Project Report Appendices

The following section contains the appendices as listed in the Utah FEMA HQ QL1/QL2 2018 LiDAR Project Report.

Appendix A

Flight Logs

There were 46 total lifts. Available flight logs for 38 lifts are found on the following pages.

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April 21, 2018 A (SN8227, N22GE)

Airborne LiDAR Data Collection Log Sheet :: Quantum Spatial, Inc

(email log daily to flight_log_distribution_list@quantumspatial.com)

Date: 4-21-18

Lift: (A) B C D E Pg 1 of 1

Project: UINTAH HERBER QL2 Proj #: 33116 Flight Mgmt File: 20180421-150552

Aircraft: N22GE Begin Hobbs: 9472.4 End Hobbs: 9474.7 Total: 2.3 Pilot: RADKTE Co-Pilot: — Tech: Schoone

Dep Apt: KVEL Dep Time (Lcl): 09:18 (Z): 15:18 Arr Apt: KVEL Arr Time (Local): 11:38 (Z): 17:38 Tot Time Aloft:

CORS: (Y) / N Sta 1: PPP Sta 2: Flyovers: Y / (N) If Y, times: Sta1) Sta2)

GPS Unit: Y / (N) Sta 1: Sta 2: Flyovers: Y / (N) If Y, times: Sta1) Sta2)

Gd Temp beg: 8 °c End: 12 °c OAT beg: -3 °c End: -3 °c Altimeter begin: 30.18 end: 30.18

LiDAR	Type	Serial #	Alt AGL	Alt AMSL	Avg Terr Ht	Max Gdspd	Avg Pt Spacing
	ALS-80	8227	2200M			140	
	FOV 40	Scan Freq 52	MpiA (Y) / N	Pulses In Air 2	Pulse Rate 288	Power 100%	PPSM 2

BLK-A Beg GB 11 End GB 34 Tot GB 23 Storage Name/# 146

Line #	Hdg	Start (UTC):	End (UTC):	Gd Spd	PDOP/# Sats	GPS Altitude	Crab	Turb (0, -, +)	FLIGHT LINE NOTES – visibility, clouds, smoke, partial, etc.
~~117~~	270					12080			BLOCK A 130 Go-CUE
111	177	15:49	15:52	160	1.4/16	11207	+1		CLEAR- LIGHT TURB V 10+
110	357	15:58	16:05	145	1.6/16	11207	-2		
109	177	16:08	16:14	157	1.1/19	11214	+2		
108	357	16:18	16:25	144	1.0/20	11217	+1		
107	177	16:28	16:35	160	1.1/19	11234	+2		
106	357	16:38	16:45	145	1.2/19	11243	-2		
105	177	16:48	16:54	155	1.2/20	11257	0		
104	357	16:58	17:04	146	1.1/21	11260	-3		
103	177	17:07	17:14	161	1.2/20	11276	+1		CLOUD SHADOW/CUE 14.5 FSE
UL001	86	17:22	17:24	160	1.2/19	11263	—		XTIE

Total Proj Lines: A = 187 Lines Flown: 9 Lines Remain: 178 Online Time: 1.6 Mob Time: Notes:

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April 22, 2018 A (SN8227, N22GE)

Airborne LiDAR Data Collection Log Sheet :: Quantum Spatial, Inc

Date: 4-22-18

(email log daily to flight_log_distribution_list@quantumspatial.com)

Life: A B C D E Pg 1 of 2

Project: UINTAH HERBER QL2 Proj #: 33116 FLight Mgmt File: 20180422-131941

Aircraft: N22GE Begin Hobbs: 94741.7 End Hobbs: 94776 Total: 2.9 Pilot: RADTKE Co-Pilot: — Tech: Schoone

Dep Apt: KVEL Dep Time (Lcl): 07:22 (Z): 13:22 Arr Apt: KVEL Arr Time (Local): 10:25 (Z): 16:24 Tot Time Aloft:

CORS: (Y) / N Sta 1: PPP Sta 2: Flyovers: Y / (N) If Y, times: Sta1) Sta2)

GPS Unit: Y / (N) Sta 1: Sta 2: Flyovers: Y / (N) If Y, times: Sta1) Sta2)

Gd Temp beg: 06 °c End: 14 °c OAT beg: -4 °c End: -3 °c Altimeter begin: 30.21 end: 30.20

LiDAR	Type	Serial #	Alt AGL	Alt AMSL	Avg Terr Ht	Max Gdspd	Avg Pt Spacing
	ALS-80	8227	2200m			140	
	FOV 40	Scan Freq 52	MpiA (Y) / N	Pulses In Air 2	Pulse Rate 288	Power 100%	PPSM 2

BLK-A

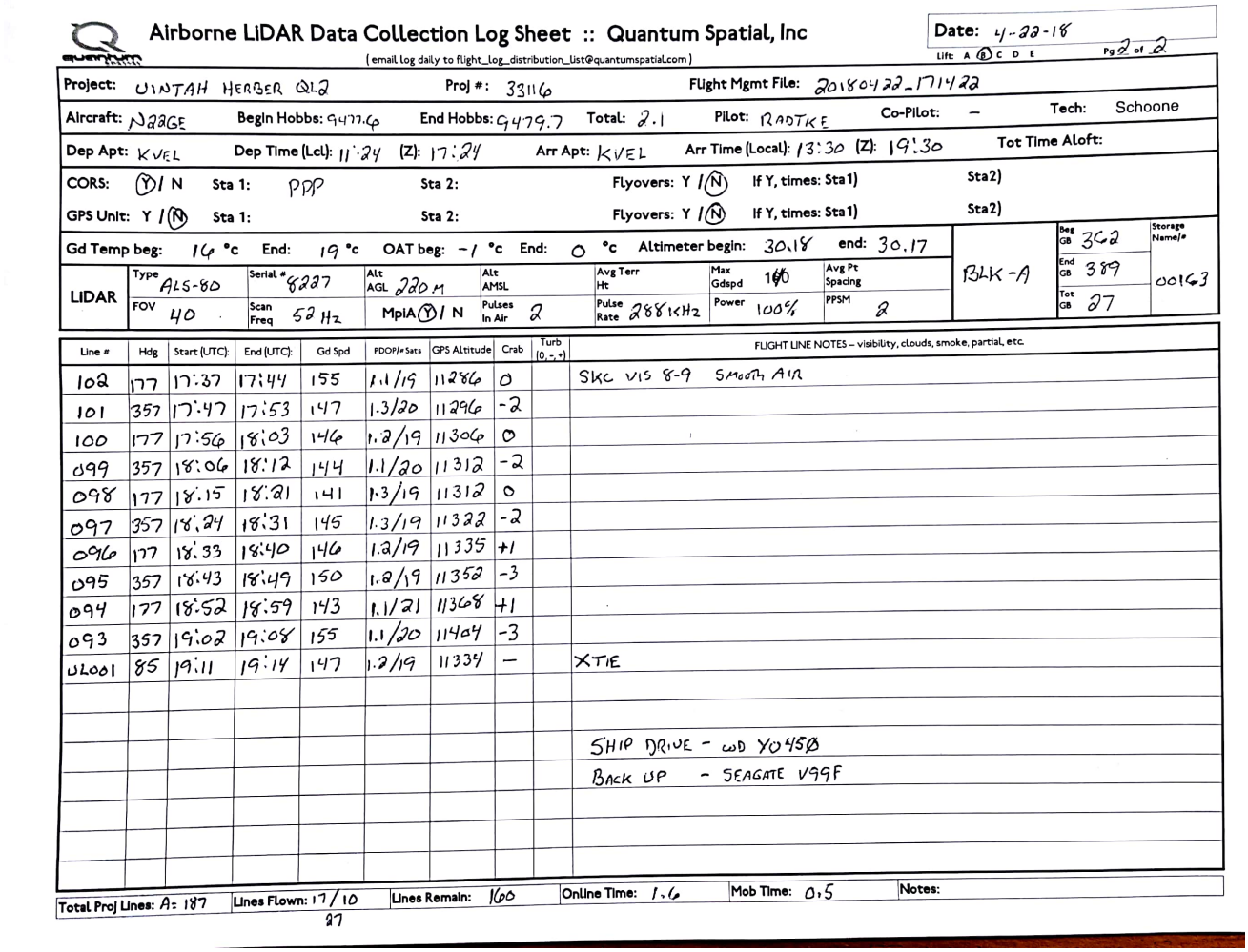
Beg GB	End GB	Tot GB	Storage Name/#
311	362	51	00163

Line #	Hdg	Start (UTC):	End (UTC):	Gd Spd	PDOP/# Sats	GPS Altitude	Crab	Turb (0, -, +)	FLIGHT LINE NOTES – visibility, clouds, smoke, partial, etc.
015	270	13:42	13:56	156	1.1/20	12287	0		SKC VIS +9 SMOOTH AIR
016	90	14:00	14:15	144	1.0/21	12165	0		
017	270	14:18	14:33	141	1.1/19	12080	0		
018	90	14:37	14:53	149	1.2/18	12008	+1		
019	270	14:56	15:12	147	1.2/17	11942	-1		
020	90	15:15	15:31	149	1.2/17	11912	0		
021	270	15:34	15:49	144	1.1/17	11883	-1		LIGHT TURB W. END
022	90	15:52	16:08	148	1.2/17	11850	0		" "
ULOO1	358	16:11	16:13	154	1.0/18	12082	—		XTIE
									SHIP DRIVE - WD Y045Ø
									BACK UP - SEAGATE 1V9F

Total Proj Lines: A = 187 Lines Flown: 9/8/17 Lines Remain: 170 Online Time: 2.5 Mob Time: 0.4 Notes:

Scanned by CamScanner

April 22, 2018 B (SN8227, N22GE)



Airborne LiDAR Data Collection Log Sheet :: Quantum Spatial, Inc

(email log daily to flight_log_distribution_list@quantumspatial.com)

Date: 4-22-18 Lift: A (B) C D E Pg 2 of 2

Project: UINTAH HERBER QL2 Proj #: 33116 Flight Mgmt File: 20180422_171422

Aircraft: N22GE Begin Hobbs: 9477.6 End Hobbs: 9479.7 Total: 2.1 Pilot: RADTKE Co-Pilot: – Tech: Schoone

Dep Apt: KVEL Dep Time (Lcl): 11:24 (Z): 17:24 Arr Apt: KVEL Arr Time (Local): 13:30 (Z): 19:30 Tot Time Aloft:

CORS: (Y) / N Sta 1: PPP Sta 2: Flyovers: Y / (N) If Y, times: Sta1) Sta2)

GPS Unit: Y / (N) Sta 1: Sta 2: Flyovers: Y / (N) If Y, times: Sta1) Sta2)

Gd Temp beg: 16 °c End: 19 °c OAT beg: -1 °c End: 0 °c Altimeter begin: 30.18 end: 30.17

LiDAR	Type ALS-80	Serial # 8227	Alt AGL 220 M	Alt AMSL	Avg Terr Ht	Max Gdspd 160	Avg Pt Spacing
	FOV 40	Scan Freq 52 Hz	MpiA (Y) / N	Pulses In Air 2	Pulse Rate 288 kHz	Power 100%	PPSM 2

BLK-A | Beg GB 362 | End GB 389 | Tot GB 27 | Storage Name/# 00163

Line #	Hdg	Start (UTC):	End (UTC):	Gd Spd	PDOP/# Sats	GPS Altitude	Crab	Turb (0, -, +)	FLIGHT LINE NOTES – visibility, clouds, smoke, partial, etc.
102	177	17:37	17:44	155	1.1/19	11286	0		SKC VIS 8-9 SMOOTH AIR
101	357	17:47	17:53	147	1.3/20	11296	-2		
100	177	17:56	18:03	146	1.2/19	11306	0		
099	357	18:06	18:12	144	1.1/20	11312	-2		
098	177	18:15	18:21	141	1.3/19	11312	0		
097	357	18:24	18:31	145	1.3/19	11322	-2		
096	177	18:33	18:40	146	1.2/19	11335	+1		
095	357	18:43	18:49	150	1.2/19	11352	-3		
094	177	18:52	18:59	143	1.1/21	11368	+1		
093	357	19:02	19:08	155	1.1/20	11404	-3		
UL001	85	19:11	19:14	147	1.2/19	11334	–		XTIE
									SHIP DRIVE - WD Y0450
									BACK UP - SEAGATE V99F

Total Proj Lines: A: 187 | Lines Flown: 17/10 27 | Lines Remain: 160 | Online Time: 1.6 | Mob Time: 0.5 | Notes:

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April 22, 2018 C (SN8227, N22GE)

Airborne LiDAR Data Collection Log Sheet :: Quantum Spatial, Inc

(email log daily to flight_log_distribution_list@quantumspatial.com)

Date: 4-22-2018 Lift: A B (C) D E Pg 1 of 1

Project: Uintah Herber QL2 Proj #: 33116 Flight Mgmt File: 20180422-205205

Aircraft: 22GE Begin Hobbs: 9479.7 End Hobbs: 9483.7 Total: Pilot: Lee Co-Pilot: Tech: Cox

Dep Apt: KUEL Dep Time (Lcl): 3:05 (Z): 21:05 Arr Apt: KUEL Arr Time (Local): 7:05 (Z): 01:05 Tot Time Aloft: 4.0

CORS: (Y) / N Sta 1: PPP Sta 2: Flyovers: Y / N If Y, times: Sta1) Sta2)

GPS Unit: Y / N Sta 1: Sta 2: Flyovers: Y / N If Y, times: Sta1) Sta2)

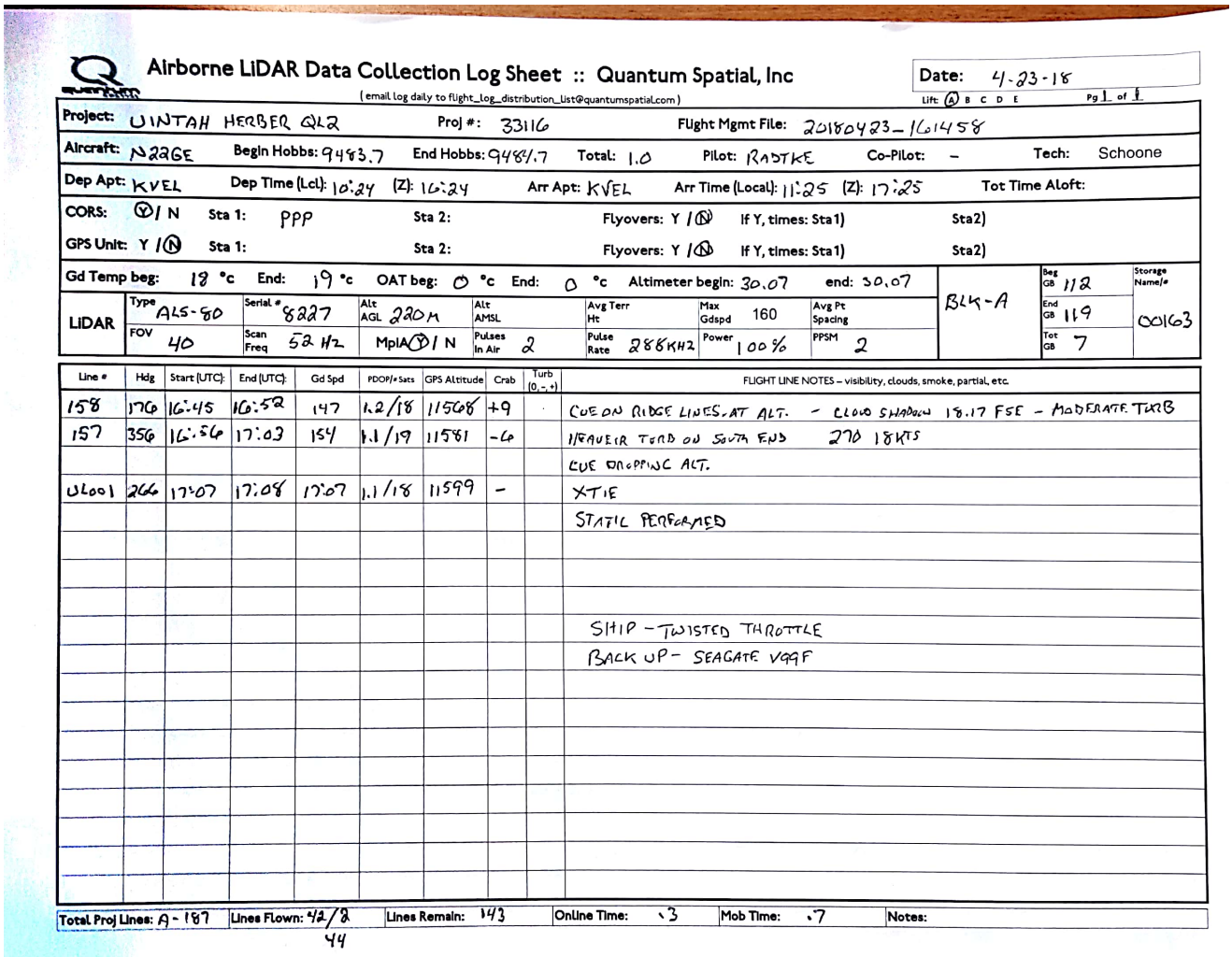
Gd Temp beg: °c End: °c OAT beg: °c End: °c Altimeter begin: end:

