	16100	14300	1950	21700	19600
11	086	IMP		20.080	BRAWLEY, WESTERN AVENUE	1950	21700	19600	1700	19100	16900
11	086	IMP		20.250	BRAWLEY, K STREET	1700	19100	16900	1100	12900	12200
11	086	IMP		20.627	SOUTH JCT. RTE. 78	1100	12900	12300	1550	17900	17200
11	086	IMP		20.990	BRAWLEY, RIO VISTA AVENUE	1550	17900	17200	1800	20900	20000
11	086	IMP		21.250	LAS FLORES DRIVE	1800	20900	20000	1700	20700	19600
11	086	IMP	R	22.882	KALIN ROAD	1700	20700	19600	770	9500	8800
11	086	IMP	R	24.057	JCT RTE 78	760	9400	8700	1450	17200	16400
11	086	IMP	R	27.211	WESTMORLAND, B STREET	1450	17200	16400	1450	16400	15300
11	086	IMP		27.510	WESTMORLAND, CENTER STREET	1450	16400	15300	1900	24600	23400
11	086	IMP		27.760	WESTMORLAND, WEST CITY LIMITS/ H STREET	1900	24600	23400	1150	13400	12700
11	086	IMP		28.006	MARTIN ROAD	1150	13400	12700	1150	14600	12800
11	086	IMP	R	29.005	LACK ROAD	1150	14600	12800	1250	19000	17300
11	086	IMP	R	33.757	BANNISTER ROAD	1250	19000	17300	1150	14900	13200
11	086	IMP		43.559	NORTH JCT. RTE. 78	1100	14600	12400	1100	13300	11900
11	086	IMP		53.900	AIR PARK DRIVE	1100	13600	12100	2250	20000	18400
11	086	IMP		56.120	SALTON CITY, SOUTH MARINA DRIVE	2250	20000	18400	2250	20600	18900
11	086	IMP		63.630	SALTON SEA BEACH ROAD	2250	20600	18900	1500	19900	16900
11	086	IMP		66.143	DESERT SHORES DRIVE	1700	19400	16800	1500	19900	16800
11	086	IMP		67.824	IMPERIAL/RIVERSIDE COUNTY LINE	1500	19900	16800			
08	086	RIV		0.000	IMPERIAL/RIVERSIDE COUNTY LINE				1500	19900	16800
08	086	RIV		1.710	LINCOLN ST - RT	1500	19900	16800	1500	19900	16800
08	086	RIV	R	3.484	81ST AVE	1500	19900	16800	1400	19600	16800
08	086	RIV	R	11.031	JCT RTE 195	1550	19000	16500	1400	18600	16500
08	086	RIV	R	12.477	JCT RTE 111	1400	18600	16500	1650	22600	19400
08	086	RIV	R	16.744	AIRPORT BLVD	1950	27500	23500	2450	34500	29500

08	086	RIV	R	22.157	DILLON RD	2450	34500	29500	2800	39000	33500
08	086	RIV	R	23.000	JCT RTE 10	2800	39000	33500			
11	111	IMP	R	0.000	CALEXICO, SOUTH CITY LIMITS, AT MEXICAN BOUNDARY				2300	30500	29500
11	111	IMP	R	0.200	CALEXICO, SECOND STREET	2300	30500	29500	2300	32000	29500
11	111	IMP	R	0.273	THIRD ST	2300	32000	29500	2600	35500	34000
11	111	IMP		0.836	CALEXICO, GRANT STREET (EIGHTH STREET)	2600	35500	34000	2600	35500	34000
11	111	IMP	R	1.183	JCT. RTE. 98	2600	35500	34000	2500	32500	31500
11	111	IMP	R	2.211	COLE ROAD	2600	33500	31500	2850	37500	34500
11	111	IMP	R	4.741	JCT. RTE. 86 WEST	2850	37500	34500	3000	36500	34500
11	111	IMP	R	6.242	MC CABE ROAD	2950	36000	34500	2650	36000	34000
11	111	IMP	R	7.714	JCT. RTE. 8	2650	36000	34000	2800	31500	29500
11	111	IMP	R	9.503	EVAN HEWES HWY	2000	26500	24000	2000	25500	22900
11	111	IMP	R	11.299	ATEN RD	2050	26500	22900	1300	17400	16900
11	111	IMP	R	12.874	WORTHINGTON ROAD	1300	17400	16900	1450	17700	15800
11	111	IMP	R	17.385	KEYSTONE ROAD	1450	17700	15800	1300	16400	15300
11	111	IMP	R	22.015	JCT. RTE. 78	1400	17500	15300	880	8000	7600
11	111	IMP		23.538	SHANK ROAD	880	8000	7600	620	6400	6000
11	111	IMP		23.787	DEL RIO RD. RT. Y	620	6400	6000	630	6500	6000
11	111	IMP		24.682	ANDRE RD. F	620	6400	6000	710	6800	5300
11	111	IMP		26.670	RUTHERFORD ROAD	810	7700	6000	900	8600	6800
11	111	IMP		32.010	CALIPATRIA, SOUTH CITY LIMITS	800	7700	6100	790	7600	6000
11	111	IMP		32.513	JCT. RTE. 115 EAST	750	7200	5700	710	6700	5400
11	111	IMP		32.740	CALIFORNIA STREET	710	6700	5400	860	7800	5900
11	111	IMP		36.090	SINCLAIR ROAD	860	7800	5900	620	5600	3500
11	111	IMP		39.820	NILAND AVENUE	620	5600	3500	400	3550	2800
11	111	IMP		40.400	THIRD STREET	400	3550	2800	470	4100	3150
11	111	IMP		40.710	BEAL ROAD	470	4100	3150	320	3150	2350
11	111	IMP		42.470	ENGLISH ROAD	310	2950	2250	300	2800	2200
11	111	IMP		57.625	BOMBAY BEACH ROAD	260	2200	1700	240	1850	1750
11	111	IMP		65.394	IMPERIAL/RIVERSIDE COUNTY LINE	270	2150	1800			
08	111	RIV		0.001	IMPERIAL/RIVERSIDE COUNTY LINE				240	1900	1650
08	111	RIV		7.670	SALTON SEA STATE PARK ROAD	170	1750	1650	340	3450	3300
08	111	RIV		18.428	MECCA,	580	5700	5000	890	8800	7700
08	111	RIV	R	18.511	LINCOLN ST -RT	570	5800	5500	730	7400	7000
08	111	RIV	R	19.318	JCT RTE 86	730	7400	7000	730	7400	7000
08	111	RIV		47.252	PALM SPRINGS, GOLF CLUB DRIVE	2850	31500	29000	3200	35500	32600
08	111	RIV	T	47.795	EAST PALM CANYON/GENE AUTRY TRAIL	2850	31500	29000	1300	13500	12700
08	111	RIV	T	48.318	GENE AUTRY TR N/O PALM CYN	1300	13500	12700	1250	13500	12700
08	111	RIV	T	49.370	PALM SPRINGS, RAMON ROAD	1250	13500	12700	1950	20100	18900
08	111	RIV	T	51.588	VISTA CHINO	2100	21700	20400	2700	31500	29600
08	111	RIV	T	52.371	PALM SPRINGS, FARRELL DRIVE	2700	31500	29600	2150	25000	23500
08	111	RIV	T	52.876	PALM SPRINGS, SUNRISE WAY	2150	25000	23500	2000	22800	21400

08	111	RIV	T	53.376	PALM SPRINGS, AVENIDA CABALLEROS	2000	22800	21400	1300	15000	14100
08	111	RIV	T	53.627	PALM SPRINGS, VIA MIRALESTE	1300	15000	14100	1300	15000	14100
08	111	RIV	T	53.877	PALM SPRINGS, INDIAN CANYON	1300	15000	14100	990	11400	10700
08	111	RIV	T	53.944	VISTA CHINO @ PALM CNYN	990	11400	10700	2200	20800	18500
08	111	RIV		54.955	PALM SPRINGS, TRAMWAY DRIVE	2000	19100	17000	2000	19100	17000
08	111	RIV	R	63.378	JCT. RTE. 10	1650	15700	14000			

RTE	RTE_SFX	DIST	CNTY	POSTMILE_PFX	POSTMILE	POSTMILE_SFX	LEG	DESCRIPTION	VEHICLE_AADT_TOTAL	TRUCK_AADT_TOTAL	TRK_PERCENT_TOT	TRK_2_AXLE	TRK_3_AXLE	TRK_4_AXLE	TRK_5_AXLE	TRK_2_AXLE_PCT	TRK_3_AXLE_PCT	TRK_4_AXLE_PCT	TRK_5_AXLE_PCT	EAL	YEAR_VER	EST
078	11	SD			0.004		A	OCEANSIDE, JCT. RTE. 5	78000	3643	4.67	1709	369	283	1282	46.92	10.12	7.77	35.19	578 07	E	
078	11	SD			1.498		A	OCEANSIDE, EL CAMINO REAL	138000	6721	4.87	3153	680	522	2365	46.92	10.12	7.77	35.19	1,066 07	E	
078	11	SD			5.944		B	VISTA, MELROSE DRIVE	128000	6618	5.17	3105	670	514	2329	46.92	10.12	7.77	35.19	1,049 07	E	
078	11	SD			5.944		A	VISTA, MELROSE DRIVE	123000	5867	4.77	2753	594	456	2065	46.92	10.12	7.77	35.19	930 07	E	
078	11	SD			10.606		X	SAN MARCOS,RANCHO SANTA FE	118000	5410	4.58	3523	464	209	1214	65.12	8.58	3.86	22.44	616 19	V	
078	11	SD			16.539		B	ESCONDIDO, JCT. RTE. 15	168000	7644	4.55	3587	774	594	2690	46.92	10.12	7.77	35.19	1,212 07	V	
078	11	SD	R		17.268		B	ESCONDIDO, CENTRE CITY PARKWAY	86000	4558	5.3	2484	428	246	1399	54.50	9.40	5.40	30.70	645 97	E	
078	11	SD	N		17.68		B	ESCONDIDO, BROADWAY/LINCOLN PARKWAY	58000	580	1	310	138	89	44	53.40	23.80	15.30	7.50	52 86	E	
078	11	SD	T		19.094		B	ESCONDIDO ASH STREET	15400	924	6	645	114	22	143	69.80	12.30	2.40	15.50	86 96	E	
078	11	SD	T		19.094		A	ESCONDIDO ASH STREET	19300	1158	6	808	142	27	181	69.80	12.30	2.30	15.60	108 96	E	
078	11	SD			18.94		A	ESCONDIDO, GRAND AVENUE	16800	1025	6.1	715	126	25	159	69.80	12.30	2.40	15.50	95 96	E	
078	11	SD	R		22.56		A	CLOVERDALE/SAN PASQUAL ROAD	10200	599	5.87	424	60	31	84	70.78	10.02	5.18	14.02	54 19	V	
078	11	SD	R		27.315		A	BANDY CANYON ROAD	9300	874	9.4	438	139	53	244	50.10	15.90	6.10	27.90	120 81	E	
078	11	SD			35.519		B	JCT. RTE. 67 SOUTHWEST	10400	229	2.2	91	51	10	77	39.80	22.30	4.20	33.70	36 87	E	
078	11	SD			35.519		A	JCT. RTE. 67 SOUTHWEST	21100	1161	5.5	802	132	51	175	69.10	11.40	4.40	15.10	108 87	V	
078	11	SD			51.108		B	WEST JCT. RTE. 79	6000	360	6	255	42	31	32	70.90	11.60	8.50	9.00	28 93	V	
078	11	SD			51.108		A	WEST JCT. RTE. 79	4650	291	6.26	246	21	10	14	84.54	7.22	3.44	4.81	17 19	V	
078	11	SD			58.133		B	EAST JCT. RTE. 79	5000	830	16.6	652	104	37	37	78.50	12.50	4.50	4.50	51 88	E	
078	11	SD			58.133		A	EAST JCT. RTE. 79	4200	1021	24.3	825	123	36	38	80.80	12.00	3.50	3.70	59 88	E	
078	11	IMP	R		9.203		A	SOUTH JCT RTE 86	9000	2800	31.11	604	173	83	1940	21.57	6.17	2.96	69.30	719 18	V	
078	11	IMP	R		12.891		X	JCT 78/111 - WEST	8450	5141	60.84	2636	176	166	2164	51.27	3.42	3.22	42.09	879 18	V	
078	11	IMP	R		12.891		B	JCT 78/111 - WEST	12200	5704	46.75	2924	195	184	2401	51.27	3.42	3.22	42.09	976 18	V	
078	11	IMP	R		12.891		A	JCT 78/111 - WEST	13600	5592	41.12	2867	191	180	2354	51.27	3.42	3.22	42.09	957 18	V	
078	11	IMP			15.499		B	E JCT RTE 78/111	11800	5461	46.28	3092	419	291	1659	56.62	7.68	5.33	30.37	762 17	E	
078	11	IMP			15.499		A	E JCT RTE 78/111	4550	2397	52.68	1346	159	141	751	56.17	6.64	5.87	31.32	342 18	V	
078	11	IMP			18.651		A	WEST JCT. RTE. 115	3700	1158	31.3	272	71	5	811	23.50	6.10	0.40	70.00	297 85	V	
078	11	IMP			21.023		A	EAST JCT. RTE. 115	2100	572	27.24	202	35	24	311	35.31	6.12	4.20	54.37	121 19	V	
078	08	RIV			9.352		B	28TH AVENUE/NEIGHBORS BOULEVARD	1700	204	12	31	20	16	137	15.10	9.80	7.80	67.30	53 93	E	
078	08	RIV			9.352		A	28TH AVENUE/NEIGHBORS BOULEVARD	1900	143	7.5	22	14	11	96	15.30	9.70	7.60	67.40	37 93	E	
078	08	RIV			16.169		B	JCT. RTE. 10	2800	171	6.1	26	17	13	115	15.00	10.00	7.50	67.50	44 93	E	
086	11	IMP	R		0		A	JCT. RTE. 111	4850	315	6.5	229	21	13	52	72.70	6.70	4.10	16.50	30 78	V	
086	11	IMP			6.006		B	JCT. RTE. 8	22400	1344	6	927	101	44	271	69.00	7.50	3.30	20.20	142 78	E	
086	11	IMP			6.006		A	JCT. RTE. 8	32000	2016	6.3	1339	163	44	470	66.40	8.10	2.20	23.30	230 78	V	
086	11	IMP	L		8.525		B	ADAMS/IMPERIAL AVENUES	17000	1122	6.6	679	86	66	291	60.50	7.70	5.90	25.90	142 79	V	
086	11	IMP	L		8.525		A	ADAMS/IMPERIAL AVENUES	28500	1796	6.3	867	199	32	697	48.30	11.10	1.80	38.80	294 78	V	
086	11	IMP			15.32		B	KEYSTONE ROAD	13800	4658	33.75	4450	79	39	90	95.53	1.70	0.84	1.93	200 19	V	
086	11	IMP	R		24.057		B	JCT RTE 78	8700	1092	12.55	537	77	55	423	49.22	7.03	5.00	38.75	180 18	V	
086	11	IMP	R		27.211		B	WESTMORLAND, B STREET	16400	4659	28.41	699	388	932	2640	15.00	8.33	20.00	56.67	1,108 03	E	
086	11	IMP			27.51		B	WESTMORLAND, CENTER STREET	15300	4312	28.18	834	96	113	3269	19.35	2.22	2.62	75.81	1,182 03	E	
086	11	IMP			28.006		A	MARTIN ROAD	12800	4068	31.78	1221	401	314	2132	30.01	9.86	7.72	52.41	861 19	V	
086	11	IMP			43.559		B	NORTH JCT. RTE. 78	12400	2874	23.18	556	64	75	2179	19.35	2.22	2.62	75.81	788 03	E	
086	11	IMP			43.559		A	NORTH JCT. RTE. 78	11900	4284	36	651	286	1002	2343	15.19	6.68	23.40	54.70	1,005 03	E	
086	11	IMP			67.824		B	IMPERIAL/RIVERSIDE COUNTY LINE	16800	4091	24.35	963	428	297	2402	23.55	10.47	7.26	58.72	945 16	E	
086	08	RIV	R		16.744		B	AIRPORT BLVD	23500	4521	19.24	939	184	76	3322	20.77	4.07	1.67	73.49	1,207 18	V	
111	11	IMP	R		0		A	CALEXICO, SOUTH CITY LIMITS, AT MEXICAN BOUNDARY	29500	1062	3.6	592	188	21	261	55.70	17.70	2.00	24.60	131 78	V	
111	11	IMP			1.183		B	JCT. RTE. 98	34000	1632	4.8	1102	150	54	326	67.50	9.20	3.30	20.00	173 78	V	
111	11	IMP	R		1.183		A	JCT. RTE. 98	31500	2520	8	1391	262	38	829	55.20	10.40	1.50	32.90	364 78	V	
111	11	IMP	R		4.741		B	JCT. RTE. 86 WEST	34500	2760	8	1524	287	41	908	55.20	10.40	1.50	32.90	399 78	E	
111	11	IMP	R		4.741		A	JCT. RTE. 86 WEST	34500	2415	7	1273	362	116	664	52.70	15.00	4.80	27.50	324 81	E	
111	11	IMP	R		7.714		B	JCT. RTE. 8	34000	2380	7	1254	357	114	655	52.70	15.00	4.80	27.50	319 81	V	
111	11	IMP	R		7.714		A	JCT. RTE. 8	29500	3658	12.4	1716	351	55	1536	46.90	9.60	1.50	42.00	630 78	V	
111	11	IMP	R		12.874		A	WORTHINGTON ROAD	15800	7635	48.32	4711	203	120	2601	61.70	2.66	1.57	34.07	1,099 19	V	
111	11	IMP	R		17.385		A	KEYSTONE ROAD	15300	3317	21.68	1154	221	147	1795	34.79	6.67	4.42	54.12	702 15	E	
111	11	IMP			23.787		A	DEL RIO RD. RT. Y	6000	1711	28.52	1333	89	67	222	77.92	5.19	3.90	12.99	141 15	E	
111	11	IMP			26.67		B	RUTHERFORD ROAD	6000	900	15	433	49	12	407	48.10	5.40	1.30	45.20	162 85	E	
111	11	IMP			26.67		A	RUTHERFORD ROAD	6800	1435	21.1	508	75	33	819	35.40	5.20	2.30	57.10	312 78	V	
111	11	IMP			32.513		B	JCT. RTE. 115 EAST	5700	1203	21.1	426	63	28	687	35.40	5.20	2.30	57.10	262 78	E	
111	11	IMP			32.513		A	JCT. RTE. 115 EAST	5400	869	16.1	364	45	23	436	41.90	5.20	2.70	50.20	171 85	V	
111	11	IMP			39.82		B	NILAND AVENUE	3500	644	18.4	270	33	17	323	41.90	5.20	2.70	50.20	126 85	E	
111	11	IMP			39.82		A	NILAND AVENUE	2800	501	17.9	210	26	14	252	41.90	5.20	2.70	50.20	99 85	E	
111	11	IMP			65.394		B	IMPERIAL/RIVERSIDE COUNTY LINE	1800	474	26.33	115	71	53	235	24.30	14.94	11.14	49.62	99 15	E	
111	08	RIV			18.428		B	MECCA,	5000	985	19.7	413	51	27	494	41.90	5.20	2.70	50.20	194 85	E	
111	08	RIV			18.428		A	MECCA,	7700	1348	17.5	519	67	55	706	38.50	5.00	4.10	52.40	276 85	V	
111	08	RIV	T		50.8		O	TAMARISK ROAD	18900	2098	11.1	1733	183	40	143	82.60	8.70	1.90	6.80	133 92	V	
111	08	RIV	T		51.588		B	VISTA CHINO	20400	2285	11.2	1887	199	43	155	82.60	8.70	1.90	6.80	144 91	V	
111	08	RIV	T		51.588		A	VISTA CHINO	29600	2279	7.7	2072	148	18	41	90.90	6.50	0.80	1.80	103 91	V	
111	08	RIV	R		63.378																	

ENGP Attachment DRR 82 Existing LOS Calculations



HCM 6th TWSC
1: Hwy 111 & Sinclair Rd

2022 Existing Conditions

Intersection												
Int Delay, s/veh	1.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↔		↔	↔	
Traffic Vol, veh/h	14	5	3	2	5	3	9	107	8	15	99	22
Future Vol, veh/h	14	5	3	2	5	3	9	107	8	15	99	22
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	250	-	-	290	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	14	5	3	2	5	3	10	118	9	16	109	24
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	300	300	121	300	308	123	133	0	0	127	0	0
Stage 1	153	153	-	143	143	-	-	-	-	-	-	-
Stage 2	147	147	-	157	165	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	656	616	936	656	609	933	1464	-	-	1472	-	-
Stage 1	854	775	-	865	782	-	-	-	-	-	-	-
Stage 2	860	779	-	850	766	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	640	605	936	640	598	933	1464	-	-	1472	-	-
Mov Cap-2 Maneuver	640	605	-	640	598	-	-	-	-	-	-	-
Stage 1	848	766	-	859	777	-	-	-	-	-	-	-
Stage 2	845	774	-	832	758	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	10.6		10.4		0.5		0.8					
HCM LOS	B		B									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR					
Capacity (veh/h)	1464	-	-	661	680	1472	-	-				
HCM Lane V/C Ratio	0.007	-	-	0.034	0.016	0.011	-	-				
HCM Control Delay (s)	7.5	-	-	10.6	10.4	7.5	-	-				
HCM Lane LOS	A	-	-	B	B	A	-	-				
HCM 95th %tile Q(veh)	0	-	-	0.1	0	0	-	-				

HCM 6th AWSC
2: Hwy 111 & Main St

2022 Existing Conditions

Intersection												
Intersection Delay, s/veh	17.9											
Intersection LOS	C											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	31	82	40	49	127	34	69	143	214	21	95	41
Future Vol, veh/h	31	82	40	49	127	34	69	143	214	21	95	41
Peak Hour Factor	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	31	126	62	75	195	52	106	220	329	32	146	63
Number of Lanes	0	2	0	0	2	0	0	2	0	0	2	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	12.8	14.2	23.3	12.6
HCM LOS	B	B	C	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	49%	0%	43%	0%	44%	0%	31%	0%
Vol Thru, %	51%	25%	57%	51%	56%	65%	69%	54%
Vol Right, %	0%	75%	0%	49%	0%	35%	0%	46%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	141	286	72	81	113	98	69	89
LT Vol	69	0	31	0	49	0	21	0
Through Vol	72	72	41	41	64	64	48	48
RT Vol	0	214	0	40	0	34	0	41
Lane Flow Rate	216	439	94	125	173	150	105	136
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.427	0.772	0.21	0.258	0.374	0.304	0.225	0.272
Departure Headway (Hd)	7.114	6.328	8.018	7.44	7.78	7.306	7.689	7.198
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	506	571	448	482	462	492	467	498
Service Time	4.855	4.069	5.767	5.189	5.527	5.053	5.441	4.95
HCM Lane V/C Ratio	0.427	0.769	0.21	0.259	0.374	0.305	0.225	0.273
HCM Control Delay	15.1	27.4	12.9	12.8	15.1	13.2	12.7	12.6
HCM Lane LOS	C	D	B	B	C	B	B	B
HCM 95th-tile Q	2.1	7.1	0.8	1	1.7	1.3	0.9	1.1

HCM 6th TWSC
1: Hwy 111 & Sinclair Rd

2022 Existing Conditions

Intersection												
Int Delay, s/veh	1.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↔		↔	↔	
Traffic Vol, veh/h	10	4	4	2	2	12	2	99	2	3	126	11
Future Vol, veh/h	10	4	4	2	2	12	2	99	2	3	126	11
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	250	-	-	290	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	12	5	5	2	2	14	2	119	2	4	152	13

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	299	292	159	296	297	120	165	0	0	121	0	0
Stage 1	167	167	-	124	124	-	-	-	-	-	-	-
Stage 2	132	125	-	172	173	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	657	622	892	660	618	937	1426	-	-	1479	-	-
Stage 1	840	764	-	885	797	-	-	-	-	-	-	-
Stage 2	876	796	-	835	760	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	643	620	892	651	616	937	1426	-	-	1479	-	-
Mov Cap-2 Maneuver	643	620	-	651	616	-	-	-	-	-	-	-
Stage 1	839	762	-	884	796	-	-	-	-	-	-	-
Stage 2	859	795	-	823	758	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	10.5		9.4		0.1		0.2	
HCM LOS	B		A					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1426	-	-	680	837	1479	-
HCM Lane V/C Ratio	0.002	-	-	0.032	0.023	0.002	-
HCM Control Delay (s)	7.5	-	-	10.5	9.4	7.4	-
HCM Lane LOS	A	-	-	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-

HCM 6th AWSC
2: Hwy 111 & Main St

2022 Existing Conditions

Intersection	
Intersection Delay, s/veh	12.9
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	50	101	60	156	113	25	63	86	56	35	139	63
Future Vol, veh/h	50	101	60	156	113	25	63	86	56	35	139	63
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	61	123	73	190	138	30	77	105	68	43	170	77
Number of Lanes	0	2	0	0	2	0	0	2	0	0	2	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	11.7	15	11.9	12.1
HCM LOS	B	B	B	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	59%	0%	50%	0%	73%	0%	33%	0%
Vol Thru, %	41%	43%	50%	46%	27%	69%	67%	52%
Vol Right, %	0%	57%	0%	54%	0%	31%	0%	48%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	106	99	101	111	213	82	105	133
LT Vol	63	0	50	0	156	0	35	0
Through Vol	43	43	51	51	57	57	70	70
RT Vol	0	56	0	60	0	25	0	63
Lane Flow Rate	129	121	123	135	259	99	127	162
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.263	0.222	0.24	0.244	0.502	0.176	0.252	0.296
Departure Headway (Hd)	7.316	6.608	7.187	6.519	7.095	6.502	7.115	6.604
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	494	546	503	553	511	556	507	546
Service Time	5.025	4.316	4.887	4.245	4.795	4.202	4.824	4.313
HCM Lane V/C Ratio	0.261	0.222	0.245	0.244	0.507	0.178	0.25	0.297
HCM Control Delay	12.6	11.2	12.1	11.3	16.7	10.6	12.2	12.1
HCM Lane LOS	B	B	B	B	C	B	B	B
HCM 95th-tile Q	1	0.8	0.9	1	2.8	0.6	1	1.2

ENGP Attachment DRR 85 Construction LOS Calculations



HCM 6th TWSC
1: Hwy 111 & Sinclair Rd

Existing + Project Construction

Intersection												
Int Delay, s/veh	2.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	17	5	6	2	5	3	46	107	8	15	99	60
Future Vol, veh/h	17	5	6	2	5	3	46	107	8	15	99	60
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	250	-	-	290	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	19	5	7	2	5	3	51	118	9	16	109	66
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	403	403	142	405	432	123	175	0	0	127	0	0
Stage 1	174	174	-	225	225	-	-	-	-	-	-	-
Stage 2	229	229	-	180	207	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	562	539	911	560	519	933	1414	-	-	1472	-	-
Stage 1	833	759	-	782	721	-	-	-	-	-	-	-
Stage 2	778	718	-	826	734	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	536	514	911	532	495	933	1414	-	-	1472	-	-
Mov Cap-2 Maneuver	536	514	-	532	495	-	-	-	-	-	-	-
Stage 1	803	751	-	754	695	-	-	-	-	-	-	-
Stage 2	741	692	-	805	726	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	11.5		11.3		2.2		0.6					
HCM LOS	B		B									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR					
Capacity (veh/h)	1414	-	-	583	586	1472	-	-				
HCM Lane V/C Ratio	0.036	-	-	0.053	0.019	0.011	-	-				
HCM Control Delay (s)	7.6	-	-	11.5	11.3	7.5	-	-				
HCM Lane LOS	A	-	-	B	B	A	-	-				
HCM 95th %tile Q(veh)	0.1	-	-	0.2	0.1	0	-	-				

HCM 6th AWSC

2: Hwy 111 & Main St

Existing + Project Construction

Intersection												
Intersection Delay, s/veh	21.7											
Intersection LOS	C											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	31	82	40	49	142	34	81	180	214	21	98	41
Future Vol, veh/h	31	82	40	49	142	34	81	180	214	21	98	41
Peak Hour Factor	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	48	126	62	75	218	52	125	277	329	32	151	63
Number of Lanes	0	2	0	0	2	0	0	2	0	0	2	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	13.6	15.4	30.1	13.4
HCM LOS	B	C	D	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	47%	0%	43%	0%	41%	0%	30%	0%
Vol Thru, %	53%	30%	57%	51%	59%	68%	70%	54%
Vol Right, %	0%	70%	0%	49%	0%	32%	0%	46%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	171	304	72	81	120	105	70	90
LT Vol	81	0	31	0	49	0	21	0
Through Vol	90	90	41	41	71	71	49	49
RT Vol	0	214	0	40	0	34	0	41
Lane Flow Rate	263	468	111	125	185	162	108	138
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.535	0.855	0.256	0.268	0.413	0.341	0.24	0.29
Departure Headway (Hd)	7.324	6.578	8.318	7.739	8.047	7.604	8.03	7.547
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	492	552	431	464	447	473	447	475
Service Time	5.073	4.326	6.077	5.498	5.801	5.358	5.793	5.309
HCM Lane V/C Ratio	0.535	0.848	0.258	0.269	0.414	0.342	0.242	0.291
HCM Control Delay	18.2	36.8	13.9	13.3	16.4	14.3	13.3	13.4
HCM Lane LOS	C	E	B	B	C	B	B	B
HCM 95th-tile Q	3.1	9.2	1	1.1	2	1.5	0.9	1.2

HCM 6th TWSC
1: Hwy 111 & Sinclair Rd

Existing + Project Construction

Intersection												
Int Delay, s/veh	3.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	51	4	55	2	2	12	2	99	2	3	126	11
Future Vol, veh/h	51	4	55	2	2	12	2	99	2	3	126	11
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	250	-	-	290	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	61	5	66	2	2	14	2	119	2	4	152	13
Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	299	292	159	326	297	120	165	0	0	121	0	0
Stage 1	167	167	-	124	124	-	-	-	-	-	-	-
Stage 2	132	125	-	202	173	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	657	622	892	631	618	937	1426	-	-	1479	-	-
Stage 1	840	764	-	885	797	-	-	-	-	-	-	-
Stage 2	876	796	-	805	760	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	643	620	892	579	616	937	1426	-	-	1479	-	-
Mov Cap-2 Maneuver	643	620	-	579	616	-	-	-	-	-	-	-
Stage 1	839	762	-	884	796	-	-	-	-	-	-	-
Stage 2	859	795	-	738	758	-	-	-	-	-	-	-
Approach	EB		WB			NB			SB			
HCM Control Delay, s	10.9		9.5			0.1			0.2			
HCM LOS	B		A									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR				
Capacity (veh/h)	1426	-	-	746	820	1479	-	-				
HCM Lane V/C Ratio	0.002	-	-	0.178	0.024	0.002	-	-				
HCM Control Delay (s)	7.5	-	-	10.9	9.5	7.4	-	-				
HCM Lane LOS	A	-	-	B	A	A	-	-				
HCM 95th %tile Q(veh)	0	-	-	0.6	0.1	0	-	-				

HCM 6th AWSC
2: Hwy 111 & Main St

Existing + Project Construction

Intersection	
Intersection Delay, s/veh	13.9
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	50	116	73	156	113	25	63	86	56	35	190	63
Future Vol, veh/h	50	116	73	156	113	25	63	86	56	35	190	63
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	61	141	89	190	138	30	77	105	68	43	232	77
Number of Lanes	0	2	0	0	2	0	0	2	0	0	2	0
Approach	EB			WB			NB			SB		
Opposing Approach	WB			EB			SB			NB		
Opposing Lanes	2			2			2			2		
Conflicting Approach Left	SB			NB			EB			WB		
Conflicting Lanes Left	2			2			2			2		
Conflicting Approach Right	NB			SB			WB			EB		
Conflicting Lanes Right	2			2			2			2		
HCM Control Delay	12.6			16.3			12.5			13.5		
HCM LOS	B			C			B			B		

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	59%	0%	46%	0%	73%	0%	27%	0%
Vol Thru, %	41%	43%	54%	44%	27%	69%	73%	60%
Vol Right, %	0%	57%	0%	56%	0%	31%	0%	40%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	106	99	108	131	213	82	130	158
LT Vol	63	0	50	0	156	0	35	0
Through Vol	43	43	58	58	57	57	95	95
RT Vol	0	56	0	73	0	25	0	63
Lane Flow Rate	129	121	132	160	259	99	159	193
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.274	0.232	0.271	0.301	0.532	0.188	0.32	0.366
Departure Headway (Hd)	7.623	6.912	7.417	6.781	7.386	6.792	7.263	6.84
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	472	519	485	530	490	529	495	526
Service Time	5.369	4.658	5.162	4.525	5.127	4.532	5.007	4.583
HCM Lane V/C Ratio	0.273	0.233	0.272	0.302	0.529	0.187	0.321	0.367
HCM Control Delay	13.2	11.7	12.9	12.4	18.3	11.1	13.4	13.5
HCM Lane LOS	B	B	B	B	C	B	B	B
HCM 95th-tile Q	1.1	0.9	1.1	1.3	3.1	0.7	1.4	1.7

ENGP Attachment DRR 103 LOMR Application



Massoud Rezakhani

From: Ibrahim osman <iosmanmrc@outlook.com>
Sent: Friday, May 19, 2023 3:07 AM
To: Massoud Rezakhani
Subject: Fw: Revision Project is Created with Case Number = 23-09-0889P

From: no-reply@fema.dhs.gov <no-reply@fema.dhs.gov>
Sent: Thursday, May 18, 2023 4:02 PM
To: iosmanmrc@outlook.com <iosmanmrc@outlook.com>
Subject: Revision Project is Created with Case Number = 23-09-0889P

We have received your request that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) issue a revision to the flood hazard information on the applicable National Flood Insurance Program (NFIP) map for: IMPERIAL COUNTY *, Imperial County, CA; and IMPERIAL COUNTY *, Imperial County, CA.

The Case Number assigned to your request is 23-09-0889P, and the Project ID is Alamo River.
Your Online LOMC Application ID was R4651623459011.

We are reviewing your submitted data and will contact you if additional information is required to process your request.

If additional information is not required, we will issue a final determination letter within 90 days.

You may obtain project status information from MIP via the Online LOMC homepage. To return to your application, click on the following link or copy and paste the link into the address bar of your browser:

<https://hazards.fema.gov/femaportal/onlinelomc>

Inquiries concerning the status of your request should be made by calling the FEMA Map Information eXchange (FMIX) toll free at (877) 336-2627 (877-FEMA-MAP).

Please be assured we will do our best to respond to all inquiries in a timely manner.

This message has been generated automatically. Please do not reply to this message.

LOMC Application

Application ID: R4651623459011

Revision

All (*) indicate a required field.

Project Submission Details



Case Number 23-09-0889P successfully created.

You will receive a confirmation e-mail shortly regarding your case creation. Please be sure to login to Online LOMC with your registered e-mail address and check periodically for status updates on this case.

OK

Certain documents require a plug-in. To download plug-in for Adobe Acrobat Reader [click here](#) and/or Microsoft Word [click here](#).

[DHS](#) [FEMA.gov](#) [Privacy Policy](#) [Accessibility](#) [Site Help](#) [Contact Us](#)

TECHNICAL STUDY DATA NOTEBOOK IN SUPPORT OF A

LETTER OF MAP REVISION



ALAMO RIVER, IMPERIAL COUNTY



PREPARED FOR

Mr. Jerry Salamy
2485 Natomas Park Drive, Suite 600
Sacramento, CA 95833

PREPARED BY

MRC, LLC
29830 N. 78th Way
Scottsdale, Arizona 85266

TECHNICAL SUPPORT DATA NOTEBOOK

In Support of a Letter of Map Revision

for

The Property Located Along Alamo River, Imperial County, CA

Prepared for:

Mr. Jerry Salamy, Project Manager

Jacobs

2485 Natomas Park Drive, Suite 600

Sacramento, CA 95833

Submitted by MRC, LLC

Dated: March 25, 2023



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Appendix A – Mapping Support Information

Appendix B – HEC-RAS Output Files for Existing Condition [LOMR]

Appendix C – MT-2 Forms

LIST OF EXHIBITS

Exhibit 1 – Existing FEMA FIRM Panel

Exhibit 2 – Topographic Map

Exhibit 3 – Work Map

Exhibit 4 – Annotated FIRM Panel

Exhibit 5 – Hydraulic Models and Electronic Files

EXECUTIVE SUMMARY

This report summarizes the results of the MRC, LLC (“MRC”) updated detailed floodplain study along the Alamo River within Imperial County, California. This study focuses on the proposed sites located immediately adjacent east to the Salton Sea, on the southwest corner of the intersection of McKendry Road and Boyle Road. These sites are located in flood zone A, as shown on the Digital Flood Insurance Rate Map (DFIRM) Panel No. 06025C0700C and 06025C0725C for Imperial County, CA, and Incorporated Areas, dated September 26, 2008.

The floodplain boundary for the sites, which is subject to flood hazards along the Alamo River, is currently designated as Zone A (according to FEMA, Zone A is “subject to inundation by the 1-percent-annual-chance flood event”) and is depicted on the aforementioned DFIRM panel.

Results of MRC’s analyses are hereby released to Jacobs for their use in evaluating potential hazards associated with the project site and for further detailed evaluation of the project area in the future.

STATEMENT OF LIMITATIONS

This report has been prepared to investigate the potential flood hazard associated along the southwest corner of the intersection of McKendry Road and Boyle Road project site. MRC performed an investigation of the project area to further the understanding of the Zone A floodplain boundaries shown on the effective Flood Insurance Rate Map (FIRM) panel. The scope of services performed during this investigation may not adequately address the needs of other users, and any re-use of this report or the findings, conclusions, or recommendations presented herein are at the sole risk of the user.

Our investigation included aerial map inspection of the project area and an evaluation of the contributing watershed based upon the updated topographic map from Jacobs.

MRC has no direct knowledge of and offers no warranty for information provided by others. Comments outlined in the report are derived from the engineering experience and judgment of MRC staff, in accordance with current standards of professional practice. The investigation outlined in this report may be invalidated, wholly or in part, by changes beyond our control.

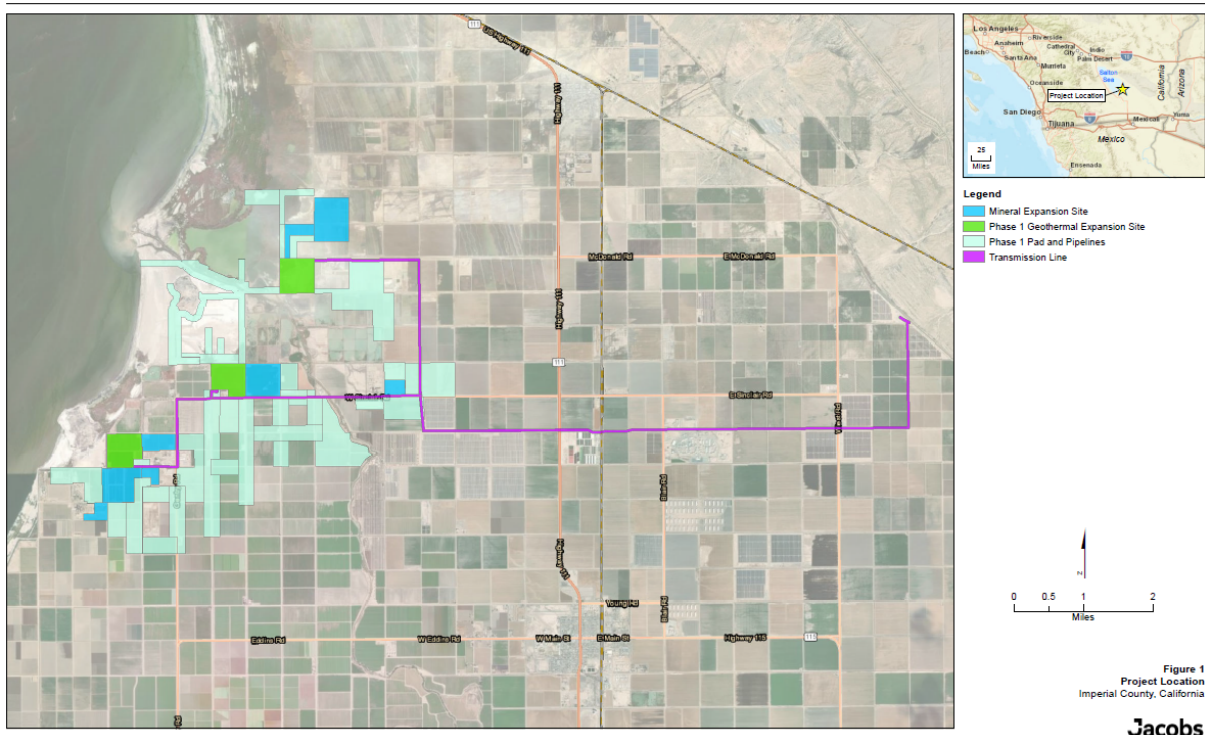
We have made every effort to perform our investigation based on conventional professional civil engineering standards of care and the stipulations provided in our contract. If new data becomes available, or there are perceived omissions or misstatements in this report regarding any aspect of our work, we ask that they be brought to our attention as soon as possible so that we have the opportunity to fully address them.

SECTION 1.0 INTRODUCTION

1.1 Purpose of Study

Jacobs has retained MRC to investigate and revise the flood hazard information for the project area located on the southwest corner of the intersection of McKendry Road and Boyle Road in Imperial County, CA. The vicinity map and project location are provided as **Figure 1** below.

This report summarizes the results of MRC's scope of work to revise the flood hazard information for the project area located at the southwest corner of the intersection of McKendry Road and Boyle Road in Imperial County, CA. The results of MRC's analyses are hereby released to Jacobs for its use in evaluating potential hazards associated with the project site and for further detailed evaluation of the project area in the future.



Jacobs

1.2 Authority and Acknowledgement

MRC was contracted by Jacobs to evaluate and (if appropriate) revise the flood hazard risk in support of a Letter of Map Revision (LOMR).

1.3 Review of Existing Studies

MRC made a request for obtaining back up data from the Federal Emergency Management Agency (FEMA) Engineering Library. No backup engineering data was available.

SECTION 2.0 SURVEY AND MAPPING INFORMATION

2.1 Topographic Map

Updated topographic data and aerial maps prepared by Jacobs were used in our hydraulic modeling. A copy of the topographic map is attached under Exhibit 2. A terrain DEM raster and TIN data set was also developed from the topographic data for use in our hydraulic modeling of floodplain mapping.

2.2 As-Built Conditions

There are no as-built conditions for this LOMR.

SECTION 3.0 HYDRAULICS

The Alamo River has been modeled (HEC-RAS 5.07 1D) to study the hydraulic behavior of the river in existing conditions. The river is intended to be studied against base flow of one percent annual chance of flood discharge of 4500 cfs. The hydraulic analysis of the existing condition is based on updated topographic information. This hydraulic model along with other associated geometric data was used to establish the 100-year water surface elevations along a reach of the Alamo River.

The hydraulic analysis results reveals that the floodplain boundaries are reduced, and the associated 100-year water surface elevations are lower when compared to the effective flood risk information depicted on FIRM panels.

The main channel and overbanks were modeled together for final mapping and combined into a single model at the final stage. (Input/output of models are attached)

Channel and Flow Path Representation

Alamo River stream centerline and flow paths on the left and right overbanks were digitized in ArcGIS and imported into the HEC-RAS model. Overbank flow paths were delineated based on topographic data, aerial imagery and results from preliminary runs.

Cross Sections

Cross sections for the Alamo River main channel were limited to the channel banks. Geometry for the channel portion was obtained from a triangulated irregular network (TIN). Cross sections on the overbanks were oriented based on preliminary modeling results by determining the flow direction and deepest parts of the overbanks.

In addition, 2-foot contours were used along with aerial imagery to appropriately define the effective portion of the cross sections. The overbank cross sections were connected to the main channel cross sections at locations where the main channel overtopped.

Roughness Coefficients

Landcover information from Imperial County has been used and augmented at several locations in the channel to match the existing conditions information from the imagery data. Channel has a roughness value of 0.036 and an overbank roughness value of 0.045.

Starting Condition (Boundary Condition)

The upstream flow boundary feeds the inflow to the hydraulic model. No flow change locations have been modeled other than use of lateral structure to carry the flow out of the 1-D system. Downstream boundary conditions are based on slope area method as the downstream revision is at the confluence with Alamo River. Normal slope has been used to control the left and right areas.

Flow Regime

A supercritical flow regime was used in the hydraulic model to evaluate changes in the water surface elevation that could result as the slope in the channel profile changes.

Floodplain Delineation

Floodplains for the main channel and left and right overbank areas were delineated using RAS-Mapper and a 2-foot ground surface DEM. The generated draft floodplain boundaries from RAS-Mapper are exported to ArcMAP to develop the final floodplain mapping. No floodway analysis was conducted as part of the study. No encroachment will be allowed within the constructed channel. Furthermore, the channel is either dedicated right away or drainage easement. Currently, no floodway is designated for the Alamo River on the effective FIRM Panels.

SECTION 4.0 DISCUSSIONS AND CONCLUSION

The HEC-RAS model analysis results show that by using the updated topography along a reach of the Alamo River results in changes to the FEMA DFIRM Panel No. 06025C0700C and 06025C0725C. A LOMR application has been prepared and submitted to revise the floodplain boundaries and flood elevations for the above-mentioned reach of Alamo River. Also, the revised analysis results show that the revised floodplain will not negatively impact the adjacent properties.

SECTION 5.0: REFERENCES

1. Federal Emergency Management Agency (FEMA), *Flood Insurance Rate Map, Panel Nos. 06025C0700C and 06025C0725C* for Imperial County, CA, and Incorporated Areas, dated September 26, 2008.

APPENDICES

APPENDIX A

(Mapping Support Information)



LiDAR Validation Report

Document no: 01

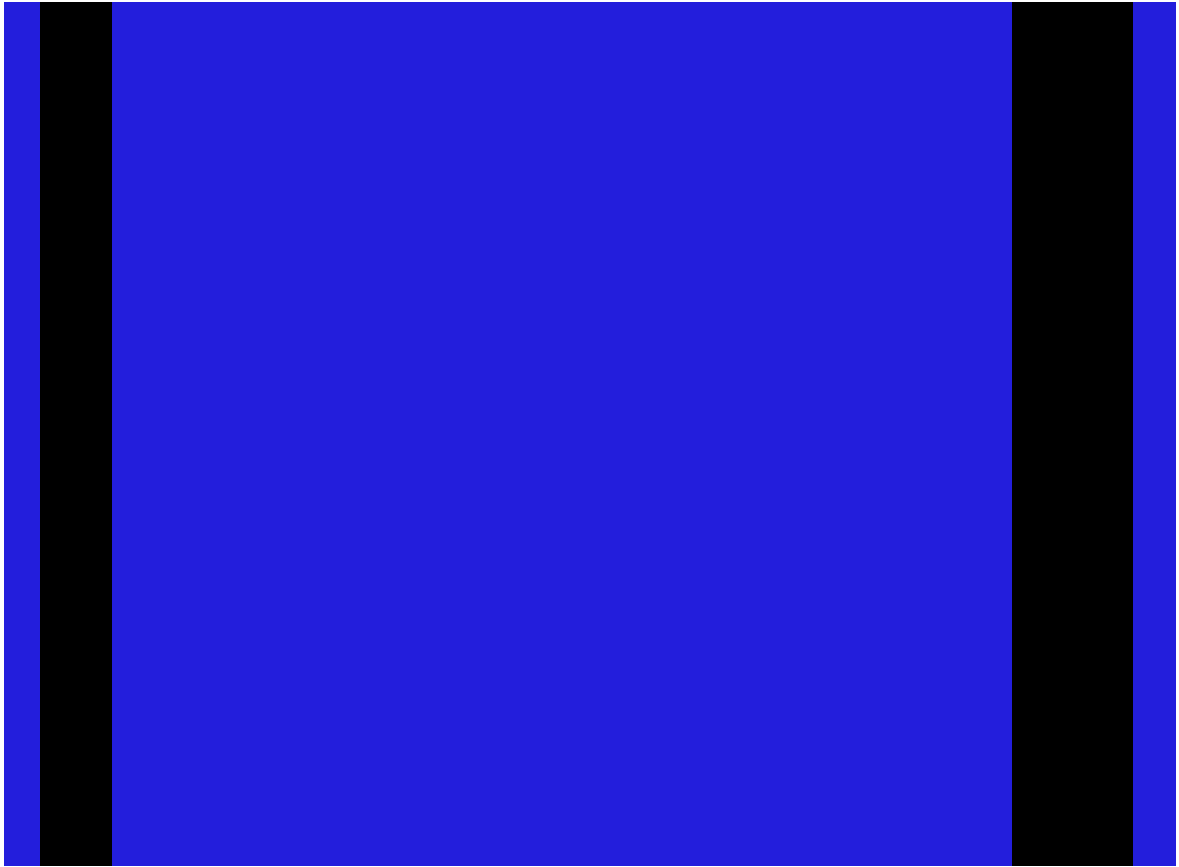
Version: 02

BHE Renewables, LLC

Black Rock, Elmore North, and Morton Bay Geothermal Projects

Letter of Map Revision/Conditional Letter of Map Revision

April 27, 2023





LiDAR Validation Report

Client name: BHE Renewables, LLC

Project name: Letter of Map Revision/Conditional Letter of Map Revision

Client reference: Black Rock, Elmore North, and Morton Bay Geothermal Projects Project no: [Project number]

Document no: 01 Project manager: [Project manager]

Version: 02 Prepared by: Kristopher Andersen

Date: April 27, 2023 File name: BHER_Lidar_Validation_Report_Final.docx

Document status: [Document suitability – Delete row if not applicable]

Document history and status

Version	Date	Description	Author	Checked	Reviewed	Approved
01	4/19/2023	Final	Andersen	Vossman	Engesath	
02	4/27/2023	Edits	Andersen	Vossman		

Distribution of copies

Version	Issue approved	Date issued	Issued to	Comments

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1.2	LiDAR Acquisition Summary	2
1.3	LiDAR Field Survey	8
1.4	LiDAR Data Processing.....	17
1.5	Conclusion	20

1. Introduction

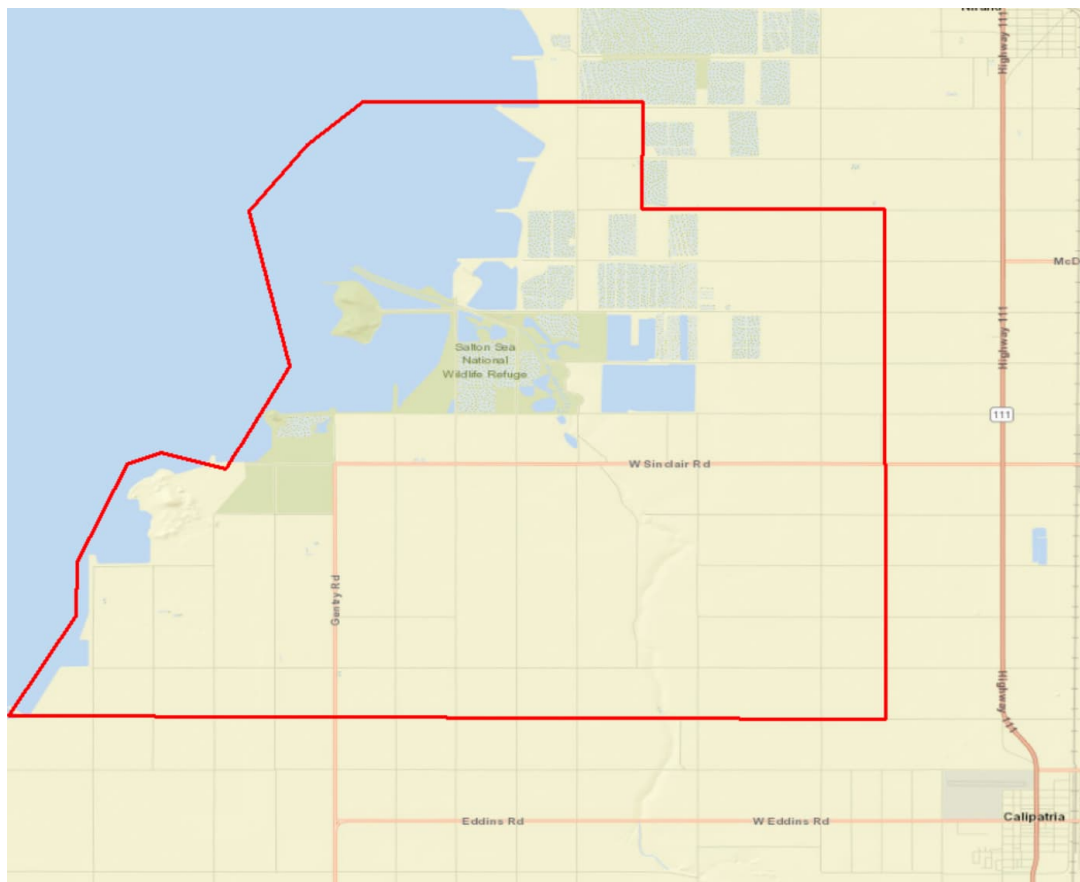
In late spring and early summer of 2022, a LiDAR survey was performed on 21,418 acres. This summary report provides the process used to generate detailed terrain models derived from 10 points per square meter Airborne LiDAR as well as the numerous QC steps within the workflow.

The vertical accuracy was verified following the guidelines in the 2014 ASPRS positional accuracy standards at the 95% confidence interval.

Horizontal Accuracy was calculated following the 2014 ASPRS positional accuracy standards, section 7.5. Derived from estimated GNSS errors, IMU errors, and flying altitude. Visual inspection was also performed. Checking for point cloud misalignment and horizontal location based on ground control points that were visible in the Lidar intensity. Horizontal accuracy is stated as laid out in USGS Lidar Base Specification 2022 rev.

The LiDAR was captured from a sensor in the belly hole of a fixed wing aircraft. This sensor is sending and receiving constant GPS data from a base station rover located at a nearby airfield, which ensures the sensor is constantly adjusting and correcting the millions of positional data points being collected.

The project area shown below is located along the southeast shore of the Salton Sea just to the northwest of Calipatria, California. The ground conditions are mostly low vegetation and hard packed loose surface. The LiDAR was not used to capture any data about the bathymetry of the adjacent water.



LiDAR Validation Report

1.1 Horizontal and Vertical Control Used

(REF FRAME): NAD_83(2011)	
EPOCH:2010.0000	
Mapping System: CA State Plane Zone 6	
Vertical Datum: NAVD88 (GEOID18)	
Units: US Survey Feet	

1.2 LiDAR Acquisition Summary

The LiDAR data was flown on May 13, 2022 using a Cessna 206 Fixed Wing single engine aircraft. Conditions were clear and there was no turbulence.

The LiDAR was collected with an ALTM Galaxy T1000 fixed mount LiDAR system. This system is common for large collection areas due to its consistent point coverage and distribution as well as its reliability in challenging airspaces.



Parameter	Specification
Sensor Performance	
Performance envelope ^{1,2,3,4}	150-4700 m AGL, nominal
Absolute horizontal accuracy ^{2,5}	1/10,000 x altitude; 1 σ
Absolute elevation accuracy ^{2,3}	< 0.03-0.20 m RMSE from 150-4700 m A
Laser Configuration	
Topographic laser	1064-nm near-infrared
Laser classification	Class IV (US FDA 21 CFR 1040.10 and 1040.11; IEC/EN 60825-1)
Pulse repetition frequency (effective)	Programmable, 50-1000 kHz
Beam divergence	0.25 mrad (1/e)
Laser range precision ⁵	< 0.008 m, 1 σ
Minimum target separation distance	< 0.7 m (discrete)
Range capture	Up to 8 range measurements, including last
Intensity capture	Up to 8 intensity measurements, including last (12-bit)
Sensor Configuration	
Position and orientation system	POS AV™ AP60 (OEM); 220-channel dual frequency GNSS receiver; GNSS airborne antenna with Iridium filters; high-accuracy AIMU (Type 57); non-ITAR
Scan angle (FOV)	10-60°
Swath width	10-115% of altitude AGL
Scan frequency	0-120 Hz advertised (0-240 scan lines/sec)
Scan product	2000 maximum
Flight management system	Optech FMS (Airborne Mission Manager and Nav) with operator console
SwathTRAK™	Dynamic FOV for fixed-width data swaths in variable terrain
PulseTRAK™	Multipulse tracking algorithm with no density loss across PIA transition zones
Roll compensation	±5° minimum
Data storage	Internal solid-state drive (SSD)
Power requirements	28 V; 300 W
Dimensions and weight	Sensor: 0.34 x 0.34 x 0.25 m, 27 kg — PDU: 0.42 x 0.33 x 0.10 m, 6.5 kg
Operating temperature	0 to +35°C
Optional Peripherals	
External data storage	Ruggedized, removable 2.5" SSD
Image capture	Compatible with all Optech CS-Series and most 3rd party digital metric cameras
Full waveform capture	12-bit Optech IWR-3 Intelligent Waveform Recorder with removable SSD
Gyro-stabilization	SOMAG GSM 3000/4000 integration kit
Multi-sensor mounts and pods	2 and 4-station machined aluminum sensor mounts (aircraft and/or helicopter) Carbon-fiber sensor mounts supporting nadir and fore/aft oblique cameras Heli-pod mount options for Bell 206/407 (FAA-approved)

1. Target reflectivity >20%; 90% detection probability

2. Dependent on selected operational parameters; assumes nominal FOV of up to 40° in standard atmospheric conditions (i.e. 23-km visibility) and use of Optech LMS Professional software suite

3. Angle of incidence <20°

4. Target size > laser footprint

5. Under Teledyne Optech test conditions, 1 sigma

LiDAR Validation Report

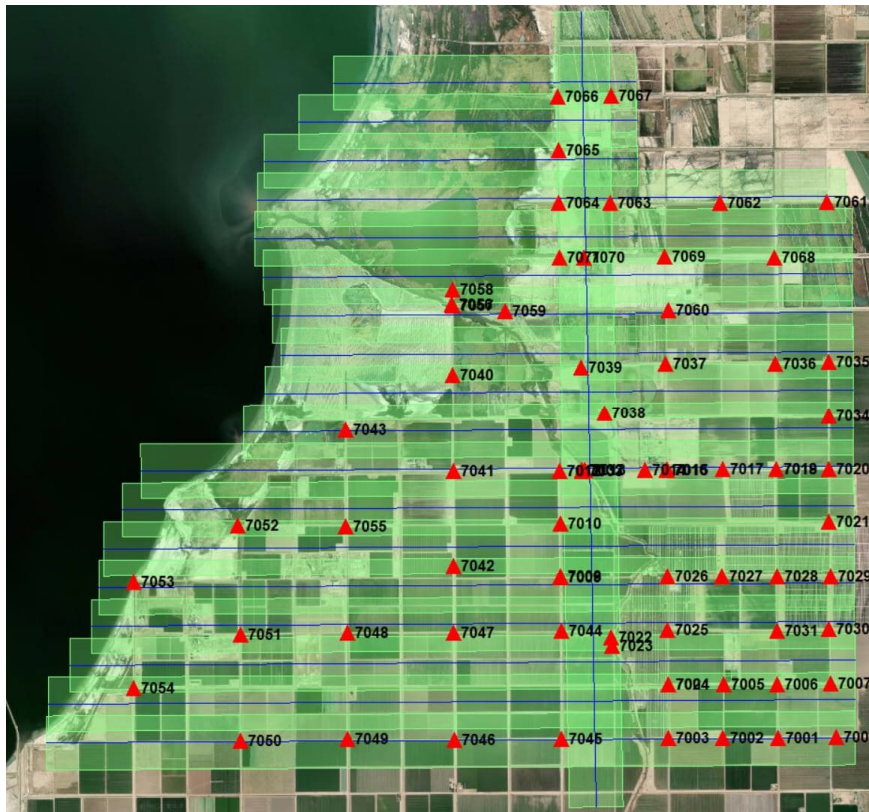
The flight log below shows the start and end time of each flight line, the heading, altitude above mean sea level, the aircraft speed and the strength of the satellite signal. All of these inputs are critical when calibrating the swaths post-collection as well as for potential troubleshooting if anomalies are discovered.

LIDAR FLIGHT REPORT																																																																																																																																																																																																																											
POS/AV Filename: 20220513_1.25Y				Flight Plan Info				Weather Info																																																																																																																																																																																																																			
Date: 5-13-22	Project: 22CA-1041			Roll Comp	On	Grnd Pressure (INMG)	29.98	 Notes:																																																																																																																																																																																																																			
Aircraft: N912SY	Sensor: 5060414			Scan Frequency	90	Ground Temp (C°)	26																																																																																																																																																																																																																				
Pilot: SP	Operator: JH			Scan Half Angle	18	Air Temp (C°)	18																																																																																																																																																																																																																				
HD: A / B				Laser PRF	550	Dew Point (C°)	-1																																																																																																																																																																																																																				
				Desired Range	1180	Turbulence	—																																																																																																																																																																																																																				
				Planned Ground Speed	110	Wind Speed/Gusts (kts)	—																																																																																																																																																																																																																				
				System Power		Visibility (miles)	+10																																																																																																																																																																																																																				
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ABGPS TIME ON UTC: 14:54 KIN ON UTC: 14:55 KIN OFF UTC: 14:24 TIME OFF UTC: 14:25 PDOP: .93 SV'S: 30				BASE STATION <table border="1"><thead><tr><th>POINT ID</th><th>KNOWN / AUTONOMOUS</th><th>LOCATION</th></tr></thead><tbody><tr><td>POSITION TYPE</td><td>METERS</td><td>TIME ON (UTC)</td></tr><tr><td>ANTENNA HEIGHT</td><td></td><td>TIME OFF (UTC)</td></tr><tr><td>LATITUDE</td><td></td><td>PDOP</td></tr><tr><td>LONGITUDE</td><td></td><td>SV'S</td></tr></tbody></table>				POINT ID	KNOWN / AUTONOMOUS	LOCATION	POSITION TYPE	METERS	TIME ON (UTC)	ANTENNA HEIGHT		TIME OFF (UTC)	LATITUDE		PDOP	LONGITUDE		SV'S	Engine Start (24HR Local): 7:47 Engine Stop (24HR Local): 12:26 Depart: KUDU Arrive: KUDU Ferry Start (24HR UTC): 13:01 Ferry Stop (24HR UTC): 14:24 Depart: KUDU Arrive: KUDU																																																																																																																																																																																																				
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The target area was collected in 19 passes, each overlapping on the side by about 40% to ensure complete coverage as well as giving several returns on the ground from different passes. This is important in the calibration of the data, to ensure the entire area is not only stitched together within itself, but also can be anchored to real world location.

As instructed by the project team, our flight lines extended further into the lakebed as water levels have been receding at the time of the collection and we needed to ensure capture was performed right up the water's edge. No bathymetric LiDAR was used for this project.

LiDAR Validation Report



The table below demonstrates the vertical deviation of the flight lines when the data was registered and calibrated. As shown, this LiDAR data was very accurate and well within acceptable tolerance for the topography and surface model generation specifications.

Average magnitude: 0.12424

Flightline	Points	Magnitude	Dz
111	124673002	0.1119	-0.0101
1911	32175966	0.1789	-0.0629
2011	17507927	0.1444	+0.0343
1711	44893167	0.1532	-0.0269
1811	32806676	0.1942	-0.0261
1511	53602324	0.1140	+0.0147
1611	55595377	0.1295	-0.0029
1211	58922201	0.1143	+0.0042
1311	57381122	0.1010	+0.0167
1411	54823390	0.1004	-0.0033
1011	61692424	0.1014	-0.0014
1111	59096512	0.1166	-0.0163
811	69509505	0.1278	+0.0121
911	66435038	0.1067	+0.0039
511	73284233	0.1297	+0.0132
611	71984174	0.1362	+0.0276
711	70532714	0.1353	-0.0070
311	77404169	0.1286	-0.0328
411	74441623	0.1281	+0.0159
211	41688967	0.1108	+0.0463

1.3 LiDAR Accuracy Validation

The absolute vertical accuracy was verified following the guidelines in the 2014 ASPRS positional accuracy standards. The table below shows the results of z values of the LiDAR compared against the surveyed ground control.

POINT ID	NORTHING	EASTING	SURVEYED ELEV.	LIDAR ELEV.	Dz
7000	1995400.203	6780356.69	-191.466	-191.594	-0.128
7001	1995378.057	6777490.936	-193.682	-193.754	-0.072
7002	1995358.153	6774770.65	-198.627	-198.699	-0.072
7003	1995345.93	6772085.065	-199.614	-199.642	-0.028
7004	1998003.294	6772079.427	-202.251	-202.228	0.023
7005	1998008.09	6774826.208	-201.879	-201.917	-0.038
7006	1998014.248	6777464.947	-197.378	-197.401	-0.023
7007	1998037.72	6780080.617	-194.782	-194.829	-0.047
7008	2003321.693	6766770.981	-212.211	-212.159	0.052
7009	2003277.622	6766760.261	-211.995	-211.963	0.032
7010	2005911.973	6766733.614	-215.553	-215.613	-0.06
7011	2008510.916	6766720.115	-216.343	slope	*
7012	2008532.727	6766707.287	-216.258	-216.263	-0.005
7013	2008562.873	6767955.275	-214.438	-214.541	-0.103
7014	2008575.139	6770912.424	-214.684	-214.712	-0.028
7015	2008570.641	6772014.298	-213.014	-212.999	0.015
7016	2008589.433	6772002.423	-212.783	-212.831	-0.048
7017	2008610.318	6774762.813	-208.956	-208.898	0.058
7018	2008602.731	6777397.864	-204.761	-204.653	0.108
7019	2008624.044	6777417.239	-204.366	-204.246	0.12
7020	2008622.749	6780014.234	-198.664	-198.608	0.056
7021	2006041.029	6780019.891	-196.826	-196.836	-0.01
7022	2000322.909	6769268.298	-205.721	removed	*
7023	1999912.328	6769292.566	-205.918	-205.918	0
7024	1998008.121	6772079.272	-202.212	-202.21	0.002
7025	2000694.001	6772055.286	-206.091	-206.087	0.004
7026	2003350.886	6772025.856	-209.364	-209.321	0.043
7027	2003357.542	6774729.877	-205.075	-205.145	-0.07
7028	2003323.192	6777437.271	-201.254	-201.304	-0.05
7029	2003327.356	6780081.76	-198.881	-198.899	-0.018
7030	2000740.658	6780030.512	-195.075	-195.042	0.033
7031	2000665.85	6777455.173	-199.849	-199.807	0.042
7032	2008578.239	6767801.702	-214.595	slope	*
7033	2008545.435	6767801.825	-214.518	-214.489	0.029
7034	2011254.16	6780022.151	-197.662	-197.528	0.134
7035	2013928.342	6779994.883	-197.973	-197.88	0.093

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7036	2013880.806	6777359.744	-203.378	-203.401	-0.023
7037	2013843.231	6771949.319	-214.758	-214.786	-0.028
7038	2011412.346	6768946.966	-217.441	-217.38	0.061
7039	2013675.821	6767770.249	-219.997	-220.045	-0.048
7040	2013307.346	6761422.4	-224.373	-224.253	0.12
7041	2008510.723	6761461.448	-225.073	-225.111	-0.038
7042	2003840.914	6761462.537	-218.396	-218.42	-0.024
7043	2010578.278	6756135.792	-222.307	-222.343	-0.036
7044	2000635.814	6766783.382	-208.85	-208.871	-0.021
7045	1995324.998	6766817.694	-203.122	-203.098	0.024
7046	1995292.07	6761525.03	-207.11	-207.063	0.047
7047	2000566.602	6761485.366	-212.631	-212.492	0.139
7048	2000554.537	6756209.756	-216.342	-216.266	0.076
7049	1995316.795	6756244.166	-211.216	-211.206	0.01
7050	1995206.066	6750953.914	-218.439	-218.53	-0.091
7051	2000441.676	6750930.627	-225.434	-225.383	0.051
7052	2005851.8	6750825.617	-221.374	-221.441	-0.067
7053	2003076.979	6745671.395	-220.923	-220.972	-0.049
7054	1997836.012	6745680.381	-220.846	-220.965	-0.119
7055	2005812.034	6756156.241	-223.77	-223.882	-0.112
7056	2016759.314	6761385.155	-224.55	-224.459	0.091
7057	2016750.764	6761417.211	-224.926	slope	*
7058	2017534.6	6761428.196	-227.028	-227.139	-0.111
7059	2016469.475	6764019.964	-222.531	-222.605	-0.074
7060	2016509.733	6772100.516	-216.137	-216.128	0.009
7061	2021817.317	6779898.653	-192.893	-192.798	0.095
7062	2021788.42	6774651.661	-208.666	-208.526	0.14
7063	2021783.705	6769230.355	-221.237	-221.159	0.078
7064	2021769.049	6766662.715	-224.323	-224.285	0.038
7065	2024401.316	6766636.742	-222.432	-222.316	0.116
7066	2027042.71	6766612.824	-221.003	-220.894	0.109
7067	2027055.951	6769272.41	-217.526	-217.569	-0.043
7068	2019109.073	6777308.319	-201.619	-201.712	-0.093
7069	2019119.08	6771906.114	-214.563	-214.587	-0.024
7070	2019102.04	6767916.305	-218.046	-218.167	-0.121
7071	2019104.613	6766700.395	-223.329	-223.474	-0.145

Average Dz	0.000
Minimum DZ	-0.145
Maximum DZ	0.140
Average Magnitude	0.061
STD Deviation	0.073

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Confidence Level(95.0%)	0.018
Lower CI (95%)	-0.018
Upper CI (95%)	0.017
RMSE	0.073
Units Feet	

The relative vertical accuracy was also compared for each swath (flightline) captured to ensure there were no fatal flaws in the calibration of the swaths prior to classification.

Flightline	Magnitude	Abs(DZ)	Dz
111	0.112	0.010	-0.010
1911	0.179	0.063	-0.063
2011	0.144	0.034	0.034
1711	0.153	0.027	-0.027
1811	0.194	0.026	-0.026
1511	0.114	0.015	0.015
1611	0.130	0.003	-0.003
1211	0.114	0.004	0.004
1311	0.101	0.017	0.017
1411	0.100	0.003	-0.003
1011	0.101	0.001	-0.001
1111	0.117	0.016	-0.016
811	0.128	0.012	0.012
911	0.107	0.004	0.004
511	0.130	0.013	0.013
611	0.136	0.028	0.028
711	0.135	0.007	-0.007
311	0.129	0.033	-0.033
411	0.128	0.016	0.016
211	0.111	0.046	0.046

Average Dz	0.000
Minimum DZ	-0.063
Maximum DZ	0.046
Average Magnitude	0.128
STD Deviation	0.025
Confidence Level(95.0%)	0.012
Lower CI (95%)	-0.012
Upper CI (95%)	0.012
RMSE	0.025
Units Feet	

Additional LiDAR relative accuracy provided by the aerial contractor is provided in Attachment 1.

1.4 LiDAR Field Survey

This project also included the delivery of rectified orthophotography, which requires an even distribution of fixed visible targets. These targets can be existing permanent features visible on the ground. We were able to use these hard surface known points to calibrate and validate the accuracy of the LiDAR as well as rectify the orthoimagery. The exact values of each control point are shown in the table below.

Point ID	Northing	Easting	Elevation	Description
7000	1995400.203	6780356.69	-191.466	GROUND DIRT RD
7001	1995378.057	6777490.936	-193.682	GROUND ASPHALT RD
7002	1995358.153	6774770.65	-198.627	GROUND DIRT RD
7003	1995345.93	6772085.065	-199.614	GROUND ASPHALT RD
7004	1998003.294	6772079.427	-202.251	GROUND ASPHALT RD
7005	1998008.09	6774826.208	-201.879	GROUND DIRT RD
7006	1998014.248	6777464.947	-197.378	ASPHALT RD
7007	1998037.72	6780080.617	-194.782	GROUND DIRT RD
7008	2003321.693	6766770.981	-212.211	CONCRETE SOUTH EAST CORNER
7009	2003277.622	6766760.261	-211.995	ASPHALT
7010	2005911.973	6766733.614	-215.553	ASPHALT
7011	2008510.916	6766720.115	-216.343	STOP BAR NORTH ANGLE POINT
7012	2008532.727	6766707.287	-216.258	ASPHALT
7013	2008562.873	6767955.275	-214.438	END OF YELLOW SKIPPY STRIPE
7014	2008575.139	6770912.424	-214.684	END OF YELLOW SKIPPY STRIPE
7015	2008570.641	6772014.298	-213.014	STOP BAR NORTH ANGLE POINT
7016	2008589.433	6772002.423	-212.783	ASPHALT
7017	2008610.318	6774762.813	-208.956	END OF YELLOW SKIPPY STRIPE
7018	2008602.731	6777397.864	-204.761	END OF YELLOW SOLID STRIPE
7019	2008624.044	6777417.239	-204.366	END OF YELLOW SOLID STRIPE
7020	2008622.749	6780014.234	-198.664	END OF YELLOW SKIPPY STRIPE
7021	2006041.029	6780019.891	-196.826	DIRT ROAD
7022	2000322.909	6769268.298	-205.721	CON N EDGE
7023	1999912.328	6769292.566	-205.918	DIRT ROAD
7024	1998008.121	6772079.272	-202.212	ASPHALT
7025	2000694.001	6772055.286	-206.091	END OF YELLOW SKIPPY STRIPE
7026	2003350.886	6772025.856	-209.364	ASPHALT
7027	2003357.542	6774729.877	-205.075	DIRT ROAD
7028	2003323.192	6777437.271	-201.254	ASPHALT
7029	2003327.356	6780081.76	-198.881	DIRT ROAD

LiDAR Validation Report

Point ID	Northing	Easting	Elevation	Description
7030	2000740.658	6780030.512	-195.075	DIRT ROAD
7031	2000665.85	6777455.173	-199.849	ASPHALT
7032	2008578.239	6767801.702	-214.595	CONCRETE NW CORNER BRIDGE
7033	2008545.435	6767801.825	-214.518	CONCRETE SW CORNER BRIDGE
7034	2011254.16	6780022.151	-197.662	DIRT ROAD
7035	2013928.342	6779994.883	-197.973	DIRT ROAD
7036	2013880.806	6777359.744	-203.378	GRAVEL ROAD
7037	2013843.231	6771949.319	-214.758	DIRT ROAD
7038	2011412.346	6768946.966	-217.441	DIRT ROAD
7039	2013675.821	6767770.249	-219.997	DIRT ROAD
7040	2013307.346	6761422.4	-224.373	DIRT ROAD
7041	2008510.723	6761461.448	-225.073	END OF YELLOW SOLID STRIPE
7042	2003840.914	6761462.537	-218.396	DIRT ROAD
7043	2010578.278	6756135.792	-222.307	DIRT ROAD
7044	2000635.814	6766783.382	-208.85	ASPHALT
7045	1995324.998	6766817.694	-203.122	ASPHALT
7046	1995292.07	6761525.03	-207.11	DIRT ROAD
7047	2000566.602	6761485.366	-212.631	DIRT ROAD
7048	2000554.537	6756209.756	-216.342	END OF YELLOW SKIPPY STRIPE
7049	1995316.795	6756244.166	-211.216	END OF YELLOW SKIPPY STRIPE
7050	1995206.066	6750953.914	-218.439	DIRT ROAD
7051	2000441.676	6750930.627	-225.434	DIRT ROAD
7052	2005851.8	6750825.617	-221.374	DIRT ROAD
7053	2003076.979	6745671.395	-220.923	DIRT ROAD
7054	1997836.012	6745680.381	-220.846	STOP BAR ANGLE POINT WEST
7055	2005812.034	6756156.241	-223.77	CONCRETE NW CORNER
7056	2016759.314	6761385.155	-224.55	CONCRETE NW CORNER
7057	2016750.764	6761417.211	-224.926	CONCRETE NE CORNER
7058	2017534.6	6761428.196	-227.028	DIRT ROAD
7059	2016469.475	6764019.964	-222.531	DIRT ROAD
7060	2016509.733	6772100.516	-216.137	DIRT ROAD
7061	2021817.317	6779898.653	-192.893	DIRT ROAD
7062	2021788.42	6774651.661	-208.666	DIRT ROAD
7063	2021783.705	6769230.355	-221.237	DIRT ROAD
7064	2021769.049	6766662.715	-224.323	DIRT ROAD

LiDAR Validation Report

Point ID	Northing	Easting	Elevation	Description
7065	2024401.316	6766636.742	-222.432	DIRT ROAD
7066	2027042.71	6766612.824	-221.003	DIRT ROAD
7067	2027055.951	6769272.41	-217.526	DIRT ROAD
7068	2019109.073	6777308.319	-201.619	STOP BAR EAST ANGLE POINT
7069	2019119.08	6771906.114	-214.563	AC
7070	2019102.04	6767916.305	-218.046	END OF YELLOW SOLID STRIPE
7071	2019104.613	6766700.395	-223.329	STOP BAR SW CORNER

The following pages are examples of the survey control points used for calibration of the LiDAR and validation of the data's accuracy. Visible paint markings, corners of concrete pads and defined structures were used as the control targets. All these points were observed using RTK GPS and tied to a local benchmark.

As shown in many of these photos, the number painted on the ground corresponds directly to the target locations shown in the flight plan on the previous page. This allows each surveyed location to be checked against the LiDAR point cloud and derived surface, to ensure accuracy was within the specifications of this project.

















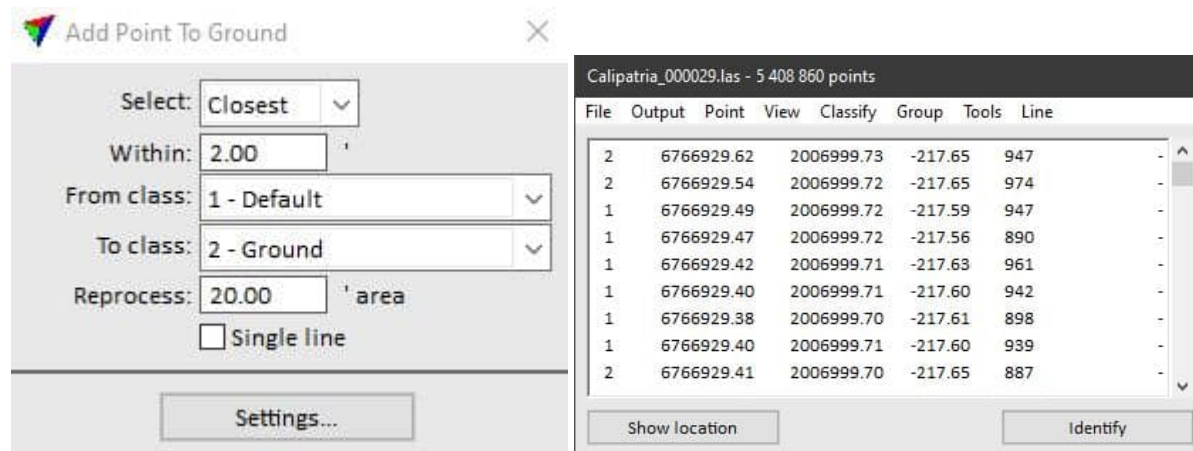
1.5 LiDAR Data Processing

LiDAR Classification Process:

The first step in the process is the calibration of the LiDAR data immediately after it's been flown. This is done in the event of a system malfunction, a reflight can quickly be performed prior to demobilization. The calibration process uses the ground control values and the airborne GPS data to properly align and orient the swaths and create a single point cloud of all swaths combined and tied together.

The calibrated, unclassified point cloud is loaded into a processing program called TerraScan and split into smaller parcels for automatic classification. A macro is run on the dataset to determine ground points using algorithms imbedded in the program to decipher which LiDAR returns from the scan are ground. Once ground points are determined, additional macro processes can be run to classify vegetation, buildings, etc. A team of processors work through each of the smaller parcels for an overall QC on the automatic classifications and adjust where needed.

LiDAR Validation Report



A final macro process can be run on the ground points to pull "key" ground points for surface mapping. The purpose of the key ground point process is to help thin the dataset to a smaller file size allowing the LiDAR deliverable to be a more user friendly file for the end user to work with. The thinning process still maintains an accurate representation of the surface as a final product. All classification and exporting is conducted in the program TerraScan.

Once the data is classified to ground, the accuracy is then checked against the control. This check compares the surveyed values with the LiDAR derived value. Below is the result of the accuracy checks. The "Dz" column shows how much higher or lower the LiDAR point is versus the surveyed control. Units are in feet. The rule of thumb is there should be half as much variation in elevation as the intended contour interval. For example, for 1' contours, Dz values of .5 or less are acceptable.

LiDAR Accuracy Reports

Point ID	Northing	Easting	Surveyed Elev.	LiDAR Elev.	Dz
7000	1995400.203	6780356.69	-191.466	-191.594	-0.128
7001	1995378.057	6777490.936	-193.682	-193.754	-0.072
7002	1995358.153	6774770.65	-198.627	-198.699	-0.072
7003	1995345.93	6772085.065	-199.614	-199.642	-0.028
7004	1998003.294	6772079.427	-202.251	-202.228	0.023
7005	1998008.09	6774826.208	-201.879	-201.917	-0.038
7006	1998014.248	6777464.947	-197.378	-197.401	-0.023
7007	1998037.72	6780080.617	-194.782	-194.829	-0.047
7008	2003321.693	6766770.981	-212.211	-212.159	0.052
7009	2003277.622	6766760.261	-211.995	-211.963	0.032
7010	2005911.973	6766733.614	-215.553	-215.613	-0.06
7011	2008510.916	6766720.115	-216.343	slope	*
7012	2008532.727	6766707.287	-216.258	-216.263	-0.005
7013	2008562.873	6767955.275	-214.438	-214.541	-0.103
7014	2008575.139	6770912.424	-214.684	-214.712	-0.028
7015	2008570.641	6772014.298	-213.014	-212.999	0.015

LiDAR Validation Report

Point ID	Northing	Easting	Surveyed Elev.	LiDAR Elev.	Dz
7016	2008589.433	6772002.423	-212.783	-212.831	-0.048
7017	2008610.318	6774762.813	-208.956	-208.898	0.058
7018	2008602.731	6777397.864	-204.761	-204.653	0.108
7019	2008624.044	6777417.239	-204.366	-204.246	0.12
7020	2008622.749	6780014.234	-198.664	-198.608	0.056
7021	2006041.029	6780019.891	-196.826	-196.836	-0.01
7022	2000322.909	6769268.298	-205.721	removed	*
7023	1999912.328	6769292.566	-205.918	-205.918	0
7024	1998008.121	6772079.272	-202.212	-202.21	0.002
7025	2000694.001	6772055.286	-206.091	-206.087	0.004
7026	2003350.886	6772025.856	-209.364	-209.321	0.043
7027	2003357.542	6774729.877	-205.075	-205.145	-0.07
7028	2003323.192	6777437.271	-201.254	-201.304	-0.05
7029	2003327.356	6780081.76	-198.881	-198.899	-0.018
7030	2000740.658	6780030.512	-195.075	-195.042	0.033
7031	2000665.85	6777455.173	-199.849	-199.807	0.042
7032	2008578.239	6767801.702	-214.595	slope	*
7033	2008545.435	6767801.825	-214.518	-214.489	0.029
7034	2011254.16	6780022.151	-197.662	-197.528	0.134
7035	2013928.342	6779994.883	-197.973	-197.88	0.093
7036	2013880.806	6777359.744	-203.378	-203.401	-0.023
7037	2013843.231	6771949.319	-214.758	-214.786	-0.028
7038	2011412.346	6768946.966	-217.441	-217.38	0.061
7039	2013675.821	6767770.249	-219.997	-220.045	-0.048
7040	2013307.346	6761422.4	-224.373	-224.253	0.12
7041	2008510.723	6761461.448	-225.073	-225.111	-0.038
7042	2003840.914	6761462.537	-218.396	-218.42	-0.024
7043	2010578.278	6756135.792	-222.307	-222.343	-0.036
7044	2000635.814	6766783.382	-208.85	-208.871	-0.021
7045	1995324.998	6766817.694	-203.122	-203.098	0.024
7046	1995292.07	6761525.03	-207.11	-207.063	0.047
7047	2000566.602	6761485.366	-212.631	-212.492	0.139
7048	2000554.537	6756209.756	-216.342	-216.266	0.076
7049	1995316.795	6756244.166	-211.216	-211.206	0.01
7050	1995206.066	6750953.914	-218.439	-218.53	-0.091

LiDAR Validation Report

Point ID	Northing	Easting	Surveyed Elev.	LiDAR Elev.	Dz
7051	2000441.676	6750930.627	-225.434	-225.383	0.051
7052	2005851.8	6750825.617	-221.374	-221.441	-0.067
7053	2003076.979	6745671.395	-220.923	-220.972	-0.049
7054	1997836.012	6745680.381	-220.846	-220.965	-0.119
7055	2005812.034	6756156.241	-223.77	-223.882	-0.112
7056	2016759.314	6761385.155	-224.55	-224.459	0.091
7057	2016750.764	6761417.211	-224.926	slope	*
7058	2017534.6	6761428.196	-227.028	-227.139	-0.111
7059	2016469.475	6764019.964	-222.531	-222.605	-0.074
7060	2016509.733	6772100.516	-216.137	-216.128	0.009
7061	2021817.317	6779898.653	-192.893	-192.798	0.095
7062	2021788.42	6774651.661	-208.666	-208.526	0.14
7063	2021783.705	6769230.355	-221.237	-221.159	0.078
7064	2021769.049	6766662.715	-224.323	-224.285	0.038
7065	2024401.316	6766636.742	-222.432	-222.316	0.116
7066	2027042.71	6766612.824	-221.003	-220.894	0.109
7067	2027055.951	6769272.41	-217.526	-217.569	-0.043
7068	2019109.073	6777308.319	-201.619	-201.712	-0.093
7069	2019119.08	6771906.114	-214.563	-214.587	-0.024
7070	2019102.04	6767916.305	-218.046	-218.167	-0.121
7071	2019104.613	6766700.395	-223.329	-223.474	-0.145
	Average dz	0			
	Minimum dz	-0.145			
	Maximum dz	0.14			
	Average magnitude	0.061			
	Root mean square	0.073			
	Std deviation	0.073			

1.6 Conclusion

The LiDAR data is validated and checked at several gates throughout the process. The first QC check is performed immediately off the plane with the initial calibration of the data. If there is a fatal flaw in the data, it would be caught in this QC check.

The second check is performed during the classification. The classification will reveal if there are any abnormal spikes or dips in the LiDAR returns.

LiDAR Validation Report

The final check is performed after the data has been classified and thinned. This is where the accuracy is thoroughly vetted using the provided control values and measured against the values of that same point in the LiDAR surface.

The data collected, processed and delivered for this project passed every QC check through the process and the resulting data is well within specification for detailed design and construction planning.

1.7 Certification

I, Aaron D. Willis, a Licensed Land Surveyor with license number 8881, hereby certify that I have reviewed and verified this LiDAR Validation Report.

I affirm that the LiDAR data was collected, processed, and analyzed as presented in this report, and that this work took place under my oversight.