LiDAR						BLK A		
Type: ALS80	Serial #: 8227	Alt AGL: 2200m	Alt AMSL:	Avg Terr Ht:	Max Gdspd: 140	Avg Spacing:	Beg GB: 719	Storage Name/#: B
FOV: 40	Scan Freq: 52	MpiA: (Y) N	Pulses in Air: 2	Pulse Rate: 288	Power: 100%	PPSM: 2	End GB: 673	8146
							Tot GB: 46	

Line #	Hdg	Start (UTC)	End (UTC)	Gd Spd	PDOP/#Sats	GPS Altitude	Crab	Turb (0,-,+)	FLIGHT LINE NOTES -- visibility, clouds, smoke, partial, etc
2 092	176	2136	—	—	1.1/22	11335	—	—	Abort line 2 fast/off line Slvm 21:15
2 092	176	2148	2155	138	1.0/23	11380	0	4	clear
091	356	2200	2206	158	1.0/22	11450	0	3	
171	175	2211	2219	134	1.9/21	11175	1	3	
170	355	2222	2229	150	1.3/19	11500	2	3	
169	175	2235	2242	137	1.1/20	11350	2	3	
168	355	2245	2252	150	1.1/20	11400	1	3	
167	175	2256	2305	139	1.0/20	11400	2	3	
166	355	2308	2315	154	1.0/19	11590	1	3	
165	175	2320	2328	142	1.3/16	11400	0	2	
164	355	2332	2339	158	1.1/18	11520	1	2	
163	175	2344	2352	139	1.1/18	11300	1	2	
162	355	2355	0002	147	1.3/17	11750	0	2	
161	175	0006	0014	144	1.3/18	11500	0	2	
160	355	0018	0025	160	1.3/19	11650	0	2	
159	175	0029	0037	146	1.3/19	11555	0	2	
1001	092	0041	0044	156	1.4/18	11450		3	X-Tie Slvm 00:46

Total Proj Lines: Lines Flown: 15 Lines Remain: Online Time: 3:15 Mob Time: .75 Notes:

April 23, 2018 A (SN8227, N22GE)



Airborne LiDAR Data Collection Log Sheet :: Quantum Spatial, Inc

(email Log daily to flight_Log_distribution_List@quantumspatial.com)

Date: 4-23-18 Lift: A B C D E Pg 1 of 1

Project: UINTAH HERBER QL2 Proj #: 33116 Flight Mgmt File: 20180423_161458

Aircraft: N22GE Begin Hobbs: 9483.7 End Hobbs: 9484.7 Total: 1.0 Pilot: RADTKE Co-Pilot: – Tech: Schoone

Dep Apt: KVEL Dep Time (Lcl): 10:24 (Z): 16:24 Arr Apt: KVEL Arr Time (Local): 11:25 (Z): 17:25 Tot Time Aloft:

CORS: Y / N Sta 1: PPP Sta 2: Flyovers: Y / N If Y, times: Sta1) Sta2)

GPS Unit: Y / N Sta 1: Sta 2: Flyovers: Y / N If Y, times: Sta1) Sta2)

Gd Temp beg: 18 °c End: 19 °c OAT beg: 0 °c End: 0 °c Altimeter begin: 30.07 end: 30.07

LiDAR	Type	Serial #	Alt AGL	Alt AMSL	Avg Terr Ht	Max Gdspd	Avg Pt Spacing
	ALS-80	8227	220M			160	
	FOV 40	Scan Freq 52 Hz	MpiA Y / N	Pulses In Air 2	Pulse Rate 288KHz	Power 100%	PPSM 2

BLK-A | Beg GB 112 | End GB 119 | Tot GB 7 | Storage Name/# 00163

Line #	Hdg	Start (UTC):	End (UTC):	Gd Spd	PDOP/# Sats	GPS Altitude	Crab	Turb (0, -, +)	FLIGHT LINE NOTES – visibility, clouds, smoke, partial, etc.
158	176	16:45	16:52	147	1.2/18	11568	+9		CUE ON RIDGE LINES AT ALT. – CLOUD SHADOW 18.17 FSE – MODERATE TURB
157	356	16:56	17:03	154	1.1/19	11581	-6		HEAVIER TURB ON SOUTH END 270 18KTS
									CUE DROPPING ALT.
UL001	266	17:07	17:08	17:07	1.1/18	11599	–		XTIE
									STATIC PERFORMED
									SHIP – TWISTED THROTTLE
									BACK UP – SEAGATE V99F

Total Proj Lines: A - 187 Lines Flown: 42/2 44 Lines Remain: 143 Online Time: 3 Mob Time: 7 Notes:

April 24, 2018 A (SN8227, N22GE)

Airborne LiDAR Data Collection Log Sheet :: Quantum Spatial, Inc

(email Log daily to flight_log_distribution_List@quantumspatial.com)

Date: 4-24-18 Life: (A) B C D E Pg 1 of 1

Project: UINTAH HEBER QL2 Proj #: 33116 Flight Mgmt File: 20180424_132934 / 20180424152553

Aircraft: N22GE Begin Hobbs: 9484.7 End Hobbs: 9487.9 Total: 3.2 Pilot: RADTKE Co-Pilot: – Tech: Schoone

Dep Apt: KVEL Dep Time (Lcl): 07:34 (Z): 13:34 Arr Apt: KVEL Arr Time (Local): 11:00 (Z): 17:00 Tot Time Aloft:

CORS: (Y) / N Sta 1: PPP Sta 2: Flyovers: Y (N) If Y, times: Sta1) Sta2)

GPS Unit: Y / (N) Sta 1: Sta 2: Flyovers: Y / (N) If Y, times: Sta1) Sta2)

Gd Temp beg: 06 °c End: 11 °c OAT beg: −8 °c End: −7 °c Altimeter begin: 30.33 end: 30.34

BLK-A

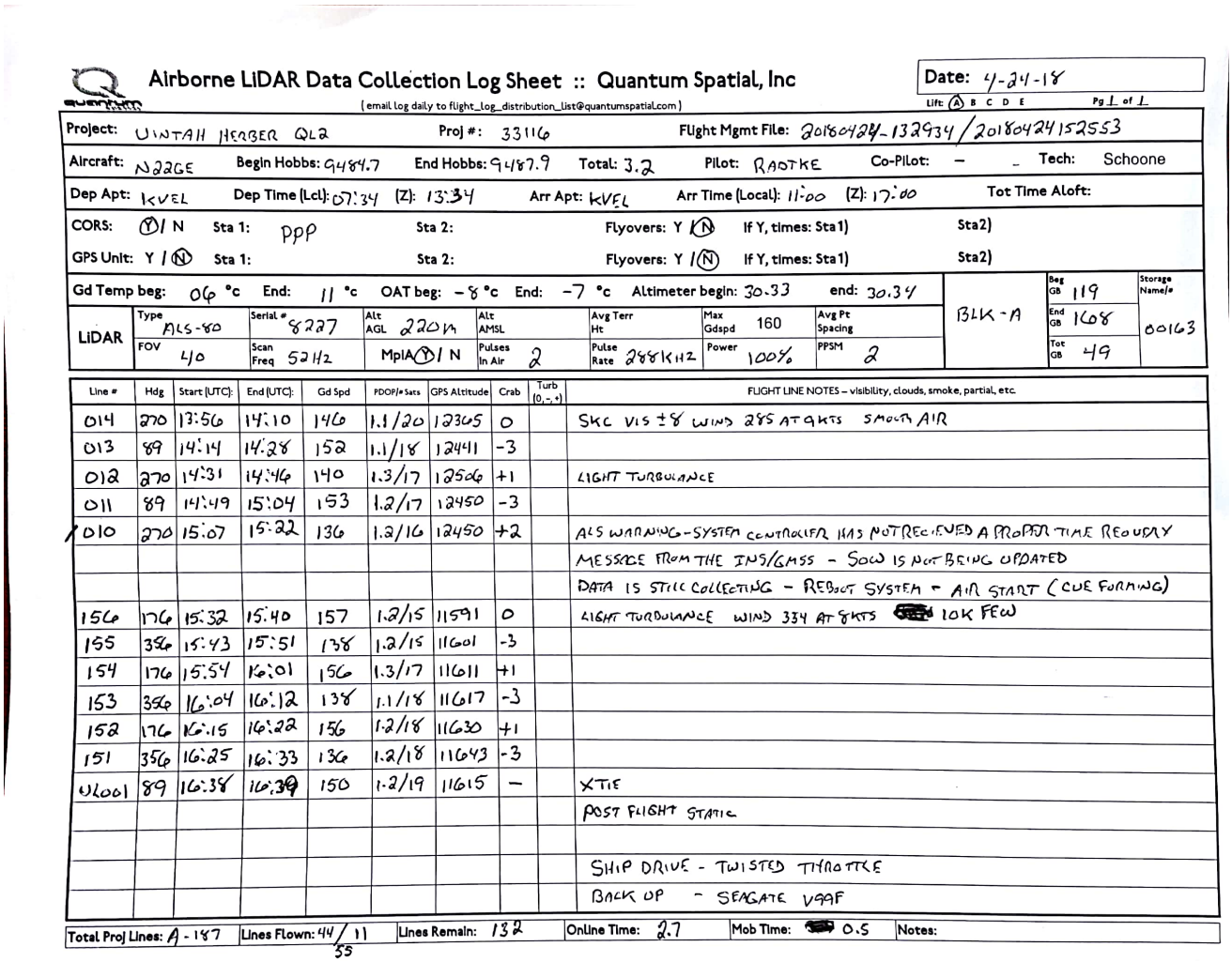
LiDAR	Type	Serial #	Alt AGL	Alt AMSL	Avg Terr Ht	Max Gdspd	Avg Pt Spacing
	ALS-80	8227	2200			160	
	FOV 40	Scan Freq 52 Hz	MpIA (Y) / N	Pulses In Air 2	Pulse Rate 288 kHz	Power 100%	PPSM 2

Beg GB	End GB	Tot GB	Storage Name/#
119	1608	49	00163

Line #	Hdg	Start (UTC):	End (UTC):	Gd Spd	PDOP/# Sats	GPS Altitude	Crab	Turb (0,-,+)	FLIGHT LINE NOTES – visibility, clouds, smoke, partial, etc.
014	270	13:56	14:10	146	1.1/20	12365	0		SKC VIS +8 WIND 285 AT 9KTS SMOOTH AIR
013	89	14:14	14:28	152	1.1/18	12441	-3		
012	270	14:31	14:46	140	1.3/17	12506	+1		LIGHT TURBULANCE
011	89	14:49	15:04	153	1.2/17	12450	-3		
010	270	15:07	15:22	136	1.2/16	12450	+2		ALS WARNING-SYSTEM CONTROLLER HAS NOT RECEIVED A PROPER TIME REQUEST
									MESSAGE FROM THE INS/GMSS - SOW IS NOT BEING UPDATED
									DATA IS STILL COLLECTING - REBOOT SYSTEM - AIR START (CUE FORMING)
156	176	15:32	15:40	157	1.2/15	11591	0		LIGHT TURBULANCE WIND 334 AT 8KTS [redacted] 10K FEW
155	356	15:43	15:51	138	1.2/15	11601	-3		
154	176	15:54	16:01	156	1.3/17	11611	+1		
153	356	16:04	16:12	138	1.1/18	11617	-3		
152	176	16:15	16:22	156	1.2/18	11630	+1		
151	356	16:25	16:33	136	1.2/18	11643	-3		
0L001	89	16:38	16:39	150	1.2/19	11615	–		XTIE
									POST FLIGHT STATIC
									SHIP DRIVE - TWISTED THROTTLE
									BACK UP - SEAGATE V99F

Total Proj Lines: A - 187 Lines Flown: 44 / 11 = 55 Lines Remain: 132 Online Time: 2.7 Mob Time: [redacted] 0.5 Notes:

April 24, 2018 B (SN8227, N22GE)



Airborne LiDAR Data Collection Log Sheet :: Quantum Spatial, Inc

(email Log daily to flight_log_distribution_list@quantumspatial.com)

Date: 4-24-18 | Life: (A) B C D E | Pg 1 of 1

Project: UINTAH HEBER QL2 | Proj #: 33116 | Flight Mgmt File: 20180424_132934 / 20180424152553

Aircraft: N22GE | Begin Hobbs: 9484.7 | End Hobbs: 9487.9 | Total: 3.2 | Pilot: RADTKE | Co-Pilot: – | Tech: Schoone

Dep Apt: KVEL | Dep Time (Lcl): 07:34 (Z): 13:34 | Arr Apt: KVEL | Arr Time (Local): 11:00 (Z): 17:00 | Tot Time Aloft:

CORS: (Y) / N | Sta 1: PPP | Sta 2: | Flyovers: Y (N) | If Y, times: Sta1) | Sta2)

GPS Unit: Y / (N) | Sta 1: | Sta 2: | Flyovers: Y / (N) | If Y, times: Sta1) | Sta2)

Gd Temp beg: 06 °c | End: 11 °c | OAT beg: –8 °c | End: –7 °c | Altimeter begin: 30.33 | end: 30.34

LiDAR	Type	Serial #	Alt AGL	Alt AMSL	Avg Terr Ht	Max Gdspd	Avg Pt Spacing
	ALS-80	8227	2200			160	
	FOV 40	Scan Freq 52 Hz	MpiA (Y) / N	Pulses In Air 2	Pulse Rate 288 kHz	Power 100%	PPSM 2