Aaron D. Willis, PLS
License No. 8881
Date: 05/03/2023



Attachment 1 LiDAR Accuracy Validation by Keystone Aerial Surveys, Incorporated

General Information

Mission Information

Project name	22CA-1041
Processing date	2022-05-19 18:15:22
Mission date	2022-05-13 14:49:43
Mission duration	02:51:20.391
Processing mode	IN-Fusion SmartBase
GPS Station	ASB

Rover Hardware Information

Product	POS AV 610 VER6 HW2.5-12
Serial number	S/N9297
IMU type	57
Receiver type	BD982
Antenna type	AT1675-80

Project File List

Rover Data Files

File name	File type
20220513_1_25Y.659	POS Data
20220513_1_25Y.660	POS Data
20220513_1_25Y.661	POS Data
20220513_1_25Y.662	POS Data
20220513_1_25Y.663	POS Data
20220513_1_25Y.664	POS Data
20220513_1_25Y.665	POS Data
20220513_1_25Y.666	POS Data
20220513_1_25Y.667	POS Data
20220513_1_25Y.668	POS Data
20220513_1_25Y.669	POS Data
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20220513_1_25Y.679	POS Data
20220513_1_25Y.680	POS Data
20220513_1_25Y.681	POS Data
20220513_1_25Y.682	POS Data
20220513_1_25Y.683	POS Data
20220513_1_25Y.684	POS Data

Input Files

File Name	File Type
Ephm1330.22g	GLONASS Broadcast Ephemeris
Ephm1330.22n	GPS Broadcast Ephemeris
bomg1330.22o	GNSS SingleBase
crrs1330.22o	GPS SingleBase
errg1330.22o	GNSS SingleBase
glrs1330.22o	GNSS SingleBase
p4951330.22o	GPS SingleBase
p4991330.22o	GNSS SingleBase
p5021330.22o	GPS SingleBase
p5031330.22o	GPS SingleBase
p5061330.22o	GNSS SingleBase
p5071330.22o	GPS SingleBase
p5081330.22o	GNSS SingleBase
p5101330.22o	GNSS SingleBase

Output Files

Filename	File type
sbt_Mission 1.out	SBET Trajectory File
NAD83(2011)_Ep2010_Sbet.out	Custom Smoothed BET Export Output

Rover Data Summary

First raw data file	20220513_1_25Y.659		
Last raw data file	20220513_1_25Y.684		
Start GPS week	2209		
Start time	485382.542 (5/13/2022 2:49:42 PM)		
End time	501947.422 (5/13/2022 7:25:47 PM)		
Start of fine alignment	490287.980 (5/13/2022 4:11:27 PM)		
Available subsystems	Primary GNSS, IMU		
POS Event Input	None		
Correction data	None		
IMU Installation Lever Arms & Mounting Angles			
Reference to IMU lever arm (m)	0.000	0.000	0.000
Reference to IMU mounting angles (deg)	0.000	0.000	180.000
Reference to Primary GNSS lever arm (m)	-0.485	-0.379	-1.141
Reference to Primary GNSS lever arm std dev (m)	-1.000		
Aircraft to Reference mounting angles (deg)	0.000	0.000	0.000

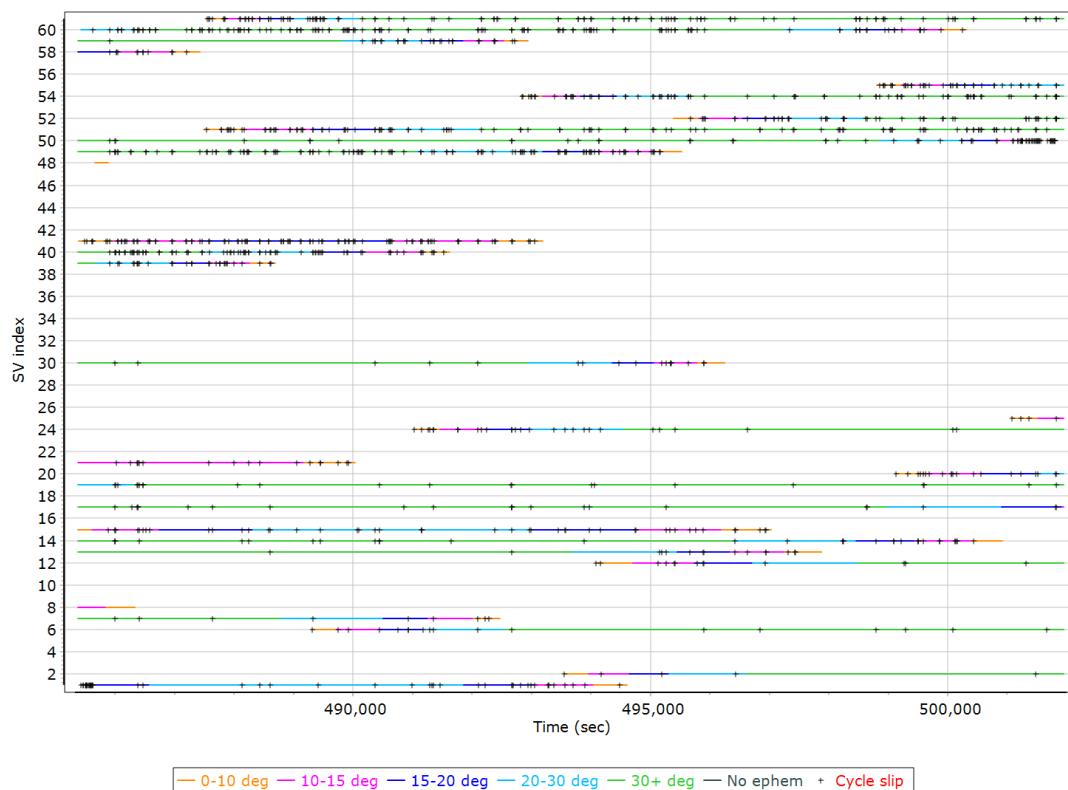
Rover Data QC

Raw IMU Import QC Summary

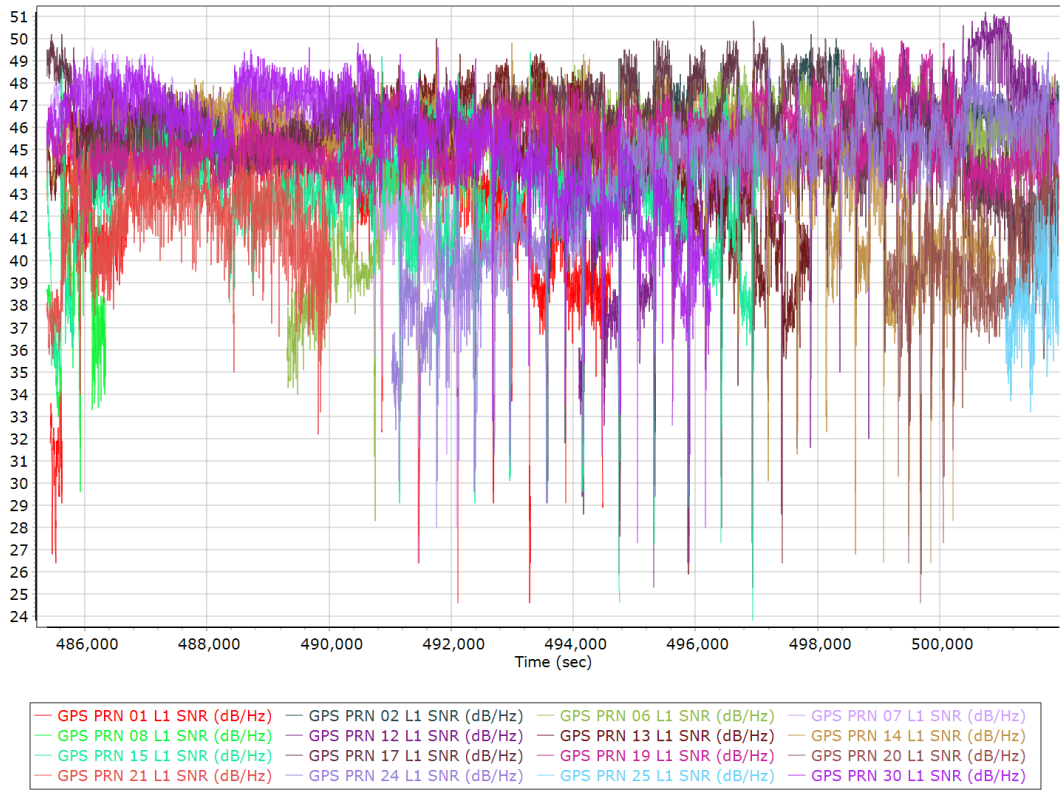
IMU data input file	imu_Mission 1.dat
IMU data check log file	imudt_Mission 1.log
IMU Records Processed	3312377
Termination Status	Normal
IMU Anomalies	0

Primary Observables & Satellite Data

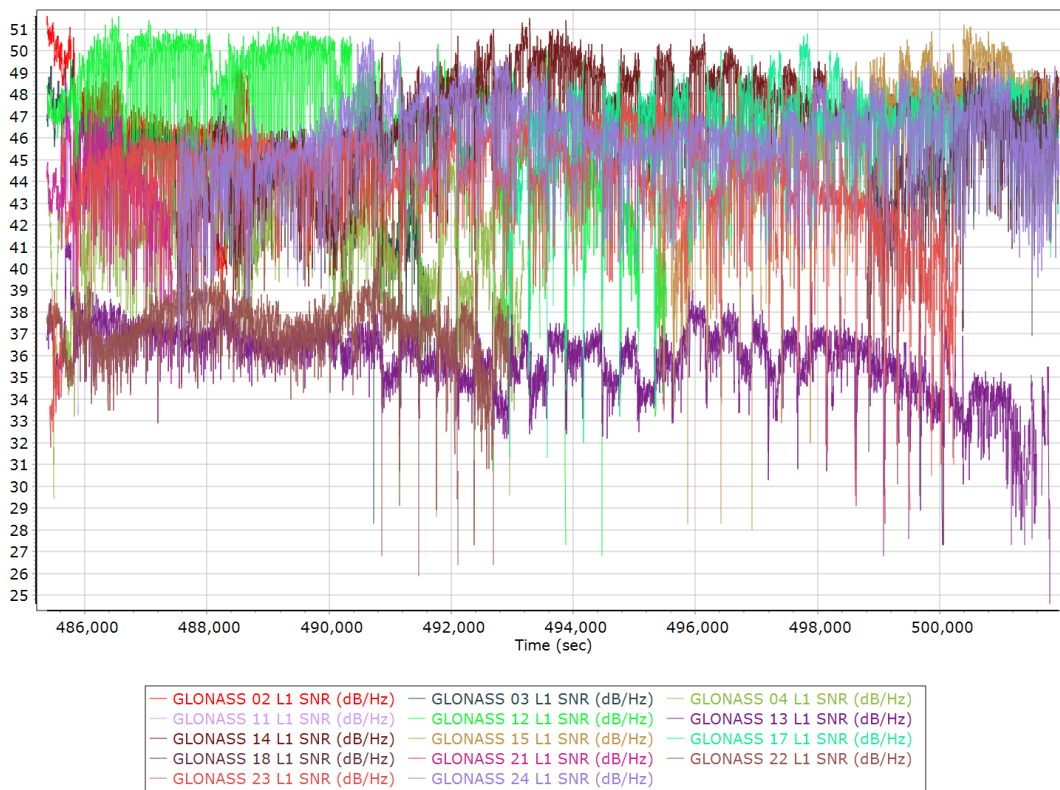
GPS/GLONASS L1 Satellite Lock/Elevation



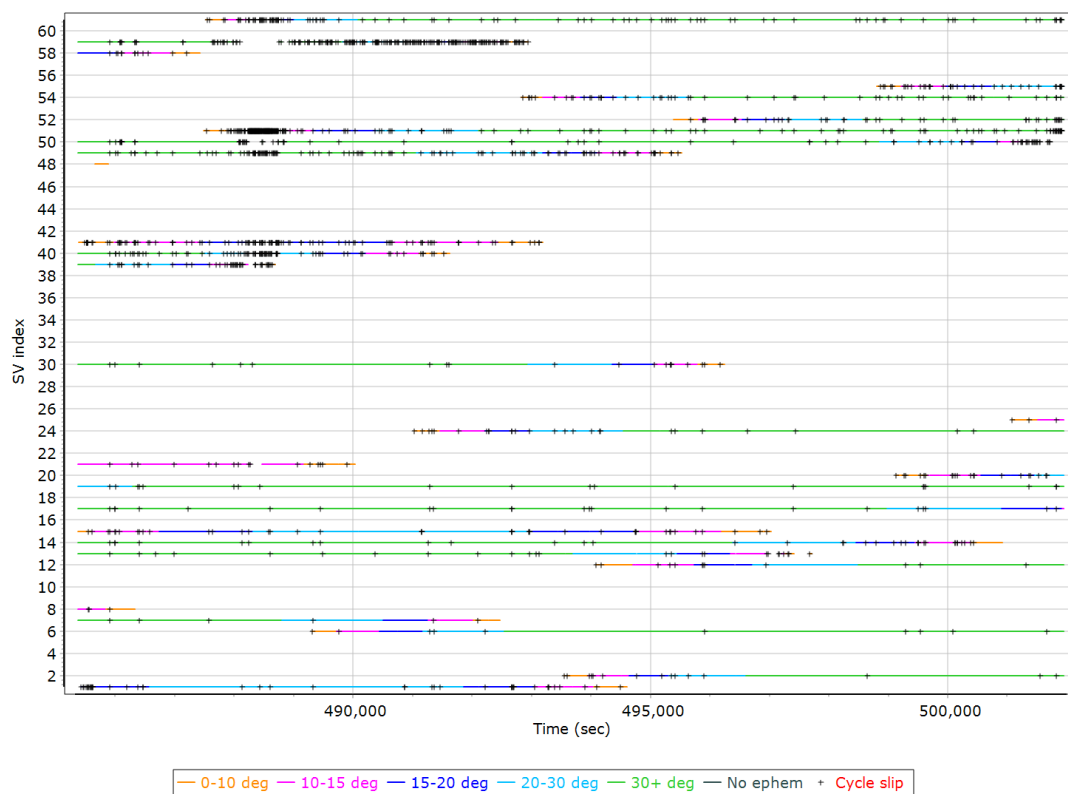
GPS L1 SNR



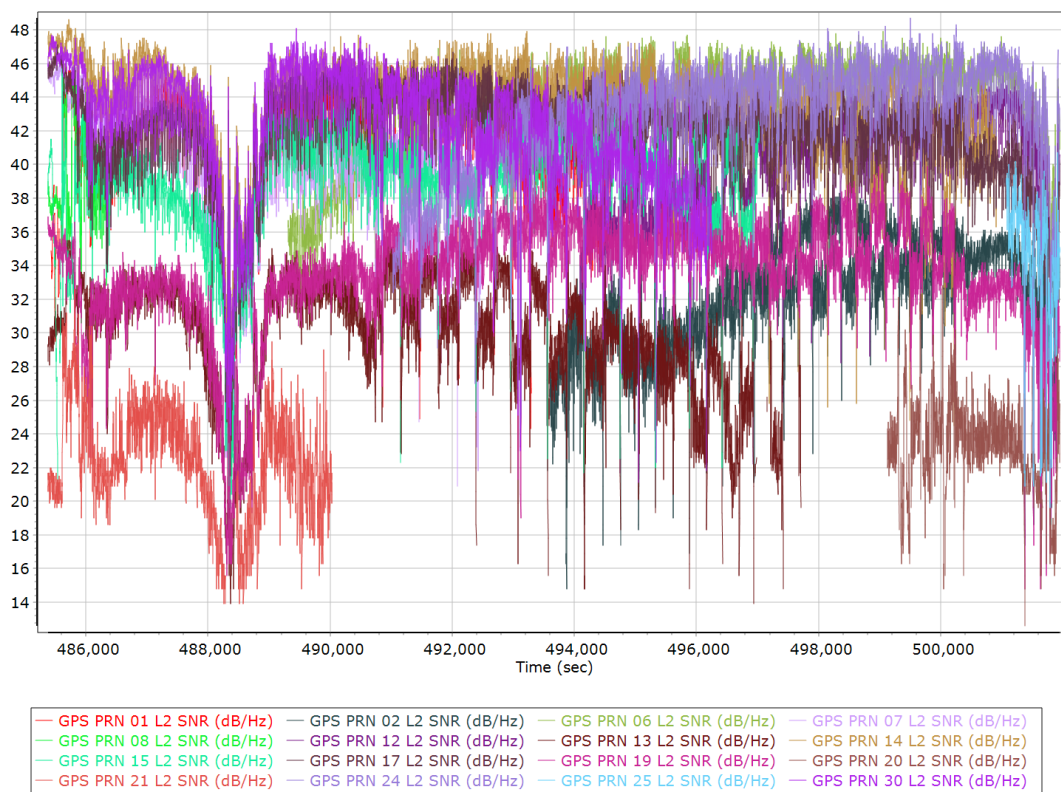
GLONASS L1 SNR



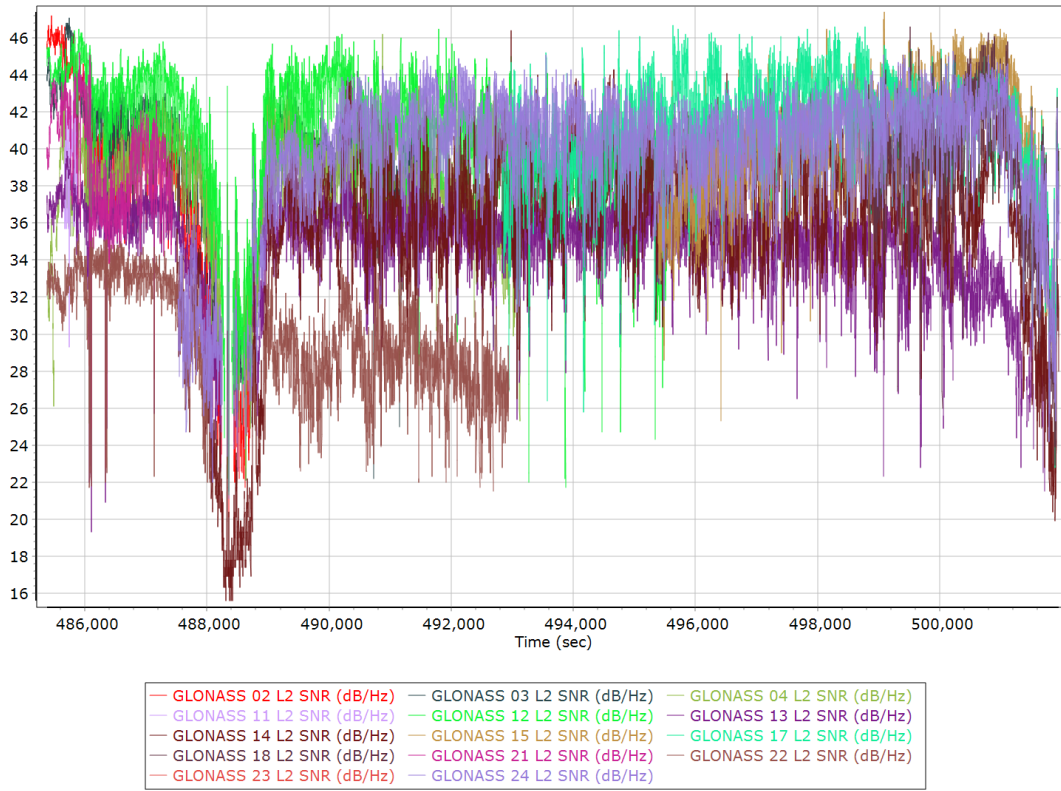
GPS/GLONASS L2 Satellite Lock/Elevation



GPS L2 SNR



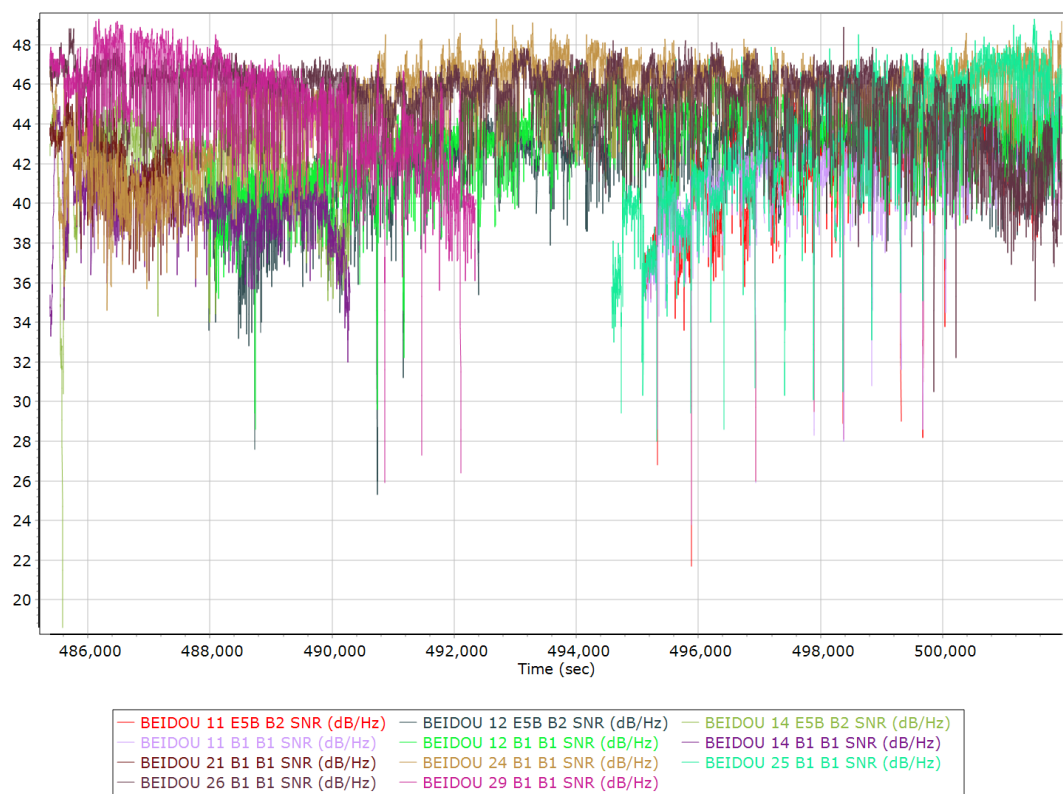
GLONASS L2 SNR



BEIDOU Satellite Lock/Elevation



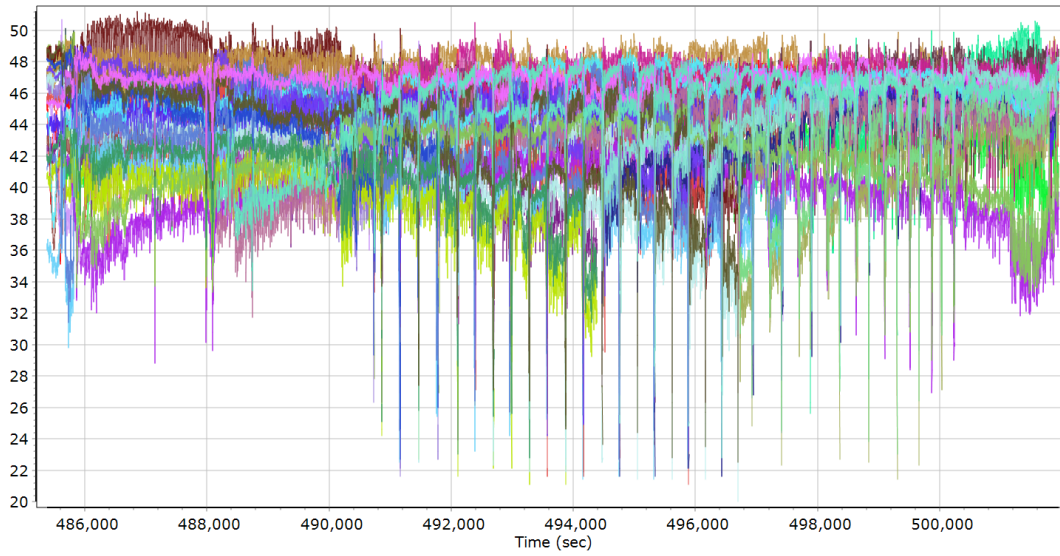
BEIDOU SNR



GALILEO Satellite Lock/Elevation



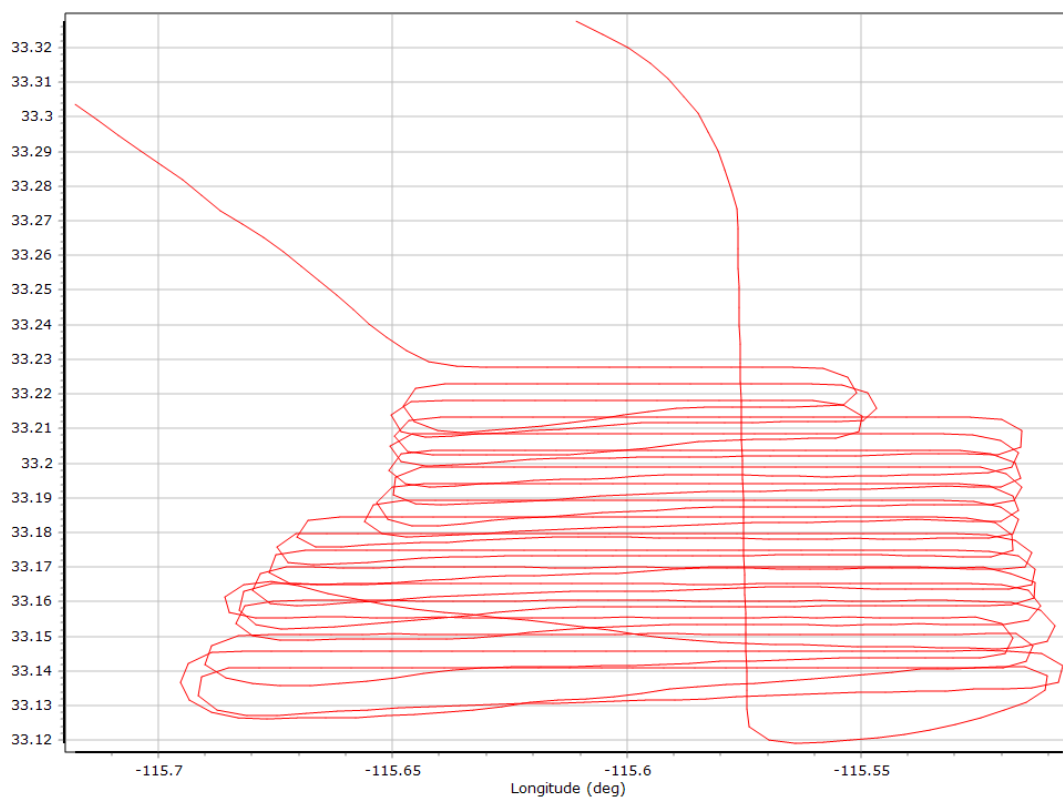
GALILEO SNR



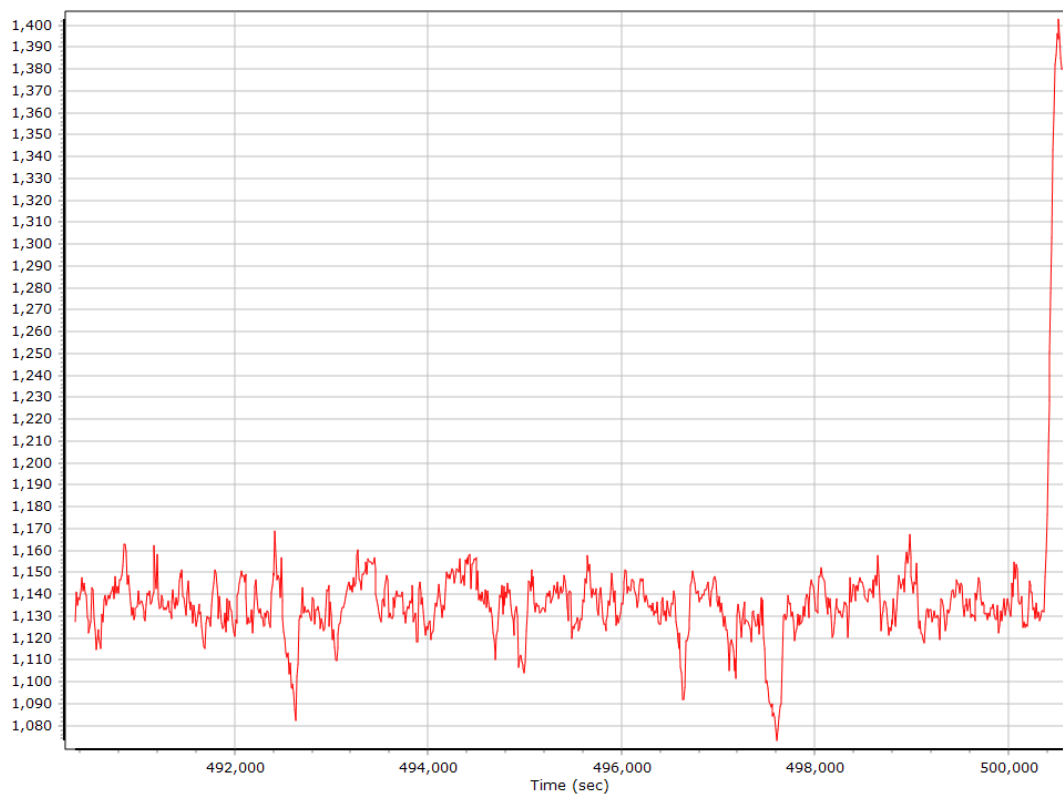
— GALILEO 02 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 03 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 05 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 08 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 11 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 12 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 24 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 25 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 30 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 34 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)
— GALILEO 36 L1 BOC_1_1_DP_MBOC SNR (dB/Hz)	— GALILEO 02 E5B BPSK10_PD SNR (dB/Hz)
— GALILEO 03 E5B BPSK10_PD SNR (dB/Hz)	— GALILEO 05 E5B BPSK10_PD SNR (dB/Hz)
— GALILEO 08 E5B BPSK10_PD SNR (dB/Hz)	— GALILEO 11 E5B BPSK10_PD SNR (dB/Hz)
— GALILEO 12 E5B BPSK10_PD SNR (dB/Hz)	— GALILEO 24 E5B BPSK10_PD SNR (dB/Hz)
— GALILEO 25 E5B BPSK10_PD SNR (dB/Hz)	— GALILEO 30 E5B BPSK10_PD SNR (dB/Hz)

Smoothed Trajectory Information

Top View



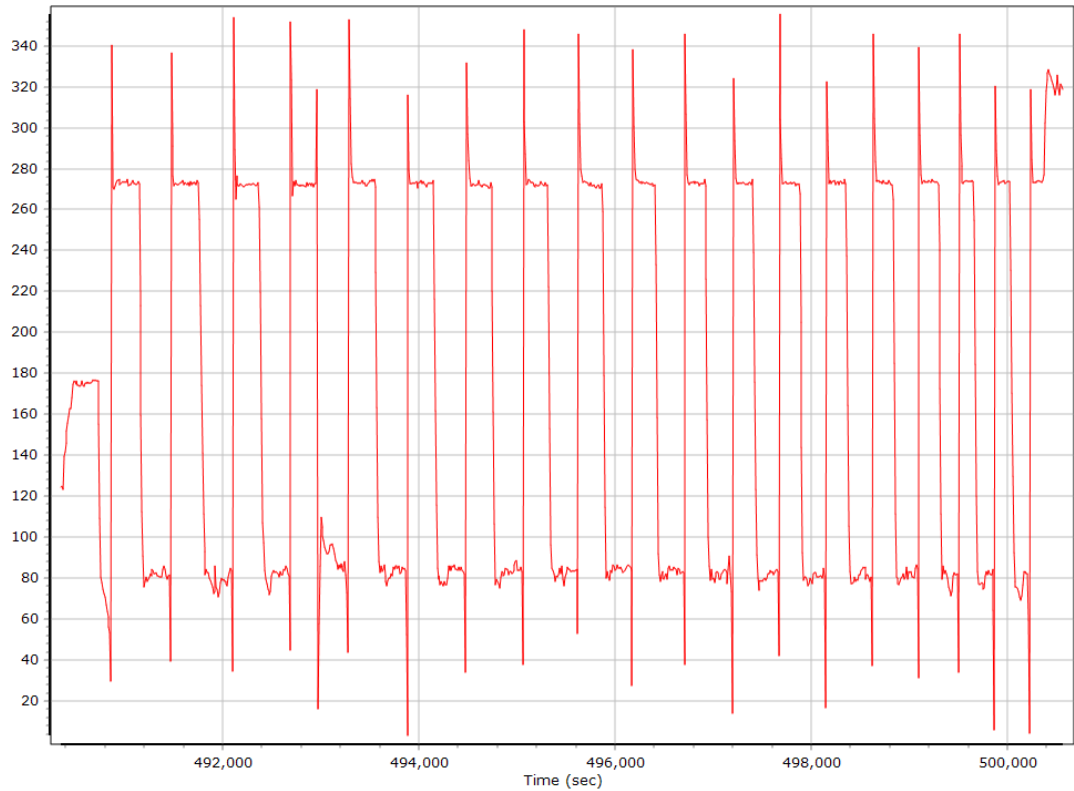
Altitude



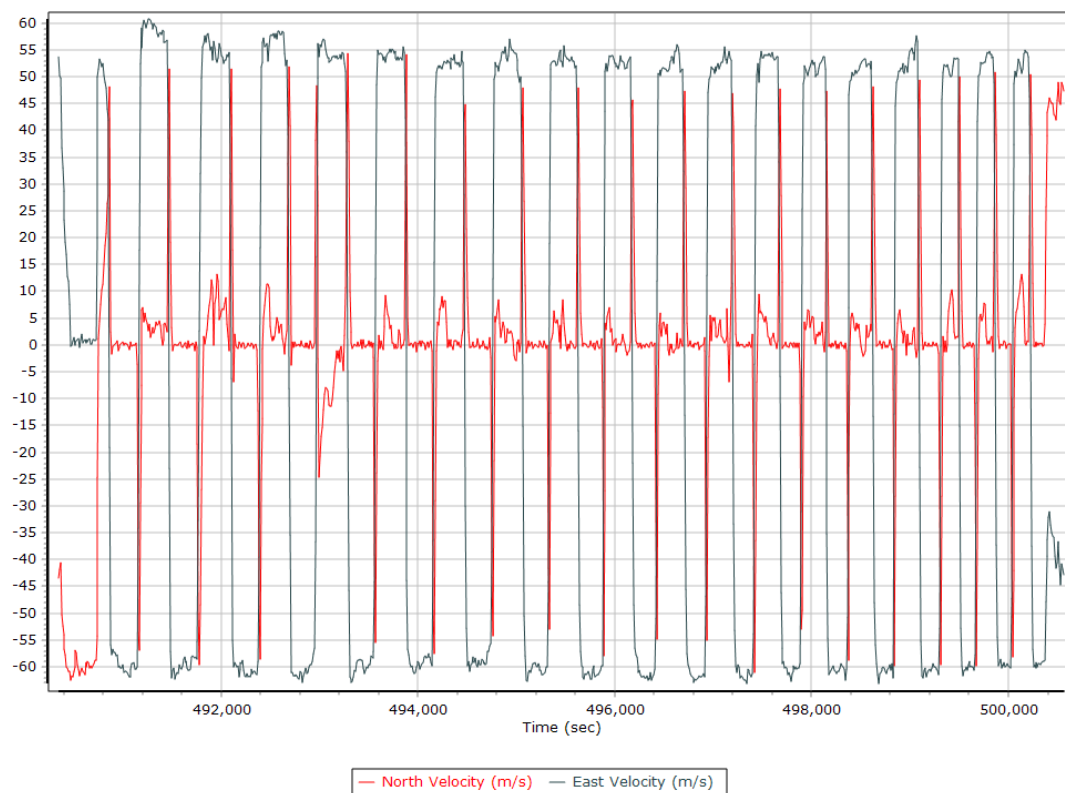
Roll/Pitch



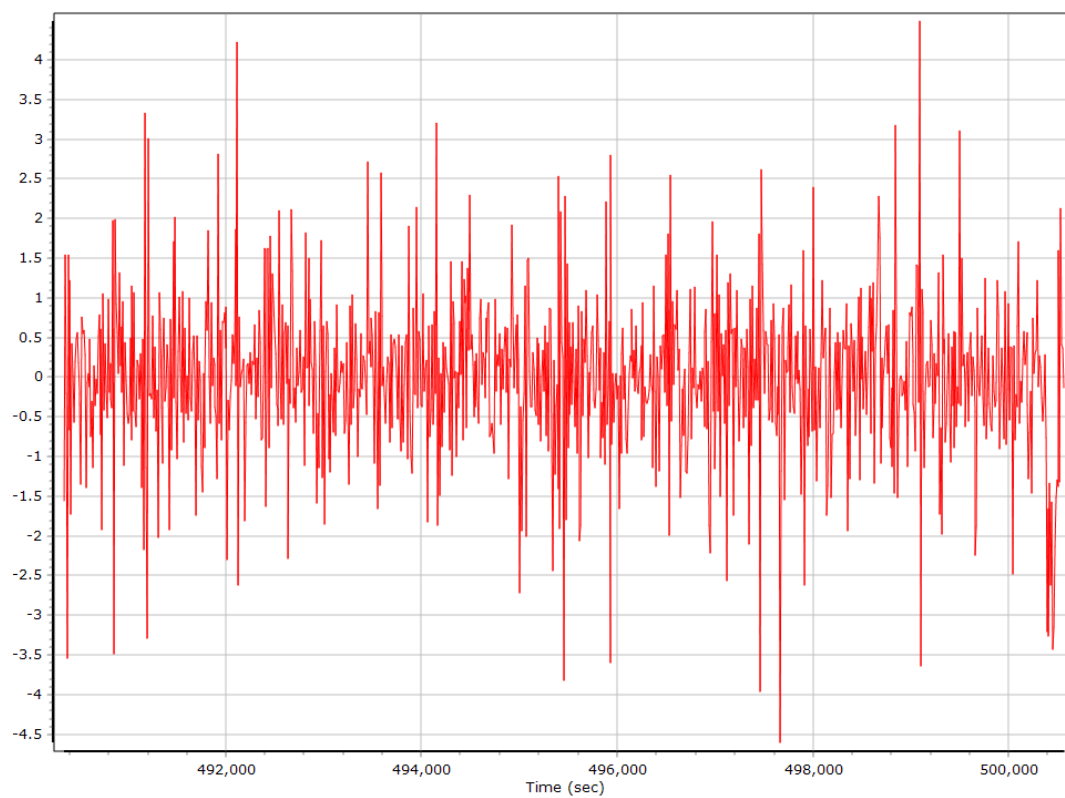
Heading



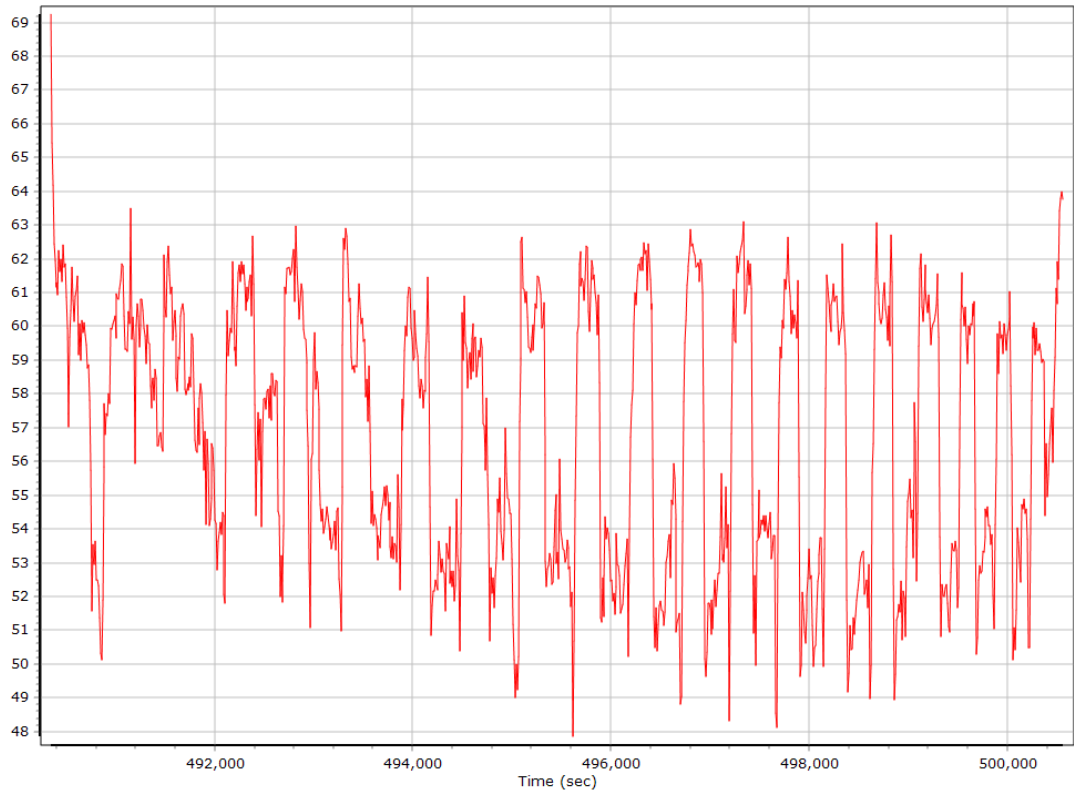
North/East Velocity



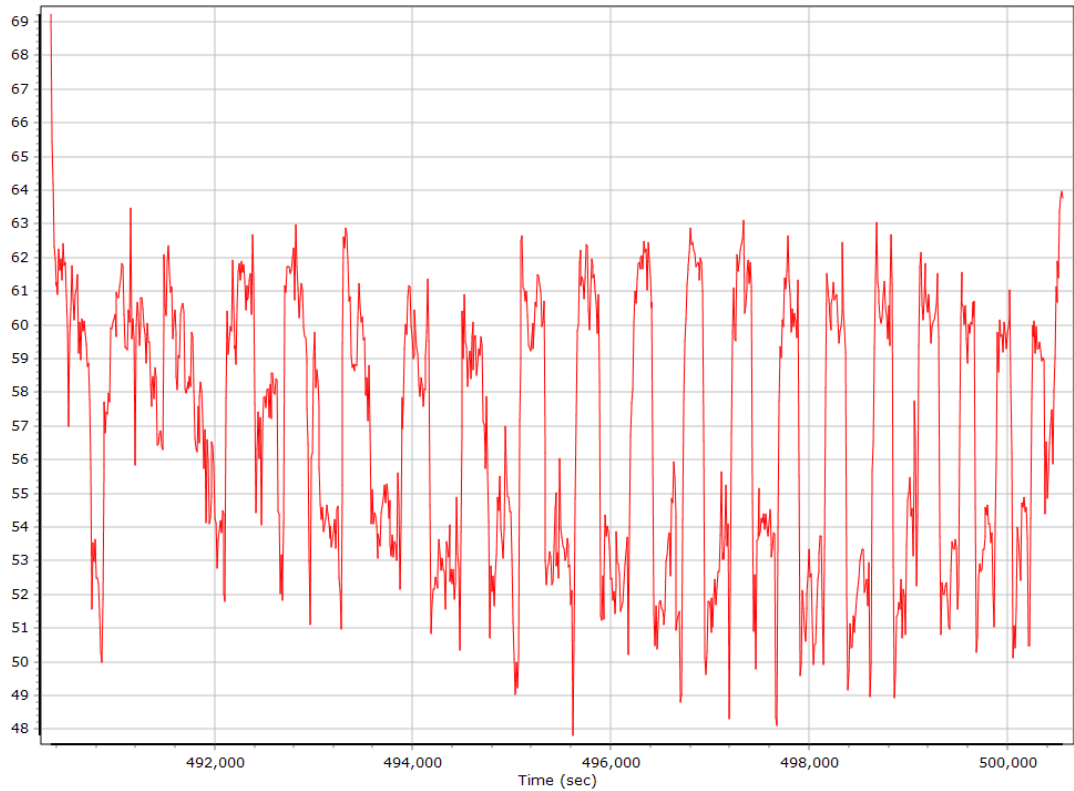
Down Velocity



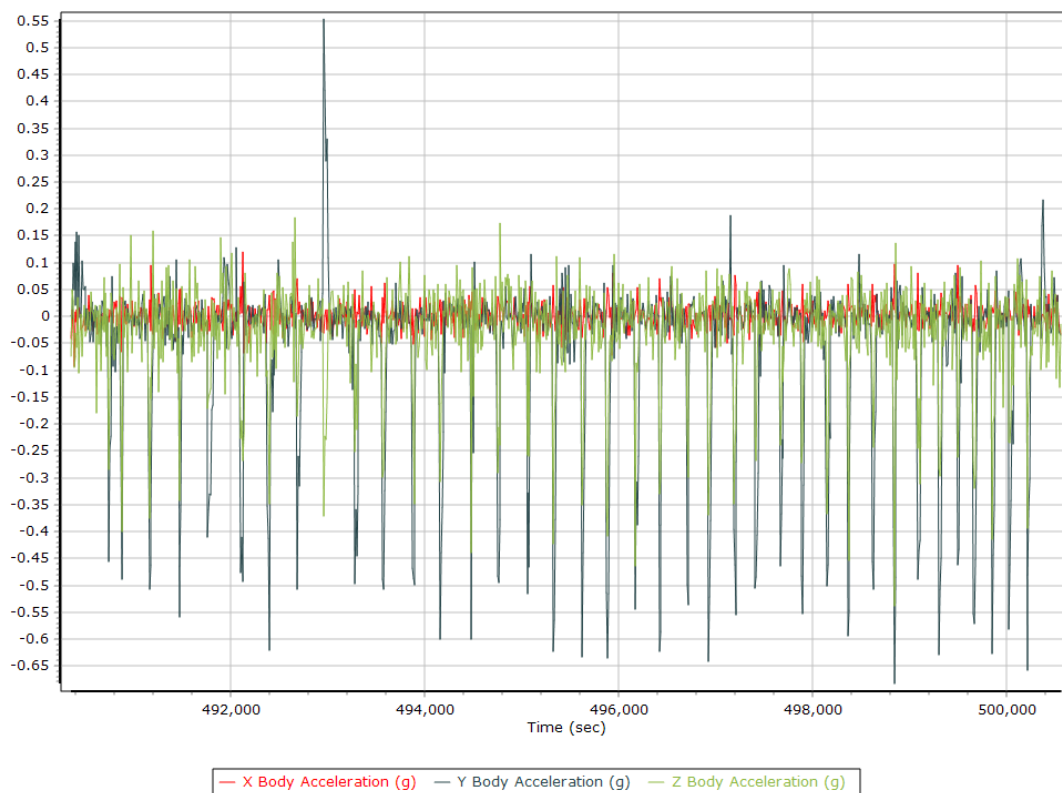
Total Speed



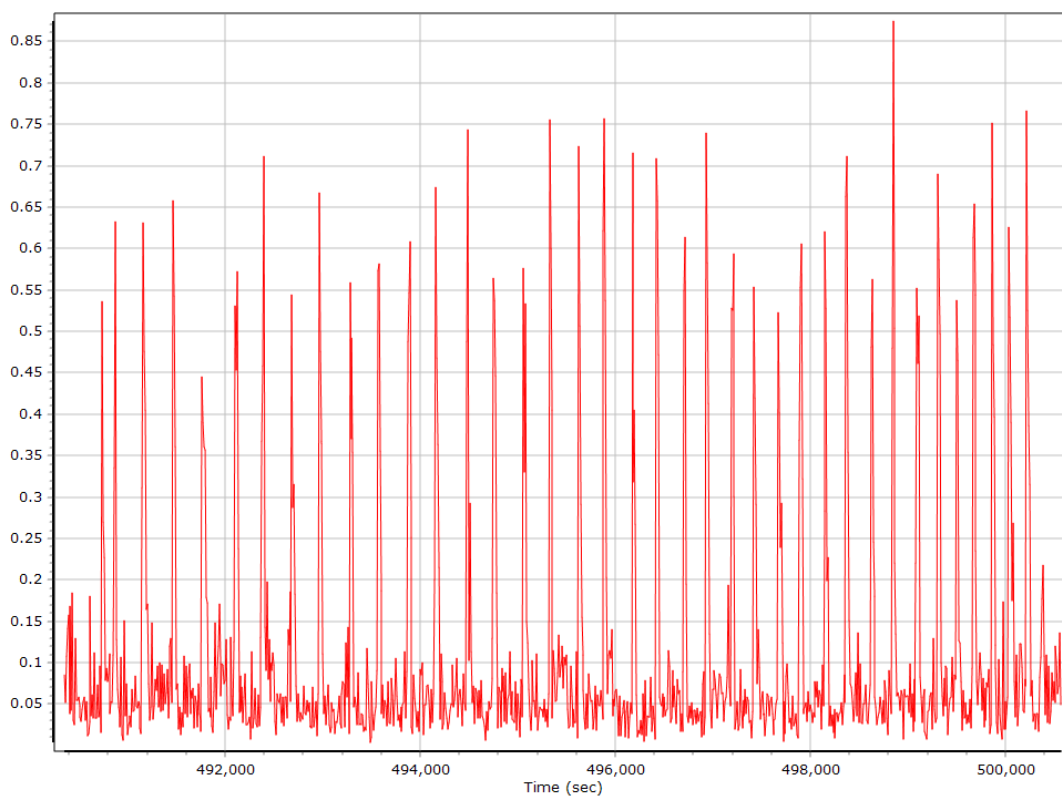
Ground Speed



Body Acceleration



Total Body Acceleration

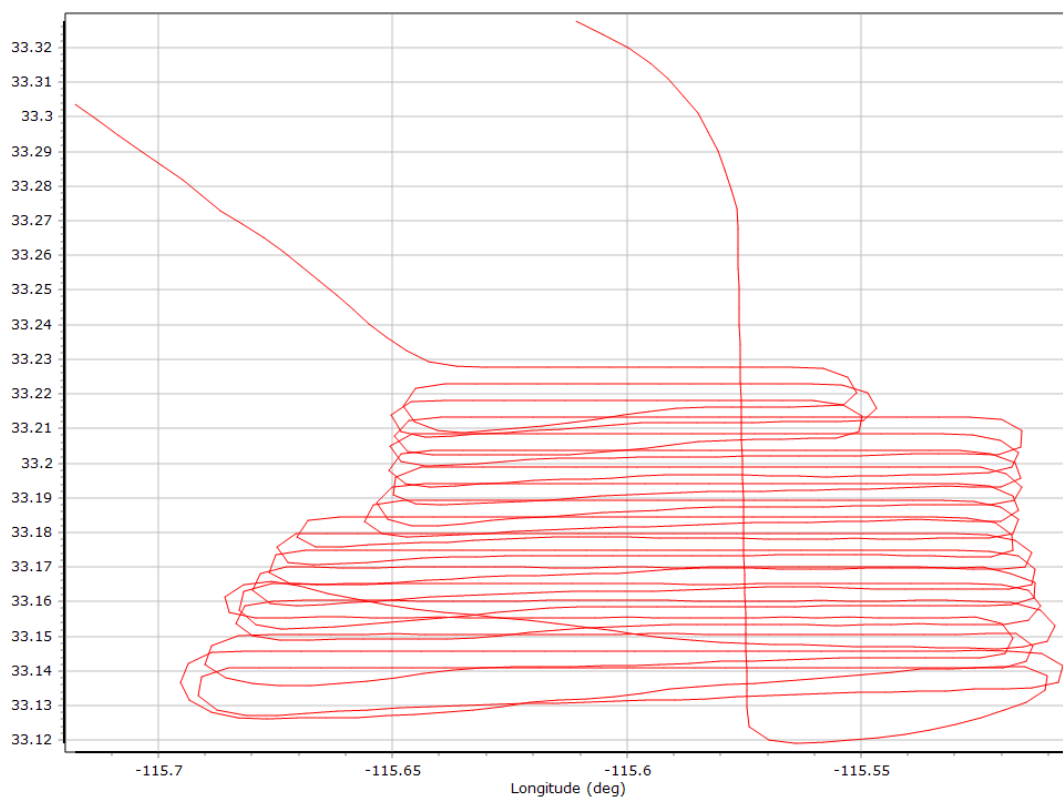


Body Angular Rate

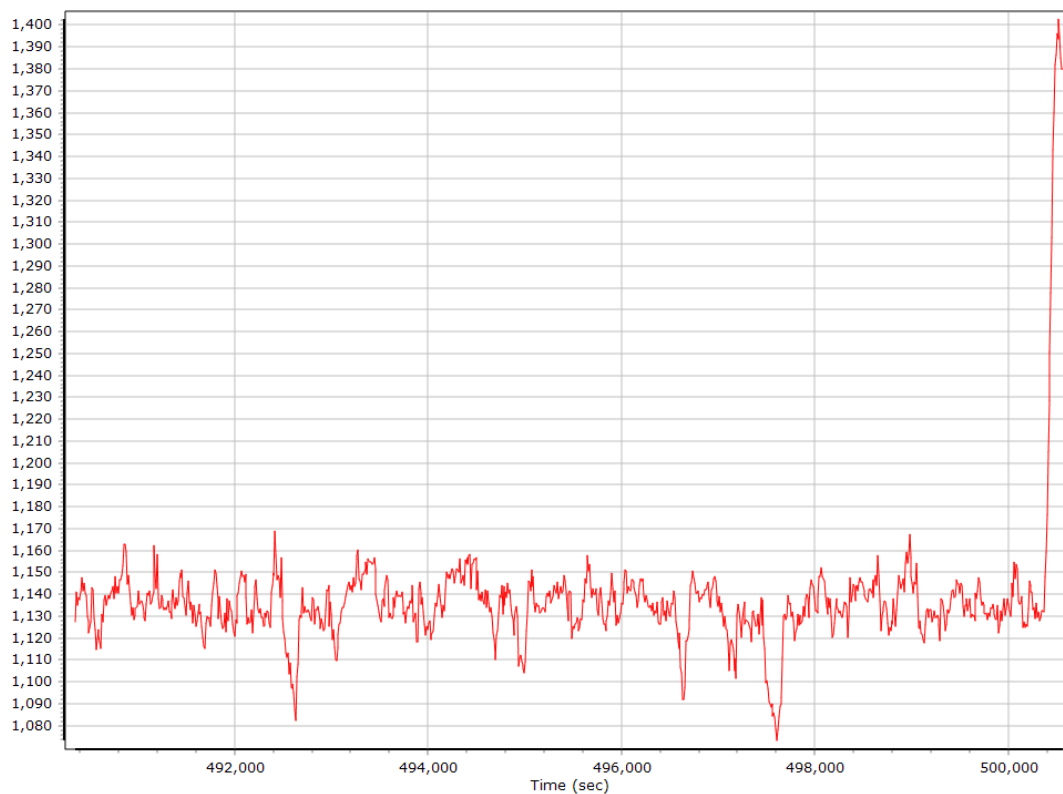


Forward Processed Trajectory Information

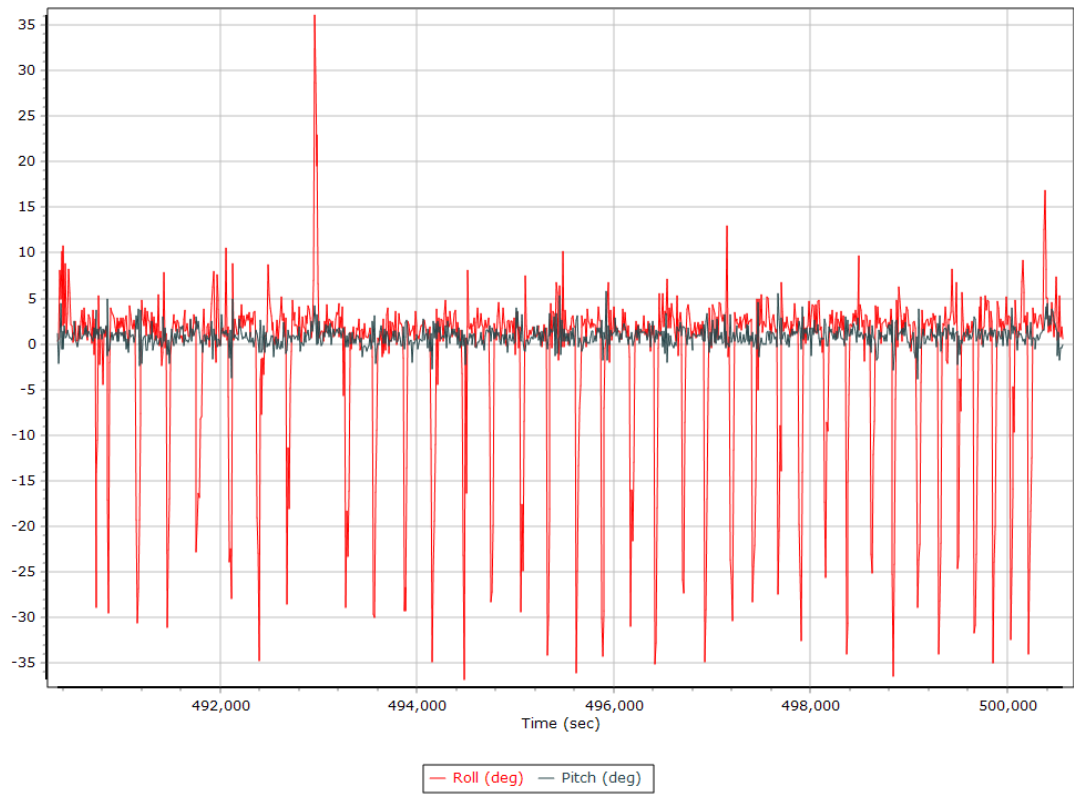
Top View



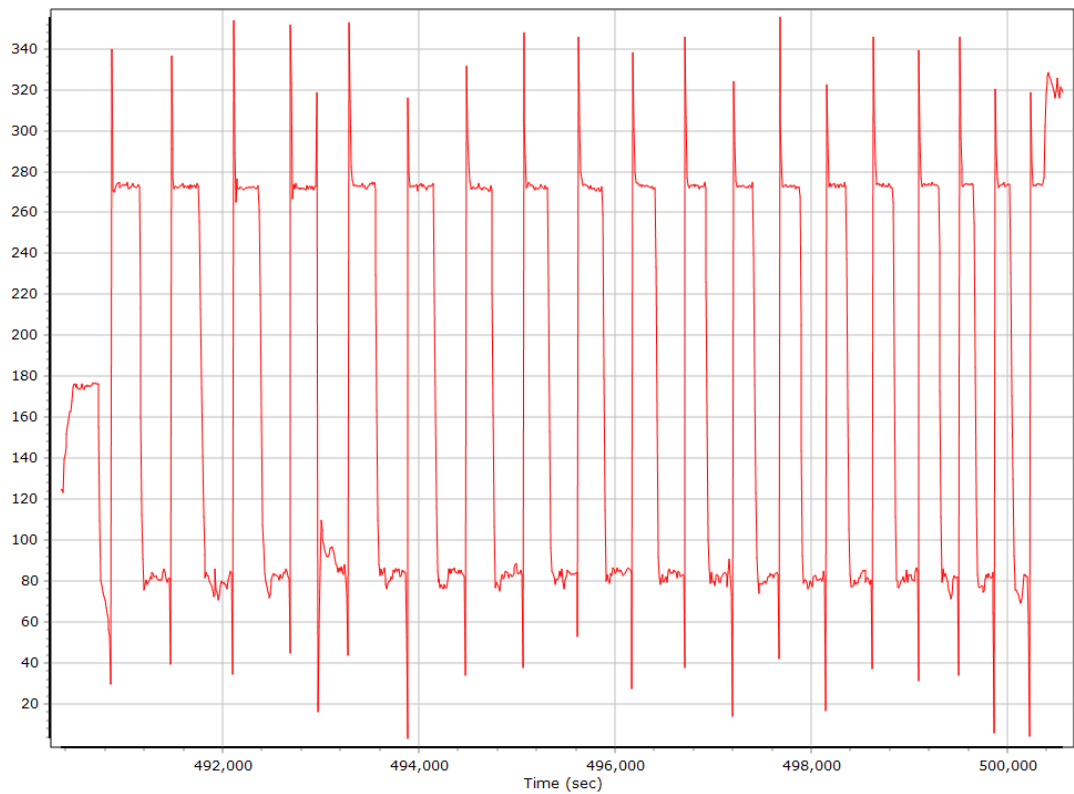
Altitude



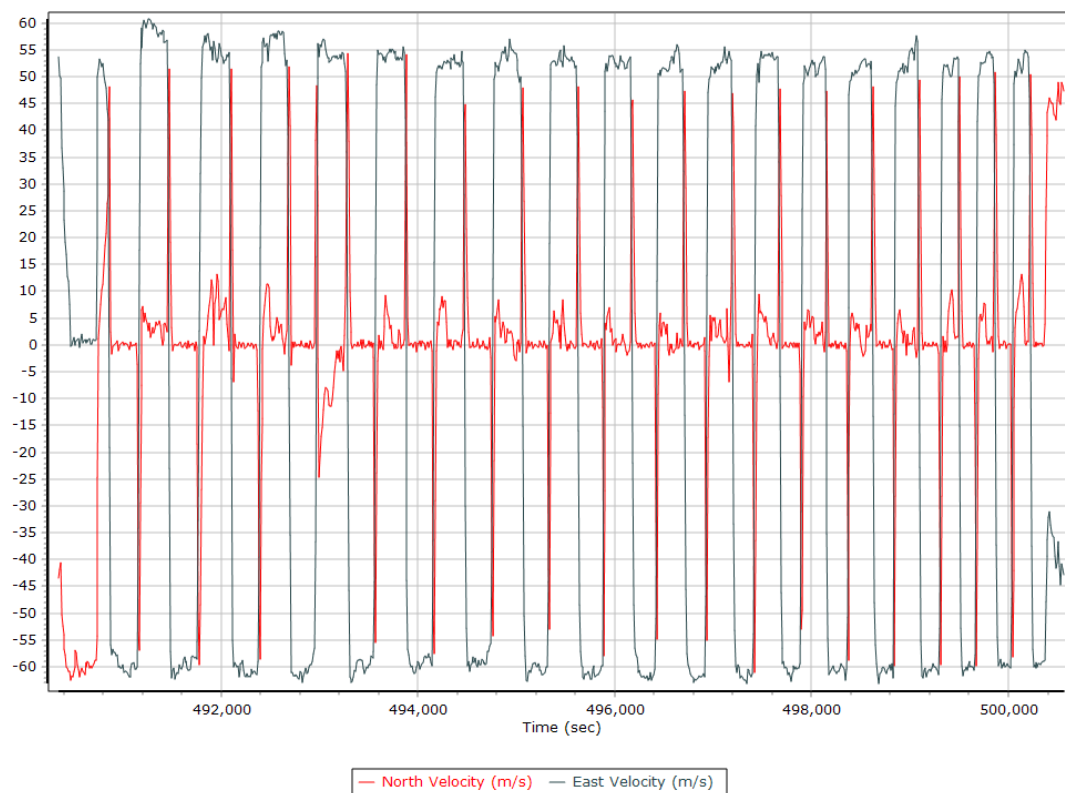
Roll/Pitch



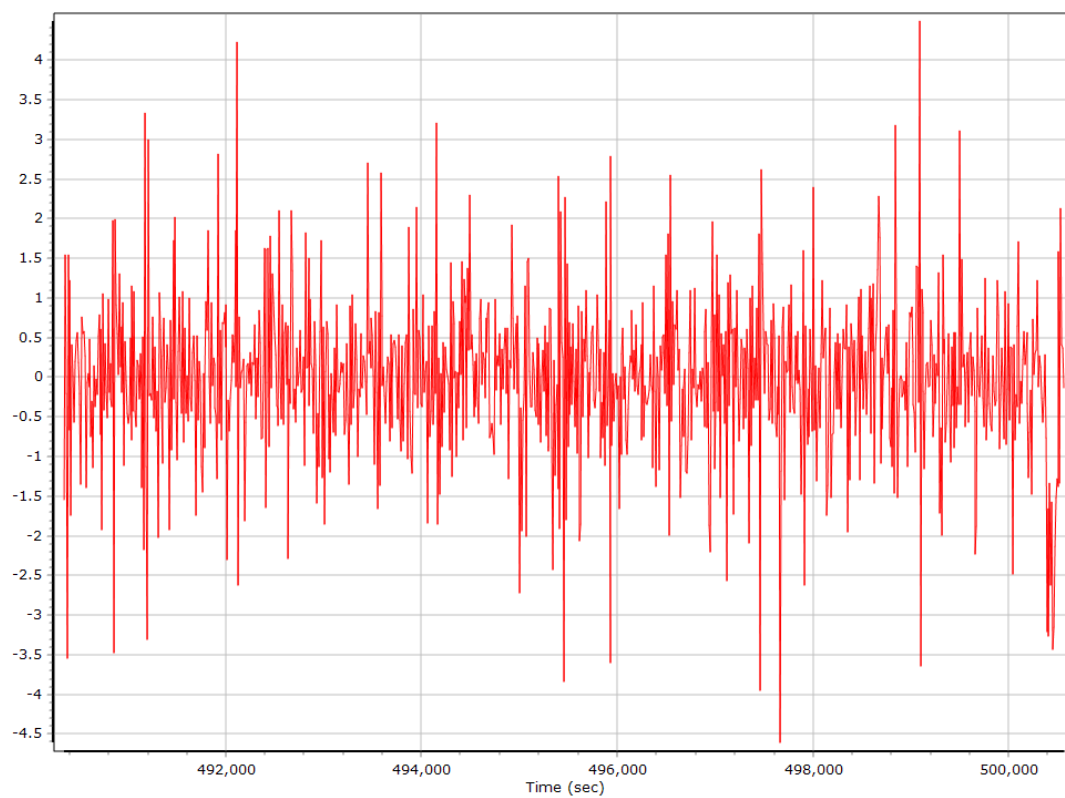
Heading



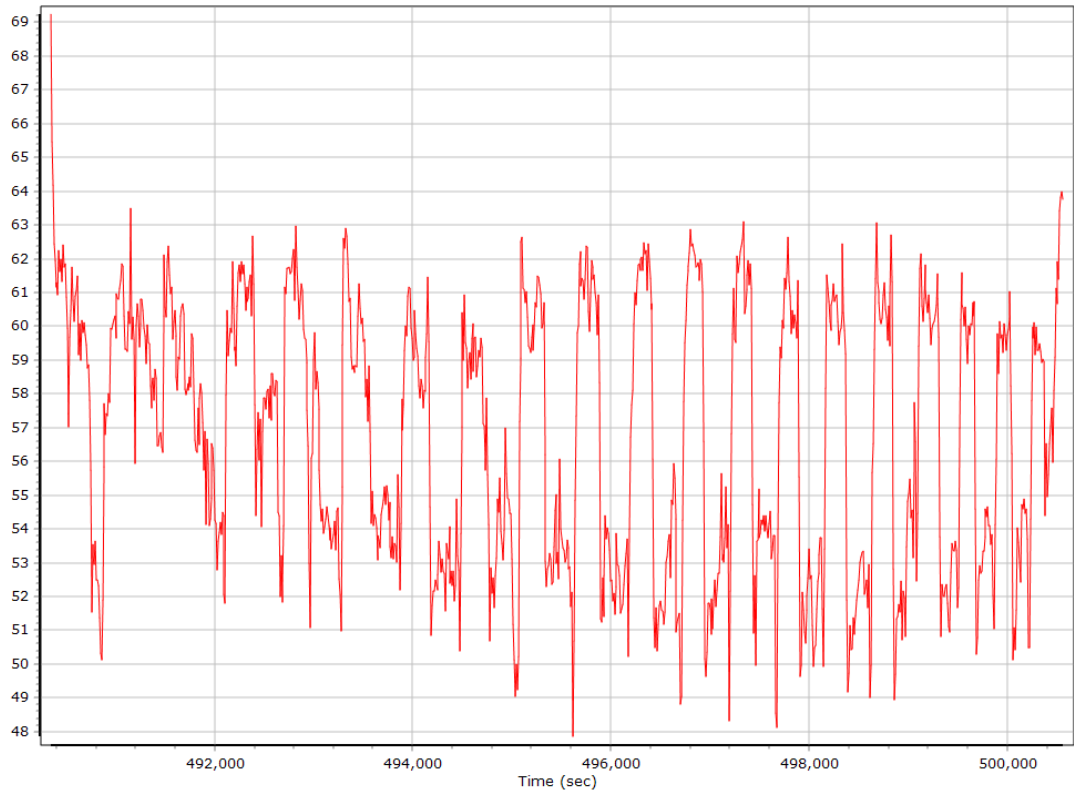
North/East Velocity



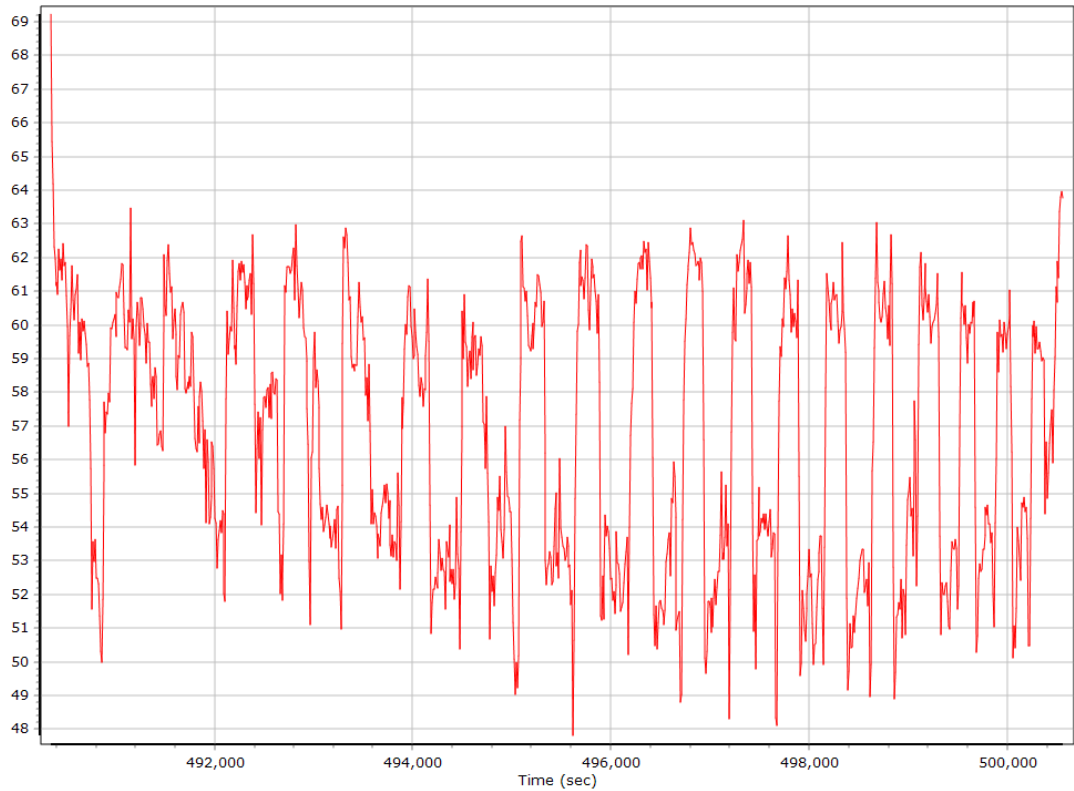
Down Velocity



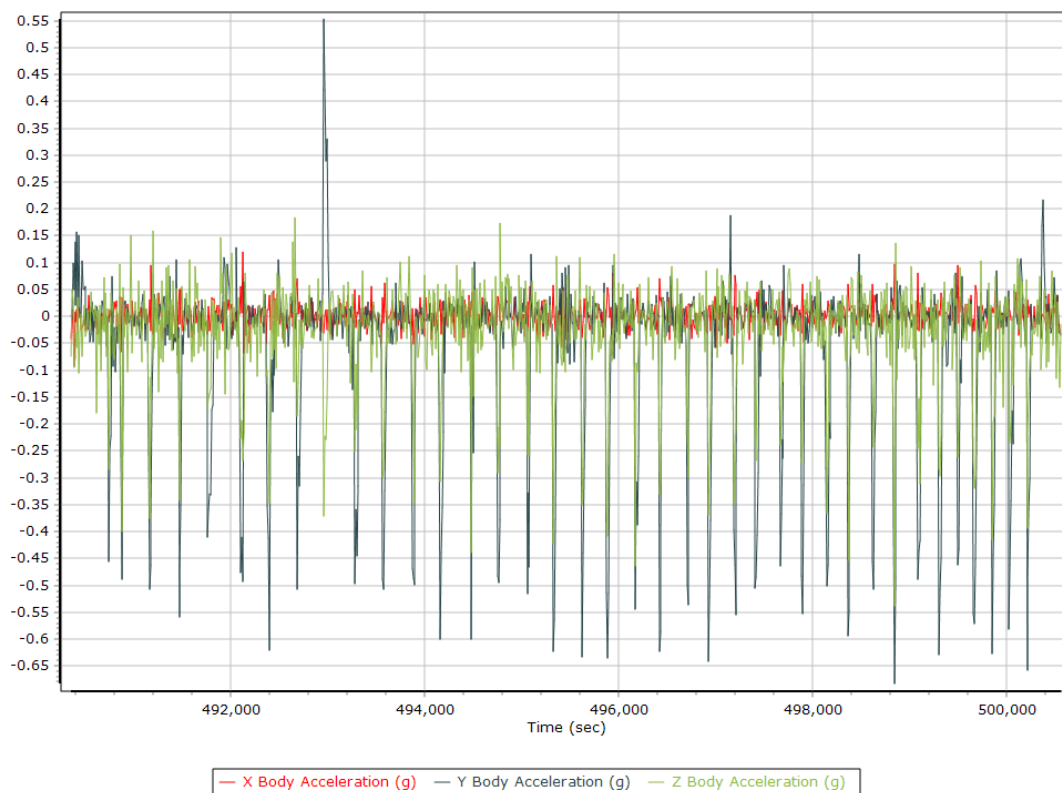
Total Speed



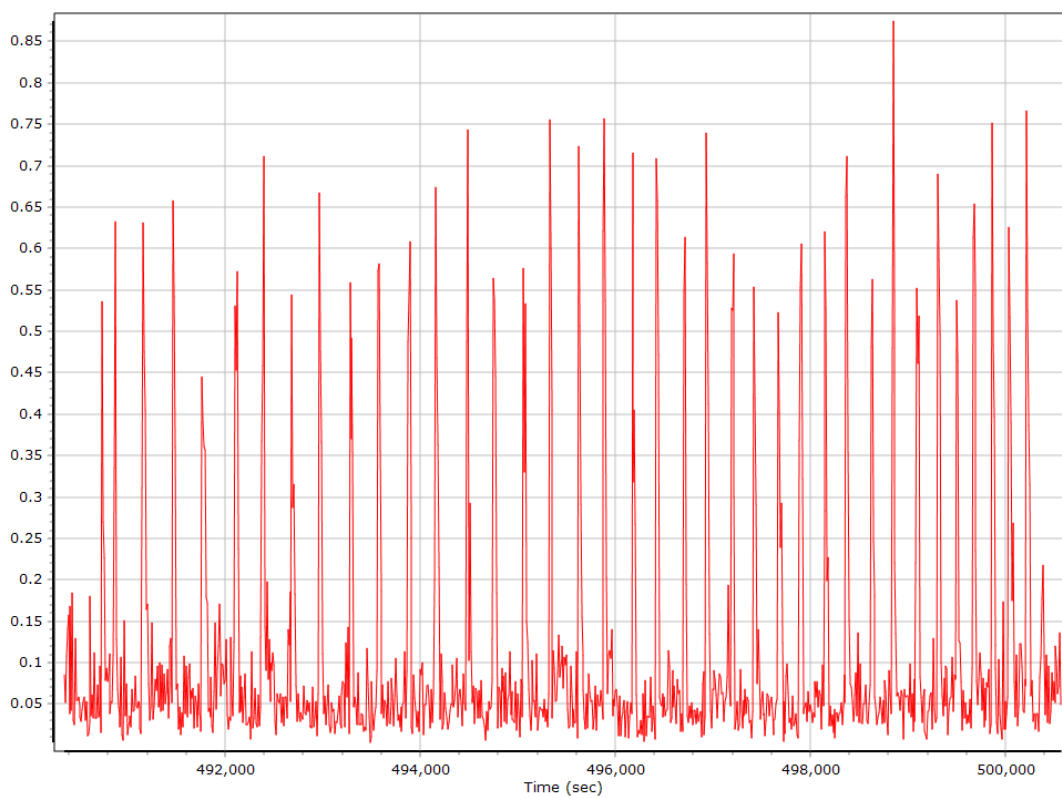
Ground Speed



Body Acceleration



Total Body Acceleration



Body Angular Rate



SmartBase Processing Summary

Smart Select Options

Archive enabled	False
User database enabled	False
Include high-rate data sites	False
Include RINEX 3 data sites	False
Target GNSS Selection	GNSS

Basestation Selection

Date	ID	Dist	System	Rate	Service	Database	Status
05/13/2022	P507	3.11	GPS	15	UNAVCO (daily)	Smart Base	Imported
05/13/2022	GLRS	12.69	GNSS	30	CORS (daily)	Smart Base	Imported
05/13/2022	P506	13.43	GNSS	30	CORS (daily)	Smart Base	Imported
05/13/2022	P495	15.24	GPS	15	UNAVCO (daily)	Smart Base	Imported
05/13/2022	P508	17.29	GNSS	15	UNAVCO (daily)	Smart Base	Imported
05/13/2022	CRRS	17.88	GPS	15	UNAVCO (daily)	Smart Base	Imported
05/13/2022	ERRG	22.42	GNSS	15	UNAVCO (daily)	Smart Base	Imported
05/13/2022	P510	23.79	GNSS	15	UNAVCO (daily)	Smart Base	Imported
05/13/2022	BOMG	24.17	GNSS	15	UNAVCO (daily)	Smart Base	Imported
05/13/2022	P499	24.28	GNSS	15	UNAVCO (daily)	Smart Base	Imported
05/13/2022	P502	27.14	GPS	15	UNAVCO (daily)	Smart Base	Imported
05/13/2022	P503	28.10	GPS	15	UNAVCO (daily)	Smart Base	Imported

SmartBase Results

SmartBase status	PROC_STATUS_OK
Primary station Id	GLRS
Primary station data rate (sec)	30.0
VRS/ASB generation rate (sec)	1.0
VRS/ASB timespan	16564 s (2209 485383 - 2209 501947)
Number of reference stations	9
Primary station GPS measurement usage (%)	98.8
Primary station GLONASS measurement usage (%)	69.6
Average number of satellites per epoch	13.0
Max number of GPS stations used	6
Min number of GPS stations used	3
Max number of GLONASS stations used	5
Min number of GLONASS stations used	3
Total full data gap (sec)	0
Total GPS full data gaps	0
Total GLONASS full data gaps	0
Total individual satellite data gap (sec)	34802
GPS precise vs. broadcast ephemeris used	0.0 % / 100.0 %
GLONASS precise vs. broadcast ephemeris used	0.0 % / 100.0 %
Termination Status	Normal

SmartBase Quality Check

Base Station - BOMG

Status	OK	SBQI	9	
Duration (Hours)	22.67	Output Coordinates	Original	
Solution Epochs	2720	Mean Epoch SVs	8.8	
Base Station Coordinates		Latitude	Longitude	Height (m)
Original		N33°21'52.66064"	W115°43'46.94756"	84.258
Adjusted		N33°21'52.66077"	W115°43'46.94765"	84.242
Coordinate Adjustments		Horizontal (m)	Vertical (m)	Total (m)
Adjustments		0.005	0.016	0.017

Base Station Information

Station ID	BOMG		
Filename	bomg1330.22o		
Start date	5/13/2022 12:00:00 AM		
End date	5/13/2022 11:59:45 PM		
Duration	23:59:45.000		
Data type	GNSS		
Receiver manufacturer, model, serial no.	Trimble	NetR9	5301K55926
Antenna manufacturer, model	Trimble	Zephyr Geodetic 2 RoHS	
Antenna height [m]	0.035		
Antenna measurement method	Bottom of antenna mount		
Offset from measured point to APC (m)	0.08546		
Latitude	N33°21'52.66064"		
Longitude	W115°43'46.94756"		
Ellipsoidal height (m)	-84.25789		
Frame	ITRF00		
Epoch	2022.3616		
Ellipsoid	WGS84		
Velocity North (mm/y)	-5.55559013037266		
Velocity East (mm/y)	-19.6092420728597		
Velocity Up (mm/y)	-1.01167654566297		

Base Station - P510

Status	OK	SBQI	9
Duration (Hours)	22.67	Output Coordinates	Original
Solution Epochs	2720	Mean Epoch SVs	7.6
Base Station Coordinates	Latitude	Longitude	Height (m)
Original	N33°08'36.86350"	W115°20'36.00324"	1.511
Adjusted	N33°08'36.86299"	W115°20'36.00314"	1.501
Coordinate Adjustments	Horizontal (m)	Vertical (m)	Total (m)
Adjustments	0.016	0.010	0.019

Base Station Information

Station ID	P510
Filename	p5101330.22o
Start date	5/13/2022 12:00:00 AM
End date	5/13/2022 11:59:45 PM
Duration	23:59:45.000
Data type	GNSS
Receiver manufacturer, model, serial no.	Septentrio PolARx5 3075033
Antenna manufacturer, model	UNAVCO TRM 59800.99 w/SCIT
Antenna height [m]	0.008
Antenna measurement method	Bottom of antenna mount
Offset from measured point to APC (m)	0.08569
Latitude	N33°08'36.86350"
Longitude	W115°20'36.00324"
Ellipsoidal height (m)	1.51071
Frame	ITRF00
Epoch	2022.3616
Ellipsoid	WGS84
Velocity North (mm/y)	-4.99201912005521
Velocity East (mm/y)	-12.5953844555759
Velocity Up (mm/y)	0.64242134555524

Base Station - ERRG

Status	OK	SBQI	7
Duration (Hours)	22.14	Output Coordinates	Original
Solution Epochs	2657	Mean Epoch SVs	8.4
Base Station Coordinates	Latitude	Longitude	Height (m)
Original	N33°06'59.20370"	W115°49'21.84761"	92.415
Adjusted	N33°06'59.20400"	W115°49'21.84774"	92.389
Coordinate Adjustments	Horizontal (m)	Vertical (m)	Total (m)
Adjustments	0.010	0.027	0.028

Base Station Information

Station ID	ERRG		
Filename	errg1330.22o		
Start date	5/13/2022 12:00:00 AM		
End date	5/13/2022 11:59:45 PM		
Duration	23:59:45.000		
Data type	GNSS		
Receiver manufacturer, model, serial no.	Topcon	NET-G3A	618-01043
Antenna manufacturer, model	Topcon	TPS CR.G3 w/SCIT	
Antenna height [m]	0.008		
Antenna measurement method	Bottom of antenna mount		
Offset from measured point to APC (m)	0.1051		
Latitude	N33°06'59.20370"		
Longitude	W115°49'21.84761"		
Ellipsoidal height (m)	-92.41514		
Frame	ITRF00		
Epoch	2022.3616		
Ellipsoid	WGS84		
Velocity North (mm/y)	3.66763783722735		
Velocity East (mm/y)	-28.2142966146359		
Velocity Up (mm/y)	-1.28262669274541		

Base Station - CRRS

Status	OK	SBQI	9	
Duration (Hours)	22.67	Output Coordinates	Original	
Solution Epochs	2720	Mean Epoch SVs	8.6	
Base Station Coordinates		Latitude	Longitude	Height (m)
Original		N33°04'11.30859"	W115°44'06.16250"	81.905
Adjusted		N33°04'11.30875"	W115°44'06.16226"	81.891
Coordinate Adjustments		Horizontal (m)	Vertical (m)	Total (m)
Adjustments		0.008	0.014	0.016

Base Station Information

Station ID	CRRS		
Filename	crrs1330.22o		
Start date	5/13/2022 12:00:00 AM		
End date	5/13/2022 11:59:45 PM		
Duration	23:59:45.000		
Data type	GPS		
Receiver manufacturer, model, serial no.	Trimble	NetRS	4427235662
Antenna manufacturer, model	Trimble	TRM59800-80 w/SCIT Dome	
Antenna height [m]	0.008		
Antenna measurement method	Bottom of antenna mount		
Offset from measured point to APC (m)	0.11		
Latitude	N33°04'11.30859"		
Longitude	W115°44'06.16250"		
Ellipsoidal height (m)	-81.90516		
Frame	ITRF00		
Epoch	2022.3616		
Ellipsoid	WGS84		
Velocity North (mm/y)	5.8325629808463		
Velocity East (mm/y)	-25.5660240595239		
Velocity Up (mm/y)	1.04648697700421		

Base Station - P508

Status	OK	SBQI	9	
Duration (Hours)	22.67	Output Coordinates	Original	
Solution Epochs	2720	Mean Epoch SVs	6.7	
Base Station Coordinates		Latitude	Longitude	Height (m)
Original		N33°14'52.00508"	W115°25'43.34564"	10.685
Adjusted		N33°14'52.00449"	W115°25'43.34597"	10.685
Coordinate Adjustments		Horizontal (m)	Vertical (m)	Total (m)
Adjustments		0.020	0.000	0.020

Base Station Information

Station ID	P508		
Filename	p5081330.22o		
Start date	5/13/2022 12:00:00 AM		
End date	5/13/2022 11:59:45 PM		
Duration	23:59:45.000		
Data type	GNSS		
Receiver manufacturer, model, serial no.	Septentrio	PolarX5	3012393
Antenna manufacturer, model	Trimble	GNSS Choke w/SCIT Dome	
Antenna height [m]	0.008		
Antenna measurement method	Bottom of antenna mount		
Offset from measured point to APC (m)	0.11		
Latitude	N33°14'52.00508"		
Longitude	W115°25'43.34564"		
Ellipsoidal height (m)	10.68466		
Frame	ITRF00		
Epoch	2022.3616		
Ellipsoid	WGS84		
Velocity North (mm/y)	-5.00219586573782		
Velocity East (mm/y)	-12.5913783711368		
Velocity Up (mm/y)	0.649036271159588		

Base Station - P495

Status	OK	SBQI	9	
Duration (Hours)	22.67	Output Coordinates	Original	
Solution Epochs	2720	Mean Epoch SVs	8.5	
Base Station Coordinates		Latitude	Longitude	Height (m)
Original		N33°02'41.85729"	W115°37'42.22588"	84.079
Adjusted		N33°02'41.85782"	W115°37'42.22590"	84.052
Coordinate Adjustments		Horizontal (m)	Vertical (m)	Total (m)
Adjustments		0.016	0.027	0.031

Base Station Information

Station ID	P495		
Filename	p4951330.22o		
Start date	5/13/2022 12:00:00 AM		
End date	5/13/2022 11:59:45 PM		
Duration	23:59:45.000		
Data type	GPS		
Receiver manufacturer, model, serial no.	Trimble	NetRS	4522251529
Antenna manufacturer, model	Trimble	Choke Ring w/SCIT Dome	
Antenna height [m]	0.008		
Antenna measurement method	Bottom of antenna mount		
Offset from measured point to APC (m)	0.11		
Latitude	N33°02'41.85729"		
Longitude	W115°37'42.22588"		
Ellipsoidal height (m)	-84.07864		
Frame	ITRF00		
Epoch	2022.3616		
Ellipsoid	WGS84		
Velocity North (mm/y)	4.66481805281871		
Velocity East (mm/y)	-22.1107184742231		
Velocity Up (mm/y)	-6.23487857957138		

Base Station - P506

Status	OK	SBQI	9
Duration (Hours)	22.67	Output Coordinates	Original
Solution Epochs	2720	Mean Epoch SVs	8.0
Base Station Coordinates	Latitude	Longitude	Height (m)
Original	N33°04'53.14484"	W115°30'36.72012"	83.465
Adjusted	N33°04'53.14495"	W115°30'36.71968"	83.457
Coordinate Adjustments	Horizontal (m)	Vertical (m)	Total (m)
Adjustments	0.012	0.008	0.014

Base Station Information

Station ID	P506
Filename	p5061330.22o
Start date	5/13/2022 12:00:00 AM
End date	5/13/2022 11:59:30 PM
Duration	23:59:30.000
Data type	GNSS
Receiver manufacturer, model, serial no.	Trimble NetR9 5303K57612
Antenna manufacturer, model	Trimble TRM59800-80 w/SCIT Dome
Antenna height [m]	0.008
Antenna measurement method	Bottom of antenna mount
Offset from measured point to APC (m)	0.11
Latitude	N33°04'53.14484"
Longitude	W115°30'36.72012"
Ellipsoidal height (m)	-83.46520
Frame	ITRF00
Epoch	2022.3616
Ellipsoid	WGS84
Velocity North (mm/y)	-9.81504405388771
Velocity East (mm/y)	-16.0580103205209
Velocity Up (mm/y)	-5.67072439392276

Base Station - P507

Status	OK	SBQI	9
Duration (Hours)	22.67	Output Coordinates	Adjusted
Solution Epochs	2720	Mean Epoch SVs	8.7
Base Station Coordinates	Latitude	Longitude	Height (m)
Original	N33°11'59.90938"	W115°36'44.66647"	78.539
Adjusted	N33°11'59.90752"	W115°36'44.66739"	78.600
Coordinate Adjustments	Horizontal (m)	Vertical (m)	Total (m)
Adjustments	0.000	0.000	0.000

Base Station Information

Station ID	P507
Filename	p5071330.22o
Start date	5/13/2022 12:00:00 AM
End date	5/13/2022 11:59:45 PM
Duration	23:59:45.000
Data type	GPS
Receiver manufacturer, model, serial no.	Trimble NetRS 4537257368
Antenna manufacturer, model	Trimble Choke Ring w/SCIT Dome
Antenna height [m]	0.008
Antenna measurement method	Bottom of antenna mount
Offset from measured point to APC (m)	0.11
Latitude	N33°11'59.90938"
Longitude	W115°36'44.66647"
Ellipsoidal height (m)	-78.53851
Frame	ITRF00
Epoch	2022.3616
Ellipsoid	WGS84
Velocity North (mm/y)	-5.02433337898832
Velocity East (mm/y)	-12.5826635389121
Velocity Up (mm/y)	0.686968671025071

Base Station - GLRS

Status	CONTROL	SBQI	9
Duration (Hours)	22.67	Output Coordinates	Control
Solution Epochs	2720	Mean Epoch SVs	7.8
Base Station Coordinates	Latitude	Longitude	Height (m)
Original	N33°16'29.31835"	W115°31'16.94681"	48.658
Adjusted	N33°16'29.31835"	W115°31'16.94681"	48.658
Coordinate Adjustments	Horizontal (m)	Vertical (m)	Total (m)
Adjustments	0.000	0.000	0.000

Base Station Information

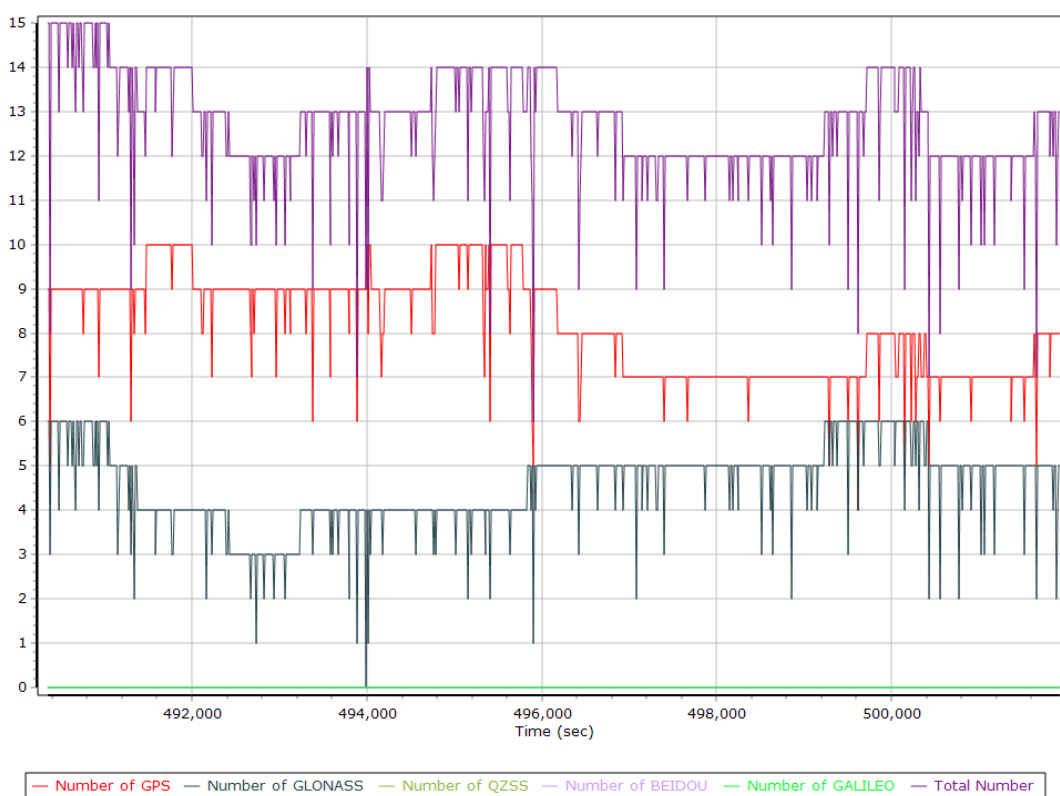
Station ID	GLRS		
Filename	glrs1330.22o		
Start date	5/13/2022 12:00:00 AM		
End date	5/13/2022 11:59:30 PM		
Duration	23:59:30.000		
Data type	GNSS		
Receiver manufacturer, model, serial no.	Trimble	NetR9	5303K57560
Antenna manufacturer, model	Trimble	TRM59800-80 w/SCIT Dome	
Antenna height [m]	0.008		
Antenna measurement method	Bottom of antenna mount		
Offset from measured point to APC (m)	0.11		
Latitude	N33°16'29.31835"		
Longitude	W115°31'16.94681"		
Ellipsoidal height (m)	-48.65782		
Frame	ITRF00		
Epoch	2022.3616		
Ellipsoid	WGS84		
Velocity North (mm/y)	-10.5091987226116		
Velocity East (mm/y)	-16.4922887886943		
Velocity Up (mm/y)	-1.15019153195771		