BLK-A | Beg GB 119 | End GB 1608 | Tot GB 49 | Storage Name/# 00163

Line #	Hdg	Start (UTC):	End (UTC):	Gd Spd	PDOP/# Sats	GPS Altitude	Crab	Turb (0,–,+)	FLIGHT LINE NOTES – visibility, clouds, smoke, partial, etc.
014	270	13:56	14:10	146	1.1/20	12365	0		SKC VIS +8 WIND 285 AT 9KTS SMOOTH AIR
013	89	14:14	14:28	152	1.1/18	12441	-3		
012	270	14:31	14:46	140	1.3/17	12506	+1		LIGHT TURBULANCE
011	89	14:49	15:04	153	1.2/17	12450	-3		
010	270	15:07	15:22	136	1.2/16	12450	+2		ALS WARNING-SYSTEM CONTROLLER HAS NOT RECEIVED A PROPER TIME REQUEST
									MESSAGE FROM THE INS/GMSS - SOW IS NOT BEING UPDATED
									DATA IS STILL COLLECTING - REBOOT SYSTEM - AIR START (CUE FORMING)
156	176	15:32	15:40	157	1.2/15	11591	0		LIGHT TURBULANCE WIND 334 AT 8KTS [redacted] 10K FEW
155	356	15:43	15:51	138	1.2/15	11601	-3		
154	176	15:54	16:01	156	1.3/17	11611	+1		
153	356	16:04	16:12	138	1.1/18	11617	-3		
152	176	16:15	16:22	156	1.2/18	11630	+1		
151	356	16:25	16:33	136	1.2/18	11643	-3		
UL001	89	16:38	16:39	150	1.2/19	11615	–		XTIE
									POST FLIGHT STATIC
									SHIP DRIVE - TWISTED THROTTLE
									BACK UP - SEAGATE V99F

Total Proj Lines: A - 187 | Lines Flown: 44 / 11 / 55 | Lines Remain: 132 | Online Time: 2.7 | Mob Time: [redacted] 0.5 | Notes:

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April 24, 2018 C (SN8227, N22GE)

Airborne LiDAR Data Collection Log Sheet :: Quantum Spatial, Inc
(email log daily to flight_log_distribution_list@quantumspatial.com)

Date: 04-24-2018 Lift: A (B) C D E Pg 1 of 1

Project: Utah Herber QL2 Proj #: 33116 Flight Mgmt File: 20180424 - 224545
Aircraft: 22GE Begin Hobbs: 9487.9 End Hobbs: 9491.0 Total: 3.1 Pilot: Lee Co-Pilot: Tech: Cox
Dep Apt: KVEL Dep Time (Lcl): 5:05 (Z): 23:05 Arr Apt: KVEL Arr Time (Local): 8:10 (Z): 02:10 Tot Time Aloft: 3.1
CORS: (Y) / N Sta 1: PPP Sta 2: Flyovers: Y / N If Y, times: Sta1) Sta2)
GPS Unit: Y / N Sta 1: Sta 2: Flyovers: Y / N If Y, times: Sta1) Sta2)
Gd Temp beg: °c End: °c OAT beg: °c End: °c Altimeter begin: end:

LiDAR: Type A580 | Serial # 8227 | Alt AGL 2200m | Alt AMSL | Avg Terr Ht | Max Gdspd 140 | Avg Pt Spacing
FOV 40 | Scan Freq 52 | MpIA (Y) N | Pulses in Air 2 | Pulse Rate 2.88 | Power 100% | PPSM 2
BK A | Beg GB 673 | End GB 631 | Tot GB 42 | Storage Name/# 8146 B

Line #	Hdg	Start (UTC)	End (UTC)	Gd Spd	PDOP/#Sats	GPS Altitude	Crab	Turb (0, -, +)	FLIGHT LINE NOTES – visibility, clouds, smoke, partial, etc.
90	89	2328	2339	153	1.3/14	10700	2	5	Turbulance – Hazey STurn 23:18
89	270	2343	2354	149	1.3/16	10600	1	4	
88	89	23:59	0011	145	1.2/16	10700	1	4	
87	270	0015	0026	151	1.3/15	10600	1	4	
86	89	0032	0043	137	1.5/14	10600	1	3	Lite Chop
85	270	0048	0059	160	1.2/16	10400	1	4	
84	89	01:04	0115	147	1.4/15	10900	1	3	
83	270	01:19	01:30	157	1.2/17	10600	1	3	
82	89	01:35	01:46	146	1.2/17	10800	1	3	
UL001	270	01:50	01:53	161	1.2/17	10550		3	x-tieline
									STurn 01:56

Total Proj Lines: Lines Flown: 9 Lines Remain: Online Time: 2.30 Mob Time: .30 Notes:

April 25, 2018 A1 (SN8227, N22GE)

Airborne LiDAR Data Collection Log Sheet :: Quantum Spatial, Inc

Date: 4-25-18

(email log daily to flight_log_distribution_list@quantumspatial.com)

Lift: (A) B C D E Pg 1 of 3

Project: UINTAH HERBER QL2 Proj #: 33116 Flight Mgmt File: 20180425-133520

Aircraft: N22GE Begin Hobbs: 9491.0 End Hobbs: 9494.0 Total: 3.0 Pilot: RADTKE Co-Pilot: — Tech: Schoone

Dep Apt: KVEL Dep Time (Lcl): 07:40 (Z): 13:40 Arr Apt: KVEL Arr Time (Local): 10:46 (Z): 16:46 Tot Time Aloft:

CORS: (Y) / N Sta 1: PPP Sta 2: Flyovers: Y / (N) If Y, times: Sta1) Sta2)

GPS Unit: Y / (N) Sta 1: Sta 2: Flyovers: Y / (N) If Y, times: Sta1) Sta2)

Gd Temp beg: 62 °c End: 69 °c OAT beg: -2 °c End: -1 °c Altimeter begin: 30.39 end: 30.36

LiDAR	Type	Serial #	Alt AGL	Alt AMSL	Avg Terr Ht	Max Gdspd	Avg Pt Spacing	BLK-A	Beg GB	Storage Name/#
	ALS-80	8227	220M			160			168	
	FOV	Scan Freq	MpiA (Y) / N	Pulses In Air	Pulse Rate	Power	PPSM		End GB	00163
	40	52 Hz		2	288 KHz	100%	2		197	
									Tot GB	
									29	

Line #	Hdg	Start (UTC)	End (UTC)	Gd Spd	PDOP/# Sats	GPS Altitude	Crab	Turb (0,-,+)	FLIGHT LINE NOTES – visibility, clouds, smoke, partial, etc.
172	352	14:03	14:05	156	1.1/17	12461	+3		SKC VIS 9-10 SMOOTH AIR WINDS 121 AT 8 KTS
173	172	14:09	14:11	148	1.1/18	12461	-2		
174	352	14:14	14:16	148	1.3/17	12461	+3		
175	172	14:20	14:22	141	1.3/17	12500	-2		
176	352	14:25	14:27	145	1.3/17	12690	+2		
177	172	14:30	14:32	147	1.5/15	13186	-2		
178	352	14:35	14:37	156	1.4/15	13773	+3		
112	221	14:41	14:41	157	1.3/16	13494	-1		
U2001	265	14:44	14:45	160	1.3/16	13407	—		XTIE
187	360	14:55	14:57	155	1.2/16	14094	+1		WINDS 127 AT 7 KTS
186	180	15:01	15:03	135	1.2/16	14015	-1		
185	360	15:06	15:08	156	1.2/16	13497	+2		SHIP DRIVE - TWISTED THROTTLE
184	180	15:12	15:14	143	1.2/16	13497	-1		BACK UP - SEAGATE V99F
183	360	15:17	15:19	151	1.2/16	13497	+2		
182	180	15:22	15:24	142	1.2/16	13497	0		
181	360	15:27	15:29	158	1.5/14	13587	+1		
180	180	15:33	15:35	140	1.4/15	13891	0		
179	360	15:38	15:40	155	1.3/16	13969	0		

Total Proj Lines: A - 187 Lines Flown: 64/21 = 85 Lines Remain: 102 Online Time: 2.6 Mob Time: .4 Notes:

Scanned by CamScanner

April 25, 2018 A2 (SN8227, N22GE)

Airborne LiDAR Data Collection Log Sheet :: Quantum Spatial, Inc

Date: 4-25-18

(email log daily to flight_log_distribution_list@quantumspatial.com)

Lift: (A) B C D E Pg 2 of 3

Project: UINTAH HERBER QL2 Proj #: 33116 Flight Mgmt File: 20180425_133520

Aircraft: N22GE Begin Hobbs: End Hobbs: Total: Pilot: RADTKE Co-Pilot: — Tech: Schoone

Dep Apt: Dep Time (Lcl): (Z): Arr Apt: Arr Time (Local): (Z): Tot Time Aloft:

CORS: (Y) / N Sta 1: PPP Sta 2: Flyovers: Y / (N) If Y, times: Sta1) Sta2)

GPS Unit: Y / (N) Sta 1: Sta 2: Flyovers: Y / (N) If Y, times: Sta1) Sta2)

Gd Temp beg: °c End: °c OAT beg: °c End: °c Altimeter begin: end:

LiDAR										
Type ALS-80	Serial # 8227	Alt AGL 220M	Alt AMSL	Avg Terr Ht	Max Gdspd 160	Avg Pt Spacing	BLK-A	Beg GB	Storage Name/#
FOV 40	Scan Freq 52Hz	MpiA (Y) / N	Pulses In Air 2	Pulse Rate 288KHz	Power 100%	PPSM 2		End GB	001603
								Tot GB	

Line #	Hdg	Start (UTC):	End (UTC):	Gd Spd	PDOP/# Sats	GPS Altitude	Crab	Turb (0,-,+)	FLIGHT LINE NOTES – visibility, clouds, smoke, partial, etc.
UL002	~~90~~ 270	15:43	15:44	155	1.4/15	13958	--		XTIE
001	270	15:47	15:55	164	1.4/15	12726	-3		
002	90	15:59	16:08	150	1.1/18	12746	+5		
003	270	16:11	16:21	147	1.2/17	12634	-3		
004	90	16:24	16:34	151	1.2/17	12546	+5		
UL003	0	16:37	16:38	159	1.2/18	12682	—		XTIE

Total Proj Lines: Lines Flown: Lines Remain: Online Time: Mob Time: Notes:

Scanned by CamScanner

April 25, 2018 B (SN8227, N22GE)

Airborne LiDAR Data Collection Log Sheet :: Quantum Spatial, Inc
(email Log daily to flight_log_distribution_list@quantumspatial.com)

Date: 4-25-18
Lift: A (B) C D E   Pg 3 of 3

Project: UINTAH HERBER QL2   Proj #: 33116   Flight Mgmt File: 20180425-173502

Aircraft: N22GE   Begin Hobbs: 9494.0   End Hobbs: 9495.7   Total: 1.7   Pilot: RADTKE   Co-Pilot: –   Tech: Schoone

Dep Apt: KVEL   Dep Time (Lcl): 11:36   (Z): 17:36   Arr Apt: KVEL   Arr Time (Local):   (Z):   Tot Time Aloft:

CORS: (Y) / N   Sta 1: PPP   Sta 2:   Flyovers: Y / (N)   If Y, times: Sta1)   Sta2)

GPS Unit: Y / (N)   Sta 1:   Sta 2:   Flyovers: Y / (N)   If Y, times: Sta1)   Sta2)

Gd Temp beg: 11 °c   End: 13 °c   OAT beg: 0 °c   End: 0 °c   Altimeter begin: 30.34   end: 30.28

BLK-A   Beg GB: 197   End GB: 222   Tot GB: 25   Storage Name/#: 00163

LiDAR: Type: ALS-80   Serial #: 8227   Alt AGL: 220M   Alt AMSL: Avg Terr Ht: Max Gdspd: 160   Avg Pt Spacing:
FOV: 40   Scan Freq: 52 Hz   MpIA (Y) / N   Pulses In Air: 2   Pulse Rate: 288KHz   Power: 100%   PPSM: 2

Line #	Hdg	Start (UTC):	End (UTC):	Gd Spd	PDOP/# Sats	GPS Altitude	Crab	Turb (0, -, +)	FLIGHT LINE NOTES – visibility, clouds, smoke, partial, etc.
009	270	17:53	18:07	152	1.1/21	12388	-5		SKC VIS 9 WIND 200/10 KTS NO RETURNS 1-2 MILES ON WESTEND
008	90	18:11	18:25	150	1.2/20	12378	+4		HIGH RIDGE ON WEST END " "
007	270	18:28	18:40	143	1.3/19	12362	-5		
006	90	18:44	18:55	152	1.1/22	12378	+4		
005	270	18:58	19:08	141	1.1/21	12444	-5		
U2001	176	19:11	19:13	151	1.0/24	12446	–		XTIE
									POST FLIGHT STATIC PERFORMED
									SHIP DRIVE - TWISTED THROTTLE
									BACK UP - SEAGATE U99F

Total Proj Lines: A-187   Lines Flown: 85/5 (90)   Lines Remain: 97   Online Time: 1.3   Mob Time: .4   Notes:

April 25, 2018 C (SN8227, N22GE)

Airborne LiDAR Data Collection Log Sheet :: Quantum Spatial, Inc
(email log daily to flight_log_distribution_list@quantumspatial.com)

Date: 4-25-2018
Lift: A B (C) D E   Pg 1 of 1

Project: Uintah Herber QL2   Proj #: 33116   Flight Mgmt File: 20180425-204613
Aircraft: 22GE   Begin Hobbs: 9495.7   End Hobbs: 9499.1   Total: 3.4   Pilot: Lee   Co-Pilot: Tech: COX
Dep Apt: KVEL   Dep Time (Lcl): 3:00   (Z): 21:00   Arr Apt: KVEL   Arr Time (Local): 6:25   (Z): 0025   Tot Time Aloft: 3.4
CORS: (Y) N   Sta 1: PPP   Sta 2:   Flyovers: Y / N   If Y, times: Sta1)   Sta2)
GPS Unit: Y / N   Sta 1:   Sta 2:   Flyovers: Y / N   If Y, times: Sta1)   Sta2)
Gd Temp beg: °c   End: °c   OAT beg: °c   End: °c   Altimeter begin: end: BLK A

LIDAR: Type ALS80   Serial # 8227   Alt AGL 2200 m   Alt AMSL   Avg Terr Ht   Max Gdspd 140   Avg Pt Spacing
FOV 40   Scan Freq 52   MpIA (Y) N   Pulses in Air 2   Pulse Rate 2.88   Power 100%   PPSM 2
Beg GB 631   End GB 589   Tot GB 42   Storage Name/# 8146 B

Line #	Hdg	Start (UTC)	End (UTC)	Gd Spd	PDOP/#Sats	GPS Altitude	Crab	Turb (0,-,+)	FLIGHT LINE NOTES – visibility, clouds, smoke, partial, etc.
23	269	2120	2137	148	1.0/20	11500	1	2	Clear STurn 21:10
24	89	2151	—	157	1.1/20	11600	1		Abort line To High/Low off line
24	89	2212	2227	160	1.2/18	11700	0	2	
25	269	2234	2251	145	1.1/21	11750	1	2	
26	89	2302	2318	153	1.2/18	11700	1	2	
27	269	2325	2342	135	1.3/17	11650	1	2	
28	89	2349	0005	145	1.1/18	11600	1	2	
UL001	269	0011	0012	160	1.3/17	11700		1	X tie line
									STurn 00:14

Total Proj Lines: Lines Flown: 6   Lines Remain: Online Time: 3.0   Mob Time: .45   Notes:

April 27, 2018 A (SN8227, N22GE)

Airborne LiDAR Data Collection Log Sheet :: Quantum Spatial, Inc

(email log daily to flight_log_distribution_list@quantumspatial.com)

Date: 4-27-2018

Lift: (A) B C D E   Pg 1 of 1

Project: Uintah HerberQL2   Proj #: 33116   Flight Mgmt File: 20180427_161018

Aircraft: 22GE   Begin Hobbs: 9500.1   End Hobbs: 9503.5   Total: 3.4   Pilot: LEE   Co-Pilot: Tech: Cox

Dep Apt: KVEL   Dep Time (Lcl): 10:20   (Z): 16:20   Arr Apt: KVEL   Arr Time (Local): 1:45   (Z): 1945   Tot Time Aloft: 3.4