GNSS QC

GNSS QC Statistics

Statistics	Min	Max	Mean
Baseline length (km)	0.05	288.00	
Number of GPS SV	3	10	8
Number of GLONASS SV	0	6	4
Number of QZSS SV	0	0	0
Number of BEIDOU SV	0	0	0
Number of GALILEO SV	0	0	0
Total number of SV	5	15	13
PDOP	1.26	6.23	1.62
QC Solution Gaps	1.00	2.00	
Solution Type	Fixed	Float	No solution
Epoch (sec)	15811.00	734.00	8.00
Percentage	95.52	4.43	0.05

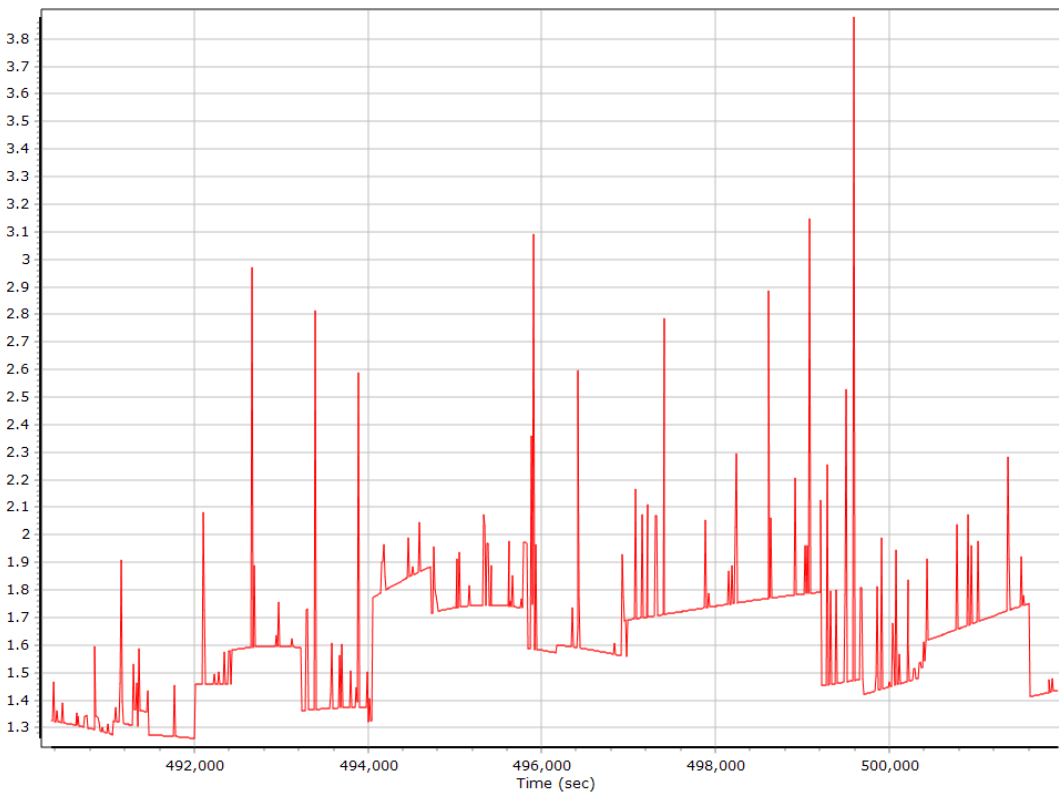
Num SVs in solution



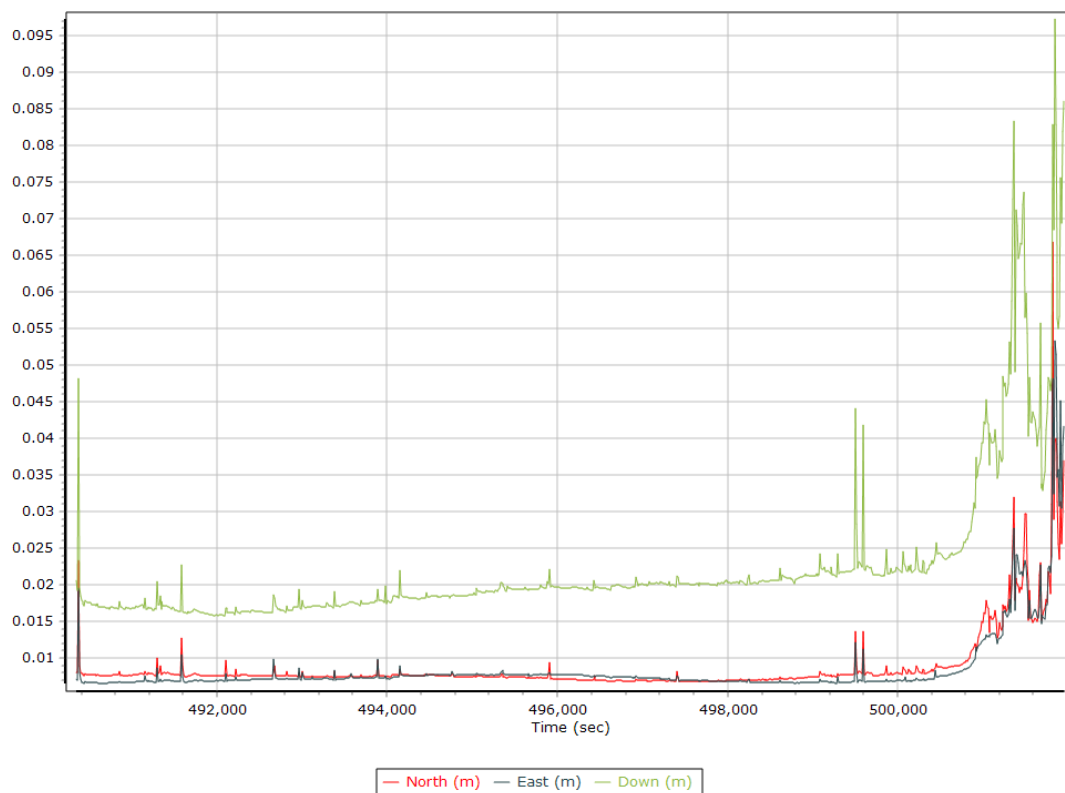
Forward/Reverse Separation



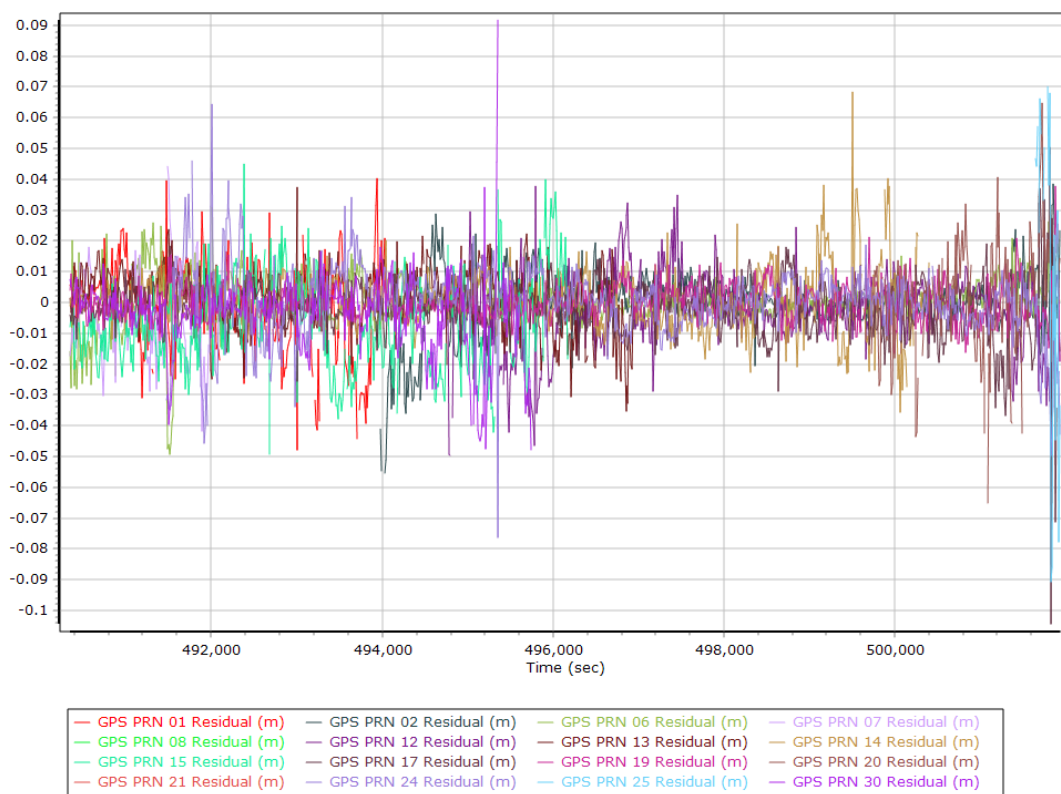
PDOP



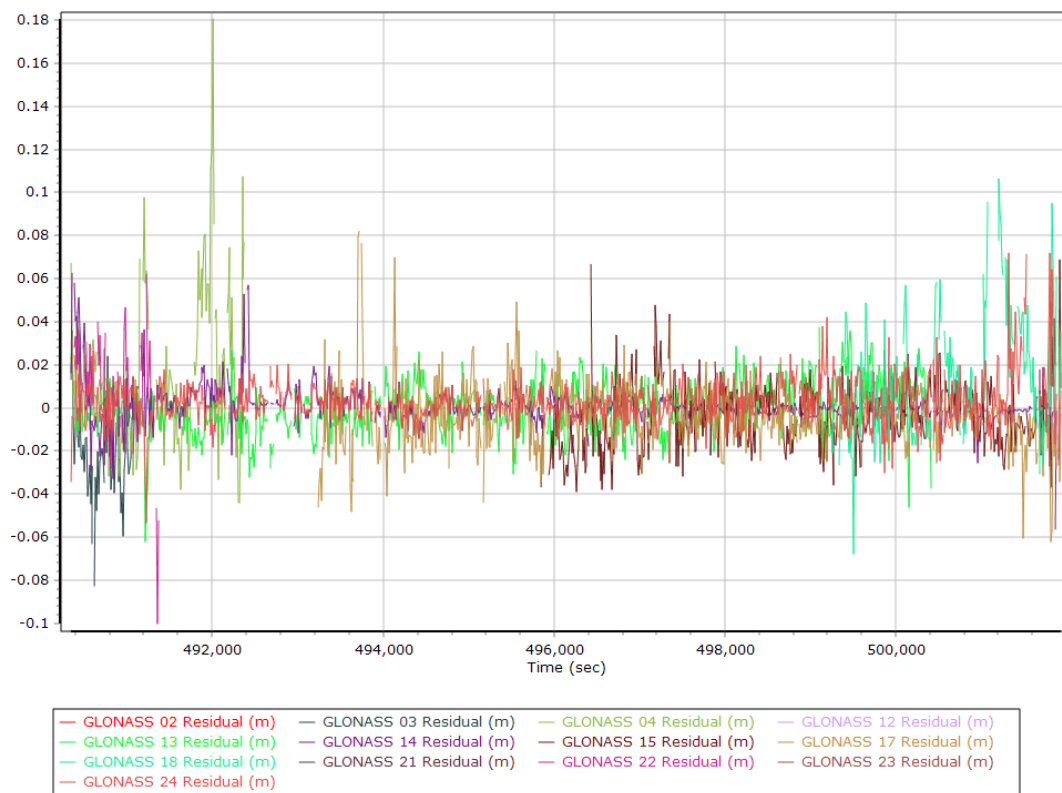
Estimated Position Accuracy



GPS Residuals



GLONASS Residuals



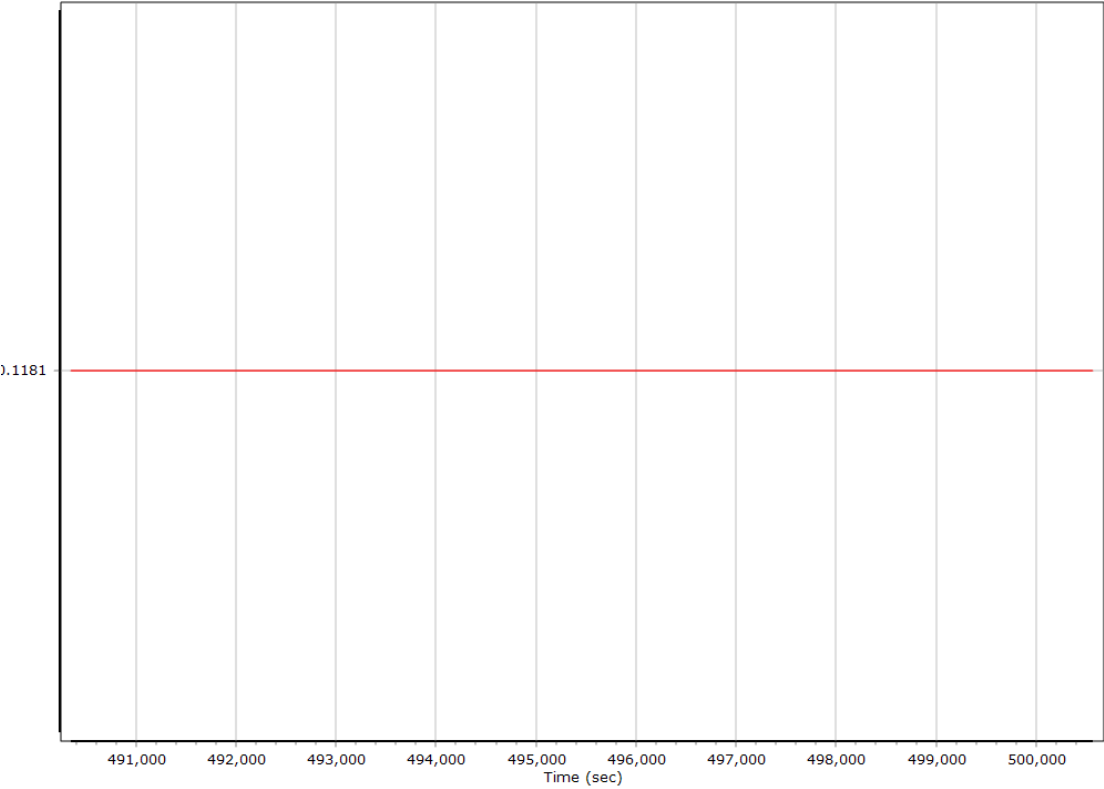
GNSS-Inertial Processor Configuration

Processing mode	IN-Fusion SmartBase		
Stabilized mount	False		
Base station	ASB		
Processing start time	490287.709 (5/13/2022 4:11:27 PM)		
Processing end time	500568.100 (5/13/2022 7:02:48 PM)		
Initial attitude source	Real-Time VNAV/RNAV Attitude		
IMU Sensor Context	Processing with Onboard IMU		
Reference to IMU lever arm (m)	0.000	0.000	0.000
Reference to IMU mounting angles (deg)	0.000	0.000	180.000
Reference to Primary GNSS lever arm (m)	0.118	-0.185	-0.949
Reference to Primary GNSS lever arm std dev (m)	0.030	0.030	0.030
Aircraft to Reference mounting angles (deg)	0.000	0.000	0.000

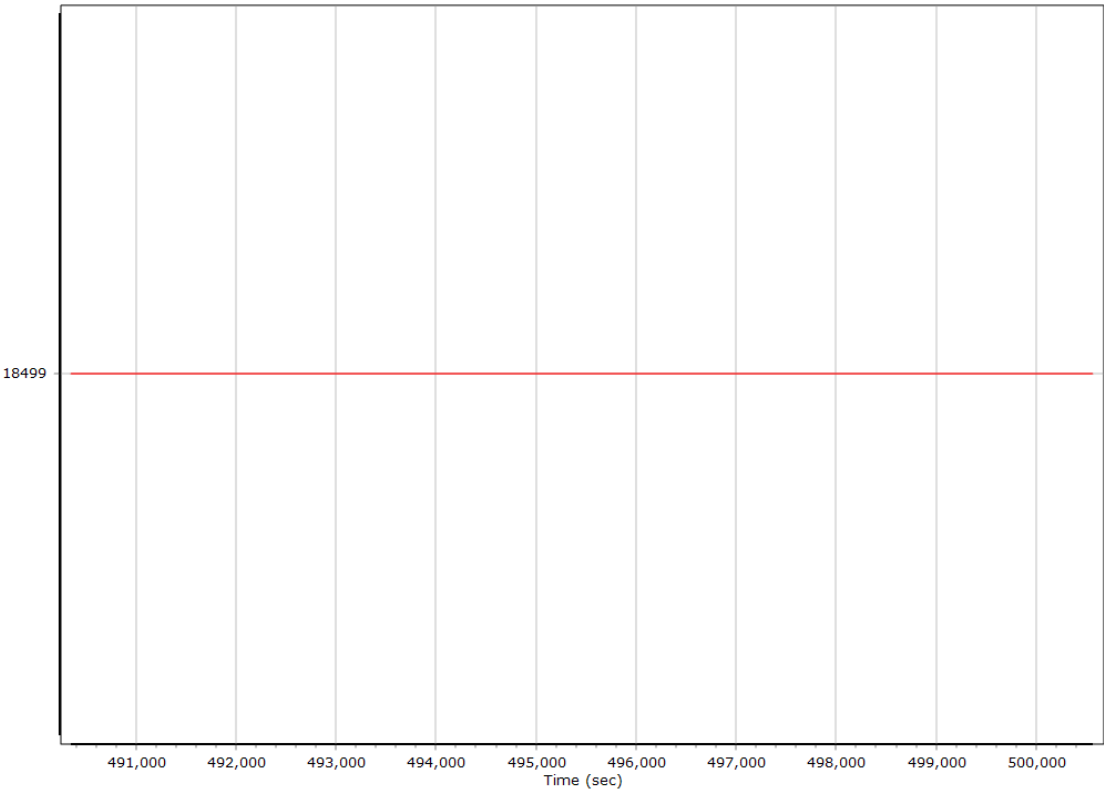
Calibrated Installation Parameters

Reference-Primary GNSS Lever Arm (m)

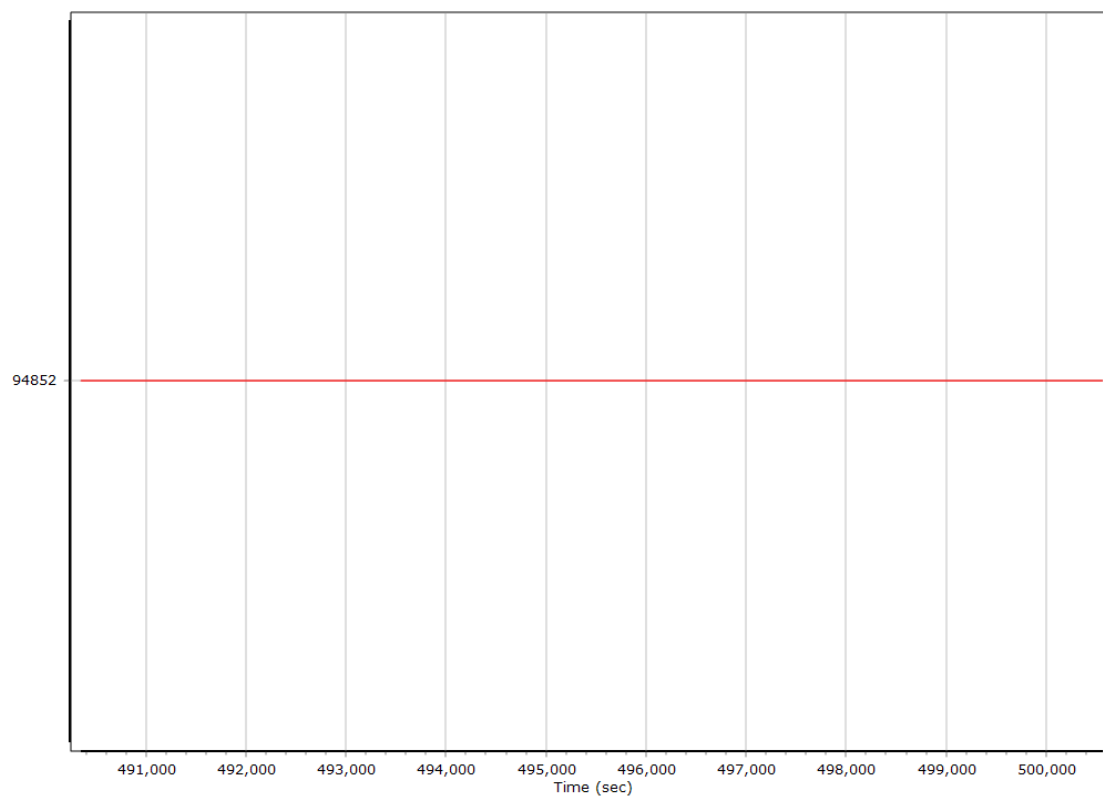
X Reference-Primary GNSS Lever Arm (m)



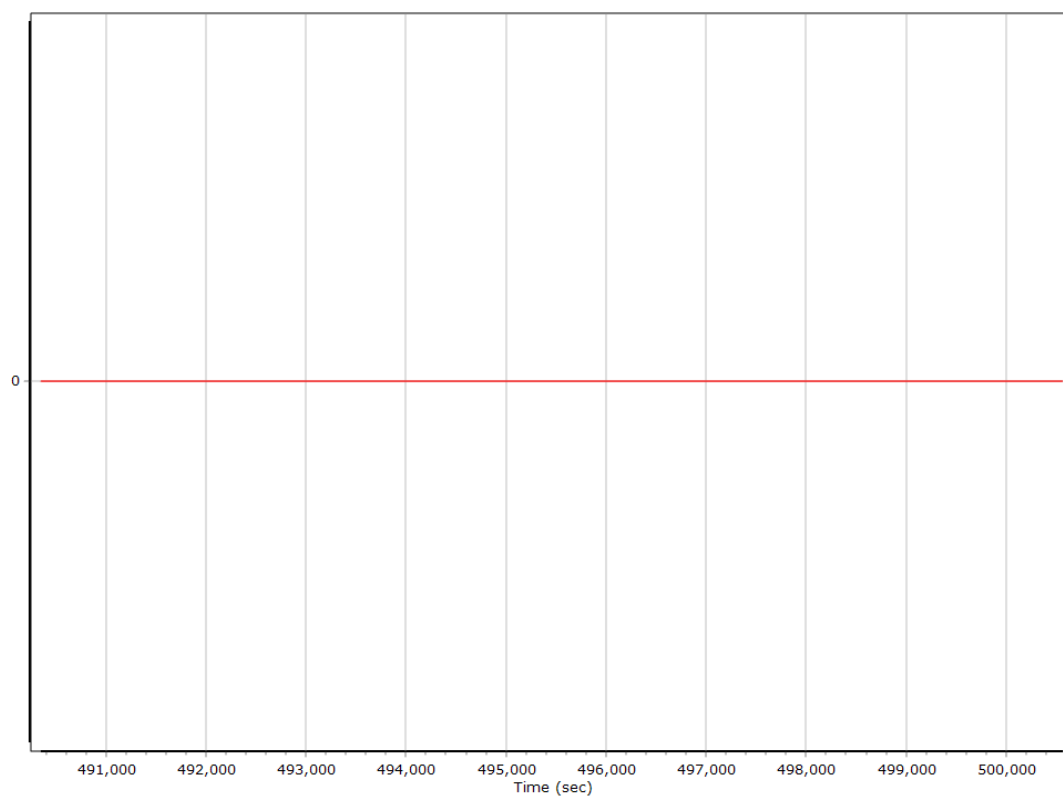
Y Reference-Primary GNSS Lever Arm (m)



Z Reference-Primary GNSS Lever Arm (m)



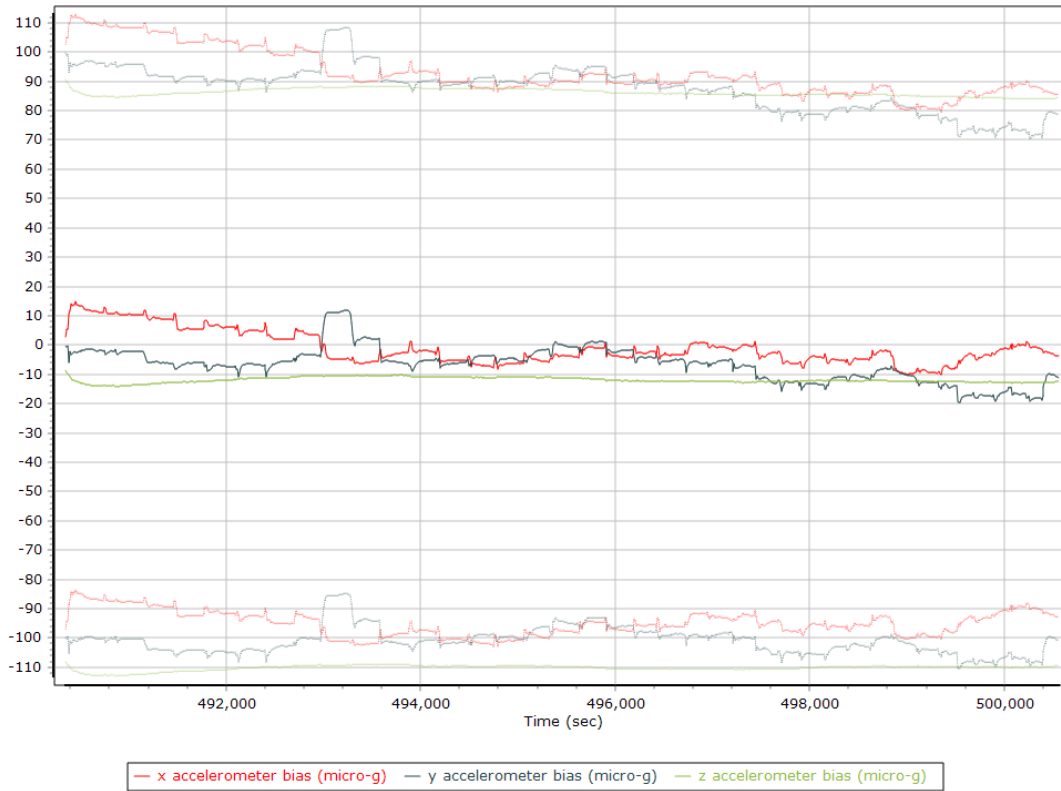
Reference-Primary GNSS Lever Arm Figure of Merit



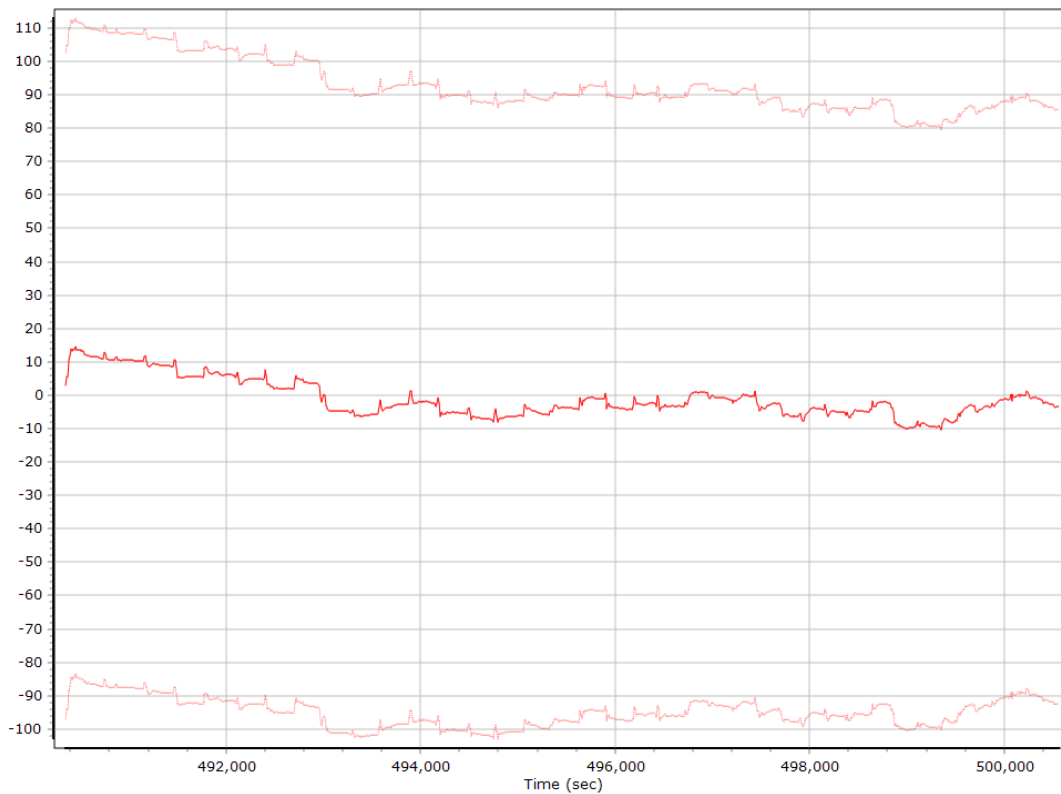
IN-Fusion QC

Forward Processed Estimated Errors, Reference Frame

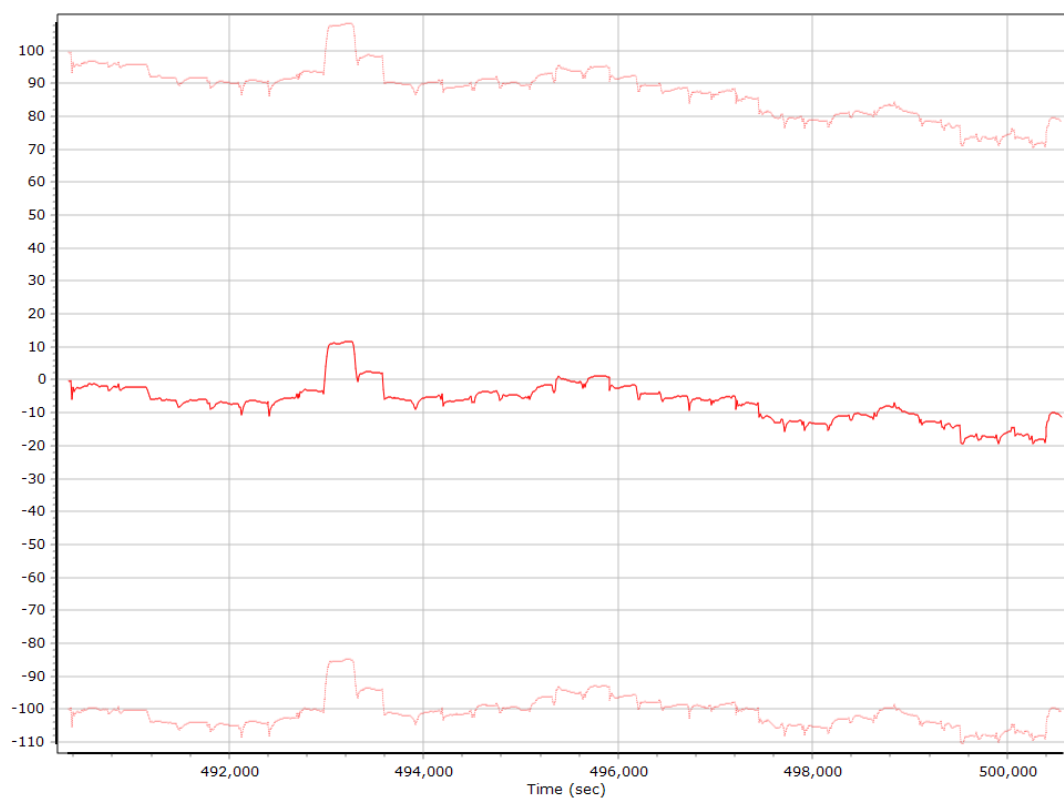
Accelerometer Bias (micro-g)



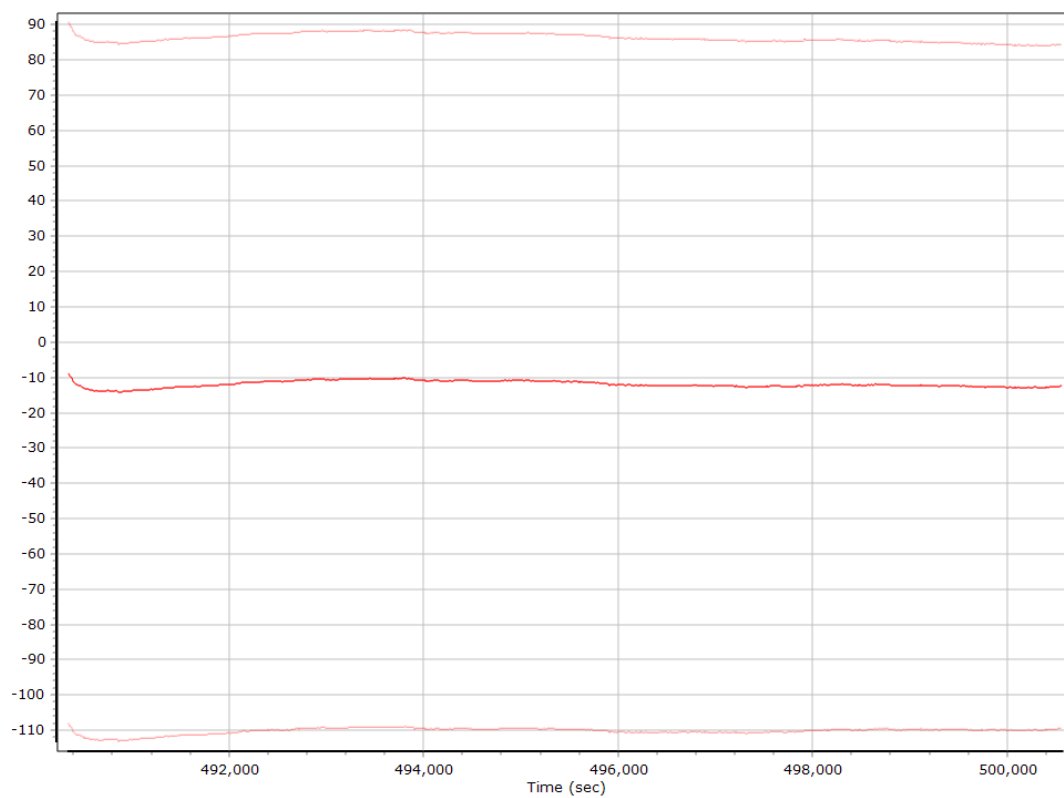
X Accelerometer Bias (micro-g)



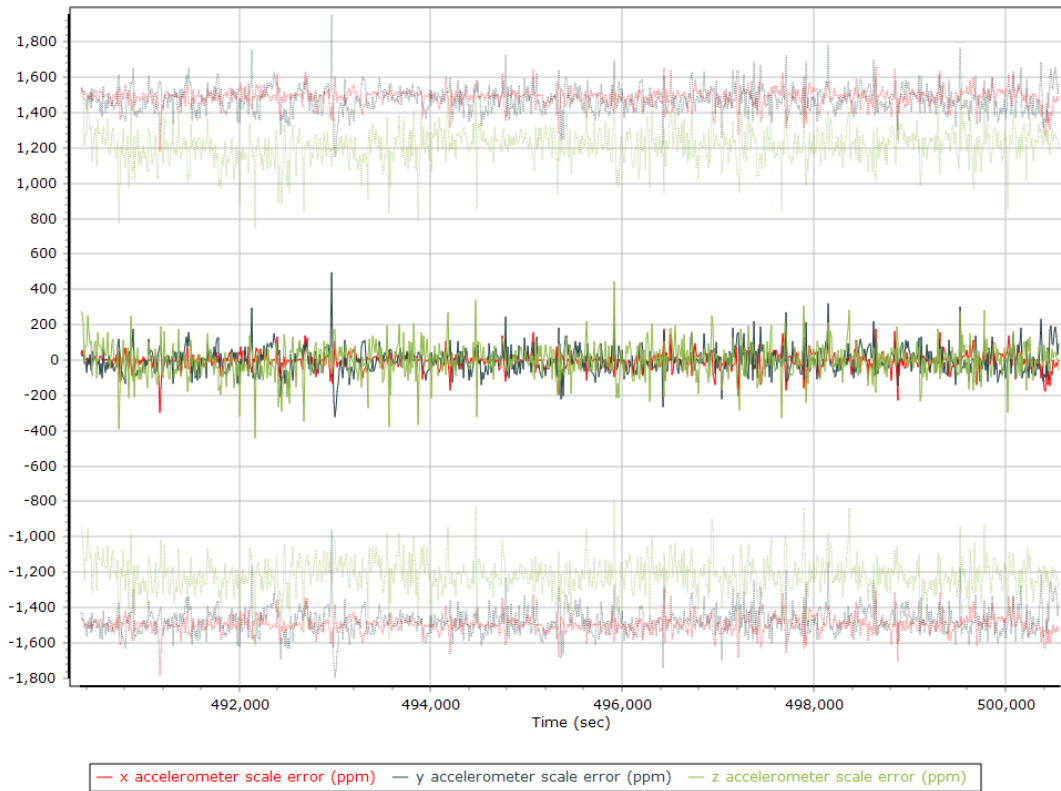
Y Accelerometer Bias (micro-g)



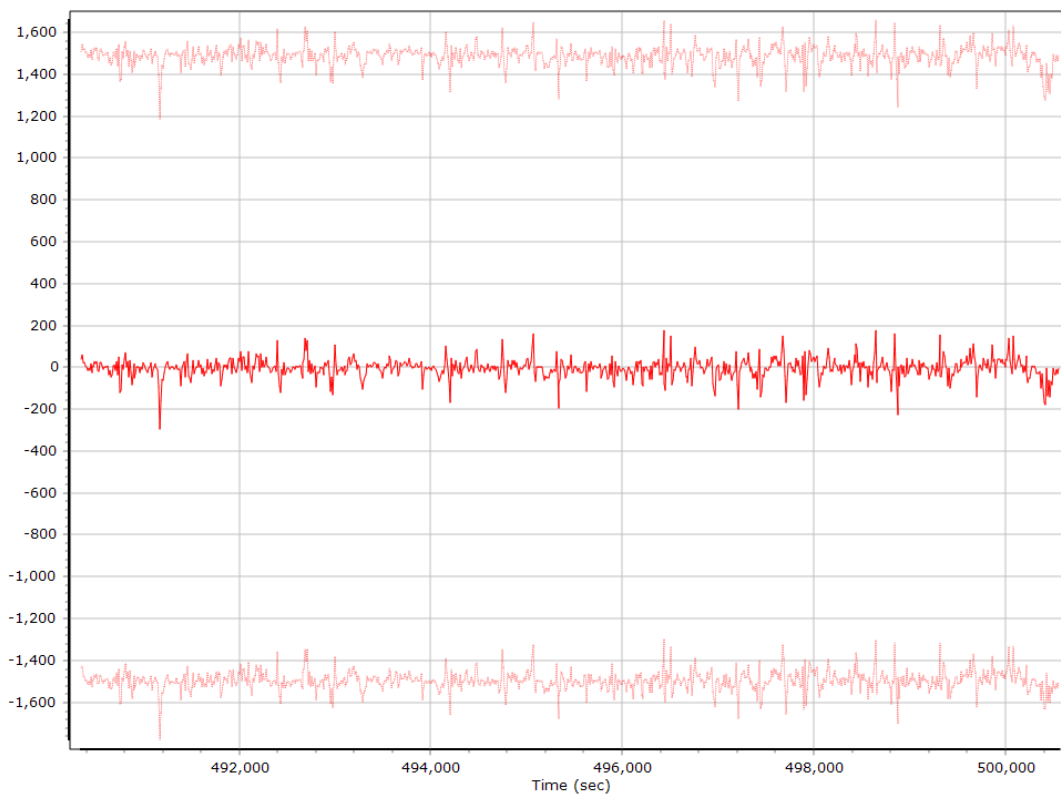
Z Accelerometer Bias (micro-g)



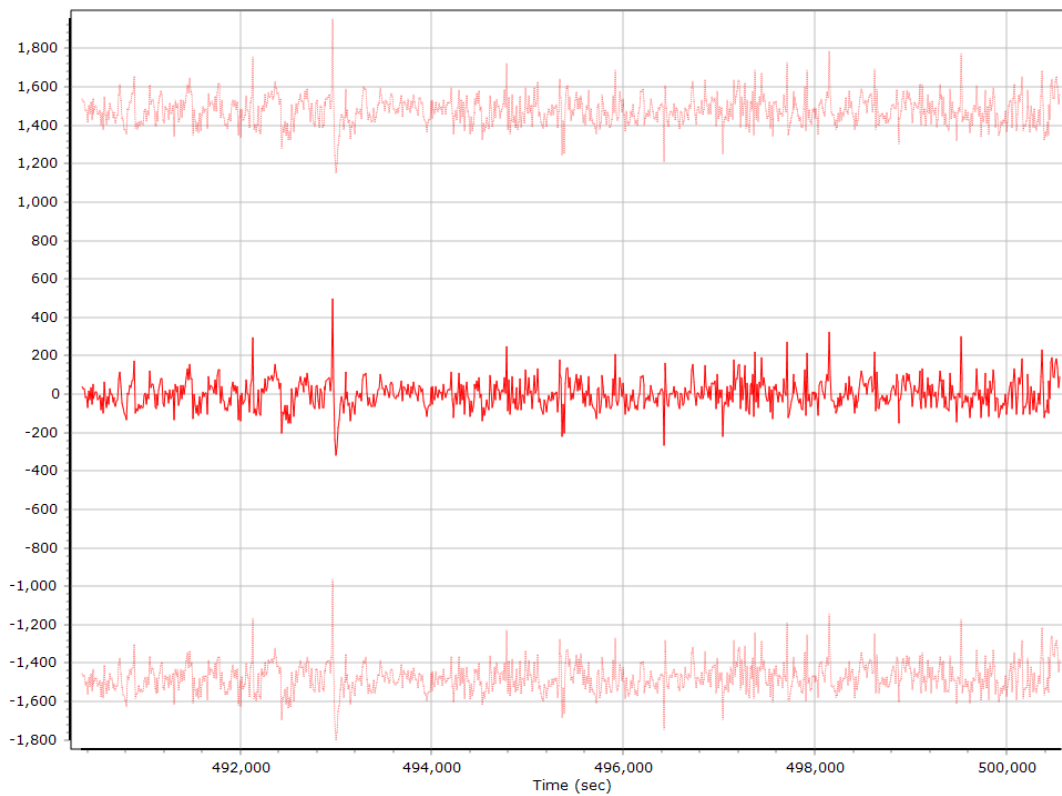
Accelerometer Scale Error (ppm)



X Accelerometer Scale Error (ppm)



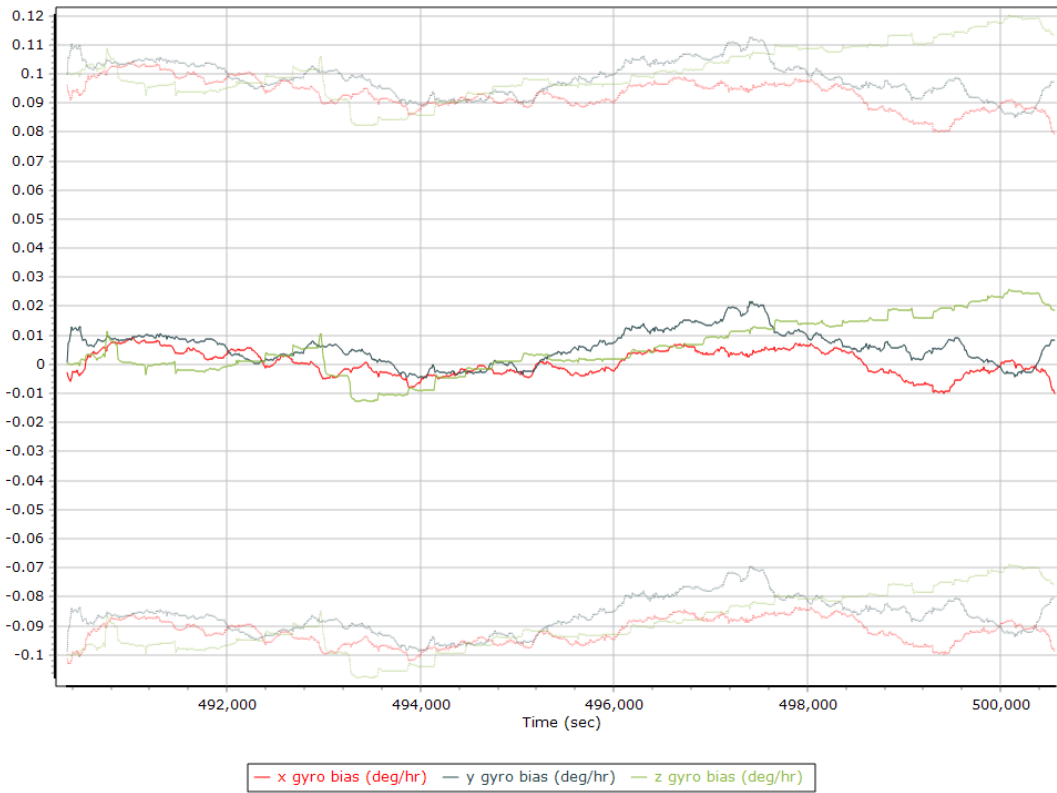
Y Accelerometer Scale Error (ppm)



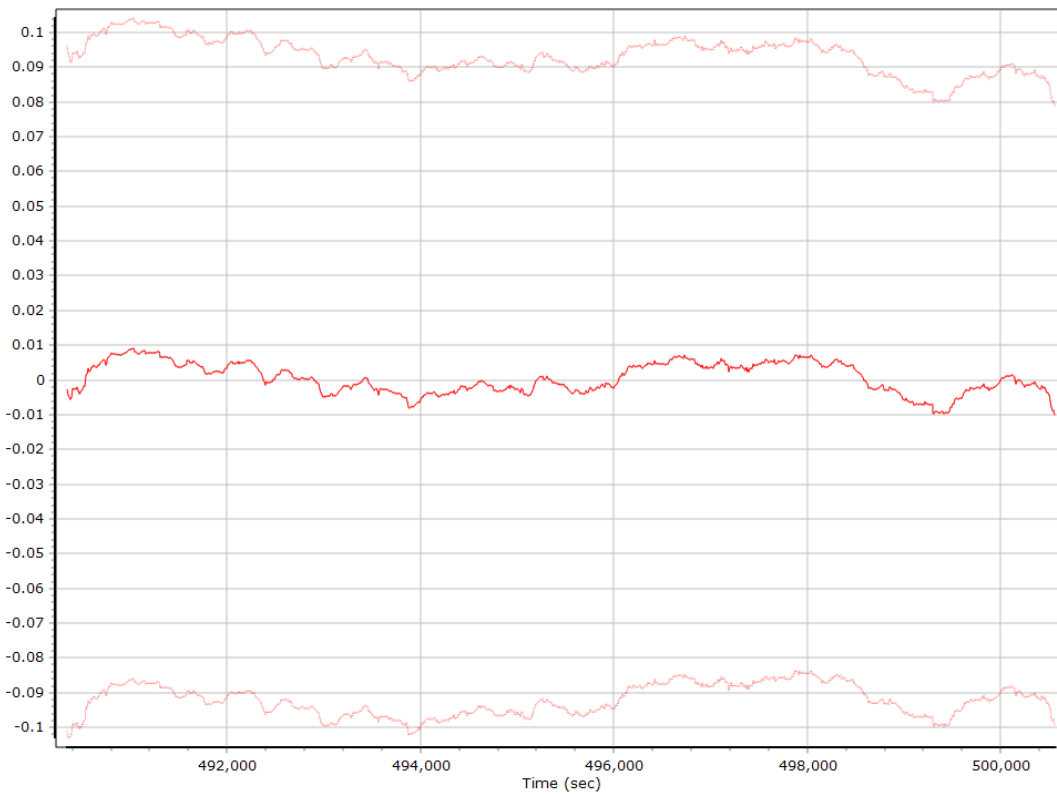
Z Accelerometer Scale Error (ppm)



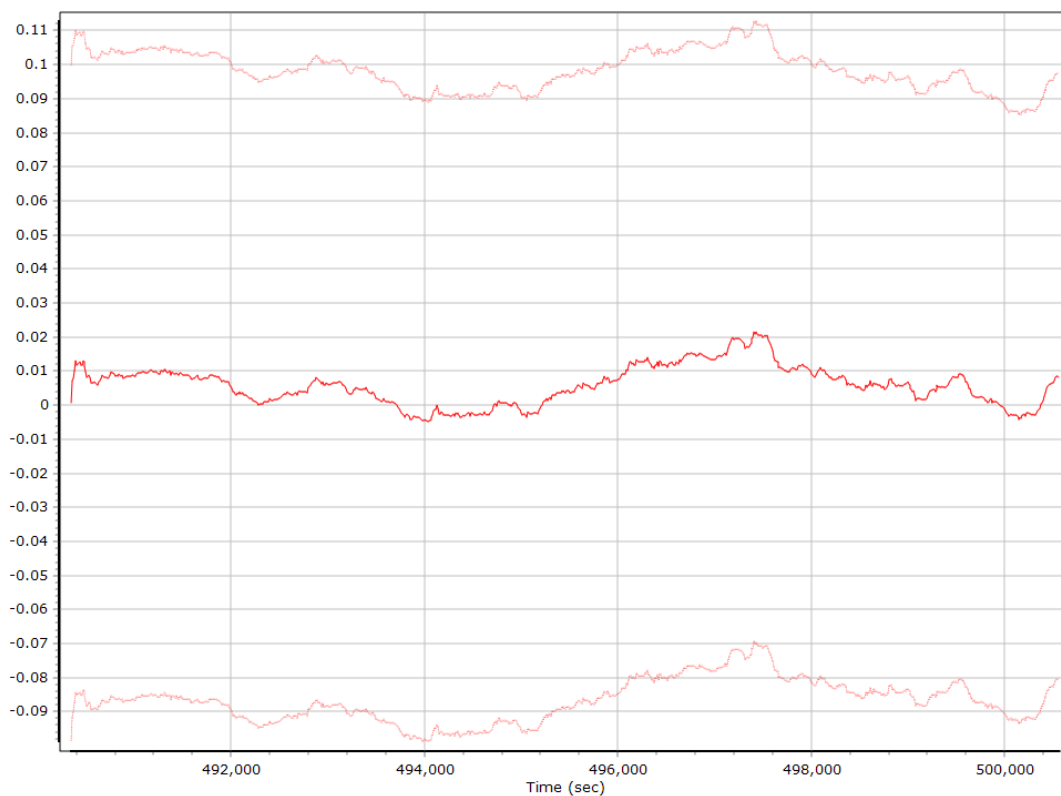
Gyro Bias (deg/h)



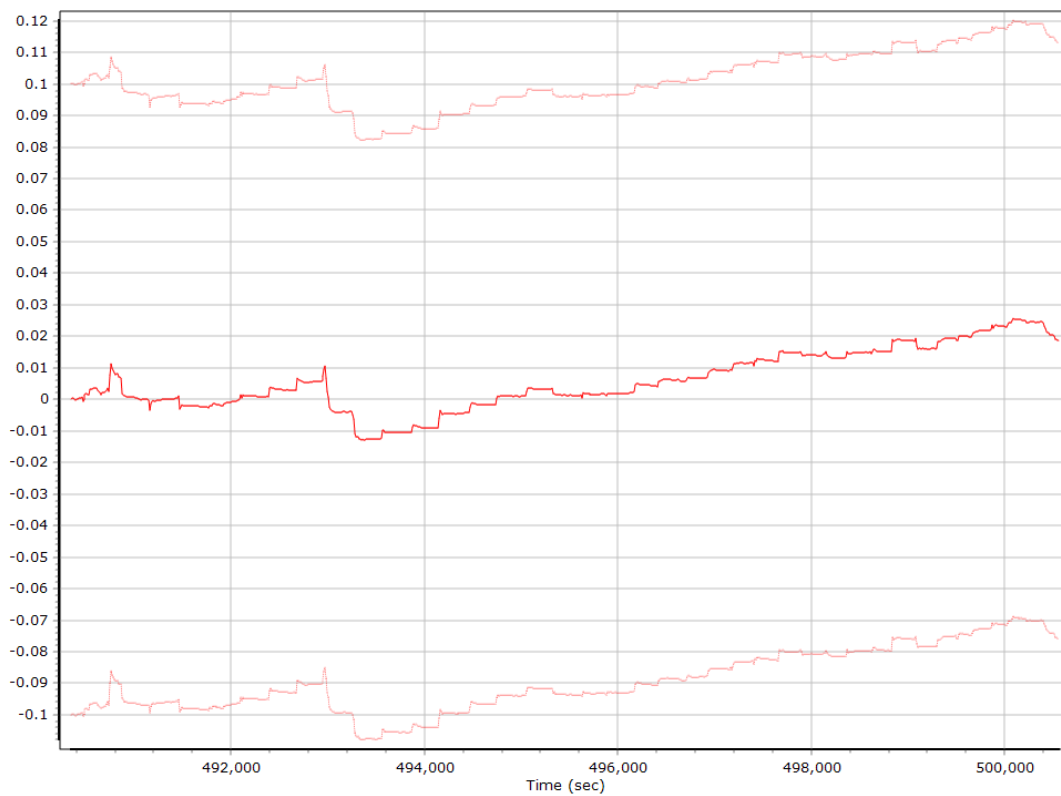
X Gyro Bias (deg/h)



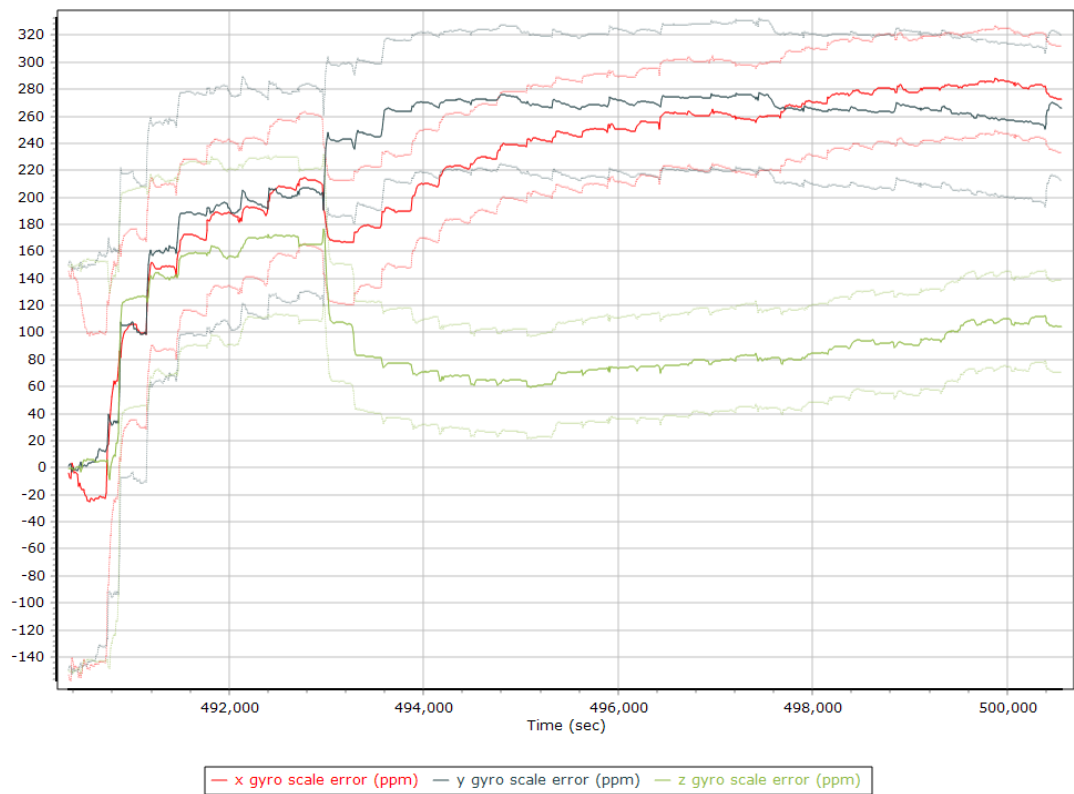
Y Gyro Bias (deg/h)



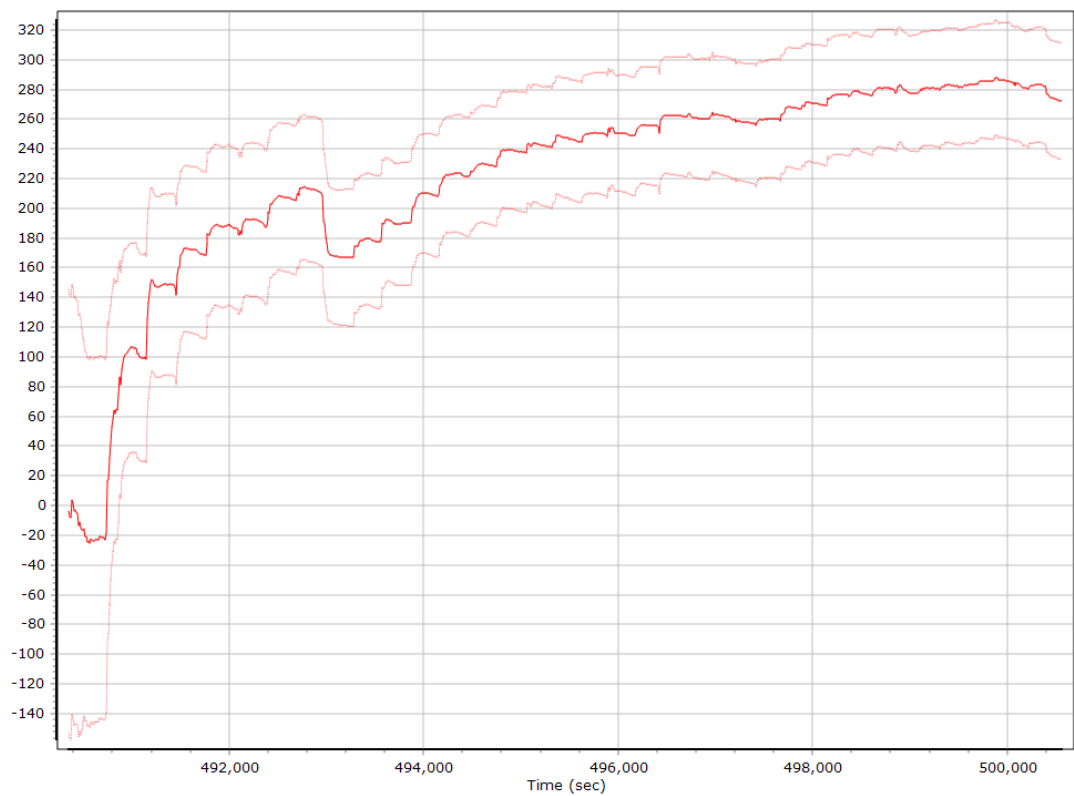
Z Gyro Bias (deg/h)



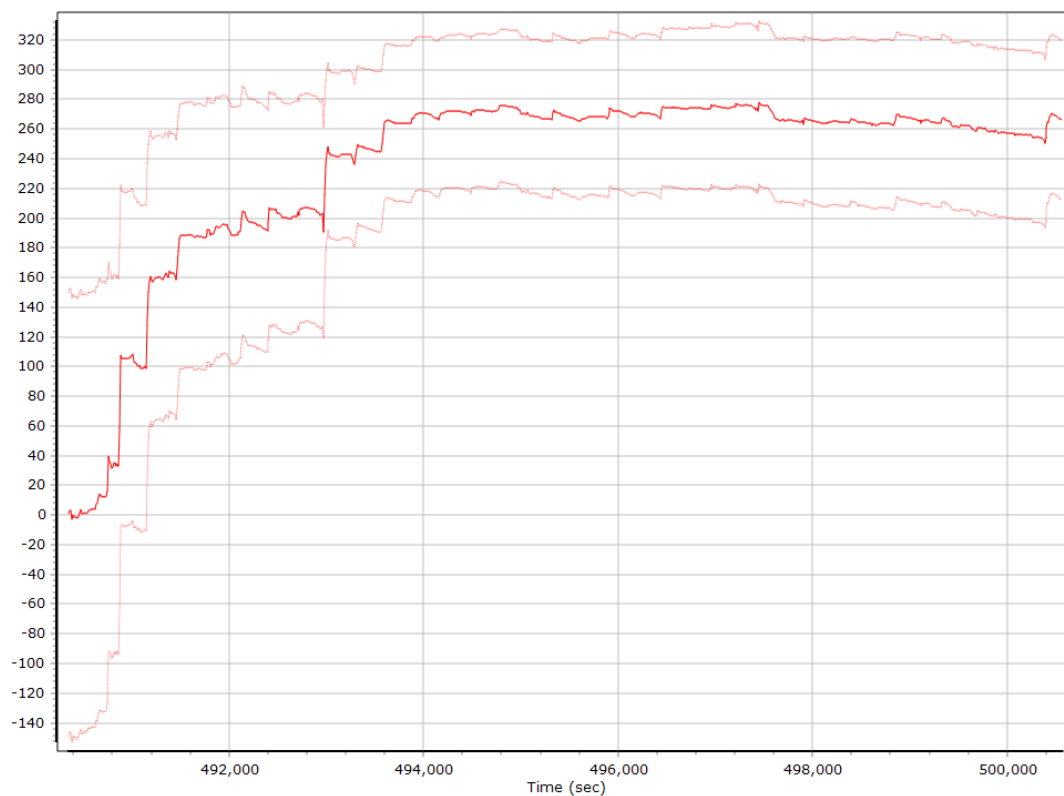
Gyro Scale Error (ppm)



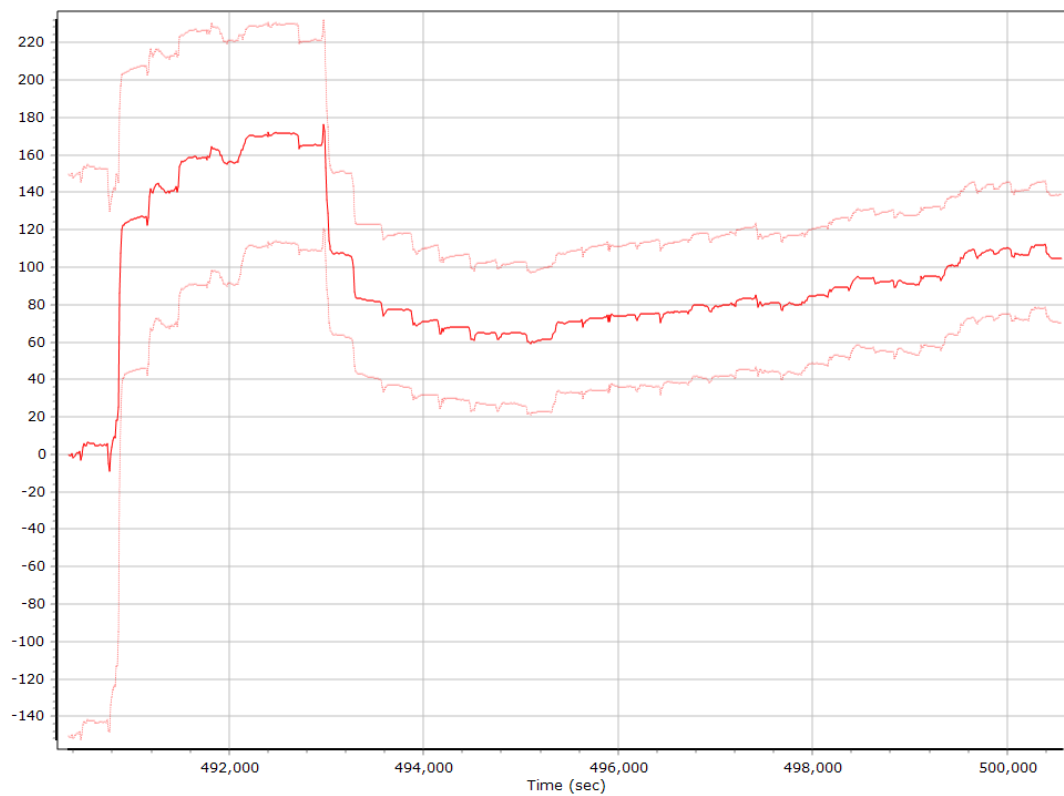
X Gyro Scale Error (ppm)



Y Gyro Scale Error (ppm)

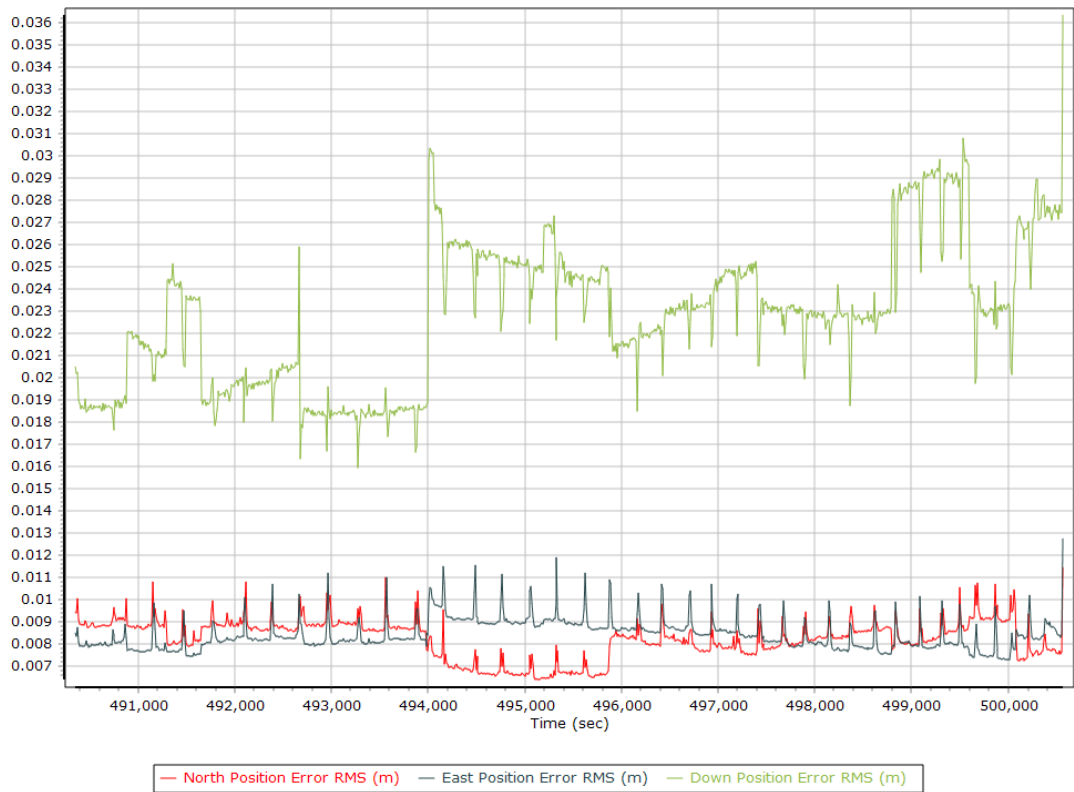


Z Gyro Scale Error (ppm)

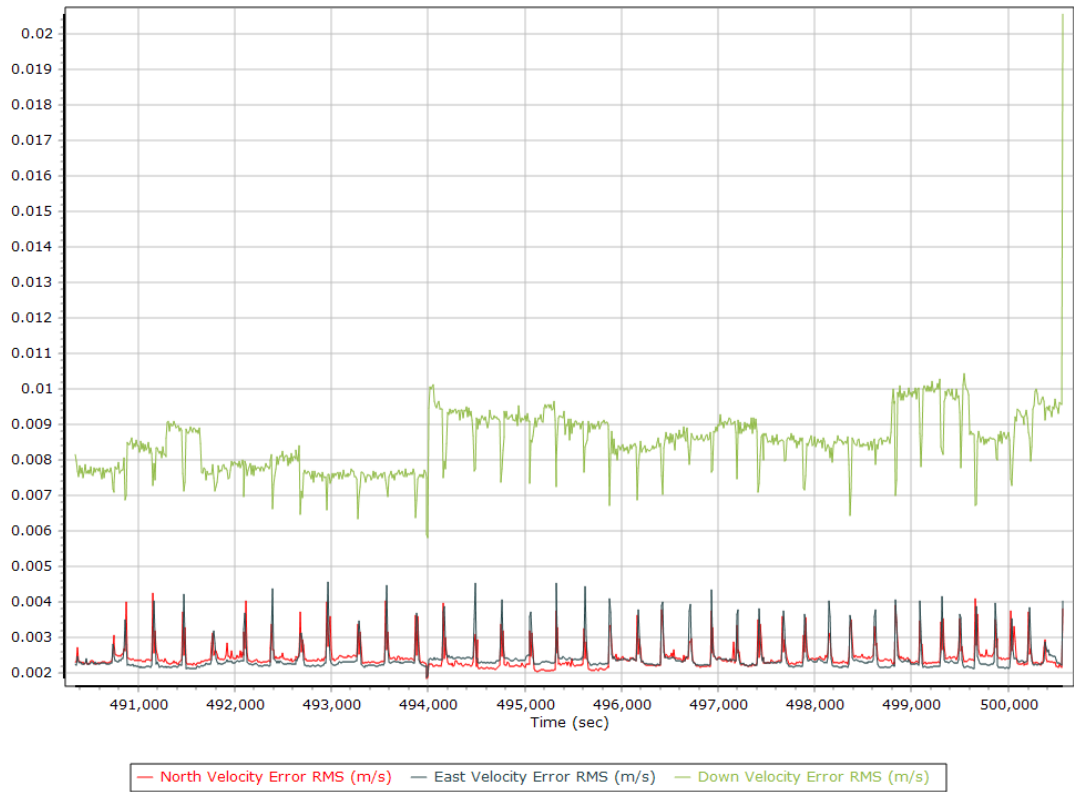


Smoothed Performance Metrics

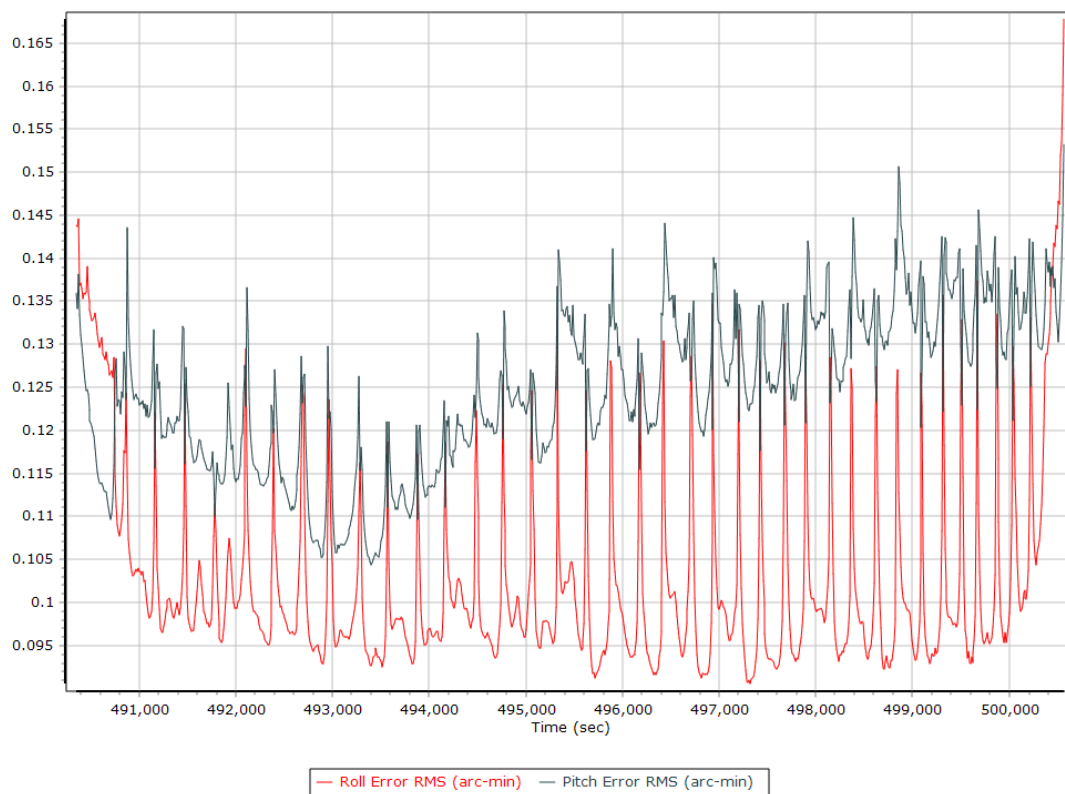
Position Error RMS (m)



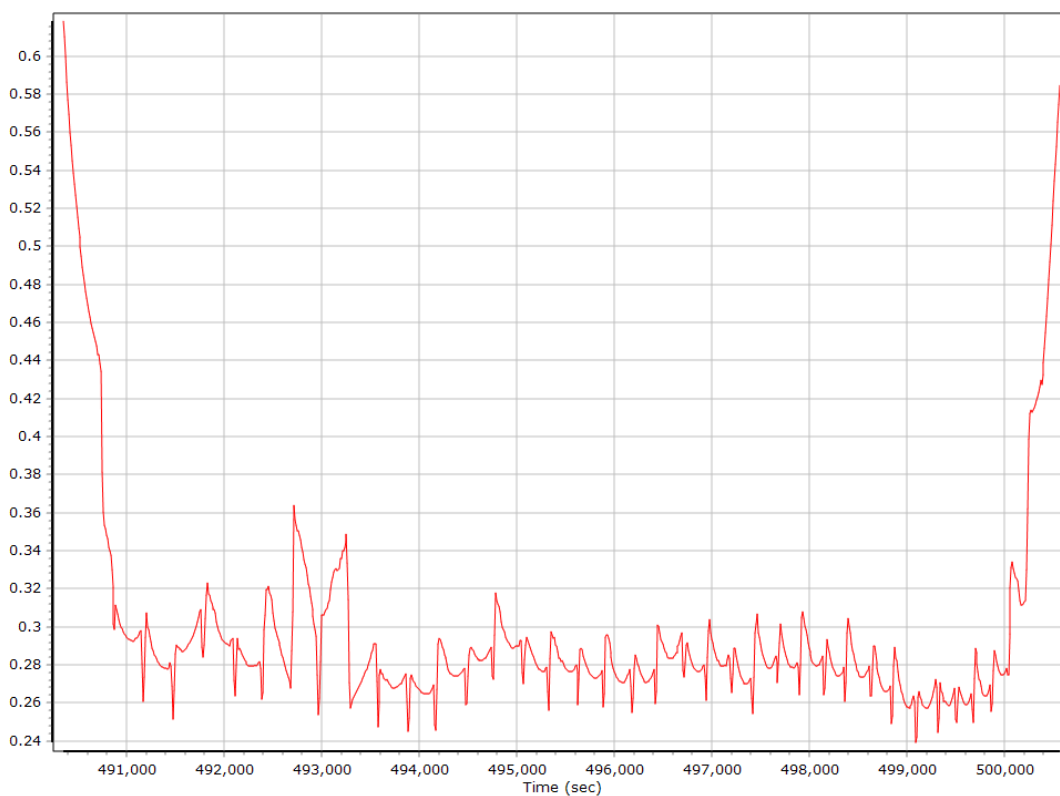
Velocity Error RMS (m/s)



Roll/Pitch Error RMS (arc-min)

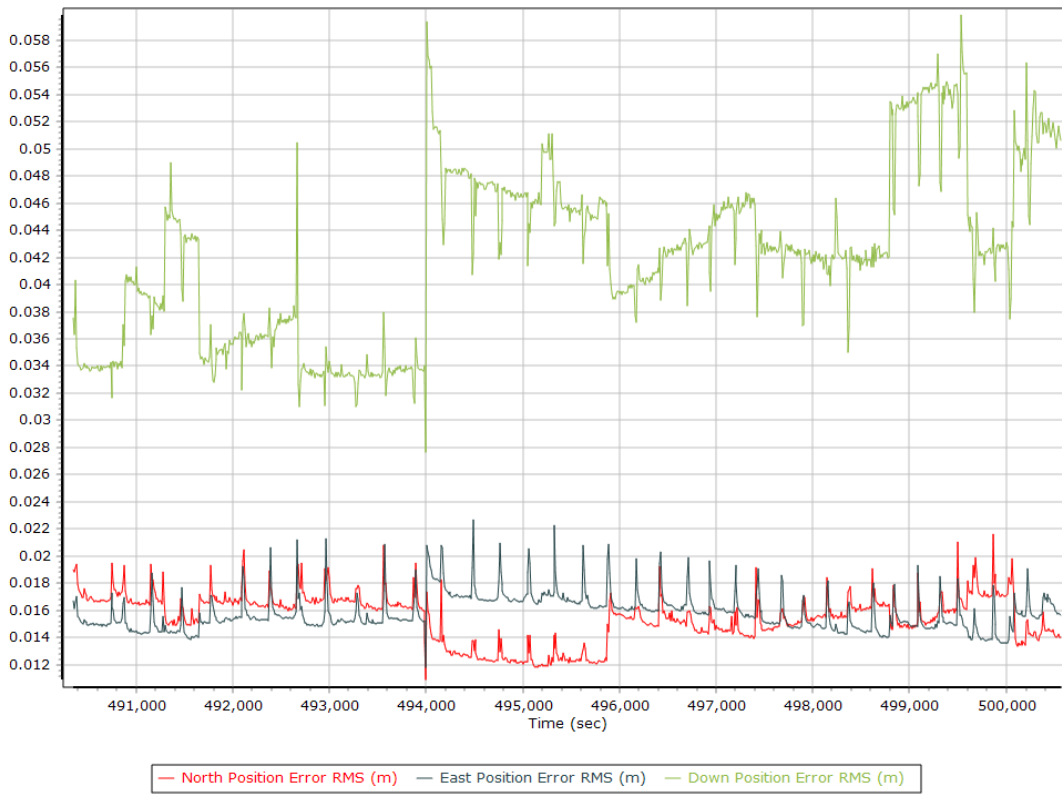


Heading Error RMS (arc-min)

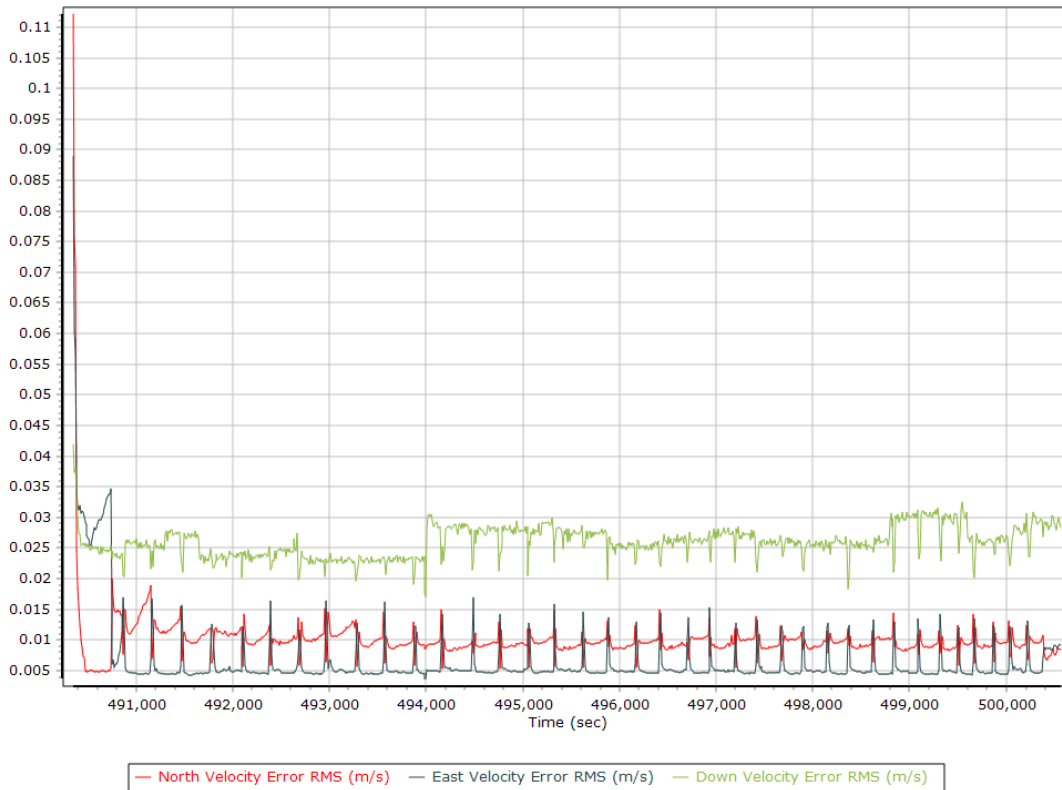


Forward Processed Performance Metrics

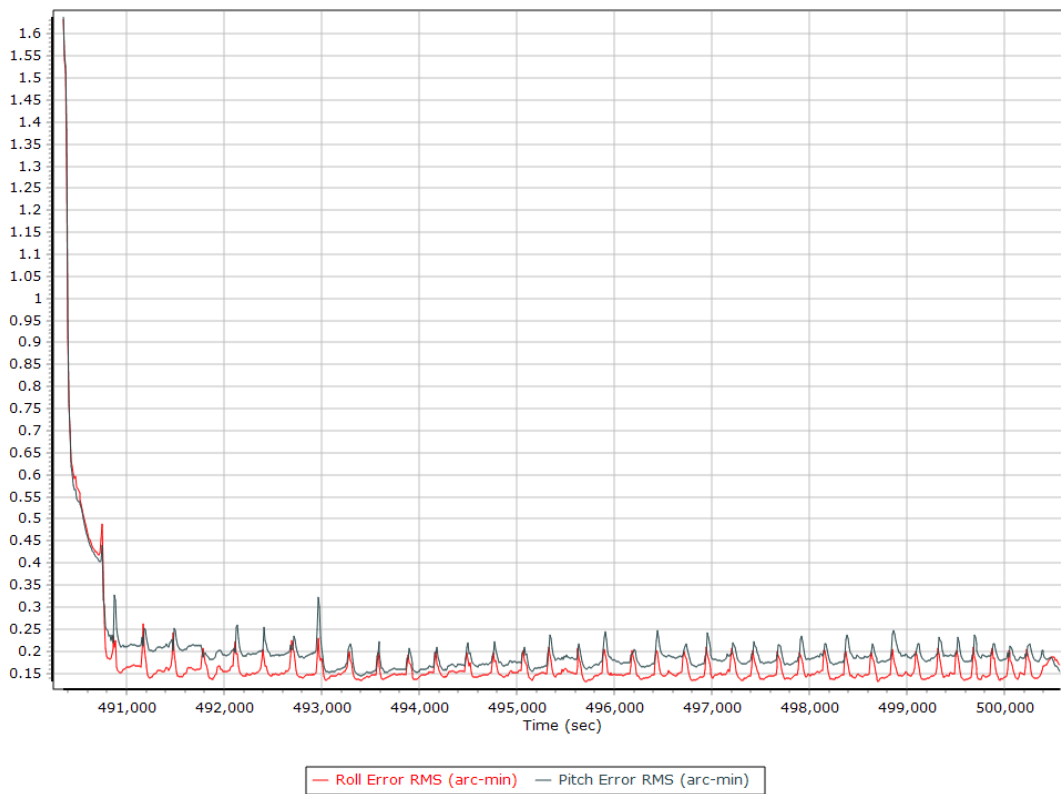
Position Error RMS (m)



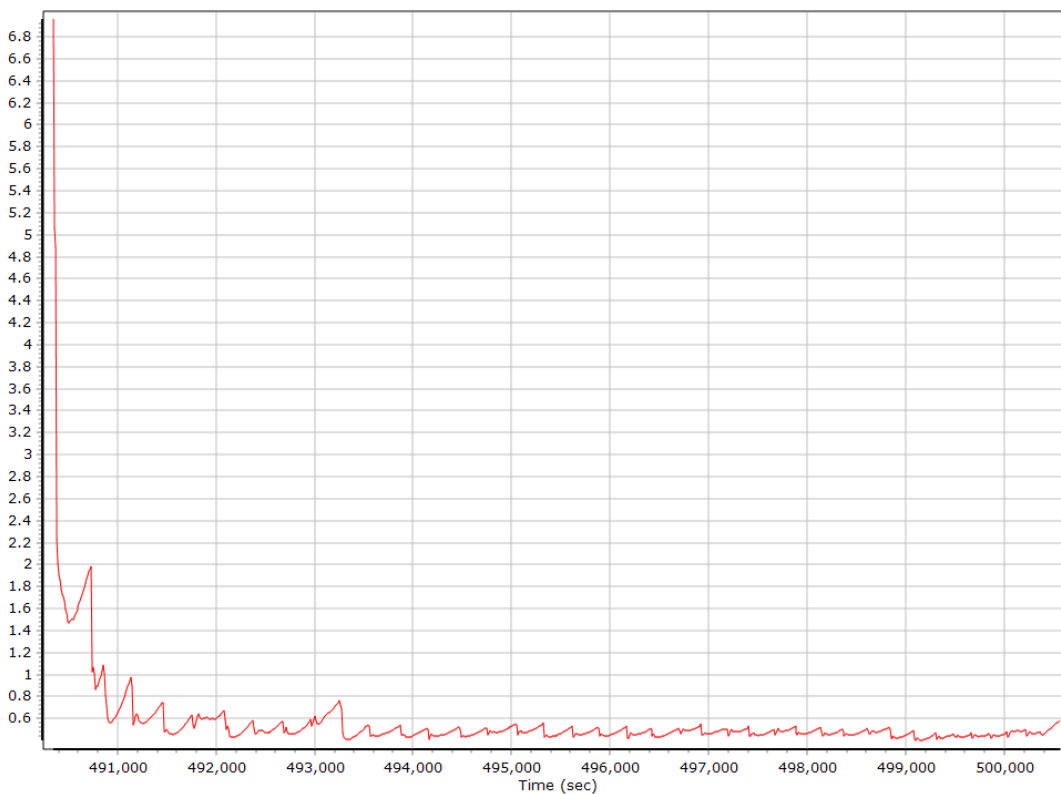
Velocity Error RMS (m/s)



Roll/Pitch Error RMS (arc-min)

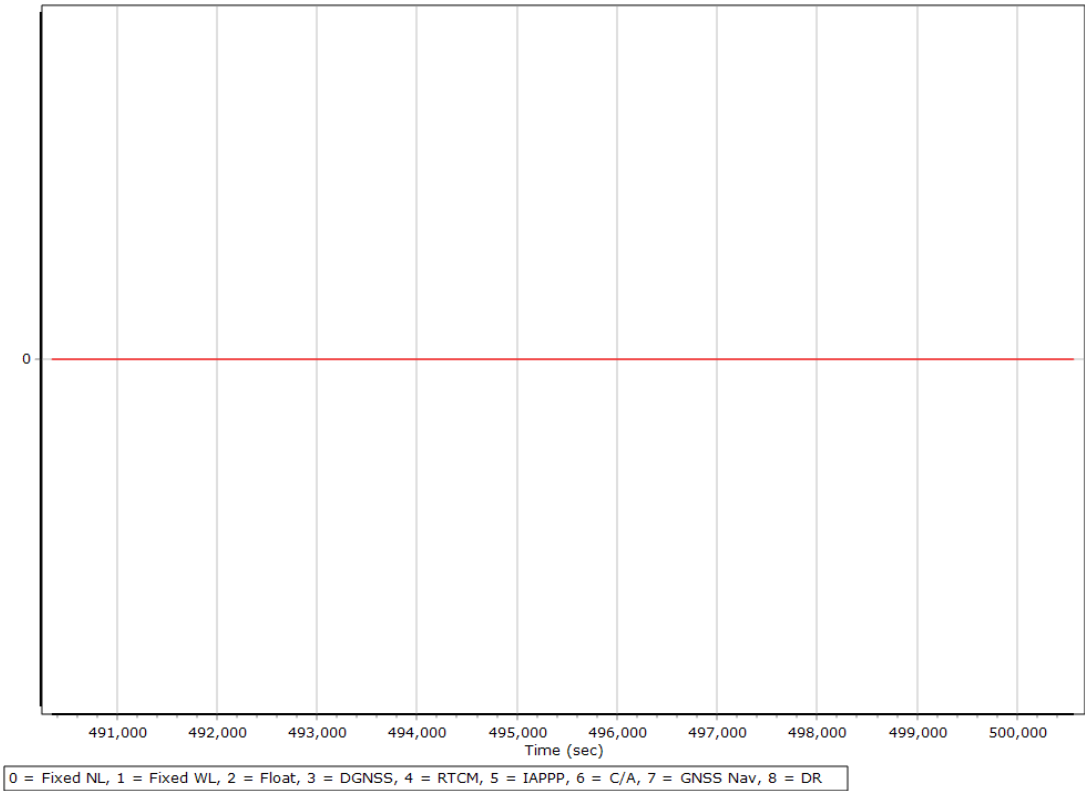


Heading Error RMS (arc-min)