CORS: (Y) N   Sta 1: PPP   Sta 2:   Flyovers: Y / N   If Y, times: Sta1)   Sta2)

GPS Unit: Y / N   Sta 1:   Sta 2:   Flyovers: Y / N   If Y, times: Sta1)   Sta2)

Gd Temp beg: °c   End: °c   OAT beg: °c   End: °c   Altimeter begin: end:

LiDAR							
Type ALS 80	Serial # 8227	Alt AGL 2200M	Alt AMSL	Avg Terr Ht	Max Gdspd 140	Avg Pt Spacing	BLK A
FOV 40	Scan Freq 50	MpIA (Y) N	Pulses in Air 2	Pulse Rate 2.88	Power 100%	PPSM 2	

Beg GB 589   End GB 537   Tot GB 52   Storage Name/# 8146 B

Line #	Hdg	Start (UTC)	End (UTC)	Gd Spd	PDOP/# Sats	GPS Altitude	Crab	Turb (0,-,+)	FLIGHT LINE NOTES – visibility, clouds, smoke, partial, etc.
29	269	1643	1658	155	1.2/20	11500	1	1	Haze STurn 1630
30	89	1704	1720	148	1.2/20	11250	1	1	
31	269	1725	1740	142	1.1/22	11500	1	1	
32	89	1747	1803	144	1.1/23	11450	1	1	
33	269	1809	1825	146	1.2/22	11450	1	1	
34	89	1830	1846	150	1.1/22	11350	1	1	
35	269	1851	1907	146	1.1/21	11350	1	1	
36	89	1911	1926	150	1.0/24	11300	1	1	– Lost GPS end of line –
UCP01	269	1931	1933	163	1.1/21	11316	1	1	X-Tr line
									STurn 1936

Total Proj Lines: Lines Flown: 8   Lines Remain: Online Time: 3.0   Mob Time: .45   Notes: Shipping Dr. Gold

April 28, 2018 A (SN8227, N22GE)

Airborne LiDAR Data Collection Log Sheet :: Quantum Spatial, Inc
(email log daily to flight_log_distribution_list@quantumspatial.com)

Date: 4-28-2017 | Lift: (A) B C D E | Pg 1 of 1

Project: Uintah Herber QL2 | Proj #: 33116 | Flight Mgmt File: 20180428-130940

Aircraft: 22GE | Begin Hobbs: 9503.5 | End Hobbs: 9507.0 | Total: 3.5 | Pilot: Lee | Co-Pilot: | Tech: Cox

Dep Apt: KVEL | Dep Time (Lcl): 7:20 (Z): 13:20 | Arr Apt: KVEL | Arr Time (Local): 10:50 (Z): 16:50 | Tot Time Aloft: 3.5

CORS: (Y) / N | Sta 1: PPP | Sta 2: | Flyovers: Y / N | If Y, times: Sta1) | Sta2)

GPS Unit: Y / N | Sta 1: | Sta 2: | Flyovers: Y / N | If Y, times: Sta1) | Sta2)

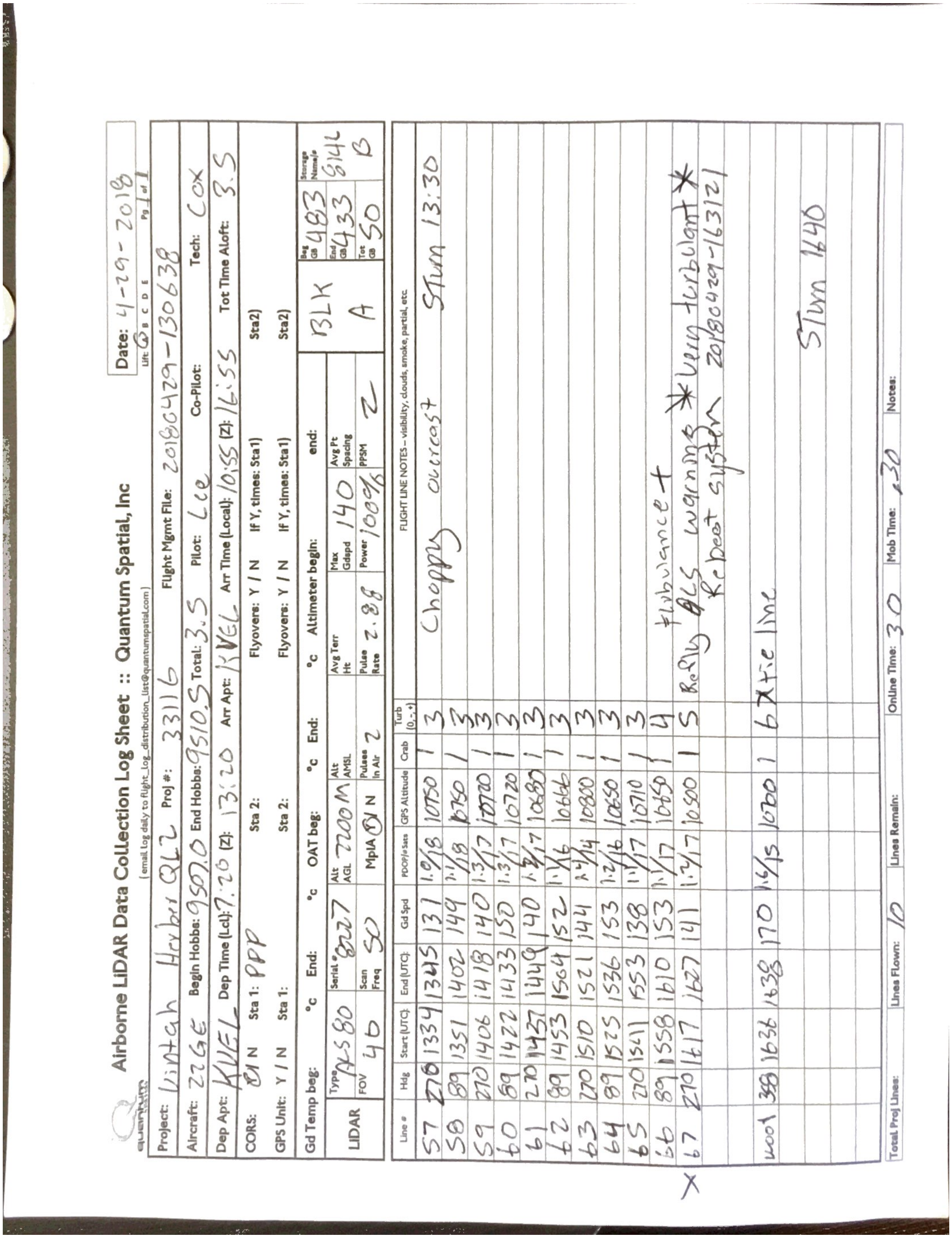
Gd Temp beg: °c End: °c OAT beg: °c End: °c Altimeter begin: end:

LiDAR								
Type ALS80	Serial # 8227	Alt AGL 2200 M	Alt AMSL	Avg Terr Ht	Max Gdspd 140	Avg Pt Spacing	BLK	Beg GB 537 / End GB 483 / Tot GB 54
FOV 40	Scan Freq 50	MpIA (Y) N	Pulses in Air 2	Pulse Rate 2.88	Power 100%	PPSM 2	A	Storage Name/# 8146 B

Line #	Hdg	Start (UTC)	End (UTC)	Gd Spd	PDOP/# Sats	GPS Altitude	Crab	Turb (0,-,+)	FLIGHT LINE NOTES – visibility, clouds, smoke, partial, etc.
37	269	13.33	1349	147	.9/22	11250	1	0	Clear Smooth STurn 1328
38	89	1355	1410	140	1.3/19	11250	1	0	
39	269	1416	1432	147	1.4/16	11150	1	0	
40	89	1437	1452	155	1.2/17	11150	1	0	
41	269	1456	1512	141	1.1/18	11100	1	0	
42	89	1517	1532	149	1.4/16	11100	1	0	
43	269	1537	1553	139	1.1/18	11250	1	0	
44	89	1557	1612	155	1.1/19	11150	1	1	
57	270	1620	—	136	1.2/19	10850	1	1	System Reboot
001	177	1632	1635	129	1.2/19	10950	–	2	x tie line 20180428-163002
									STurns 16:37
									Clouds lowering - Verga
									RTB

Total Proj Lines: | Lines Flown: 8 | Lines Remain: | Online Time: 3.0 | Mob Time: .30 | Notes:

April 29, 2018 A (SN8227, N22GE)



Airborne LiDAR Data Collection Log Sheet :: Quantum Spatial, Inc
(email log daily to flight_log_distribution_list@quantumspatial.com)

Date: 4-29-2018
Lift: A B C D E   Pg 1 of 1

Project: Uintah Herber QL2   Proj #: 33116   Flight Mgmt File: 20180429-130638
Aircraft: 22GE   Begin Hobbs: 9507.0   End Hobbs: 9510.5   Total: 3.5   Pilot: Lee   Co-Pilot: Tech: Cox
Dep Apt: KVEL   Dep Time (Lcl): 7:20   (Z): 13:20   Arr Apt: KVEL   Arr Time (Local): 10:55   (Z): 16:55   Tot Time Aloft: 3.5
CORS: Y / N   Sta 1: PPP   Sta 2:   Flyovers: Y / N   If Y, times: Sta1)   Sta2)
GPS Unit: Y / N   Sta 1:   Sta 2:   Flyovers: Y / N   If Y, times: Sta1)   Sta2)
Gd Temp beg: °c   End: °c   OAT beg: °c   End: °c   Altimeter begin: end:

LiDAR: Type ALS80   Serial # 8227   Alt AGL 7200 M   Alt AMSL   Avg Terr Ht   Max Gdspd 140   Avg Pt Spacing
FOV 40   Scan Freq 50   MpIA (Y) N   Pulses in Air 2   Pulse Rate 2.88   Power 100%   PPSM 2
BLK A   Beg GB 483   End GB 433   Tot GB 50   Storage Name/# 8141 B

Line #	Hdg	Start (UTC)	End (UTC)	Gd Spd	PDOP/# Sats	GPS Altitude	Crab	Turb (0,-,+)	FLIGHT LINE NOTES – visibility, clouds, smoke, partial, etc.
57	270	1334	1345	137	1.0/18	10750	1	3	Choppy overcast STum 13:30
58	89	1351	1402	149	1.1/18	10750	1	3	
59	270	1406	1418	140	1.3/17	10720	1	3	
60	89	1422	1433	150	1.3/17	10720	1	3	
61	270	1437	1449	140	1.2/17	10680	1	3	
62	89	1453	1504	152	1.1/16	10666	1	3	
63	270	1510	1521	144	1.4/14	10800	1	3	
64	89	1525	1536	153	1.2/16	10650	1	3	
65	270	1541	1553	138	1.1/17	10710	1	3	
66	89	1558	1610	153	1.1/17	10650	1	4	turbulance +
X 67	270	1617	1627	141	1.2/17	10500	1	5	Refly ALS warning * Very turbulant * Reboot system 20180429-163121
woot	358	1636	1638	170	1.6/15	10700	1	6	X tie line
									STum 1640

Total Proj Lines: Lines Flown: 10   Lines Remain: Online Time: 3.0   Mob Time: .30   Notes:

May 1, 2018 A (SN8227, N22GE)

Airborne LiDAR Data Collection Log Sheet :: Quantum Spatial, Inc
(email log daily to flight_log_distribution_list@quantumspatial.com)

Date: 5-1-2018 Lift: (A) B C D E Pg 1 of 1

Project: Uintah Herber QL2 Proj #: 33116 Flight Mgmt File: 20180501-142743

Aircraft: 22GE Begin Hobbs: 9510.5 End Hobbs: 9513.1 Total: 2.6 Pilot: Lee Co-Pilot: Tech: Cox

Dep Apt: KVEL Dep Time (Lcl): 8:40 (Z): 14.40 Arr Apt: KVEL Arr Time (Local): 11:20 (Z): 17:20 Tot Time Aloft: 2.6

CORS: (Y) N Sta 1: PPP Sta 2: Flyovers: Y / N If Y, times: Sta1) Sta2)

GPS Unit: Y / N Sta 1: Sta 2: Flyovers: Y / N If Y, times: Sta1) Sta2)

Gd Temp beg: °C End: °C OAT beg: °C End: °C Altimeter begin: end:

LIDAR								
Type ALS 80	Serial # 8227	Alt AGL 2200M	Alt AMSL	Avg Terr Ht	Max Gdspd	Avg Pt Spacing	BK A	Beg GB 711 / End GB 675 / Tot GB 36	Storage Name/# 8946 B
FOV 40	Scan Freq 50	MpIA (Y) / N	Pulses in Air 2	Pulse Rate 2.88	Power 100%	PPSM 2		

Line #	Hdg	Start (UTC)	End (UTC)	Gd Spd	PDOP/#Sats	GPS Altitude	Crab	Turb (0,-,+)	FLIGHT LINE NOTES – visibility, clouds, smoke, partial, etc
67	270	1452	1503	159	1.1/19	10650	1	0	Overcast low Clds in Vicinity STurn 14.48
68	89	1508	1519	157	1.6/17	10720	1	0	
69	270	1523	1534	151	1.3/17	10750	1	0	
70	89	1538	1549	153	1.1/18	10750	1	0	
71	270	1558	1609	148	1.2/18	10800	1	0	
72	89	1613	1624	151	1.2/19	10775	1	0	Cld 5 FEE
73	270	1628	1639	148	1.4/18	10800	1	0	Clds 2, 8, 24 FEE
DLOOP	006	1643	1645	156	1.2/18	10815		0	x-tie line Before Clds move in
74	89	1654	1705	156	1.3/18	10800	1	0	Clds 25, 23, 8-0 FEE
									Clouded out STurn 17:08
									RTB

Total Proj Lines: Lines Flown: 8 Lines Remain: Online Time: 2.15 Mob Time: .30 Notes:

May 6, 2018 A (SN0764, N44RL)

LIDAR Flight Log

AIRBORNE IMAGING – A Clean Harbors Company

Julian Day 126 | Flight A

Date	5/6/18	Aircraft	PA-31 N-44RL
Project	3148 QSI-Vernal	Pilot	D. Dorshner
Location	Vernal UT	Operator	B. Eisenbart
Mission Objective			

System	Riegl Q1560
Unit	2220764
IMU	Applanix
GPS Rx	Trimble
Scanner 1 Drive	0
Scanner 2 Drive	1

Additional Notes
Temp 21.1°c
Humidity 21%
Altimeter 1018.5mb
Terrain Height @ Airport 1608m

Aircraft Block Time		
Engine On 16:52	Ramp Out 17:34	Takeoff 17:35
Engine Off 22:46	Ramp In 22:34	Landing 22:33
Total 5.9 hrs	Total hrs	Total 5 hrs

Mission Plan					
AGL Height	2000	m	Pulse Rate	800	kHz
Target Speed	160	kts	Scan Rate	533	Hz
Laser Current	100	%	FOV	60	Deg's

Static Alignment	GPS Time Start	GPS Time End
Pre Mission	17:41	17:46
Post Mission	22:39	22:44