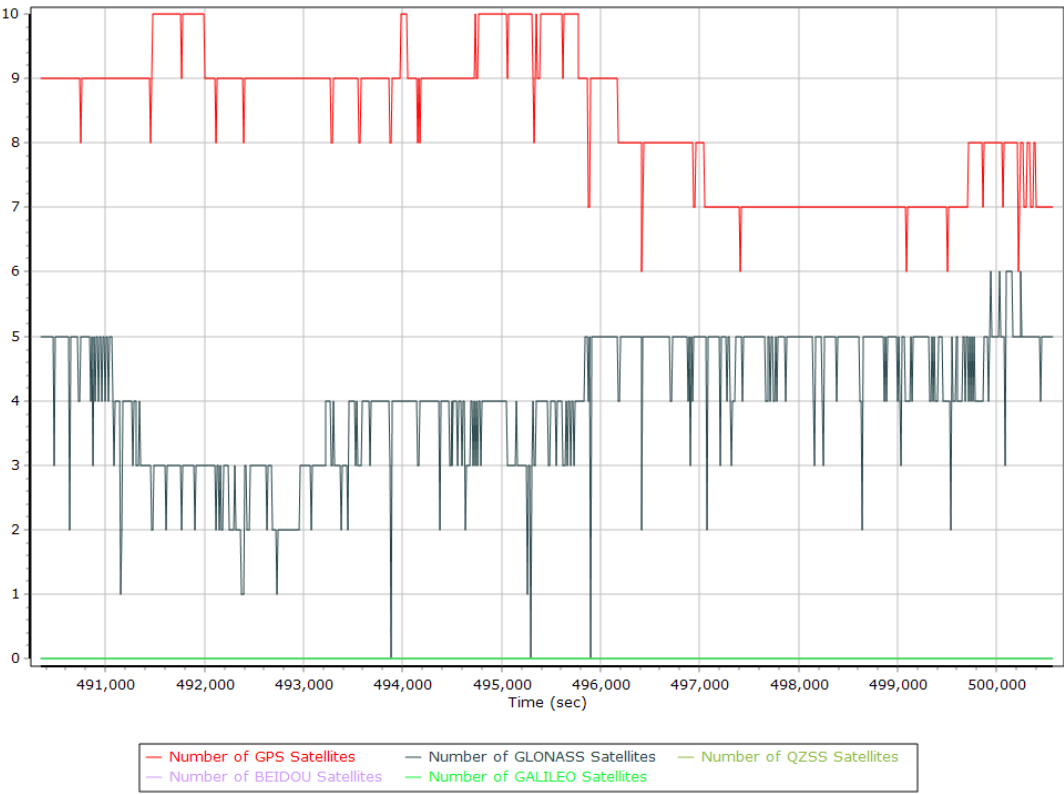


Smoothed Solution Status

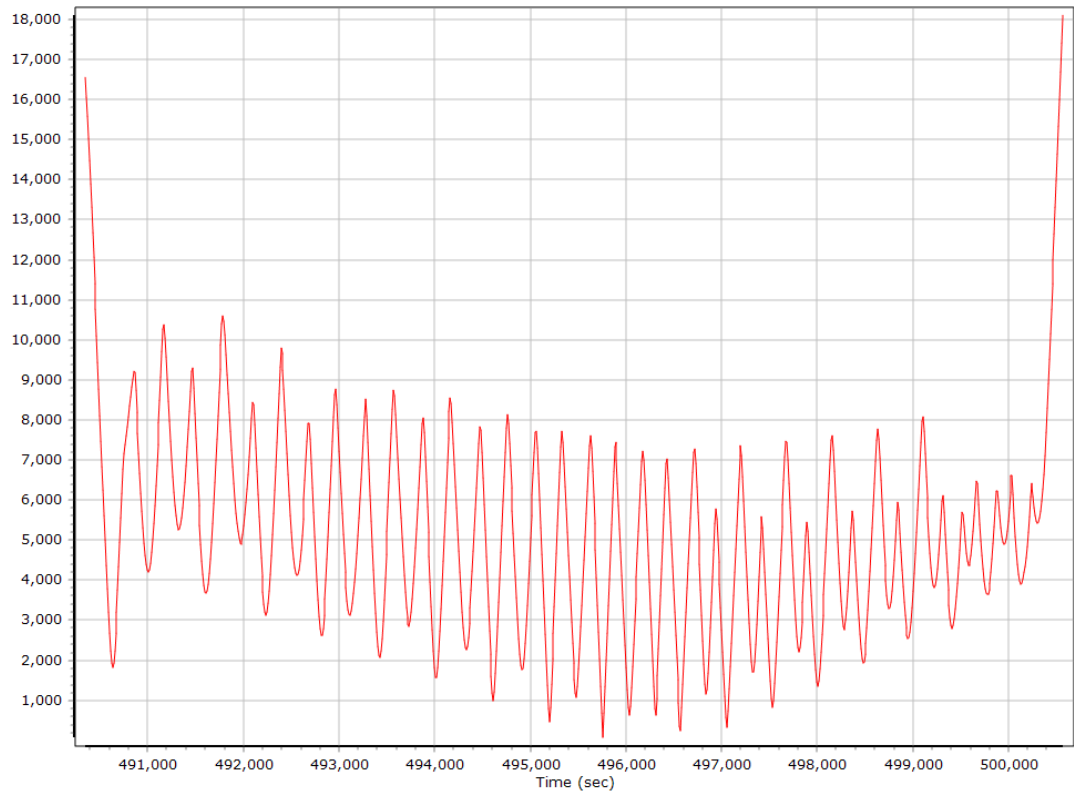
Processing Mode



Number of Satellites

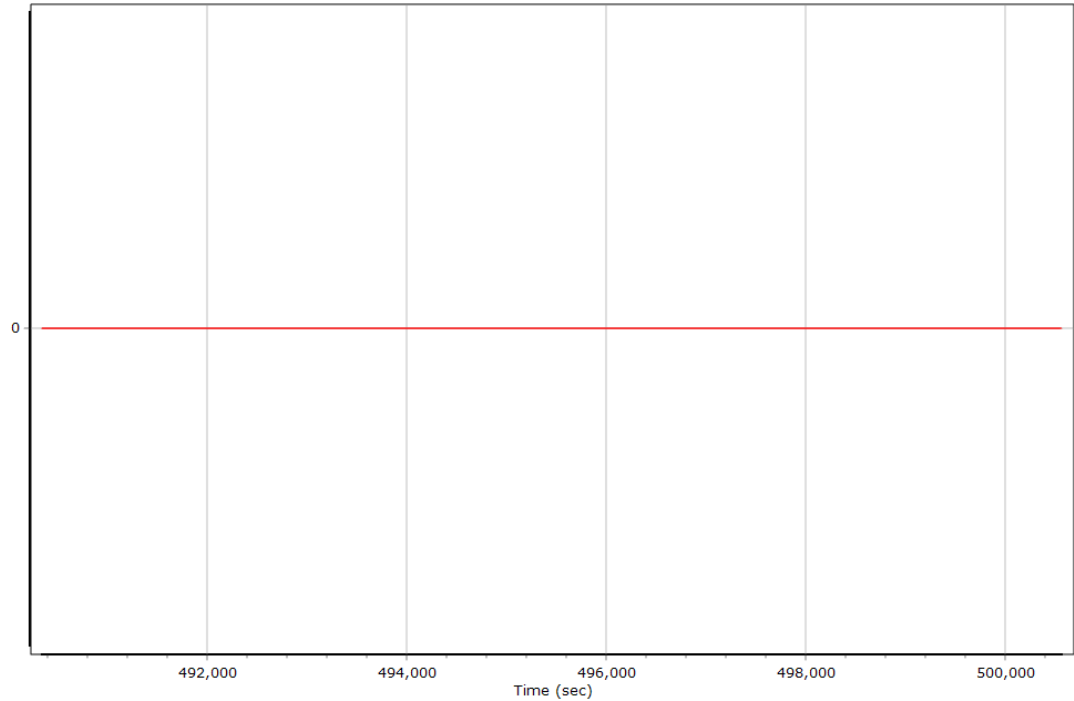


Baseline Length



Forward Processed Solution Status

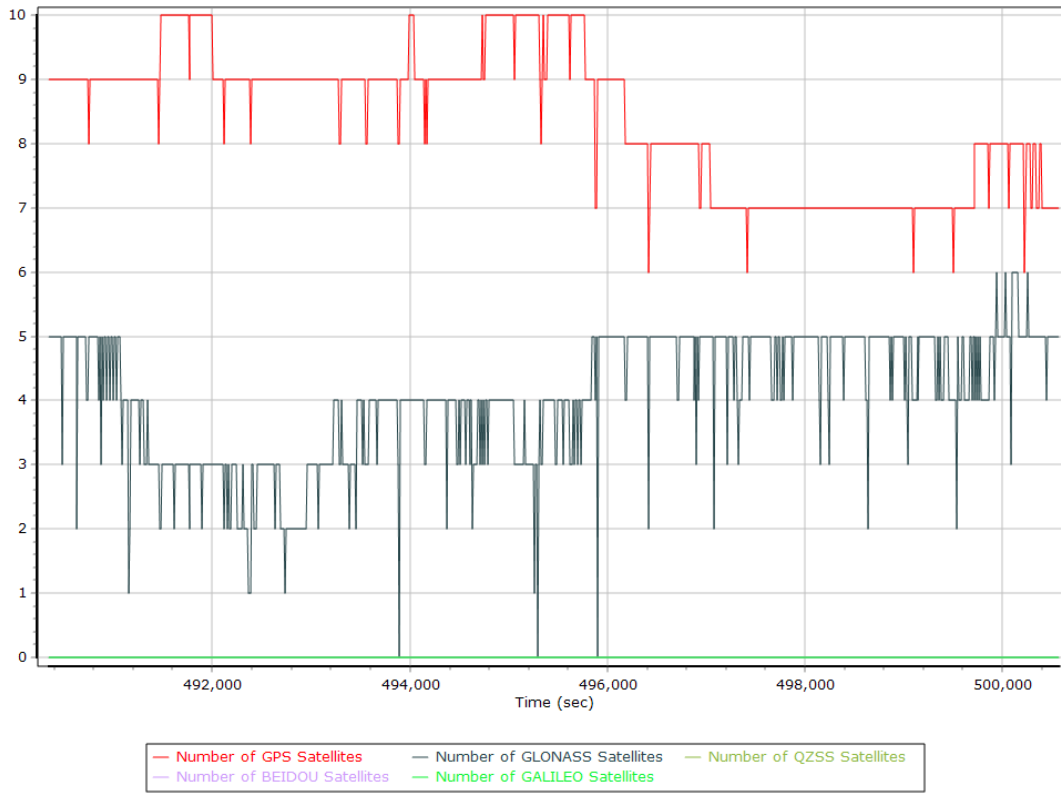
Processing Mode



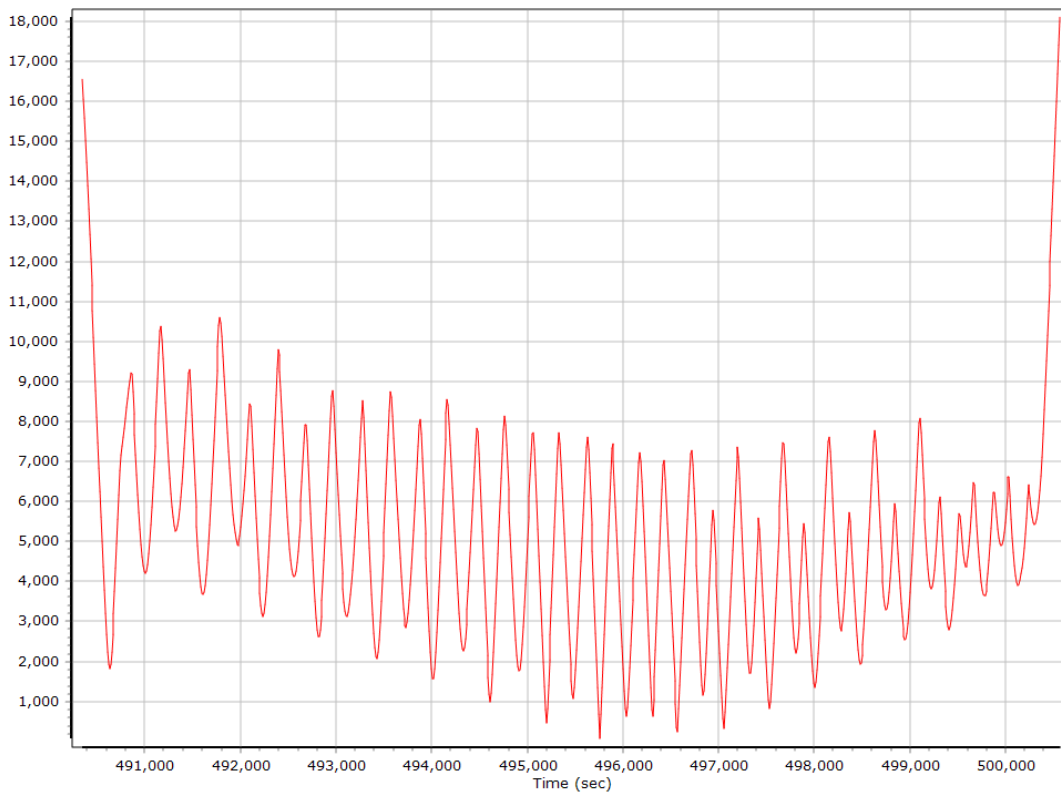
☒ Forward ☒ Reverse

0 = Fixed NL, 1 = Fixed WL, 2 = Float, 3 = DGNSS, 4 = RTCM, 5 = IAPPP, 6 = C/A, 7 = GNSS Nav, 8 = DR

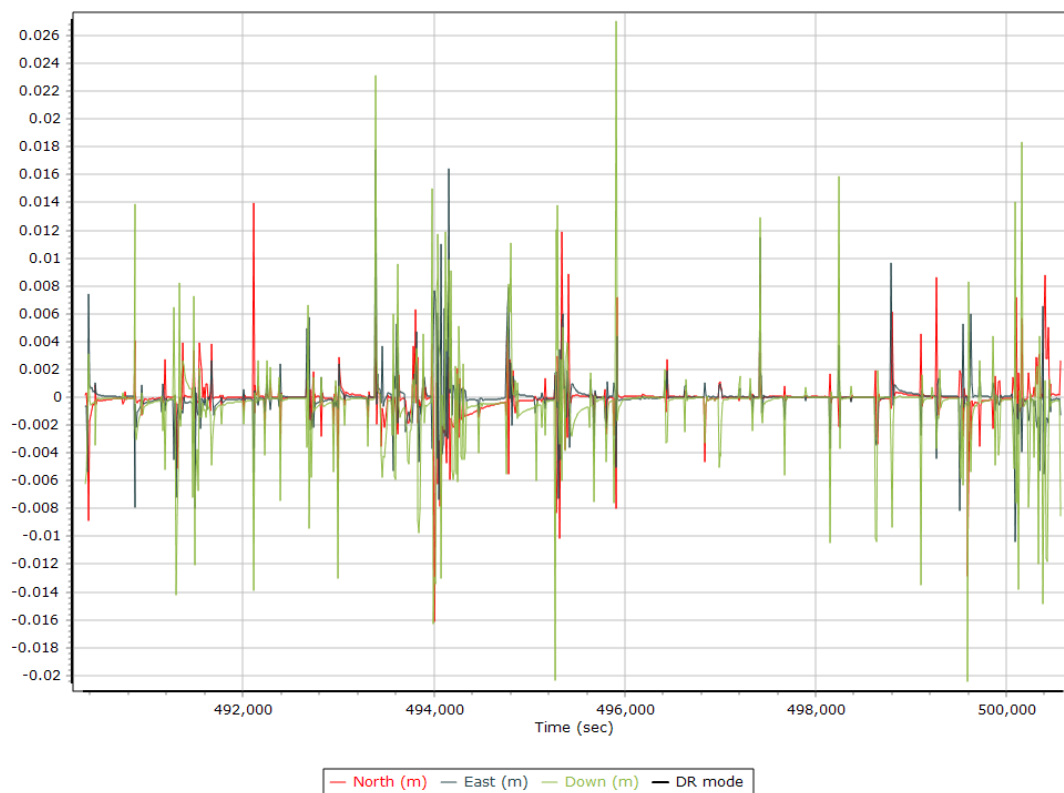
Number of Satellites



Baseline Length



SBET IAKAR Separation



Export Summary

Export file	NAD83(2011)_Ep2010_Sbet.out		
Export format	Custom Smoothed BET		
Solution in use	Post-processed		
Output rate	All Records		
Reference to Output lever arm (m)	0.000	0.000	0.000
Reference mounting angles (deg)	0.000	0.000	0.000
Output units (Coordinate / Lat & Lon)	Meter		Deg Decimal
Export start time	490289.005 (5/13/2022 4:11:29 PM)		
Export end time	500568.105 (5/13/2022 7:02:48 PM)		
Height option	Ellipsoid Height		
WGS84 height flag	False		
Grid	Universal Transverse Mercator		
Zone	UTM North 11 (120W to 114W)		
Datum	NAD83 (2011)		
Ellipsoid	GRS 1980		
Local Transformation	NONE		
Target Epoch	2010		

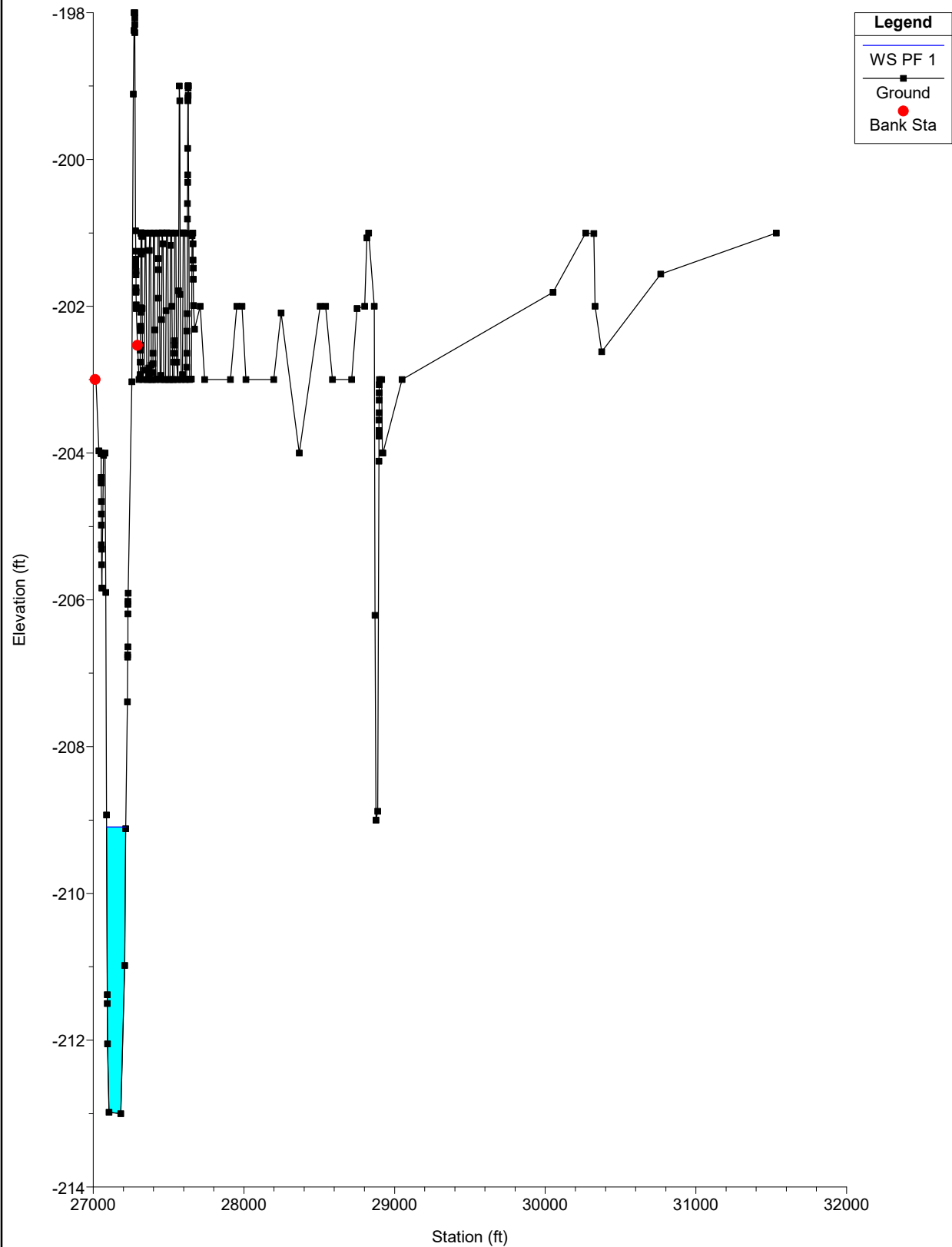
APPENDIX B

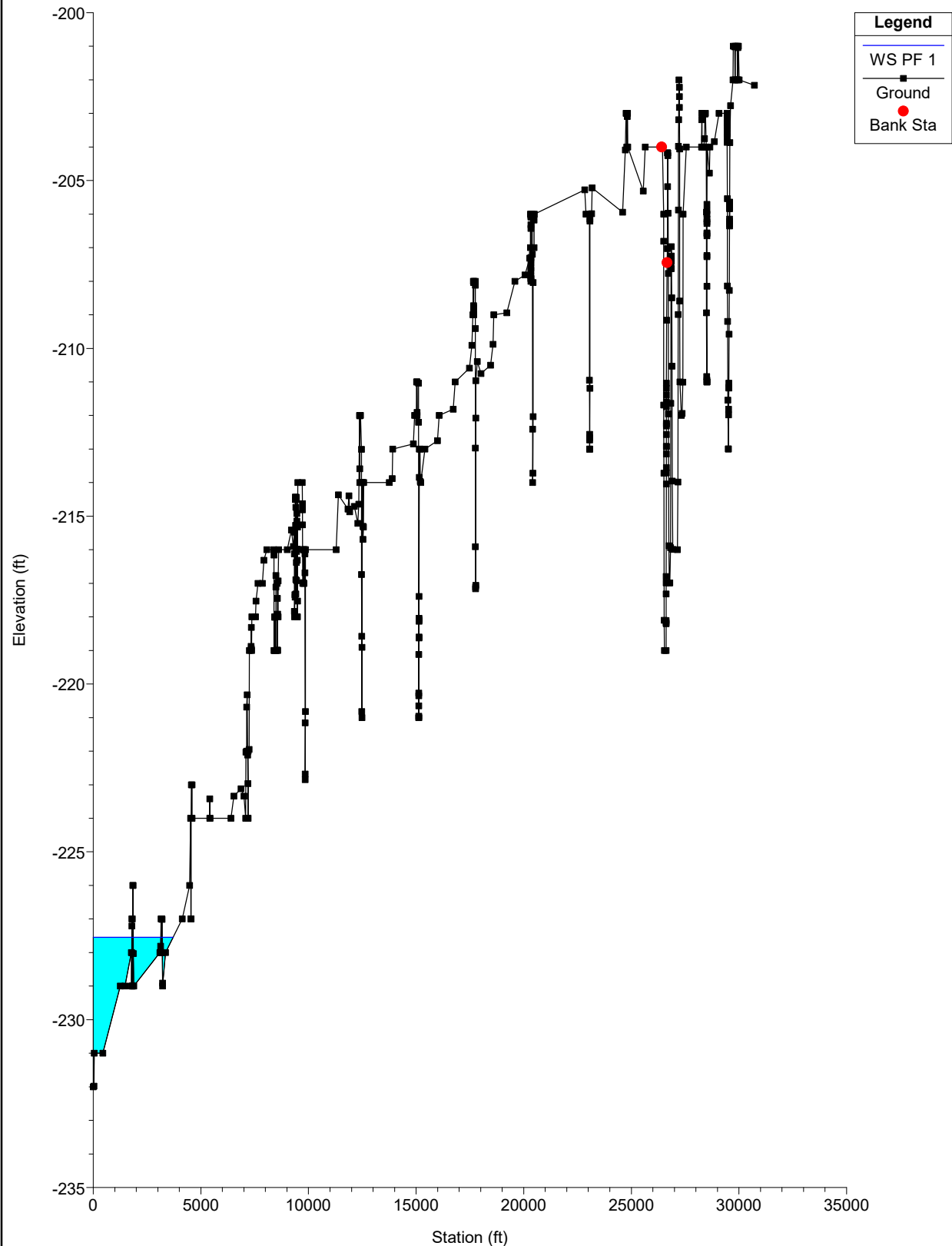
(HEC-RAS Output Files for Existing Condition [LOMR])

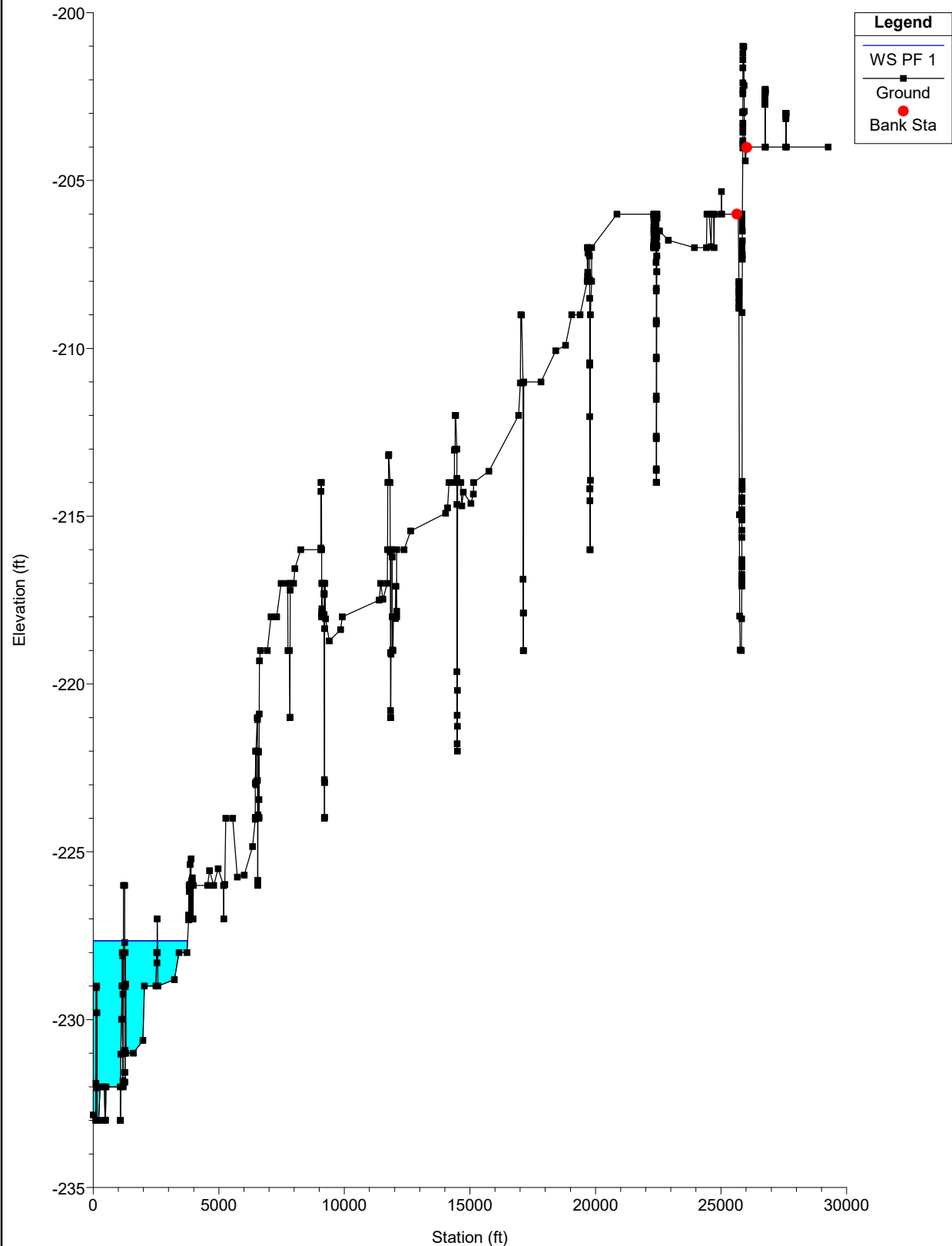
HEC-RAS Plan: 01 River: Alamo River Reach: Alamo River Profile: PF 1

Reach	River Sta	Profile	Hydr Depth	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(ft)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Alamo River	37000	PF 1	3.37	4500.00	-213.00	-209.09	-209.09	-207.40	0.012807	10.44	430.90	127.91	1.00
Alamo River	36071	PF 1	1.56	4500.00	-219.00	-227.54		-227.54	0.000247		5639.52	3612.20	0.00
Alamo River	34926	PF 1	2.52	4500.00	-219.00	-227.65		-227.64	0.000047		9304.69	3692.09	0.00
Alamo River	33520	PF 1	2.35	4500.00	-219.00	-227.70		-227.70	0.000046		10255.89	4373.10	0.00
Alamo River	32581	PF 1	3.20	4500.00	-219.00	-227.72		-227.72	0.000011		15943.71	4989.96	0.00
Alamo River	31366	PF 1	3.60	4500.00	-219.00	-227.73		-227.73	0.000007		18752.25	5211.75	0.00
Alamo River	30072	PF 1	3.30	4500.00	-219.00	-227.75		-227.75	0.000014		14413.13	4372.41	0.00
Alamo River	28816	PF 1	1.30	4500.00	-221.00	-227.82		-227.81	0.000476		4999.53	3850.64	0.00
Alamo River	25128	PF 1	1.61	4500.00	-222.00	-228.56		-228.55	0.000292		5448.83	3383.47	0.00
Alamo River	22693	PF 1	2.07	4500.00	-223.00	-229.01		-229.00	0.000152		6078.26	2940.98	0.00
Alamo River	19983	PF 1	1.97	4500.00	-224.00	-229.48		-229.47	0.000230		5439.90	2763.89	0.00
Alamo River	16662	PF 1	2.18	4500.00	-226.00	-229.61		-229.61	0.000021		16059.27	7367.41	0.00
Alamo River	13897	PF 1	2.02	4500.00	-228.00	-229.67		-229.67	0.000025		15007.94	7421.09	0.00
Alamo River	10023	PF 1	1.78	4500.00	-231.00	-229.83		-229.82	0.000136	0.51	6054.11	3391.89	0.09
Alamo River	4195	PF 1	2.32	4500.00	-234.00	-230.83		-230.82	0.000227	1.05	4578.00	1969.34	0.12
Alamo River	1623	PF 1	0.94	4500.00	-234.00	-231.67	-232.67	-231.66	0.000500	1.36	5289.16	5640.39	0.18