Flight Line	LiDAR File Name	Flight Direction	Flight Altitude	GPS Time Start	GPS Time End	Line Aborted Time	Line Aborted nmi to End	Mission ID	Comments
Test Strip		NA	12,000'	18:01	18:01			180506-180106	
PPP-8		↗	12,000'	18:03	18:08			NA	∞
997	6418126-01	0°	12,000'	18:09	18:19			180942	
01	02	270°	12,300'	18:25	18:26	18:26	3 nm	182511	Data Recorder Error
01	03	90°	12,300'	18:31	18:34			183143	Reflew
02	04	270°	12,100'	18:37	18:37	18:37	6 nm	183737	Air traffic
02	05	270°	12,100'	18:42	18:45			184212	Reflew
03	06	90°	12,000'	18:48	18:51			184806	
04	07	270°	12,000'	18:54	18:54			185412	
05	08	90°	12000'	19:01	19:05			190109	
06	09	270°	12,300'	19:07	19:08	19:08	8 nm	190734	Data Recorder Error
06	10	90°	12,300'	19:16	19:21			191645	Reflew
07	11	270°	12,500'	19:24	19:29			192414	
08	12	90°	12,600'	19:31	19:36			193143	
09	13	270	12,600'	19:39	19:44			193916	

Pg of

May 7, 2018 A (SN0764, N44RL)

LIDAR Flight Log

AIRBORNE IMAGING — A Clean Harbors Company

Julian Day 127 | Flight A

Date	5/7/18
Project	3148 QSI-Vernal
Location	Vernal UT
Mission Objective	
Aircraft	PA-31 N-44RL
Pilot	D. Dorshner
Operator	B. Eisenbart

System	Riegl Q1560
Unit	2220764
IMU	Applanix
GPS Rx	Trimble
Scanner 1 Drive	2
Scanner 2 Drive	3

Additional Notes
Temp 17.8°C
Humidity 27%
Altimeter 1016.4 mb
Terrain Height @ Airport 1608 ft

Aircraft Block Time			
Engine On 14:50	Ramp Out	Takeoff 15:13	
Engine Off 17:54	Ramp In 17:42	Landing 17:40	
Total 3 hrs	Total hrs	Total 2.5 hrs	

Mission Plan					
AGL Height	2000	m	Pulse Rate	800	kHz
Target Speed	160	kts	Scan Rate	533	Hz
Laser Current	100	%	FOV	60	Deg's

Static Alignment	GPS Time	
	Start	End
Pre Mission	14:56	15:01
Post Mission	17:41	17:46

Flight Line	LiDAR File Name	Flight Direction	Flight Altitude	GPS Time Start	GPS Time End	Line Aborted Time	Line Aborted nmi to End	Mission ID	Comments
Test Strip		NA	13,400'	15:23	15:27			150507-152308	
PPP-S			13,400'	15:25	15:30				∞
25	6498127-01	90°	13,400'	15:35	15:43			153531	
26	02	270°	13,400'	15:47	15:54			154750	
27	03	90°	13,300'	16:02	16:08	16:08	6 nm	160229	ch.1 Error
27	04	270°	13,300	16:17	16:27			161715	Reflew
28	05	90°	13,300	16:31	16:41			163117	
29	06	270°	12,900'	16:46	16:57			164604	
30	07	90°	12,800'	17:00	17:01	17:01	23 nm	170030	ch.1 Error
30	08	90°	12,800'	17:09	17:09	17:09	24 nm		ch.1 TCP Port Error
PPP-S		↷	12,800'	17:20	17:24				∞
									Unable to execute
									XTIE → TCP Port Error

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May 7, 2018 B (SN0764, N44RL)

LIDAR Flight Log

AIRBORNE IMAGING — A Clean Harbors Company

Julian Day 127 | Flight B

Date	5/7/18
Project	3148 QSI-Vernal
Location	Vernal UT
Mission Objective	

Aircraft	PA-31 N-44RL
Pilot	D. Dorshner
Operator	B. Eisenbart

System	Riegl Q1560
Unit	2220764
IMU	Applanix
GPS Rx	Trimble
Scanner 1 Drive	0
Scanner 2 Drive	1

Additional Notes
Temp 24.4°C
Humidity 15 %
Altimeter 1014.8
Terrain Height @ Airport 1603'

Aircraft Block Time			
Engine On	19:32	Ramp Out	14:50
Engine Off	22:03	Ramp In	21:55
Total	3.5 hrs	Total	hrs
		Takeoff	19:52
		Landing	21:49
		Total	3 hrs

Mission Plan					
AGL Height	2000	m	Pulse Rate	800	kHz
Target Speed	160	kts	Scan Rate	533	Hz
Laser Current	100	%	FOV	60	Deg's

Static Alignment	GPS Time	
	Start	End
Pre Mission	18:41	18:46
Post Mission	21:55	22:00

Flight Line	LiDAR File Name	Flight Direction	Flight Altitude	GPS Time Start	GPS Time End	Line Aborted Time	Line Aborted nmi to End	Mission ID	Comments
Test Strip		N/A	12,800'	19:03	19:03			190507-190320	
PPP-8		~	12,800'	19:04	19:11				∞
30	64/8127-01	270°	12,800'	17:16	19:24			191625	
31	02	90°	12,500'	19:31	19:41			193107	
32	03	270°	12,500'	19:45	19:57			194506	
33	04	90°	12,400'	19:59	20:09			195912	
34	05	270°	12,700'	20:13	20:24			201327	
35	06	90°	12,200'	20:27	20:37			202700	
36	07	270°	12,100'	20:41	20:52			204125	
37	09	90°	12,000'	20:56	21:07			205642	
38	09	270°	12,000'	21:11	21:22			211135	
XTIE	10	180°	13,000'	21:29	21:32			212917	
PPP-9		~	13,000'	21:33	21:38			NA	∞

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May 8, 2018 A (SN0764, N44RL)

Julian Day 128	Flight A

LIDAR Flight Log

AIRBORNE IMAGING
A Clean Harbors Company

Date:	May 8 / 2018	Aircraft:	N-44RL
Project:	3148 QSI Vernal	Pilot:	D. Dorschner
Location:	Vernal, UT	Operator:	Rafael Canelon
Mission Objective			

System	Riegl Q1560
Unit	64
IMU	Applanix AP50
GPS Rx	Trimble
Scanner 1 Drive	
Scanner 2 Drive	

Additional Notes
Temp
Humidity
Altimeter
Terrain Height

Aircraft Block Time		
Engine On: 15:40	Ramp Out	Take off: 16:04
Engine Off: 21:17	Ramp In	Landing: 21:02
Total: 5.7 hrs	Total hrs	Total: 5.0 hrs

Mission Plan					
AGL Height	2000 m	Pulse Rate	800	KHz	
Target Speed	160 kts	Scan Rate	191	Hz	
Laser Current	100 %	FOV	60	Deg's	

Static Alignment	GPS Time	
	Start	End
Pre-Mission	15:51	15:56
Post-Mission	21:08	21:13

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		
00		/	16:22	16:27			/	
39		W	16:30	16:40			180508_163039	
40		E	16:44	16:55			164435	
41		W	16:59	17:11			165920	
42		E	17:14	17:24			171417	
43		W	17:29	17:40			172922	
44		E	17:44	17:55			174413	
45		W	17:58	18:09			175838	
46		E	18:12	18:23			181254	
47		W	18:28	18:39			182828	
48		E	18:43	18:54			184310	
49		W	18:57	19:08			185720	
50		E	19:11	19:22			191130	
51		W	19:25	19:36			192550	
52		E	19:40	19:50			194007	

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May 9, 2018 A (SN0764, N44RL)

LIDAR Flight Log

Julian Day 129 | Flight A

Date: May 9 / 2018	Aircraft: N-44RL
Project: 3148 QSI Vernal	Pilot: D. Dorschner
Location: Vernal, UT	Operator: Rafael Canelon
Mission Objective	

System	Riegl Q1560
Unit	
IMU	Applanix AP50
GPS Rx	Trimble
Scanner 1 Drive	
Scanner 2 Drive	

Additional Notes
Temp
Humidity
Altimeter
Terrain Height

AIRBORNE IMAGING — A Clean Harbors Company

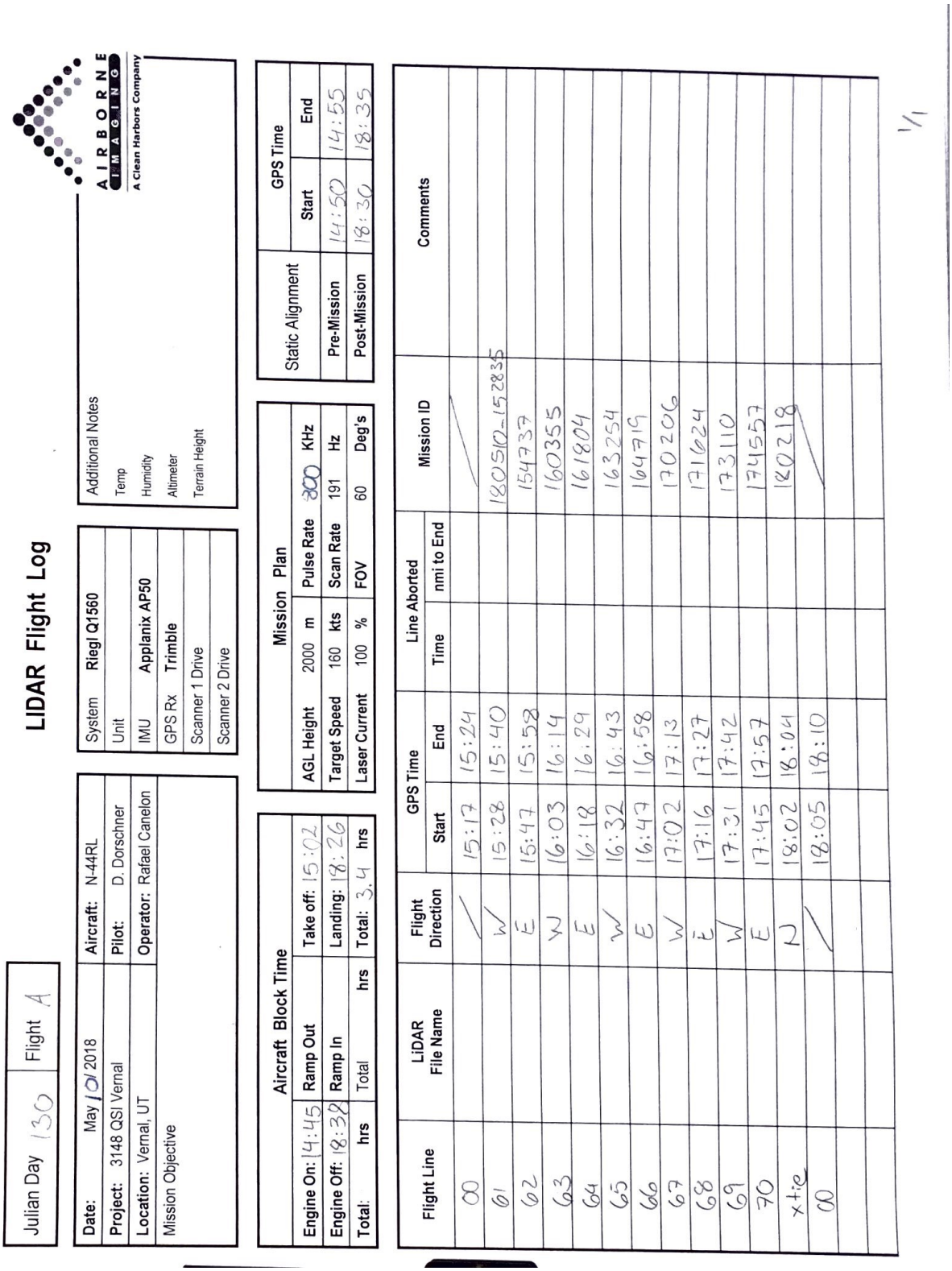
Aircraft Block Time			
Engine On: 15:07	Ramp Out	Take off: 15:27	
Engine Off: 19:33	Ramp In	Landing: 19:19	
Total: 4.4 hrs	Total	hrs	Total: 3.9 hrs

Mission Plan			
AGL Height	2000 m	Pulse Rate	800 KHz
Target Speed	160 kts	Scan Rate	191 Hz
Laser Current	100 %	FOV	60 Deg's

Static Alignment	GPS Time	
	Start	End
Pre-Mission	15:13	15:18
Post-Mission	15:26	15:31

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		
00		/	15:46	15:51			/	
998		S	15:53	16:02			180509_155326	
75		E	16:09	16:12			160916	
74		W	16:16	16:27			161609	
73		E	16:31	16:41			163103	
72		W	16:46	16:57			164611	
71		E	17:01	17:12			170132	
55		W	17:20	17:31			172024	
56		E	17:34	17:46			173452	
57		W	17:49	18:00			174914	
58		E	18:04	18:15			180416	
59		W	18:18	18:29			181819	
60		E	18:33	18:43			183326	
61		W	18:48	18:59			184840	
00		/	19:04	19:09			/	

May 10, 2018 A (SN0764, N44RL)



LIDAR Flight Log

Julian Day 130 | Flight A

Date:	May 10 2018	Aircraft:	N-44RL
Project:	3148 QSI Vernal	Pilot:	D. Dorschner
Location:	Vernal, UT	Operator:	Rafael Canelon
Mission Objective			

System	Riegl Q1560	Additional Notes	
Unit		Temp	
IMU	Applanix AP50	Humidity	
GPS Rx	Trimble	Altimeter	
Scanner 1 Drive		Terrain Height	
Scanner 2 Drive			

AIRBORNE IMAGING — A Clean Harbors Company

Aircraft Block Time			
Engine On:	14:45	Ramp Out	Take off: 15:02
Engine Off:	18:32	Ramp In	Landing: 18:26
Total:	hrs	Total	Total: 3.4 hrs

Mission Plan					
AGL Height	2000	m	Pulse Rate	300	KHz
Target Speed	160	kts	Scan Rate	191	Hz
Laser Current	100	%	FOV	60	Deg's

Static Alignment	GPS Time	
	Start	End
Pre-Mission	14:50	14:55
Post-Mission	18:30	18:35

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		
00		/	15:17	15:24				
01		W	15:28	15:40			180510-152835	
02		E	15:47	15:58			154737	
03		W	16:03	16:14			160355	
04		E	16:18	16:29			161804	
05		W	16:32	16:43			163254	
06		E	16:47	16:58			164719	
07		W	17:02	17:13			170206	
08		E	17:16	17:27			171624	
09		W	17:31	17:42			173110	
70		E	17:45	17:57			174557	
xtie		N	18:02	18:04			180218	
00		/	18:05	18:10				

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May 13, 2018 A (SN0764, N44RL)

LIDAR Flight Log

Julian Day 133 | Flight A

Date: May 13/2018 | Aircraft: N-44RL

Project: 3150 QSI Fruitland | Pilot: D. Dorschner

Location: Provo, UTAH | Operator: Rafael Canelon

Mission Objective

Aircraft Block Time			
Engine On: 17:42	Ramp Out	Take off: 18:09	
Engine Off: 21:34	Ramp In	Landing: 21:21	
Total: hrs	Total hrs	Total: hrs	

System	Riegl Q1560
Unit	
IMU	Applanix AP50
GPS Rx	Trimble
Scanner 1 Drive	
Scanner 2 Drive	

Mission Plan					
AGL Height	2000	m	Pulse Rate	900	KHz
Target Speed	160	kts	Scan Rate	191	Hz
Laser Current	100	%	FOV	60	Deg's