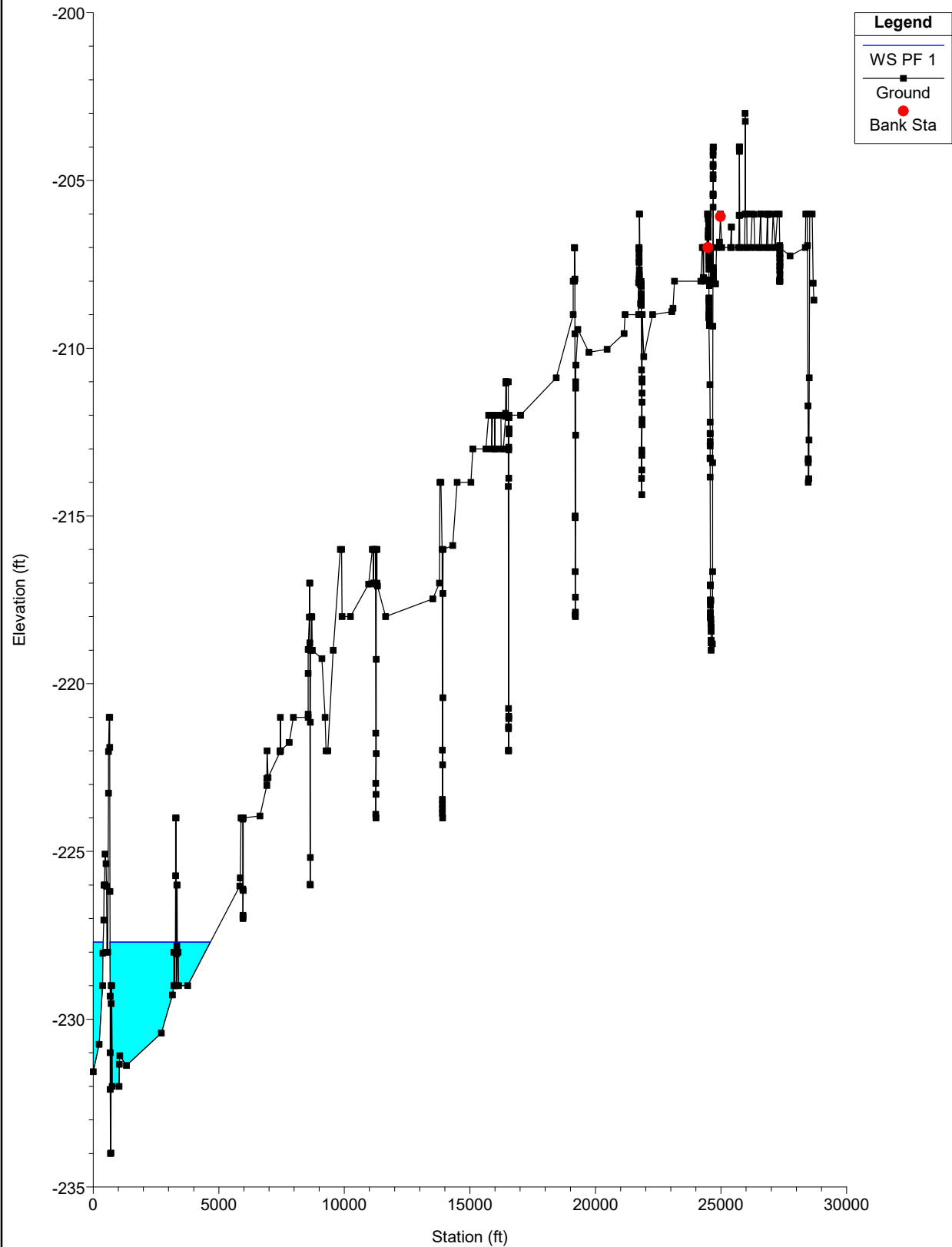
Alamo Creek Plan: AlamoRiver 9/5/2022

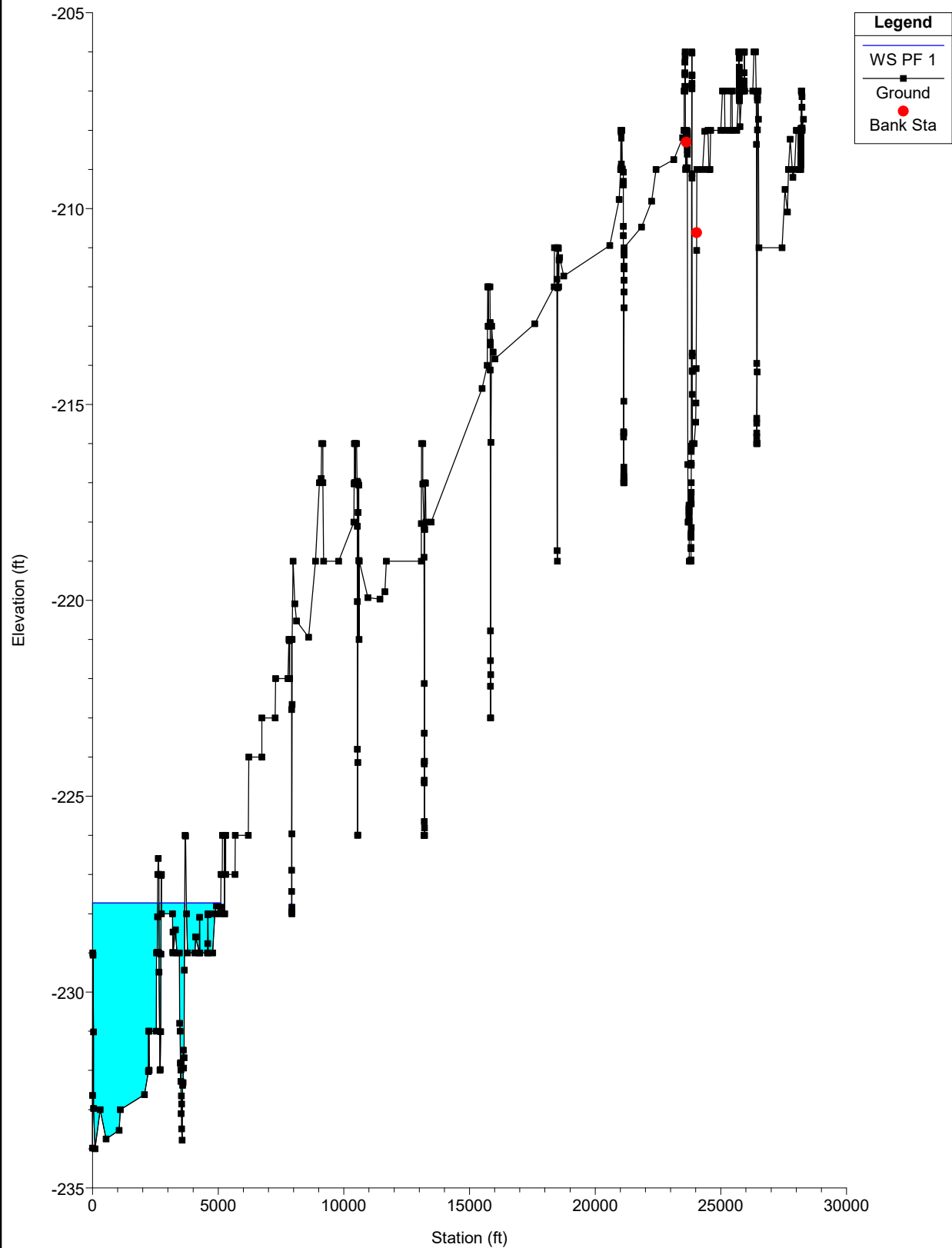


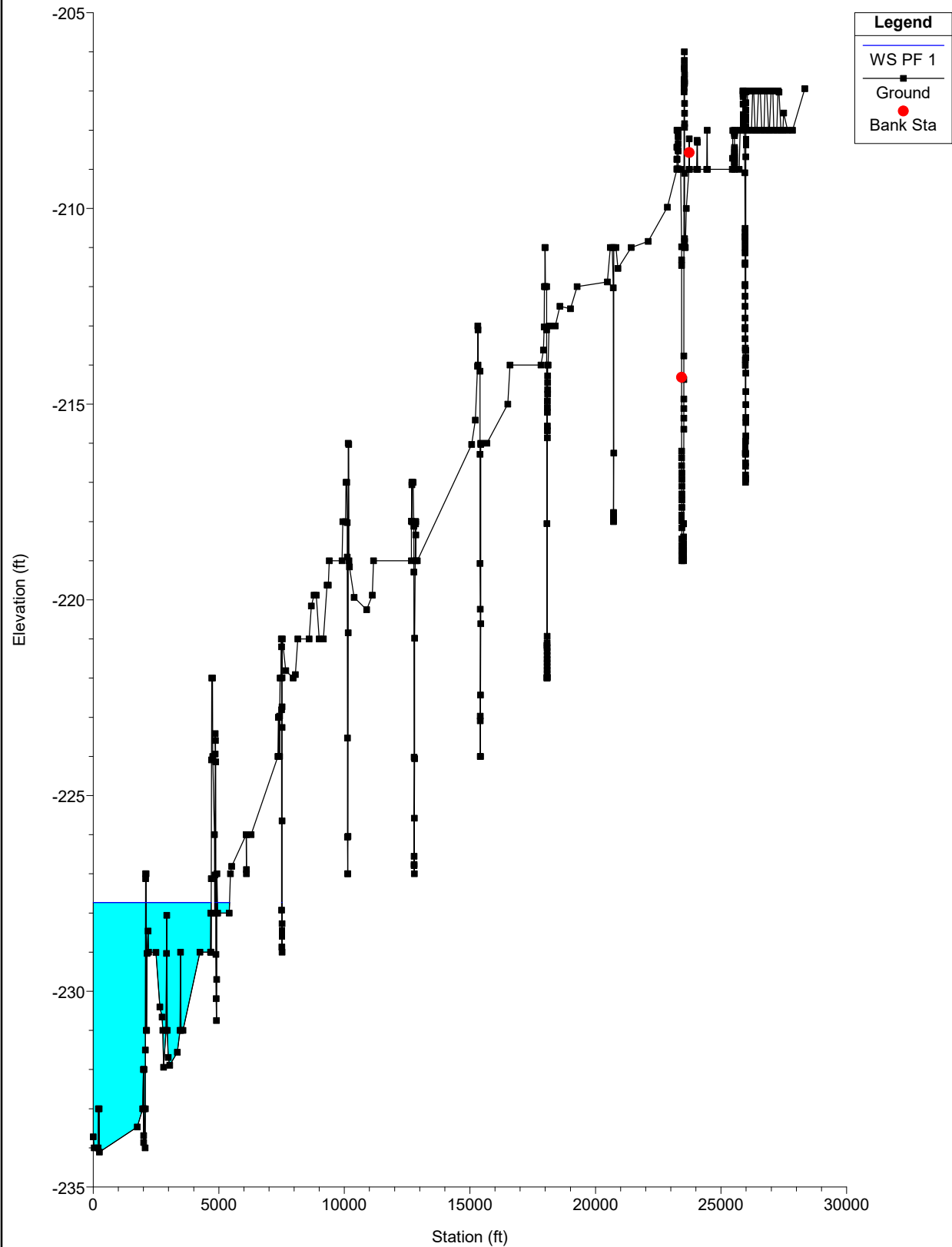




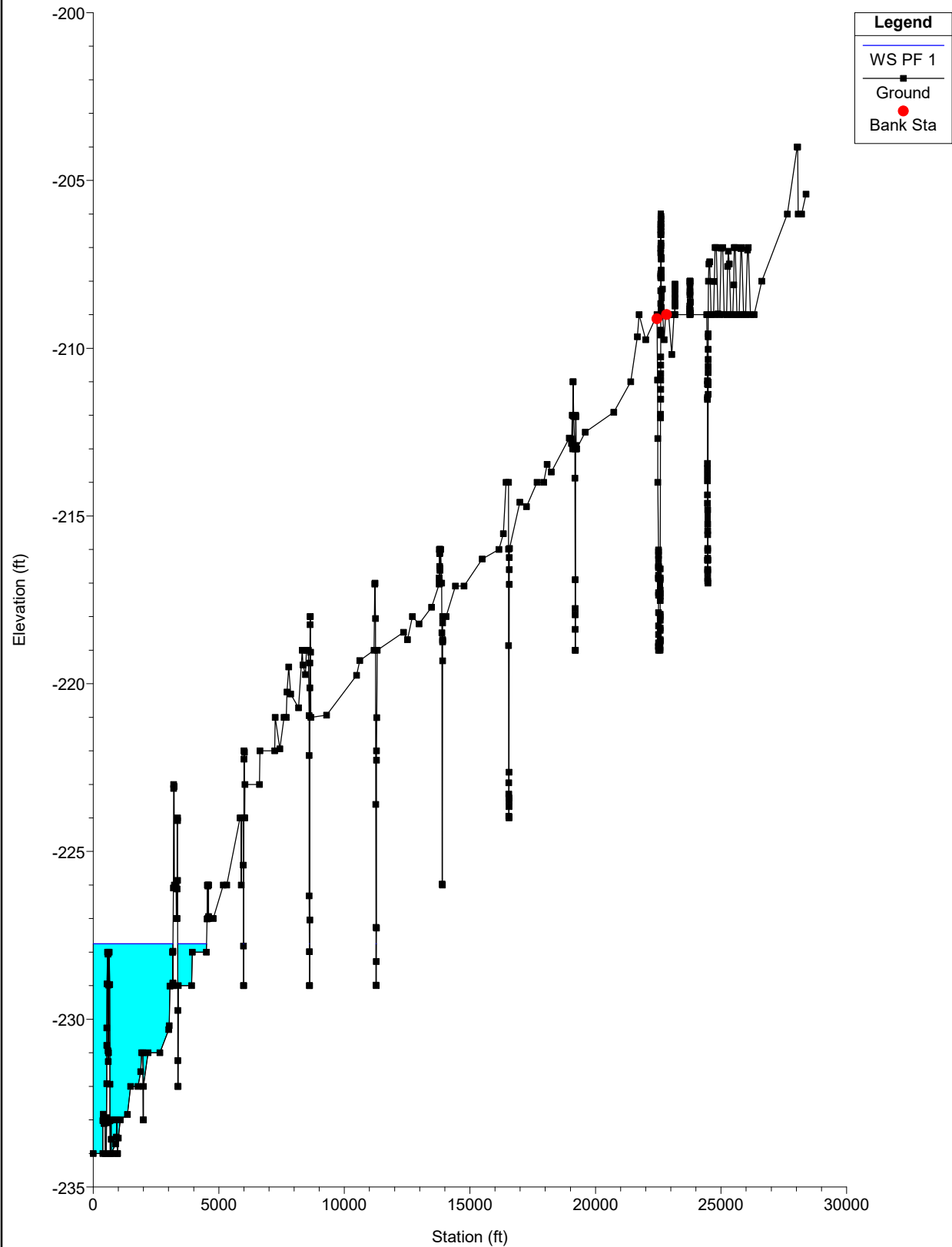
Alamo Creek Plan: AlamoRiver 9/5/2022

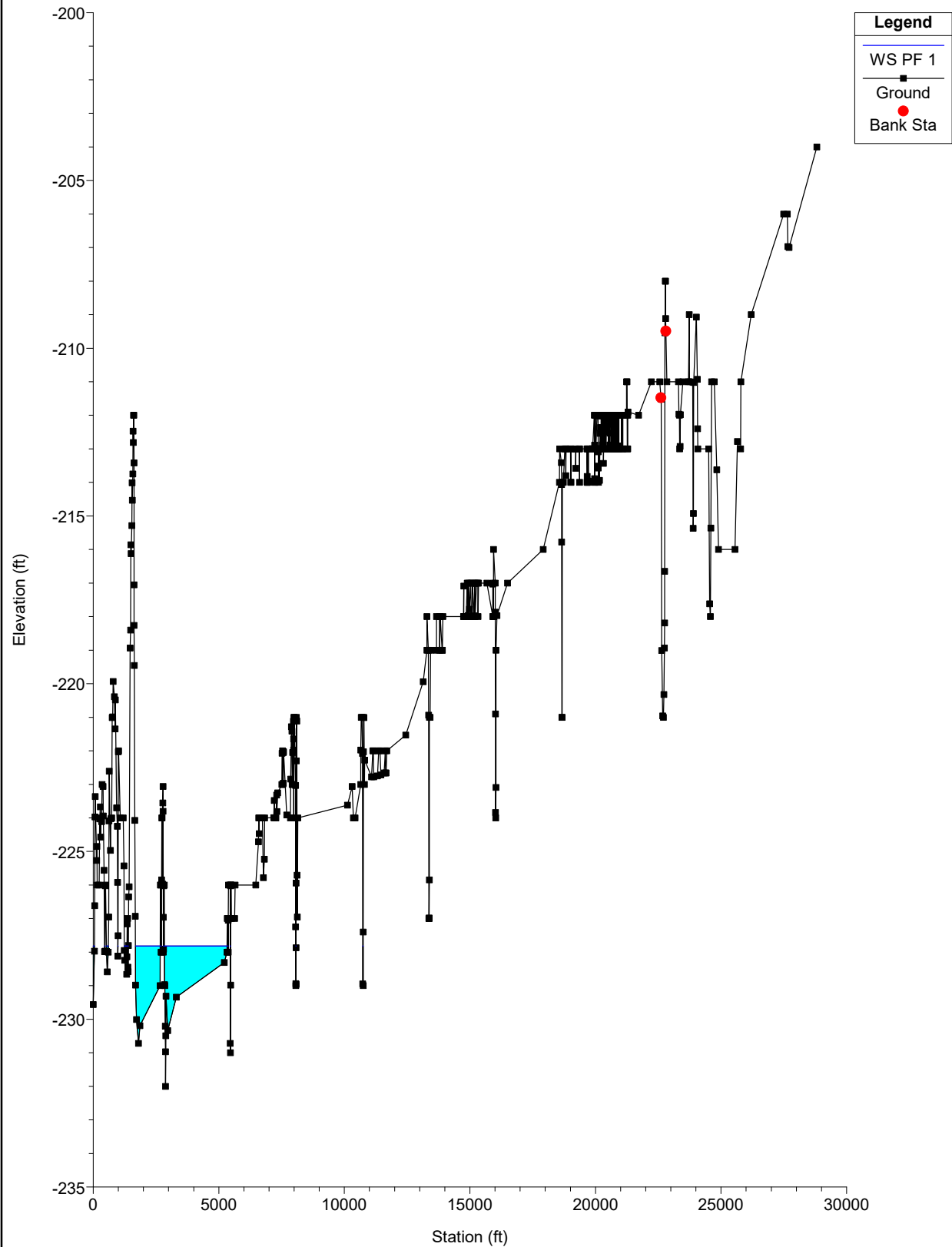


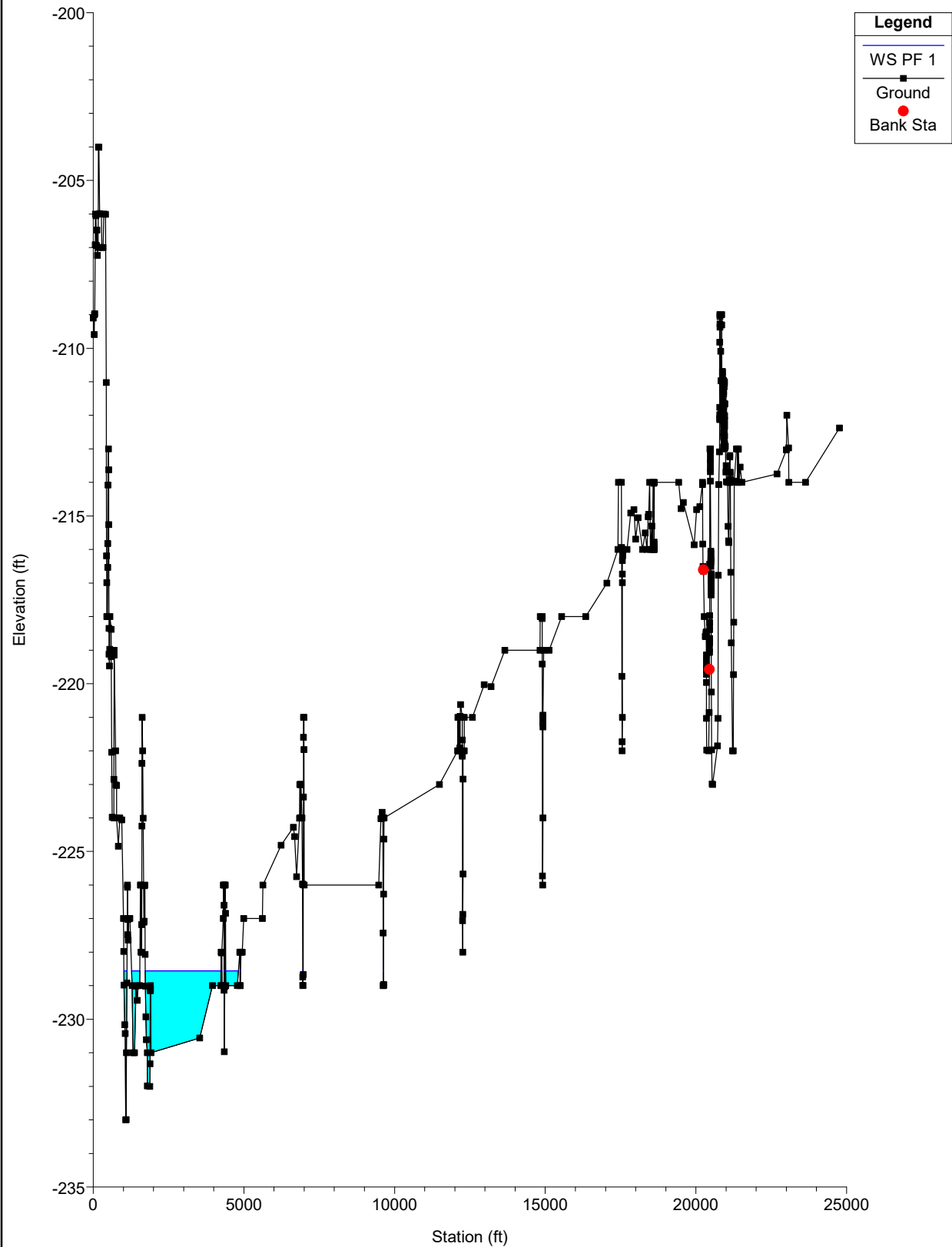


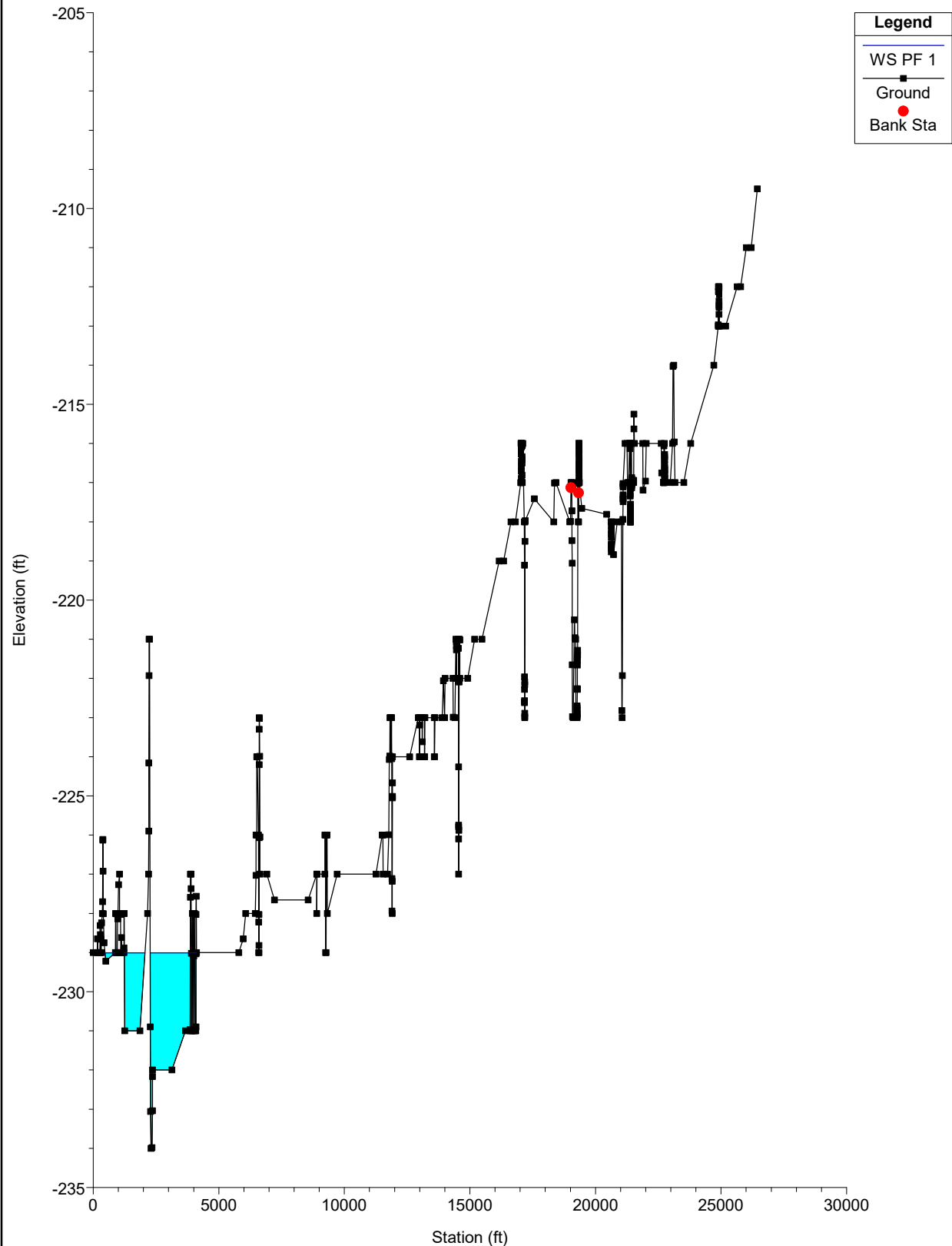


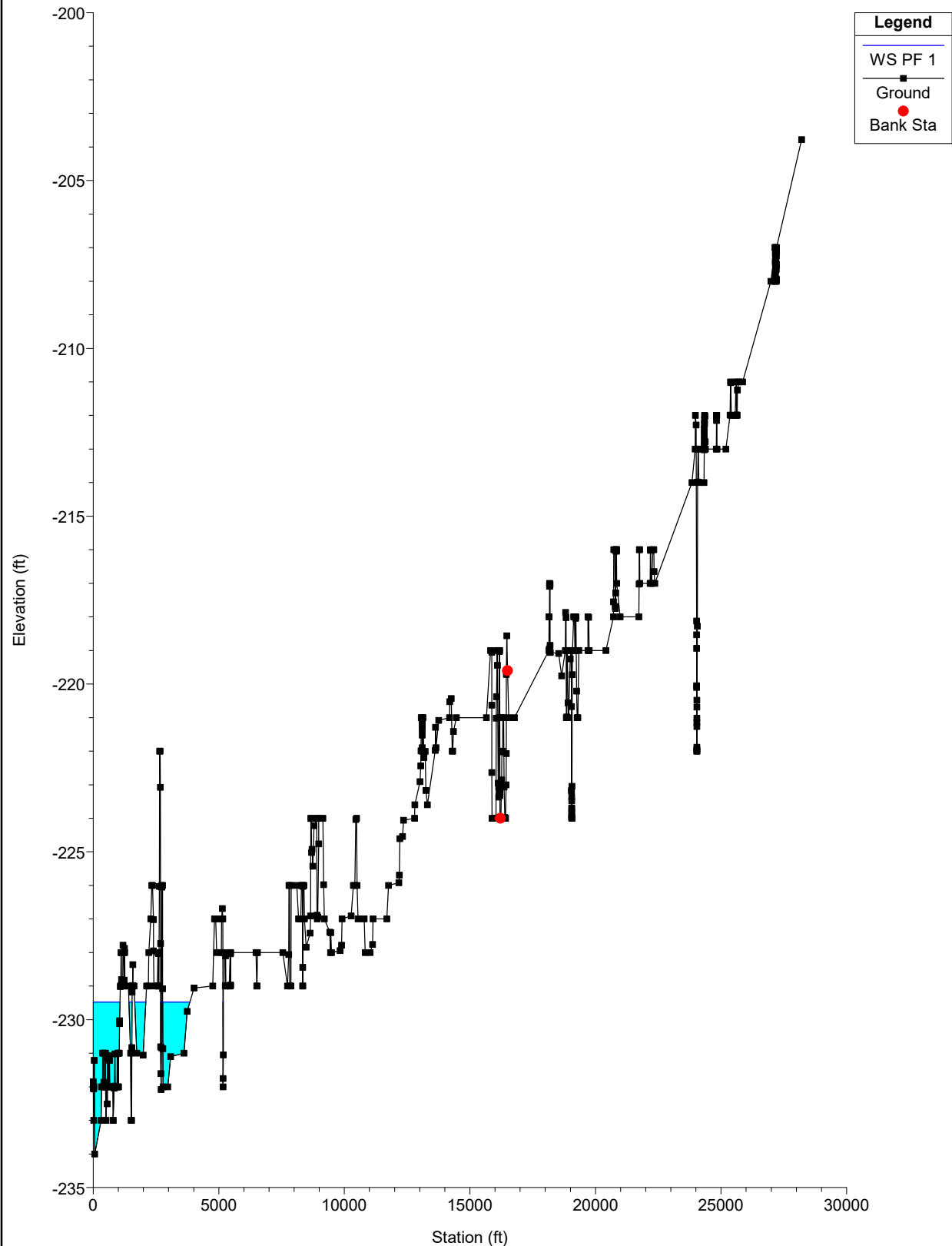
Alamo Creek Plan: AlamoRiver 9/5/2022

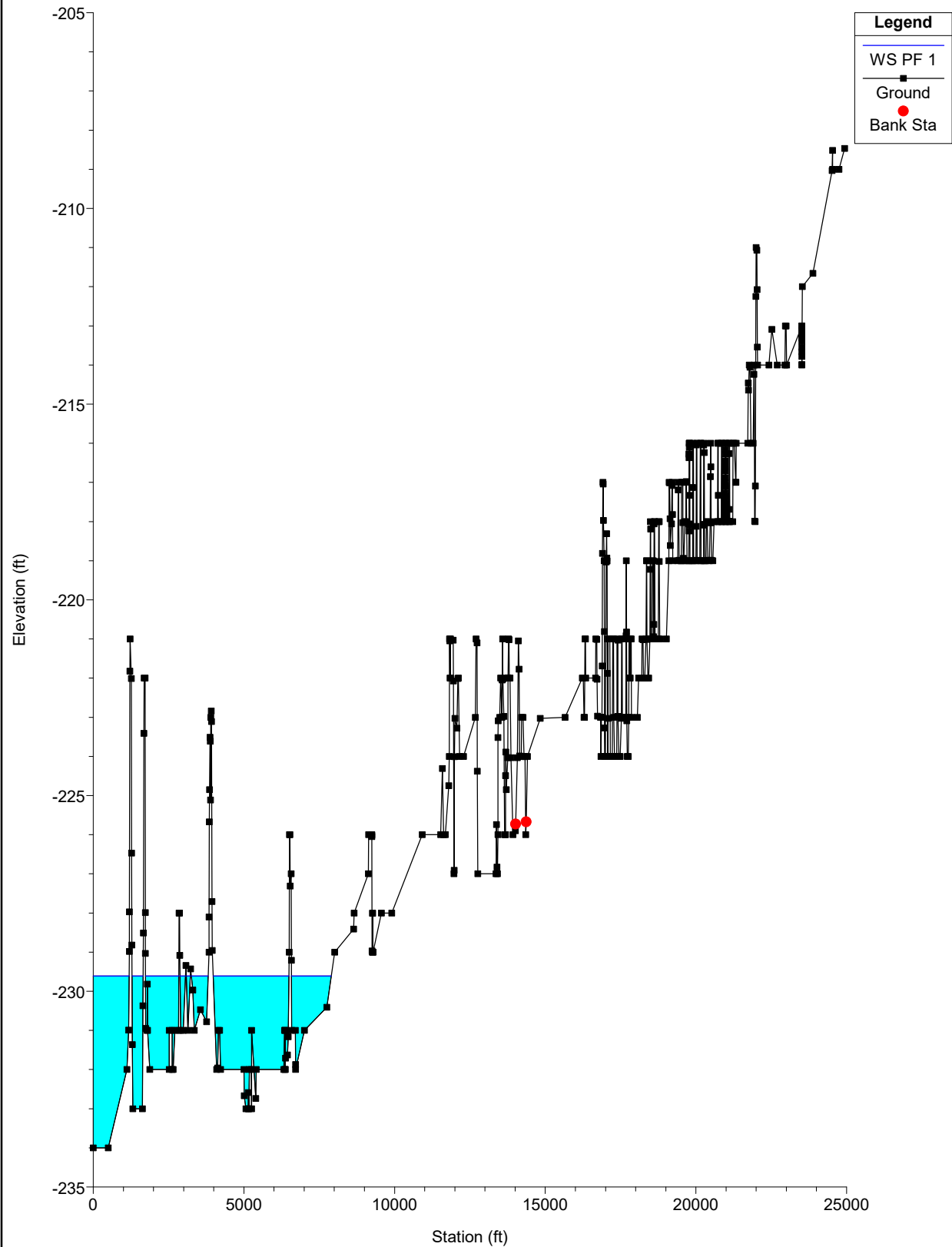


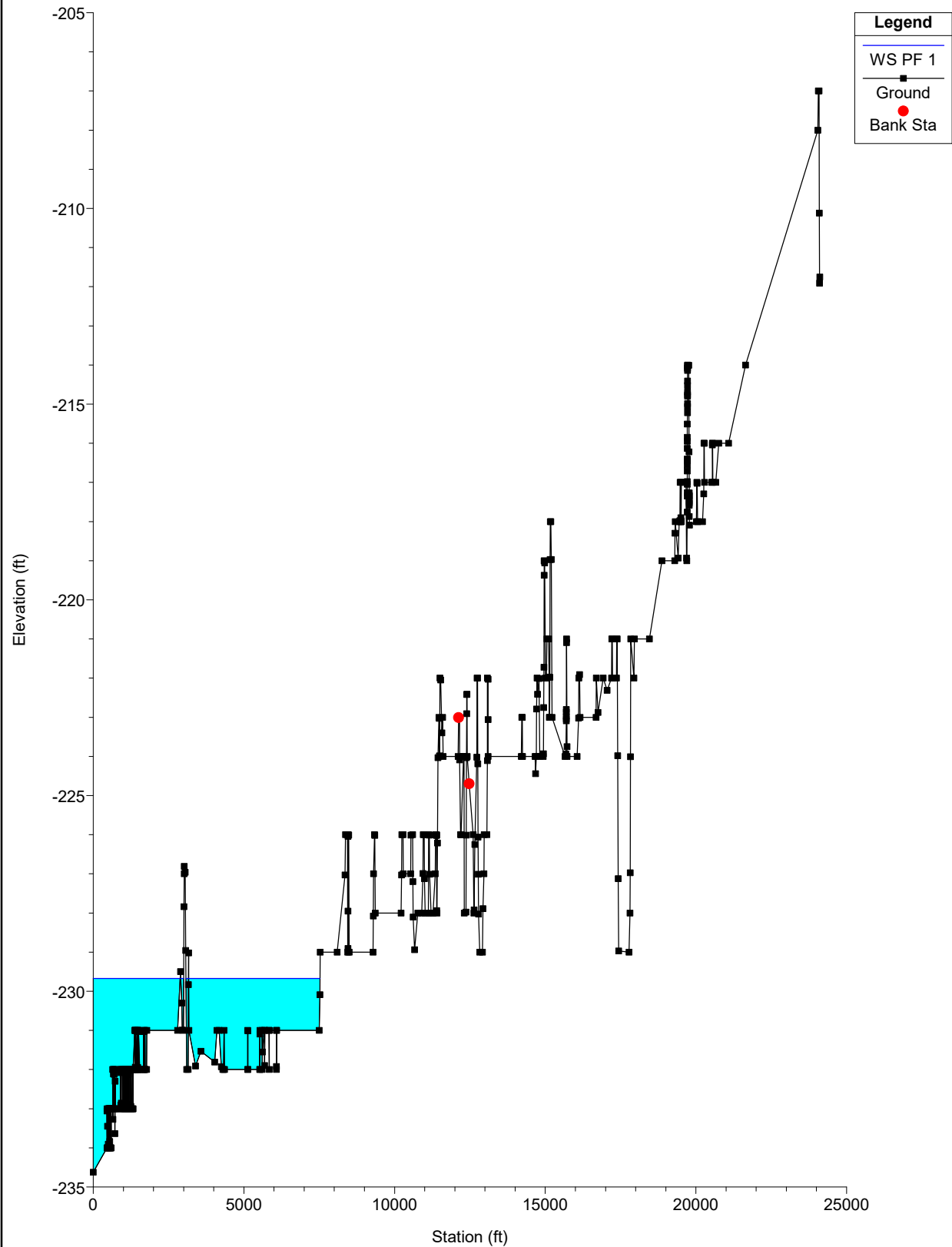


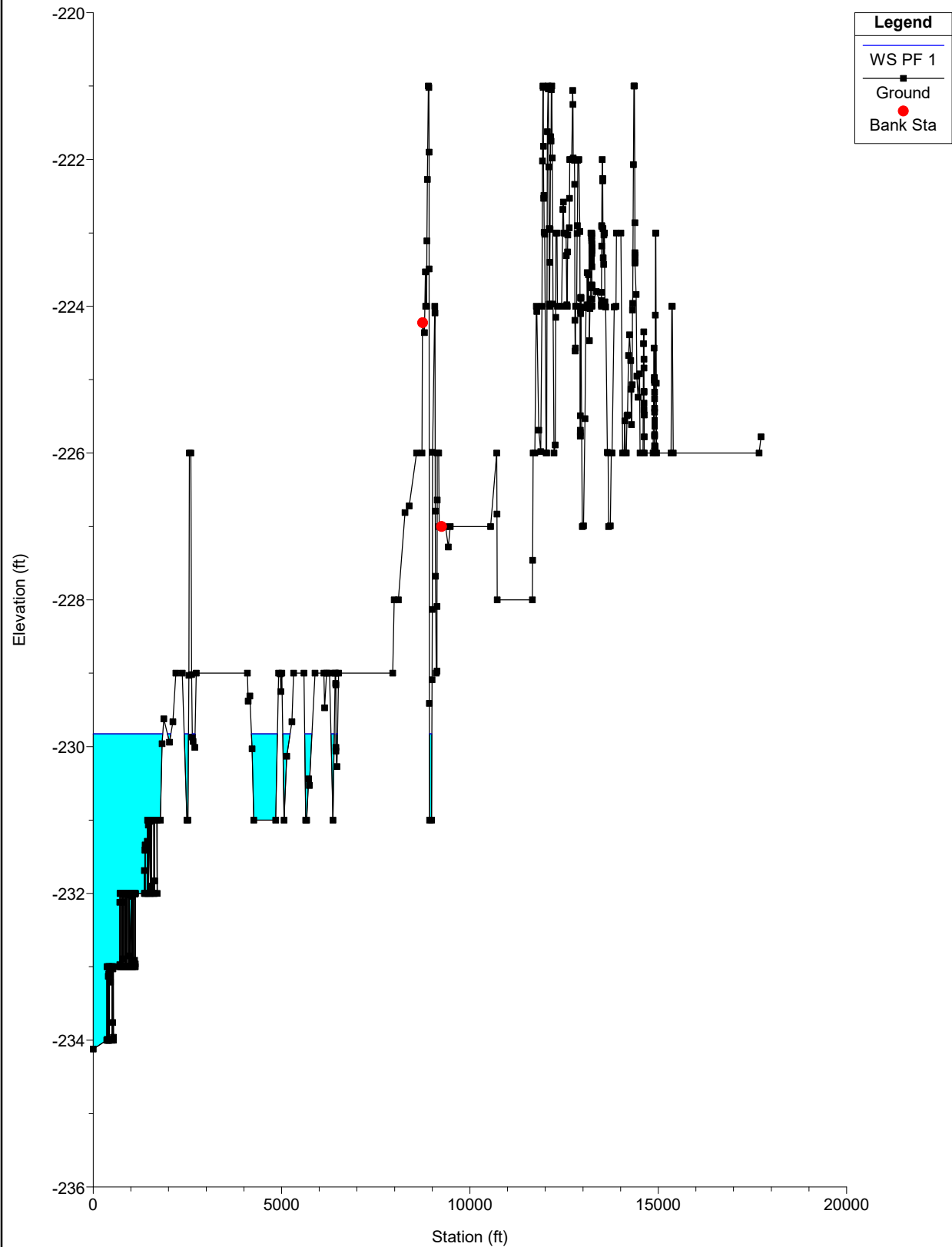


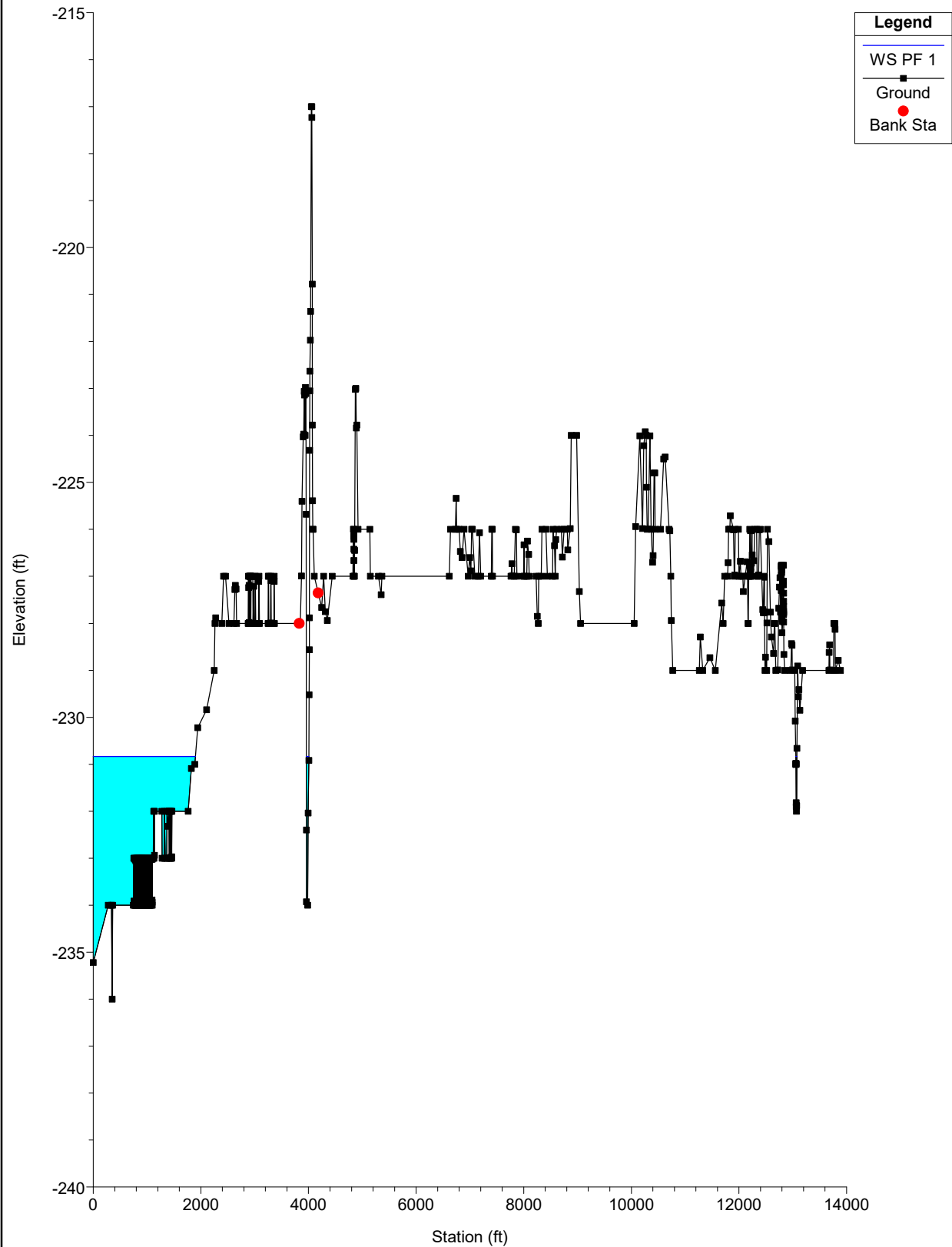


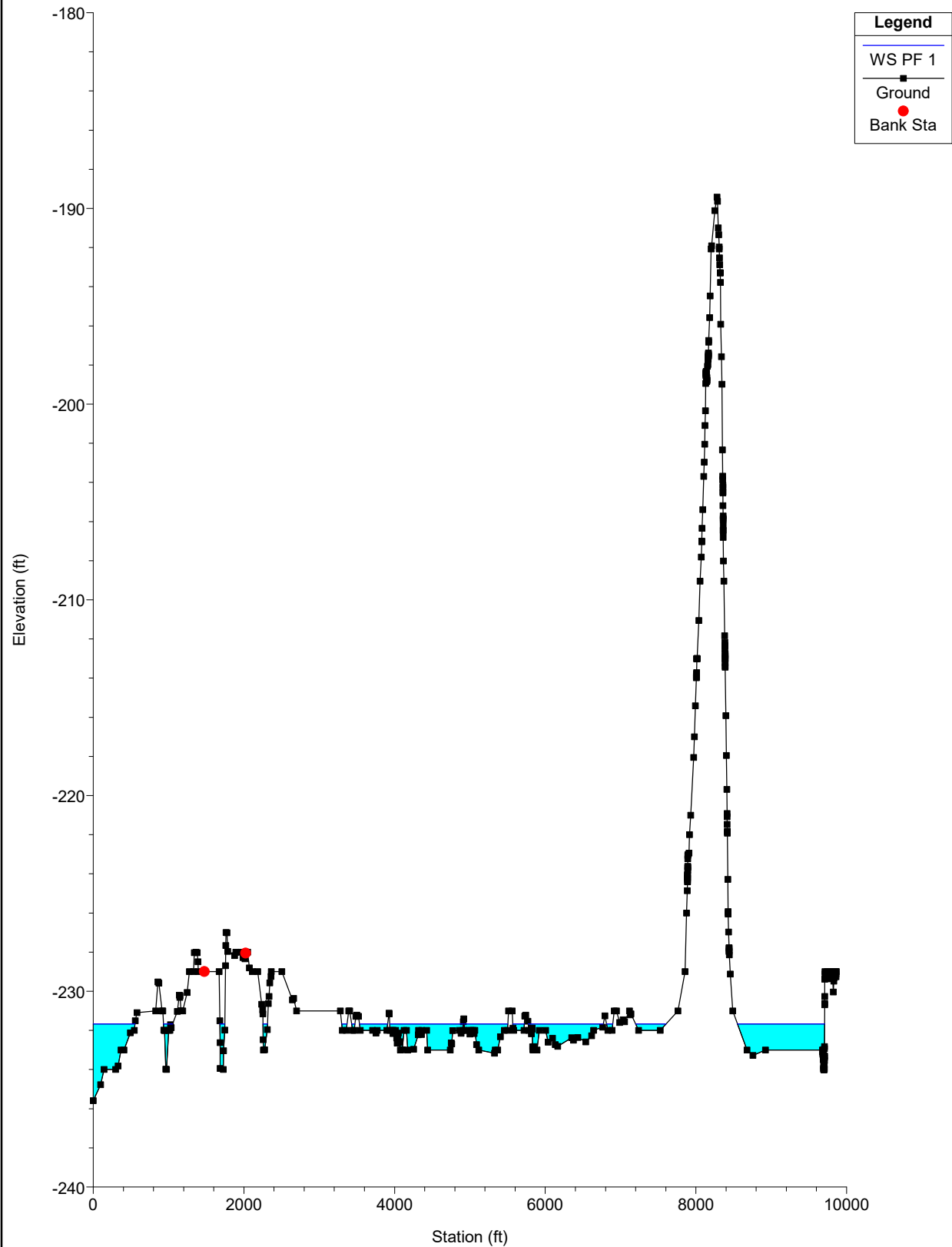












HEC-RAS HEC-RAS 5.0.7 March 2019
 U.S. Army Corps of Engineers
 Hydrologic Engineering Center
 609 Second Street
 Davis, California

```

X      X  XXXXXX   XXXX      XXXX      XX      XXXX
X      X  X        X   X      X   X      X   X      X
X      X  X        X        X   X      X   X      X
XXXXXXXX XXXX      X        XXX XXXX      XXXXXX   XXXX
X      X  X        X        X   X      X   X      X
X      X  X        X   X      X   X      X   X      X
X      X  XXXXXX   XXXX      X   X      X   X      XXXXX
  
```

PROJECT DATA

Project Title: Alamo Creek
 Project File : AlamoCreek.prj
 Run Date and Time: 9/5/2022 2:46:32 PM

Project in English units

PLAN DATA

Plan Title: AlamoRiver

Geometry Title: Alamo Creek

Flow Title : Alamo River

Plan Summary Information:

Number of: Cross Sections	=	16	Multiple Openings	=	0
Culverts	=	0	Inline Structures	=	0
Bridges	=	0	Lateral Structures	=	0

Computational Information

Water surface calculation tolerance = 0.01
 Critical depth calculation tolerance = 0.01

Maximum number of iterations	=	20
Maximum difference tolerance	=	0.3
Flow tolerance factor	=	0.001

Computation Options

Critical depth computed only where necessary	
Conveyance Calculation Method:	At breaks in n values only
Friction Slope Method:	Average Conveyance
Computational Flow Regime:	Subcritical Flow

FLOW DATA

Flow Title: Alamo River

Flow Data (cfs)

River	Reach	RS	PF 1
Alamo River	Alamo River	37000	4500

Boundary Conditions

River	Reach	Profile	Upstream
Downstream			
Alamo River	Alamo River	PF 1	

Normal S = 0.0005

GEOMETRY DATA

Geometry Title: Alamo Creek

CROSS SECTION

RIVER: Alamo River	
REACH: Alamo River	RS: 37000

INPUT

Description:

Station Elevation Data		num=		232					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
27012.3	-203	27017.2	-203	27037	-203.97	27051.5	-204	27051.5	-204.01
27052.4	-204.33	27052.6	-204.41	27053.2	-204.66	27053.6	-204.83	27054	-204.98
27054.6	-205.25	27054.8	-205.31	27055.3	-205.52	27056.7	-205.84	27068.1	-204.03
27078.5	-204	27083.2	-205.9	27088	-208.93	27093.1	-211.38	27093.4	-211.5
27095.3	-212.05	27104.2	-212.98	27183.5	-213	27208.8	-210.98	27216.1	-209.12
27226.5	-207.39	27229.1	-206.78	27229.2	-206.75	27229.4	-206.64	27230.2	-206.19
27230.7	-206.06	27230.8	-206.02	27231.3	-205.91	27256.2	-203.03	27266.6	-199.11
27271.3	-198.24	27272.8	-198	27272.9	-198	27274.2	-198	27274.5	-198
27274.9	-198	27275.3	-198.07	27275.7	-198.16	27276.1	-198.27	27281.4	-200.97
27282.2	-201.25	27282.6	-201.36	27282.9	-201.44	27283.2	-201.52	27283.4	-201.57
27284	-201.75	27284.2	-201.8	27284.2	-201.81	27285	-201.98	27285.3	-202.03
27294.4	-202.534	27302.8	-203	27310.4	-202.98	27310.9	-202.93	27311.7	-202.76
27312.3	-202.6	27312.6	-202.53	27313.3	-202.33	27313.3	-202.31	27313.4	-202.3
27313.5	-202.27	27314.2	-202.08	27314.4	-202.02	27315.8	-201.29	27316.4	-201
27316.6	-201	27317.2	-201	27317.4	-201	27317.5	-201	27317.6	-201
27318.2	-201	27318.5	-201	27319	-201	27319.6	-201	27322.3	-201.04
27322.7	-201.05	27323.1	-201.25	27324.8	-202.03	27327.9	-203	27338.5	-202.87
27345	-201	27349.7	-201	27355.9	-203	27367.3	-203	27367.7	-202.95
27368.2	-202.87	27368.4	-202.84	27371.7	-201.24	27375	-201	27379.8	-201
27385.6	-202.8	27387.1	-203	27395.2	-203	27395.7	-202.9	27396	-202.78
27396.4	-202.64	27399.6	-201	27401.7	-201	27406.6	-201.01	27409.9	-202.32
27414.5	-203	27422.4	-202.99	27427.8	-201.89	27428.6	-201.5	27429	-201.35
27429.7	-201	27430.1	-201	27436.6	-201	27444.2	-203	27450.5	-202.94
27453.6	-202.18	27456.7	-201	27456.8	-201	27457.3	-201	27457.6	-201
27457.7	-201	27463.7	-201.15	27468.1	-203	27479.5	-203	27483.7	-202.06
27485.8	-201	27486.8	-201	27487.6	-201	27487.9	-201	27488.3	-201
27494.1	-201	27499.3	-203	27508.5	-203	27512.7	-201.17	27514.3	-201
27520	-201	27522.1	-202	27527.3	-203	27535.5	-203	27537.1	-202.76
27537.4	-202.64	27537.7	-202.53	27537.9	-202.47	27540.8	-201	27548.4	-201
27553.3	-202.76	27561.6	-203	27566.4	-201.79	27571	-199	27574.1	-199.2
27578.4	-201.84	27583.4	-203	27592.4	-202.93	27597	-201	27597.5	-201
27597.9	-201	27598.7	-201	27599	-201	27599.5	-201	27599.6	-201
27606.3	-201	27611.5	-203	27619.9	-202.99	27620.8	-202.83	27621.4	-202.64
27622.2	-202.34	27622.8	-202.1	27624.6	-201.01	27625	-200.81	27625.4	-200.6
27626	-200.31	27626.2	-200.21	27627.1	-199.85	27628.6	-199.2	27628.7	-199.16
27629.2	-199	27629.5	-199	27630	-199	27630.2	-199	27630.3	-199.03
27630.7	-199.13	27639.5	-203	27650.3	-202.99	27656	-201.04	27660.2	-201
27662.7	-201.15	27663.3	-201.37	27663.5	-201.48	27663.9	-201.63	27665.2	-201.99
27671.6	-202.31	27709.2	-202	27739.3	-203	27911	-203	27953.3	-202
27987.6	-202	28012.9	-203	28197.4	-203	28246.3	-202.09	28367.8	-204
28507	-202	28542.2	-202	28588.1	-203	28715.7	-203	28751.3	-202.03
28802.1	-202	28817	-201.07	28827	-201	28864.4	-202	28870.7	-206.21
28876.9	-209	28887.5	-208.88	28895.6	-204.11	28896.4	-203.77	28896.6	-203.69
28897	-203.55	28897.2	-203.45	28897.7	-203.28	28898.1	-203.18	28898.4	-203.07
28898.7	-203	28914.3	-203	28918.7	-204	28922.4	-204	29049.4	-203

30050.9	-201.81	30267.9	-201	30322	-201.01	30330.3	-202	30374.9	-202.62
30765.6	-201.56	31533.1	-201						

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
27012.3	.045	27012.3	.036	27294.4	.045

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	27012.3	27294.4		952	929.5	971.1		.1	.3

CROSS SECTION

RIVER: Alamo River
 REACH: Alamo River RS: 36071

INPUT

Description:

Station Elevation Data		num=		452					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	-232	30.6	-231.98	47.6	-231	444.6	-231	1261.6	-229
1478.8	-229	1771.5	-228	1782.6	-228	1786.6	-229	1790.6	-227.21
1792.5	-227	1810.6	-227	1817.6	-229	1829.6	-229	1834.6	-226
1852.6	-226	1865.6	-228.03	1888.6	-229	3100.6	-228	3130.6	-227.81
3156.6	-227	3165.6	-227	3168.6	-228	3179.5	-228	3181.6	-227
3196.9	-227.01	3216.6	-228.91	3223.6	-229	3360.6	-228	4140.3	-227
4481.6	-226	4525.6	-224	4529.6	-224	4535.6	-227	4546.6	-227
4550.6	-224	4554.6	-223	4587.6	-223	4591.9	-224	5411.6	-224
5419.8	-223.42	5425.6	-224	6399.7	-224	6531.7	-223.34	6865.7	-223.12
7006.7	-223.34	7087.7	-224	7097.7	-222.03	7123.4	-222	7128.4	-220.69
7152.3	-220.32	7176.7	-222.12	7181.7	-222.97	7183.7	-224	7193.7	-224
7197.7	-222	7240.7	-221.95	7255.7	-219	7335.7	-218.88	7344.7	-218.31
7349.5	-218.95	7356.7	-219	7368	-218	7542.7	-218	7556.7	-217.53
7656.7	-217	7857.7	-217	7931.7	-216.31	8061.4	-216	8389.7	-216
8390.7	-216.16	8395.7	-219	8428.7	-219	8431.8	-218.01	8433.8	-218
8437.7	-219	8441.7	-219	8443.7	-218	8465.6	-219	8485.7	-219
8488.5	-217.11	8489.7	-216.77	8548.7	-217	8551.3	-217.45	8553.7	-218.99
8565.7	-219	8571.7	-217.92	8585.7	-218	8592.7	-216.93	8610.7	-216
9009.7	-216	9212	-215.41	9296.7	-215.9	9338.7	-215.48	9347.5	-216.12
9349.7	-217.84	9349.8	-217.85	9350.6	-217.99	9357.7	-218	9367.6	-217.34
9379.7	-217.41	9389.6	-214.5	9391.7	-214.43	9402.6	-215.27	9407.7	-214.74
9413.7	-217.32	9415.8	-216.89	9417.7	-216	9420.9	-215.99	9430.5	-214.44
9432.7	-214.5	9438.7	-216.38	9442.4	-216.05	9447.7	-216.92	9455.7	-215.15
9463.7	-214.92	9477.7	-215.98	9479.7	-216.31	9482.7	-218	9486.7	-218
9488.7	-217.53	9493.2	-215.32	9498.7	-214	9713.7	-214	9715.7	-214.81
9718.7	-214.63	9723.7	-215.26	9726.7	-217	9751.3	-216.98	9767.7	-216
9777.4	-216	9780.7	-217	9785.7	-217	9788.7	-216	9836.7	-216
9837.7	-216.12	9838.7	-216.69	9843.7	-221.16	9847.7	-222.68	9849.7	-222.85
9854.7	-220.82	9860.7	-216	11289.7	-216	11384.4	-214.36	11839.7	-214.79
11875.7	-214.39	11914.7	-214.87	12127.8	-214.71	12286.7	-215.21	12334.7	-214.64