Additional Notes

Temp

Humidity Higher humidity at west

Altimeter End of the last 3 lines

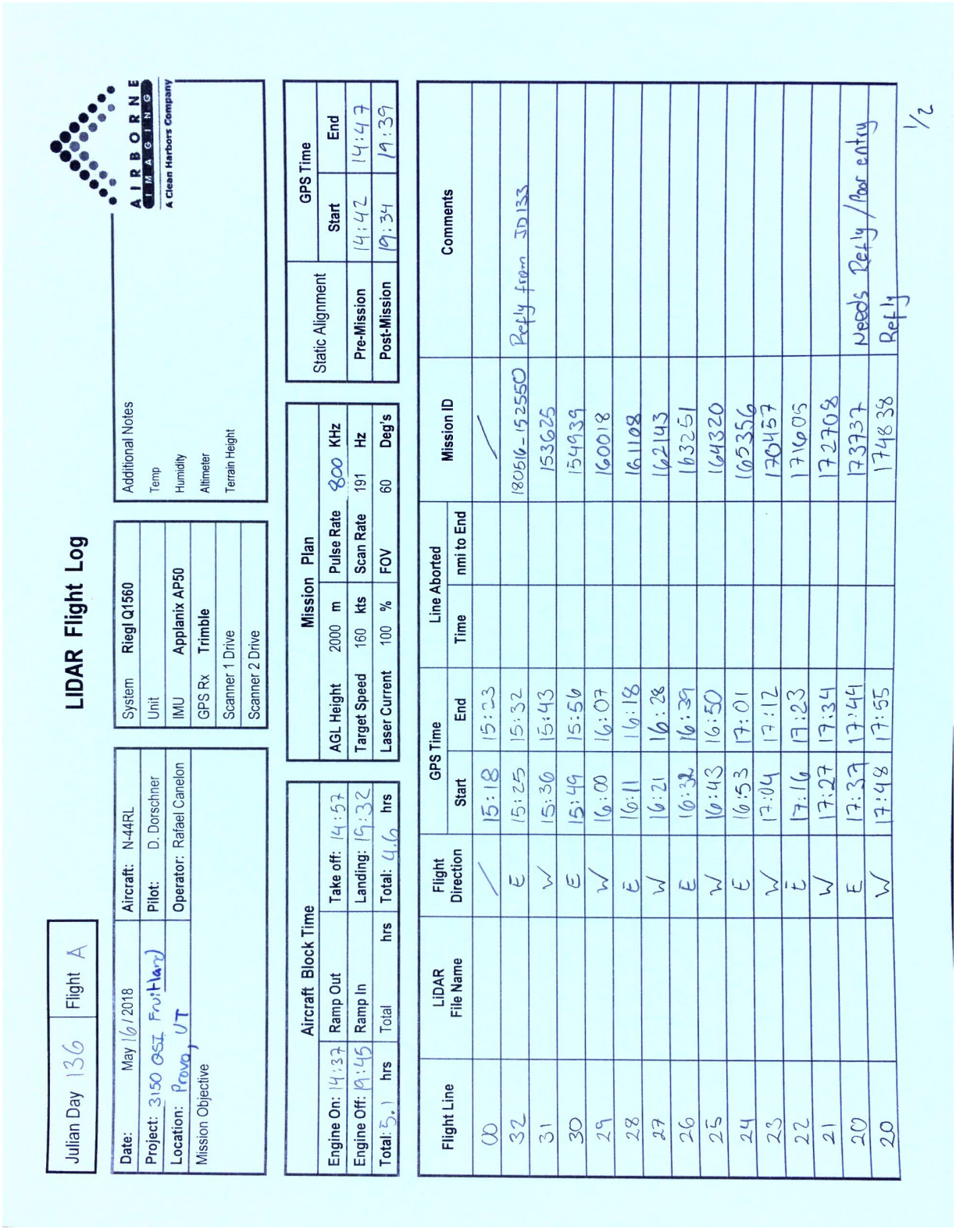
Terrain Height

AIRBORNE IMAGING — A Clean Harbors Company

Static Alignment	GPS Time Start	GPS Time End
Pre-Mission	17:47	17:52
Post-Mission	21:25	21:36

Flight Line	LiDAR File Name	Flight Direction	GPS Time Start	GPS Time End	Line Aborted Time	Line Aborted nmi to End	Mission ID	Comments
50		/	18:35	18:40			/	
41		E	18:42	18:45			180513-184233	
40		W	18:48	18:51			184839	
39		E	18:55	18:58			185528	
38		W	19:01	19:04			190154	
37		E	19:08	19:11			190807	
36		W	19:17	19:24			191741	
35		E	19:28	19:34			192813	
34		W	19:38	19:45			193843	
33		E	19:49	19:57			194951	
32		W	20:01	20:08			200116	May need re-fly
999		U	20:21	20:24			202147	
00		/	20:27	20:33			/	

May 16, 2018 A (SN0764, N44RL)



LIDAR Flight Log

Julian Day 136 | Flight A

Date: May 16 2018 | Aircraft: N-44RL
Project: 3150 GSL Fruitland | Pilot: D. Dorschner
Location: Provo, UT | Operator: Rafael Canelon
Mission Objective

Aircraft Block Time			
Engine On: 14:37	Ramp Out	Take off: 14:57	
Engine Off: 19:46	Ramp In	Landing: 19:32	
Total: 5.1 hrs	Total	Total: 4.6 hrs	

System	Riegl Q1560
Unit	
IMU	Applanix AP50
GPS Rx	Trimble
Scanner 1 Drive	
Scanner 2 Drive	

Additional Notes
Temp
Humidity
Altimeter
Terrain Height

AIRBORNE IMAGING — A Clean Harbors Company

Mission Plan					
AGL Height	2000 m	Pulse Rate	800	KHz	
Target Speed	160 kts	Scan Rate	191	Hz	
Laser Current	100 %	FOV	60	Deg's	

Static Alignment	GPS Time	
	Start	End
Pre-Mission	14:42	14:47
Post-Mission	19:34	19:39

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		
00		/	15:18	15:23			/	
32		E	15:25	15:32			180516-152550	Reply from 3D133
31		W	15:36	15:43			153625	
30		E	15:49	15:56			154939	
29		W	16:00	16:07			160018	
28		E	16:11	16:18			161108	
27		W	16:21	16:28			162143	
26		E	16:32	16:39			163251	
25		W	16:43	16:50			164320	
24		E	16:53	17:01			165356	
23		W	17:04	17:12			170457	
22		E	17:16	17:23			171605	
21		W	17:27	17:34			172708	
20		E	17:37	17:44			173737	Needs Reply / door entry
20		W	17:48	17:55			174838	Reply

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May 17, 2018 A (SN0764, N44RL)

LIDAR Flight Log

AIRBORNE IMAGING — A Clean Harbors Company

Julian Day 137	Flight A

Date: May 17 / 2018	Aircraft: N-44RL
Project: 3150 QSI Fruitland	Pilot: D. Dorschner
Location: Provo, UT	Operator: Rafael Canelon
Mission Objective	

System	Riegl Q1560
Unit	
IMU	Applanix AP50
GPS Rx	Trimble
Scanner 1 Drive	
Scanner 2 Drive	

Additional Notes
Temp
Humidity
Altimeter
Terrain Height

Aircraft Block Time		
Engine On: 14:05	Ramp Out	Take off: 14:26
Engine Off:	Ramp In	Landing:
Total: hrs	Total hrs	Total: hrs

Mission Plan					
AGL Height	2000 m		Pulse Rate	800 KHz	
Target Speed	160 kts		Scan Rate	191 Hz	
Laser Current	100 %		FOV	60 Deg's	

Static Alignment	GPS Time	
	Start	End
Pre-Mission	14:10	14:15
Post-Mission	19:04	19:09

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		
00		/	14:50	14:55			/	
80		E	14:56	15:03			180517_145613	
79		W	15:06	15:13			150612	
78		E	15:17	15:24			151704	
77		W	15:27	/	15:33	~ 7.0	152741	Line aborted due to traffic
77		E	15:46	15:54			154633	Reply
76		W	16:00	16:11			160008	
75		E	16:14	16:24			161412	
74		W	16:28	16:38			162815	
73		E	16:42	16:53			164246	
72		W	16:57	17:08			165719	
71		E	17:11	17:22			171158	
70		W	17:25	17:36			172547	
69		E	17:41	17:51			174109	Line aborted
68		W	17:55	/	17:55		175505	

May 25, 2018 A (SN0764, N44RL)

LIDAR Flight Log

Julian Day 145	Flight A

Date May 25, 2018	**Aircraft** C-GKSX		
Project 3150 QSI Fruitland	**Pilot** A. Lavalliere		
Location Provo, UT	**Operator** R. Canelon		
Mission Objective			

System	**Riegl Q1560**		
Unit	**64**		
IMU	**Applanix AP50**		
GPS Rx	**Trimble**		
Scanner 1 Drive			
Scanner 2 Drive			

Additional Notes	
Temp	
Humidity	
Altimeter	
Terrain Height	

AIRBORNE IMAGING
A Clean Harbors Company

Aircraft Block Time			
Engine On	**Ramp Out**	**Takeoff**	
Engine Off	**Ramp In**	**Landing**	
Total hrs	**Total** hrs	**Total** hrs	

Mission Plan					
AGL Height	2000 **m**	Pulse Rate	800 **KHz**		
Target Speed	160 **kts**	Scan Rate	193 **Hz**		
Laser Current	100 **%**	FOV	60 **Deg's**		

Static Alignment	GPS Time	
	Start	**End**
Pre-Mission	15:00	15:05
Post-Mission	20:07	20:12

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	**End**	**Time**	**nmi to End**		
Figure 8		---------	*15:41:00*	*15:45:00*			----------	
1		*E*	*15:47:53*	*15:58:00*			*180525_154753*	
2		*W*	*16:02:13*	*16:13:00*			*160213*	
3		*E*	*16:15:51*	*16:26:00*			*161551*	
4		*W*	*16:29:54*	*16:40:00*			*162954*	
5		*E*	*16:43:48*	*16:55:00*			*164348*	
6		*W*	*16:58:02*	*17:09:00*			*165802*	
7		*E*	*17:11:57*	*17:22:00*			*171157*	
8		*W*	*17:25:56*	*17:36:00*			*172556*	
9		*E*	*17:39:36*	*17:50:00*			*173936*	
10		*W*	*17:53:21*	*18:04:00*			*175321*	
11		*E*	*18:07:00*	*18:17:00*			*180700*	
996		*N*	*18:25:36*	*18:28:00*			*182536*	
109		*S*	*18:51:38*	*15:54:00*			*185138*	
108		*N*	*18:57:55*	*19:01:00*			*185755*	

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May 26, 2018 A (SN0764, N44RL)

LIDAR Flight Log

Julian Day 146	Flight A

Date:	May 26 / 2018	Aircraft:	C-GKSX
Project:	3750 QSI Fruitland	Pilot:	A. Lavalliere
Location:	Provo, UT	Operator:	R. Canelon
Mission Objective			

System	Riegl Q1560
Unit	
IMU	Applanix AP50
GPS Rx	Trimble
Scanner 1 Drive	
Scanner 2 Drive	

Additional Notes

Temp

Humidity

Altimeter

Terrain Height

AIRBORNE IMAGING
A Clean Harbors Company

Aircraft Block Time			
Engine On: 13:46	Ramp Out	Take off: 14:02	
Engine Off: 19:58	Ramp In	Landing: 19:38	
Total: 6.2 hrs	Total	Total: 5.6 hrs	

Mission Plan					
AGL Height	2000 m	Pulse Rate	800	KHz	
Target Speed	160 kts	Scan Rate	191	Hz	
Laser Current	100 %	FOV	60	Deg's	

Static Alignment	GPS Time	
	Start	End
Pre-Mission	13:54:00	13:59:00
Post-Mission	19:40:00	19:45:00

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		
Figure 8		--------	14:17:00	14:23:0			----------	
998		E	14:25:4	14:32:0			180526_142548	
104		N	14:39:3	14:45:0			143937	Refly from JD145
103		S	14:49:4	14:57:0			144948	
102		N	14:59:5	15:07:0			145956	
101		S	15:11:05	15:19:00			151105	
100		N	15:21:20	15:30:0			152150	
99		S	15:33:2	15:42:0			153322	
98		N	15:45:0	15:53:0			154507	
97		S	15:57:47	16:07:0			155747	
96		N	16:10:39	16:19:00			161039	
95		S	16:22:5	16:33:0			162253	
94		N	16:35:4	16:44:0			163544	
93		S	16:47:4	16:57:0			164744	

May 30, 2018 A (SN0764, N44RL)

LIDAR Flight Log

Julian Day 150	Flight A

Date: May 30 / 2018	Aircraft: N44RL
Project: 3152 QSI Herber	Pilot: Dan K.
Location: Provol, UT	Operator: Rafael Canelon
Mission Objective	

System Riegl Q1560	
Unit	
IMU Applanix AP50	
GPS Rx Trimble	
Scanner 1 Drive	
Scanner 2 Drive	

Additional Notes

Temp

Humidity

Altimeter

Terrain Height

AIRBORNE IMAGING
A Clean Harbors Company

Aircraft Block Time			
Engine On: 13:42	Ramp Out	Takeoff: 14:00	
Engine Off: 19:53	Ramp In	Landing: 19:44	
Total: 6.2 hrs	Total hrs	Total: 5.7 hrs	

Mission Plan			
AGL Height 2000m	Pulse Rate 800KHz		
Target Speed 160kts	Scan Rate 178Hz		
Laser Current 100%	FOV 60Deg's		

Static Alignment	GPS Time	
	Start	End
Pre-Mission	13:51:00	13:56:00
Post-Mission	19:46:00	19:51:00

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		
Figure 8		------	*14:17:00*	*14:22:00*			----------	
1087		*N*	*14:24:36*	*14:28:00*			*180530_142436*	
1086		*S*	*14:31:18*	*14:35:00*			*143118*	
1085		*N*	*14:39:05*	*14:43:00*			*143905*	
1084		*S*	*14:46:30*	*14:51:00*			*144630*	
1083		*N*	*14:54:19*	*14:59:00*			*145419*	
1082		*S*	*15:01:54*	*15:07:00*			*150154*	
1081		*N*	*15:09:41*	*15:14:00*			*150941*	
1080		*S*	*15:17:33*	*15:22:00*			*151733*	
1079		*N*	*15:25:24*	*15:30:00*			*152524*	
1078		*S*	*15:33:29*	*15:38:00*			*153329*	
1077		*N*	*15:41:46*	*15:47:00*			*154146*	
1076		*S*	*15:50:04*	*15:55:00*			*155004*	
1075		*N*	*15:58:19*	*16:04:00*			*155819*	
1074		*S*	*16:06:53*	*16:12:00*			*160653*	

June 3, 2018 A (SN0764, N44RL)

LIDAR Flight Log

Julian Day 153	Flight B

Date: June 03 / 2018	**Aircraft:** C-GKSX		
Project: 3150 QSI Fruitland	**Pilot:** Dan		
Location: Provo, UT	**Operator:** R.Canelon		
Mission Objective			
Refly of lines 41-32			

System	**Riegl Q1560**
Unit	
IMU	**Applanix AP50**
GPS Rx	**Trimble**
Scanner 1 Drive	
Scanner 2 Drive	

Additional Notes

Temp

Humidity

Altimeter

Terrain Height

AIRBORNE IMAGING
A Clean Harbors Company

Aircraft Block Time			
Engine On: 17:55	**Ramp Out**	**Takeoff:** 18:20	
Engine Off: 20:57	**Ramp In**	**Landing:** 20:45	
Total: 3.0 **hrs**	Total hrs	**Total:** 2.4**hrs**	

Mission Plan			
AGL Height 2000m	**Pulse Rate** 800**KHz**		
Target Speed 160**kts**	**Scan Rate** 191**Hz**		
Laser Current 100 %	**FOV** 60 **Deg's**		

Static Alignment	GPS Time	
	Start	**End**
Pre-mission	18:04:00	18:09:00
PostMission	20:47:00	20:52:00

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Mission ID	Comments
			Start	End	Time	nmi to End		
Ground Test		-------	*18:04:51*	*18:05:00*			*180602_180451*	
Tets Strip		------	*18:34:37*	*18:35:00*			*183437*	
Figure 8		-------	*18:39:00*	*18:44:00*			----------	
41		*E*	*18:48:00*	*18:51:00*			*184800*	
40		*W*	*18:53:33*	*18:56:00*			*185333*	
39		*E*	*18:59:22*	*19:02:00*			*185922*	
38		*W*	*19:05:24*	*19:08:00*			*190524*	
37		*E*	*19:11:25*	*19:14:00*			*191125*	
36		*W*	*19:20:53*	*19:28:00*			*192053*	
35		*E*	*19:30:44*	*19:37:00*			*193044*	
34		*W*	*19:40:34*	*19:47:00*			*194034*	
33		*E*	*19:50:37*	*19:57:00*			*195037*	
32		*W*	*20:01:08*	*20:08:00*			*200108*	
999		*N*	*20:16:10*	*20:23:00*			*201610*	
Figure 8		-------	*20:25:00*	*20:30:00*			----------	

August 14, 2018 C (SN1256, N44RL)

LIDAR Flight Log

AIRBORNE IMAGING — A Clean Harbors Company

Julian Day 226 | Flight C

Date	August 14, 2018	Aircraft	N44RL
Project	3153 QSI Utah	Pilot	Dorschner
Location	Provo, UT	Operator	Grayson
Mission Objective			

System	Riegl	Q1560	
Unit	56	(23231356)	
IMU			
GPS Rx	Trimble		
Scanner 1 Drive	3A		
Scanner 2 Drive	1B		

Additional Notes

Aircraft Block Time			
Engine On	19:16	Takeoff	19:38
Engine Off	22:29	Ramp In	22:40
Total	3.2 hrs	Total	3.5 hrs

Mission Plan			
AGL Height	2300 m	Pulse Rate	200 KHz
Target Speed	160 kts	Scan Rate	191 Hz
Laser Current	100 %	FOV	60° Deg's

Static Alignment	GPS Time	
	Start	End
Pre Mission	19:26	19:31
Post Mission	22:15	22:36

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Time Stamp	Comments
			Start	End	Time	nmi to End		
00		-	20:19	20:25			—	
X-Tie (9999)		W	20:25	20:34			203551	
1066		S	20:54		20:53			Ch 1 disconnect
1066		S	21:03	21:10			210351	
1065		N	21:17	21:25			211724	
1064		S	21:31	21:39			213119	
1063		N	21:40	21:40			214024	Misfire - Run - Mission Canceled
00		-	21:41	21:46				

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August 15, 2018 A (SN1256, N44RL)

LIDAR Flight Log

AIRBORNE IMAGING — A Clean Harbors Company

Julian Day	227	Flight	A

Date	August 15 2018	Aircraft	N44RL
Project	3150_QSI_Fruitland	Pilot	Dorschner
Location	Provo, UT	Operator	Grayson
Mission Objective			

System	Riegl	Q1560
Unit	56	(2221256)
IMU		
GPS Rx	Trimble	
Scanner 1 Drive	2	
Scanner 2 Drive	1	

Additional Notes

Aircraft Block Time					
Engine On	16:59	Ramp Out		Takeoff	17:24
Engine Off	21:17	Ramp In		Landing	21:03
Total	4.4 hrs	Total	hrs	Total	3.7 hrs

Mission Plan			
AGL Height	2000 m	Pulse Rate	800 KHz
Target Speed	160 kts	Scan Rate	191 Hz
Laser Current	100 %	FOV	60 Deg's

Static Alignment	GPS Time Start	GPS Time End
Pre Mission	17:04	17:09
Post Mission	21:09	21:14

Flight Line	LiDAR File Name	Flight Direction	GPS Time Start	GPS Time End	Line Aborted Time	Line Aborted nmi to End	Time Stamp	Comments
00		—	17:53	17:59			—	
X-tie (997)		N	18:00	18:03			180051	
53		E	18:14	18:23			181410	
54		W	18:29	18:38			182908	
55		E	18:44	18:54			184426	
56		W	18:58	19:08			185829	
57		E	19:12	19:22			191244	
58		W	19:27	19:36			192709	
59		E	19:41	19:51			194144	Rough - Reflight needed
59		W	19:56	20:06			195643	Reflight
62		E	20:11	20:21			201131	Possible rain to South
00		—	20:23	20:29				

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August 17, 2018 C (SN1256, N44RL)

LIDAR Flight Log

AIRBORNE IMAGING
A Clean Harbors Company

Julian Day	229
Flight	C

Date	August 17, 2018	Aircraft	N44RL
Project	3150 QSI Eval...	Pilot	Dauschner
Location	Provo, UT	Operator	Grayson
Mission Objective			

System	Riegl
Unit	56 (2221256)
IMU	Applanix AP50
GPS Rx	Trimble
Scanner 1 Drive	2
Scanner 2 Drive	1

Additional Notes

Aircraft Block Time					
Engine On	15:44	Ramp Out		Takeoff	16:08
Engine Off	20:10	Ramp In		Landing	19:54
Total	4.4 hrs	Total	hrs	Total	3.8 hrs

Mission Plan			
AGL Height	2000 m	Pulse Rate	800 KHz
Target Speed	160 kts	Scan Rate	141 Hz
Laser Current	100 %	FOV	60 Deg's

Static Alignment	GPS Time Start	GPS Time End
Pre Mission	17:49	17:54
Post Mission	20:02	20:07

Flight Line	LiDAR File Name	Flight Direction	GPS Time Start	GPS Time End	Line Aborted Time	Line Aborted nmi to End	Time Stamp	Comments
∞		–	17:55	18:01			–	
X-tre(447)		N	18:02	18:03			180248	
62		W	18:11	18:22			181139	
63		E	18:26	18:36			182643	
64		W	18:40	18:50			184040	
∞		–	18:51	18:56			–	

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August 18, 2018 A (SN1256, N44RL)

LIDAR Flight Log

AIRBORNE IMAGING
A Clean Harbors Company

Julian Day 230	Flight 1		
Date August 18, 2018	Aircraft N44RL		
Project 3752 QSI Heber	Pilot Dorschner		
Location Provo, UT	Operator [illegible]		
Mission Objective			

System	Riegl
Unit	56 (Q221256)
IMU	Applanix AP50
GPS Rx	Trimble
Scanner 1 Drive	2
Scanner 2 Drive	1

Additional Notes

Aircraft Block Time		
Engine On 15:30	Ramp Out	Takeoff 15:55
Engine Off 18:56	Ramp In	Landing 18:47
Total 3.4 hrs	Total hrs	Total 2.9 hrs

Mission Plan			
AGL Height 2300 m		Pulse Rate 800 KHz	
Target Speed 160 kts		Scan Rate 191 Hz	
Laser Current 100 %		FOV 60 Deg's	

Static Alignment	GPS Time Start	GPS Time End
Pre Mission	15:45	15:50
Post Mission	17:22	17:27

Flight Line	LiDAR File Name	Flight Direction	GPS Time Start	GPS Time End	Line Aborted Time	Line Aborted nmi to End	Time Stamp	Comments
OO		–	16:22	16:29			–	
X-tie (9999)		W	16:32	16:35			163250	
1063		S	16:49	16:58			164930	
1062		N	17:01	17:10			170152	Ch. 1 error after completion, restart required.
OO		–	17:15	17:22			–	

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August 19, 2018 A (SN1256, N44RL)

Julian Day 231 | Flight 9

LIDAR Flight Log

AIRBORNE IMAGING — A Clean Harbors Company

Date 08/19/2018	Aircraft N44RL	System Riegl	Additional Notes
Project 3152 QSI Heber	Pilot Dorschner	Unit 56 (2221256)	
Location Provo, UT	Operator Grayson	IMU Applanix AP 50	
Mission Objective		GPS Rx Trimble	
		Scanner 1 Drive 3A	
		Scanner 2 Drive 1B	

Aircraft Block Time		
Engine On 15:21	Ramp Out	Takeoff 15:45
Engine Off 20:32	Ramp In	Landing 20:18
Total 5.2 hrs	Total hrs	Total 4.6 hrs

Mission Plan			
AGL Height	2300 m	Pulse Rate	800 KHz
Target Speed	160 kts	Scan Rate	191 Hz
Laser Current	100 %	FOV	60 Deg's

Static Alignment	GPS Time Start	GPS Time End
Pre Mission	15:35	15:40
Post Mission	20:25	20:30

Flight Line	LiDAR File Name	Flight Direction	GPS Time Start	GPS Time End	Line Aborted Time	Line Aborted nmi to End	Time Stamp	Comments
∞		—	16:09	16:14				
X tie (9999)		W	16:15	16:17			161546	
1061		S	16:26		16:28		162638	Ch 1 disconnect, needs reflight
1061		N	16:39	16:48			163923	Reflight
1060		S	16:53	17:02			165328	
1059		N	17:06	17:16			170651	
1058		S	17:20	17:30			172057	
1057		N	17:35	17:44			173512	
1056		S	17:47	17:56			174740	
1055		N	18:01	18:09			180103	
1054		S	18:13	18:22			181333	
1053		N	18:25	18:34			182529	
1052		S	18:37	18:46			183749	
1051		N	18:51	19:00			185104	
1050		S	19:03	19:12			190326	

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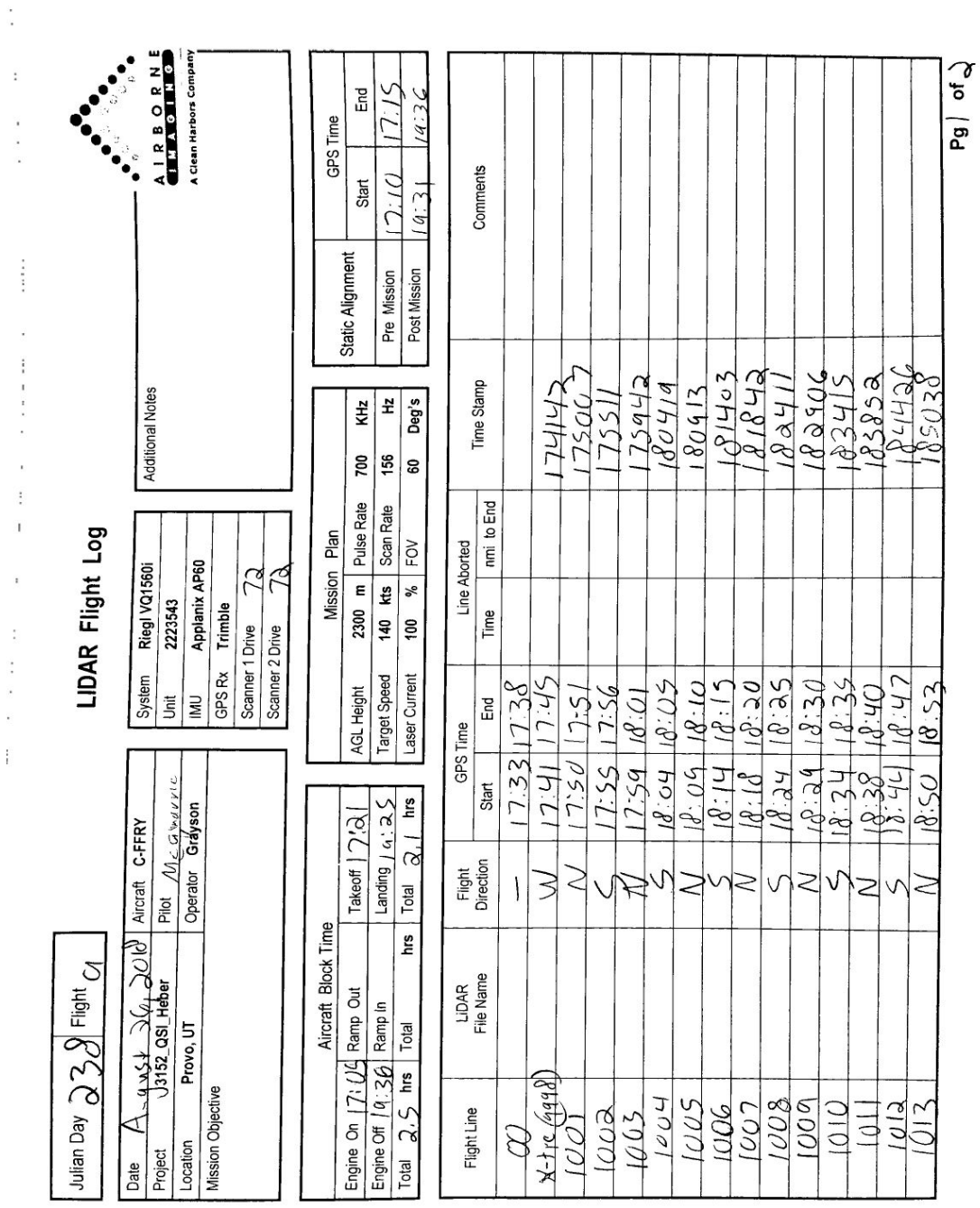
August 26, 2018 A (SN3543, CFFRY)



LIDAR Flight Log

Julian Day 238 Flight 01

Date August 26 2018 | Aircraft C-FFRY
Project 3152_QSI_Heber | Pilot Mc Gwire
Location Provo, UT | Operator Grayson
Mission Objective

System Riegl VQ1560i
Unit 2223543
IMU Applanix AP60
GPS Rx Trimble
Scanner 1 Drive 72
Scanner 2 Drive 73

Additional Notes

AIRBORNE IMAGING — A Clean Harbors Company

Aircraft Block Time

Engine On 17:05	Ramp Out	Takeoff 17:21	
Engine Off 19:36	Ramp In	Landing 19:25	
Total 2.5 hrs	Total hrs	Total 2.1 hrs	

Mission Plan

AGL Height	2300	m	Pulse Rate	700	KHz
Target Speed	140	kts	Scan Rate	156	Hz
Laser Current	100	%	FOV	60	Deg's

Static Alignment

	GPS Time Start	GPS Time End
Pre Mission	17:10	17:15
Post Mission	19:31	19:36

Flight Line	LiDAR File Name	Flight Direction	GPS Time Start	GPS Time End	Line Aborted Time	Line Aborted nmi to End	Time Stamp	Comments
00		—	17:33	17:38				
X-tie (998)		W	17:41	17:45			174142	
1001		N	17:50	17:51			175027	
1002		S	17:55	17:56			175511	
1003		W	17:59	18:01			175942	
1004		S	18:04	18:05			180419	
1005		N	18:09	18:10			180913	
1006		S	18:14	18:15			181403	
1007		N	18:18	18:20			181842	
1008		S	18:24	18:25			182411	
1009		N	18:29	18:30			182906	
1010		S	18:34	18:35			183415	
1011		N	18:38	18:40			183852	
1012		S	18:41	18:42			184426	
1013		N	18:50	18:53			185038	

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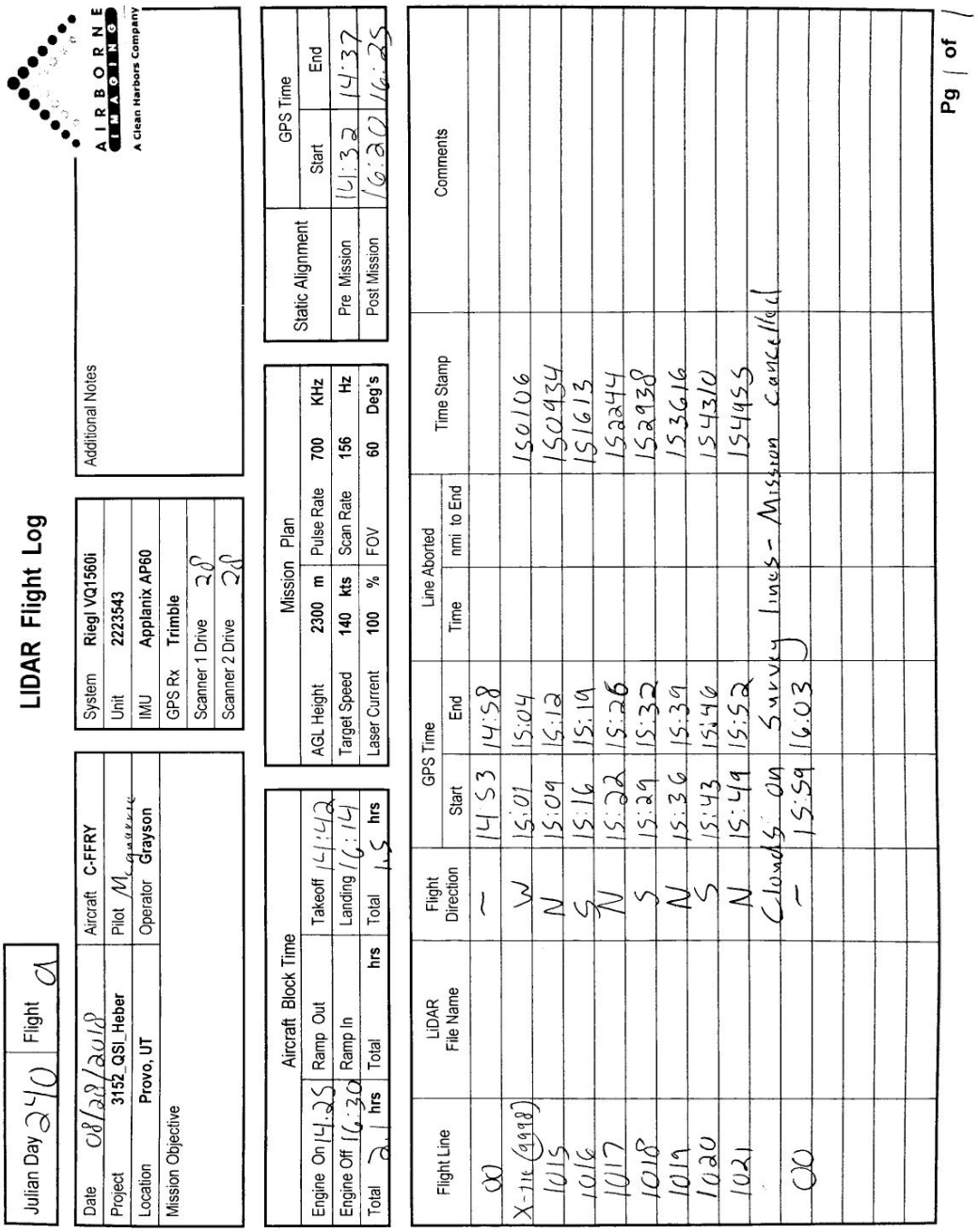
August 28, 2018 A (SN3543, CFFRY)



LIDAR Flight Log

AIRBORNE IMAGING — A Clean Harbors Company

Julian Day 240 | Flight A

Date 08/28/2018 | Aircraft C-FFRY
Project 3152_QSI_Heber | Pilot Maxwell
Location Provo, UT | Operator Grayson
Mission Objective

System Riegl VQ1560i
Unit 2223543
IMU Applanix AP60
GPS Rx Trimble
Scanner 1 Drive 20
Scanner 2 Drive 20

Additional Notes

Aircraft Block Time
Engine On 14:25 | Ramp Out | Takeoff 14:42
Engine Off 16:30 | Ramp In | Landing 16:14
Total 2.1 hrs | Total | hrs | Total 1.5 hrs

Mission Plan

AGL Height	2300 m	Pulse Rate	700	KHz
Target Speed	140 kts	Scan Rate	156	Hz
Laser Current	100 %	FOV	60	Deg's

Static Alignment	GPS Time Start	GPS Time End
Pre Mission	14:32	14:37
Post Mission	16:20	16:25

Flight Line	LiDAR File Name	Flight Direction	GPS Time Start	GPS Time End	Line Aborted Time	Line Aborted nmi to End	Time Stamp	Comments
00		~	14:53	14:58				
X-Tie (9998)		W	15:01	15:04			150106	
1015		N	15:09	15:12			150934	
1016		S	15:16	15:19			151613	
1017		N	15:22	15:26			152244	
1018		S	15:29	15:32			152938	
1019		N	15:36	15:39			153616	
1020		S	15:43	15:46			154310	
1021		N	15:49	15:52			154955	
		Clouds on Survey Lines - Mission cancelled						
00		~	15:59	16:03				

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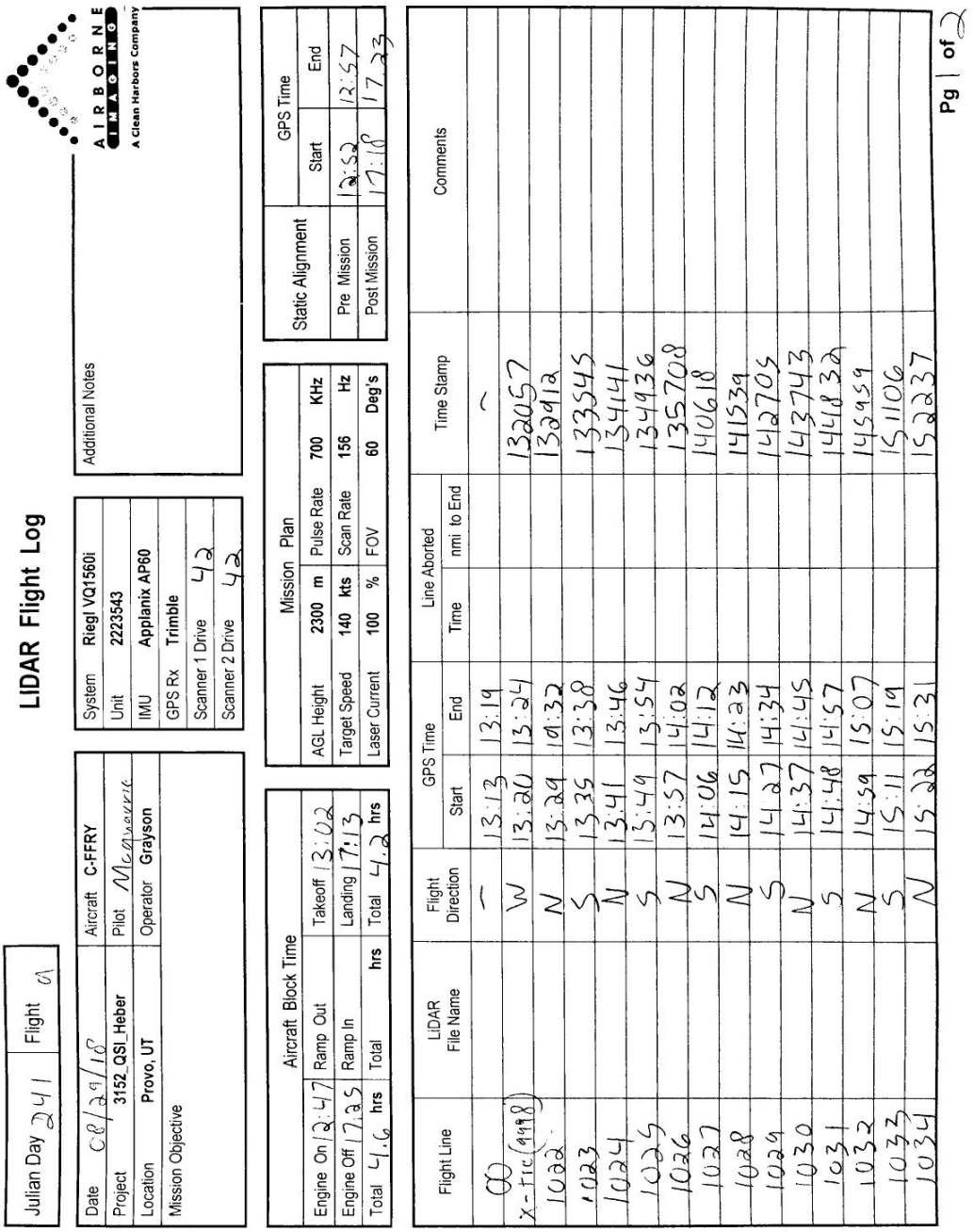
August 29, 2018 A (SN3543, CFFRY)



LIDAR Flight Log

Julian Day 241 | Flight 01

Date 08/29/18 | Aircraft C-FFRY
Project 3152_QSI_Heber | Pilot McMaverick
Location Provo, UT | Operator Grayson
Mission Objective

System Riegl VQ1560i
Unit 2223543
IMU Applanix AP60
GPS Rx Trimble
Scanner 1 Drive 42
Scanner 2 Drive 42

Additional Notes

AIRBORNE IMAGING — A Clean Harbors Company

Aircraft Block Time

Engine On	12:47	Takeoff	13:02
Engine Off	17:25	Landing	17:13
Total	4.6 hrs	Total	4.2 hrs

Mission Plan

AGL Height	2300 m	Pulse Rate	700	KHz
Target Speed	140 kts	Scan Rate	156	Hz
Laser Current	100 %	FOV	60	Deg's

Static Alignment

	GPS Time Start	GPS Time End
Pre Mission	12:52	12:57
Post Mission	17:18	17:23

Flight Line	LiDAR File Name	Flight Direction	GPS Time Start	GPS Time End	Line Aborted Time	Line Aborted nmi to End	Time Stamp	Comments
00		~	13:13	13:19			~	
X-Trc(9998)		W	13:20	13:24			132057	
1022		N	13:29	13:32			133912	
1023		S	13:35	13:38			133545	
1024		N	13:41	13:46			134141	
1025		S	13:49	13:54			134936	
1026		N	13:57	14:02			135708	
1027		S	14:06	14:12			140618	
1028		N	14:15	14:23			141539	
1029		S	14:27	14:34			142705	
1030		N	14:37	14:45			143743	
1031		S	14:48	14:57			144832	
1032		N	14:59	15:07			145959	
1033		S	15:11	15:19			151106	
1034		N	15:23	15:31			152337	

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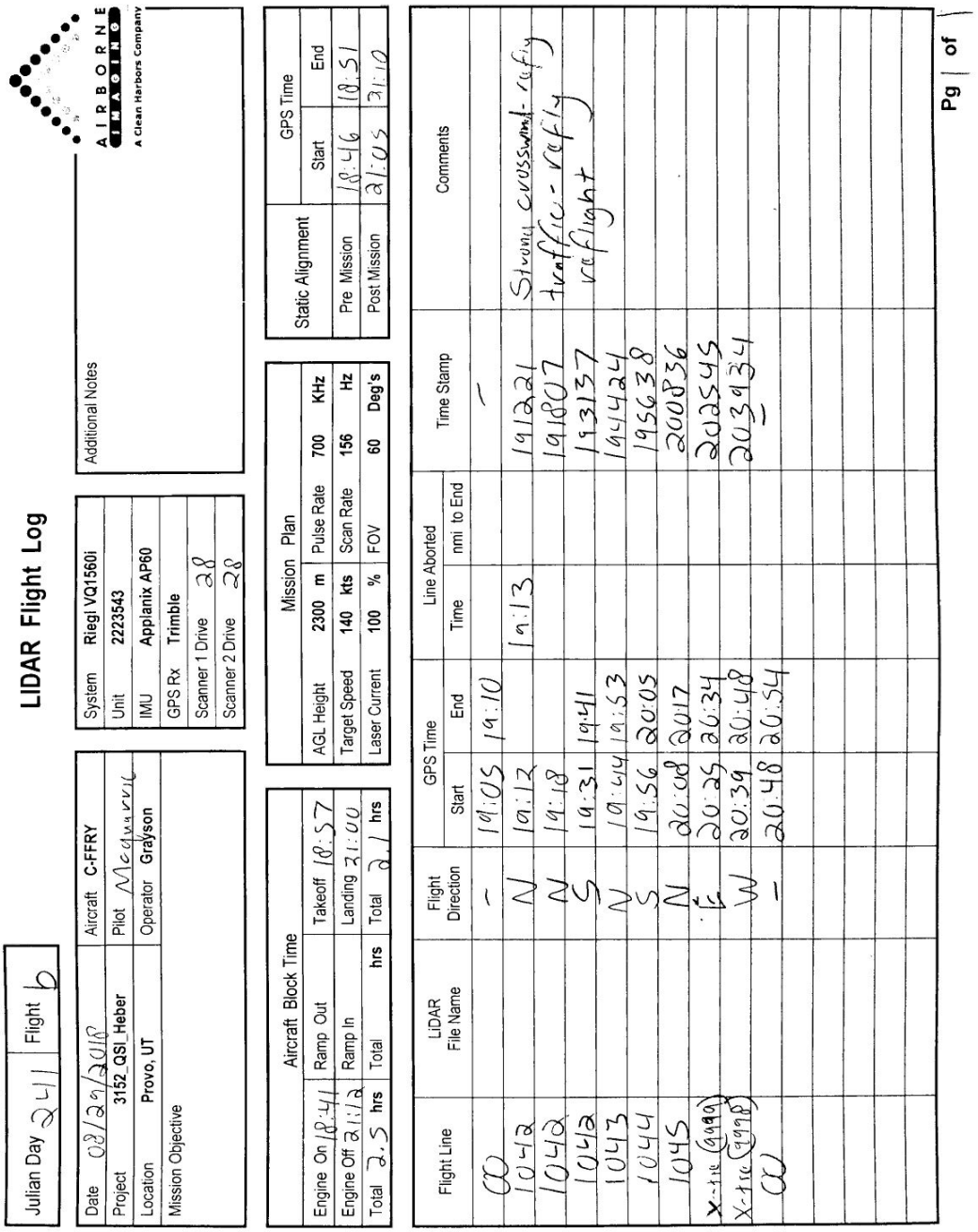
August 29, 2018 B (SN3543, CFFRY)



LIDAR Flight Log

Julian Day 241 | Flight 6

Date	08/29/2018	Aircraft	C-FFRY
Project	3152_QSI_Heber	Pilot	Mcqueen
Location	Provo, UT	Operator	Grayson
Mission Objective			

System	Riegl VQ1560i
Unit	2223543
IMU	Applanix AP60
GPS Rx	Trimble
Scanner 1 Drive	38
Scanner 2 Drive	28

Additional Notes

AIRBORNE IMAGING — A Clean Harbors Company

Aircraft Block Time			
Engine On	18:41	Ramp Out	Takeoff 18:57
Engine Off	21:12	Ramp In	Landing 21:00
Total	2.5 hrs	Total	Total 2.1 hrs

Mission Plan					
AGL Height	2300 m	Pulse Rate	700	KHz
Target Speed	140 kts	Scan Rate	156	Hz
Laser Current	100 %	FOV	60	Deg's

Static Alignment	GPS Time	
	Start	End
Pre Mission	18:46	18:51
Post Mission	21:05	21:10

Flight Line	LiDAR File Name	Flight Direction	GPS Time		Line Aborted		Time Stamp	Comments
			Start	End	Time	nmi to End		
00		-	19:05	19:10			-	
1042		N	19:12		19:13		191221	Strong crosswind - refly
1042		N	19:18				191807	traffic - refly
1042		S	19:31	19:41			193137	reflight
1043		N	19:44	19:53			194424	
1044		S	19:56	20:05			195638	
1045		N	20:08	20:17			200836	
X-line (9999)		E	20:25	20:34			202545	
X-line (9998)		W	20:39	20:48			203934	
00		-	20:48	20:54				

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