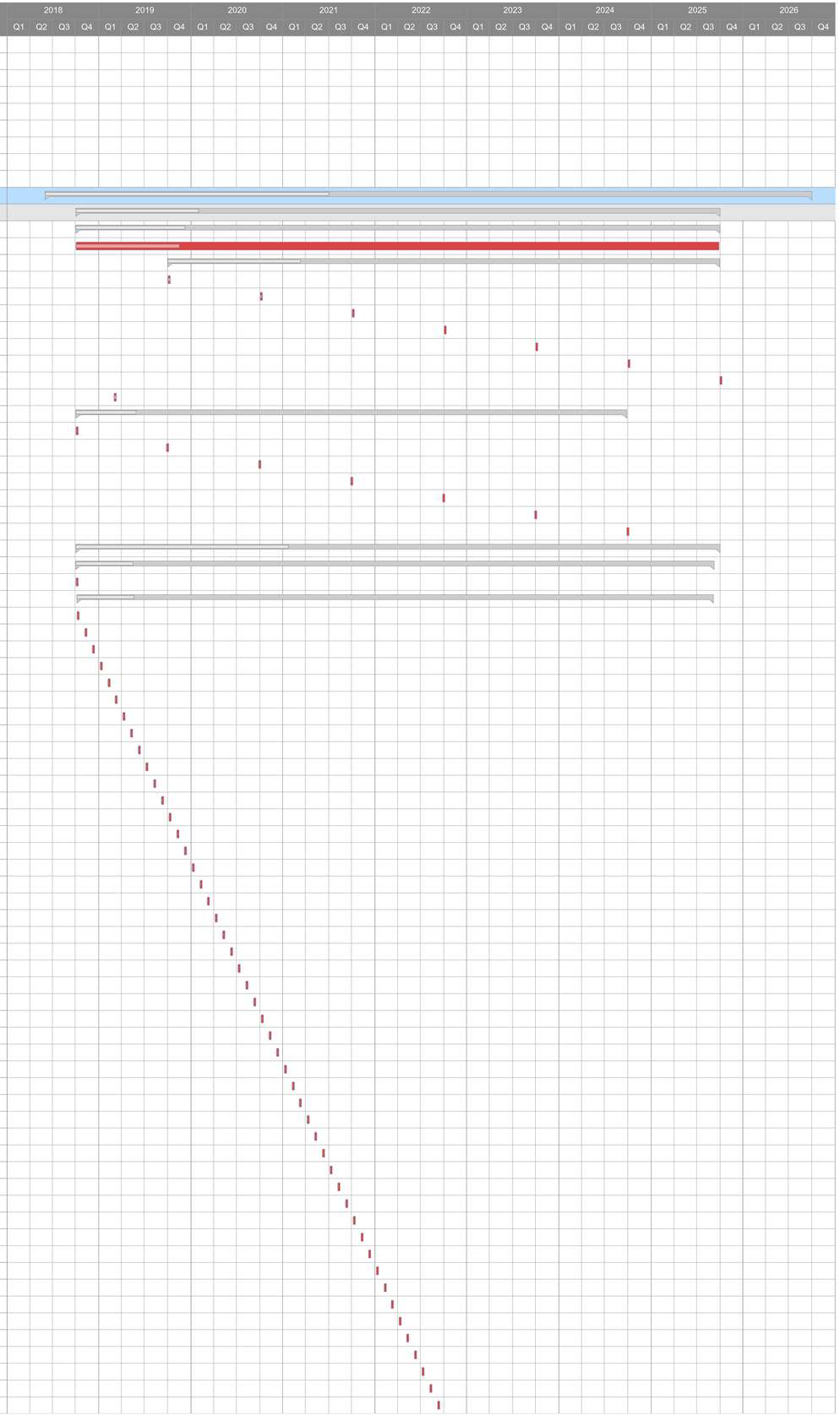
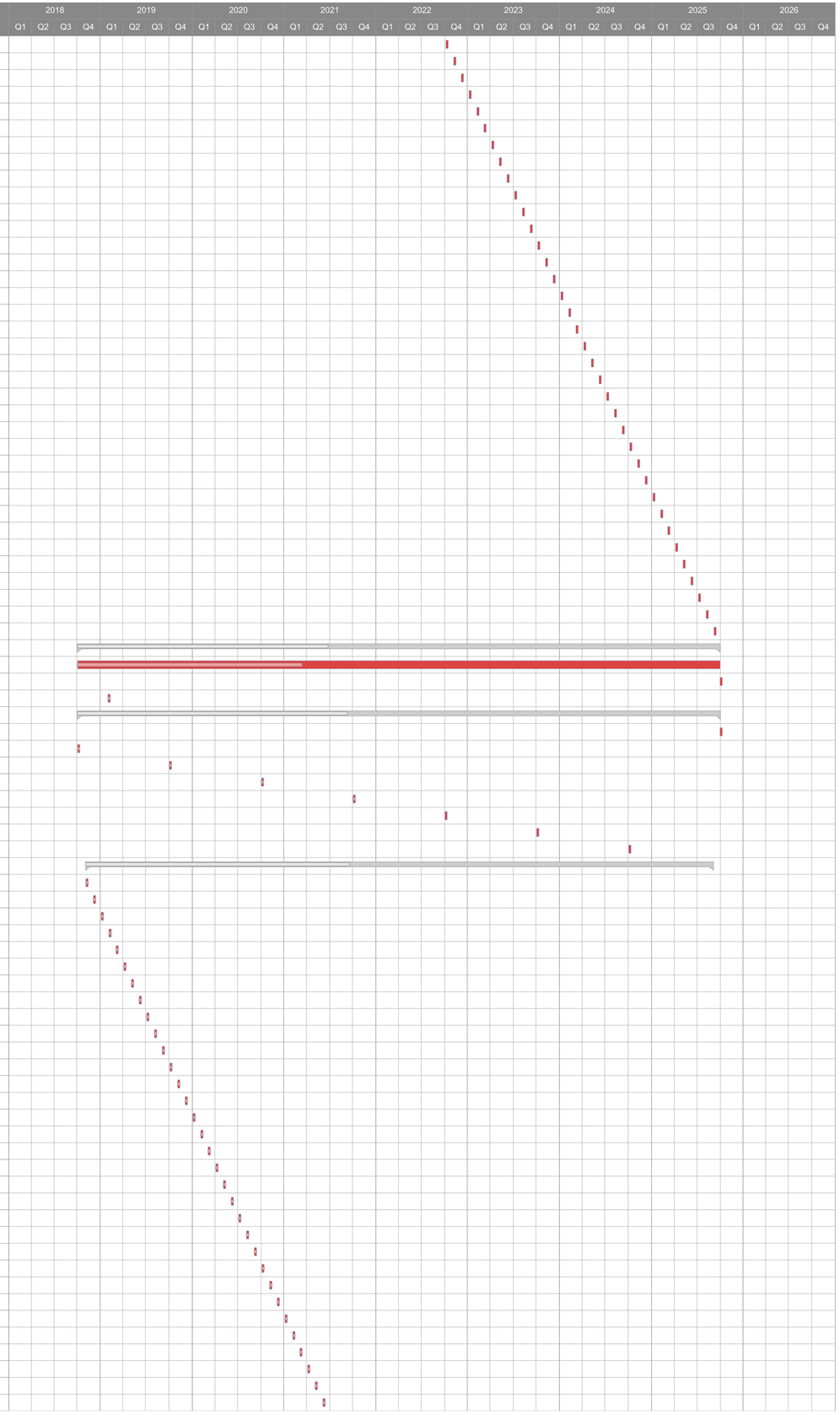
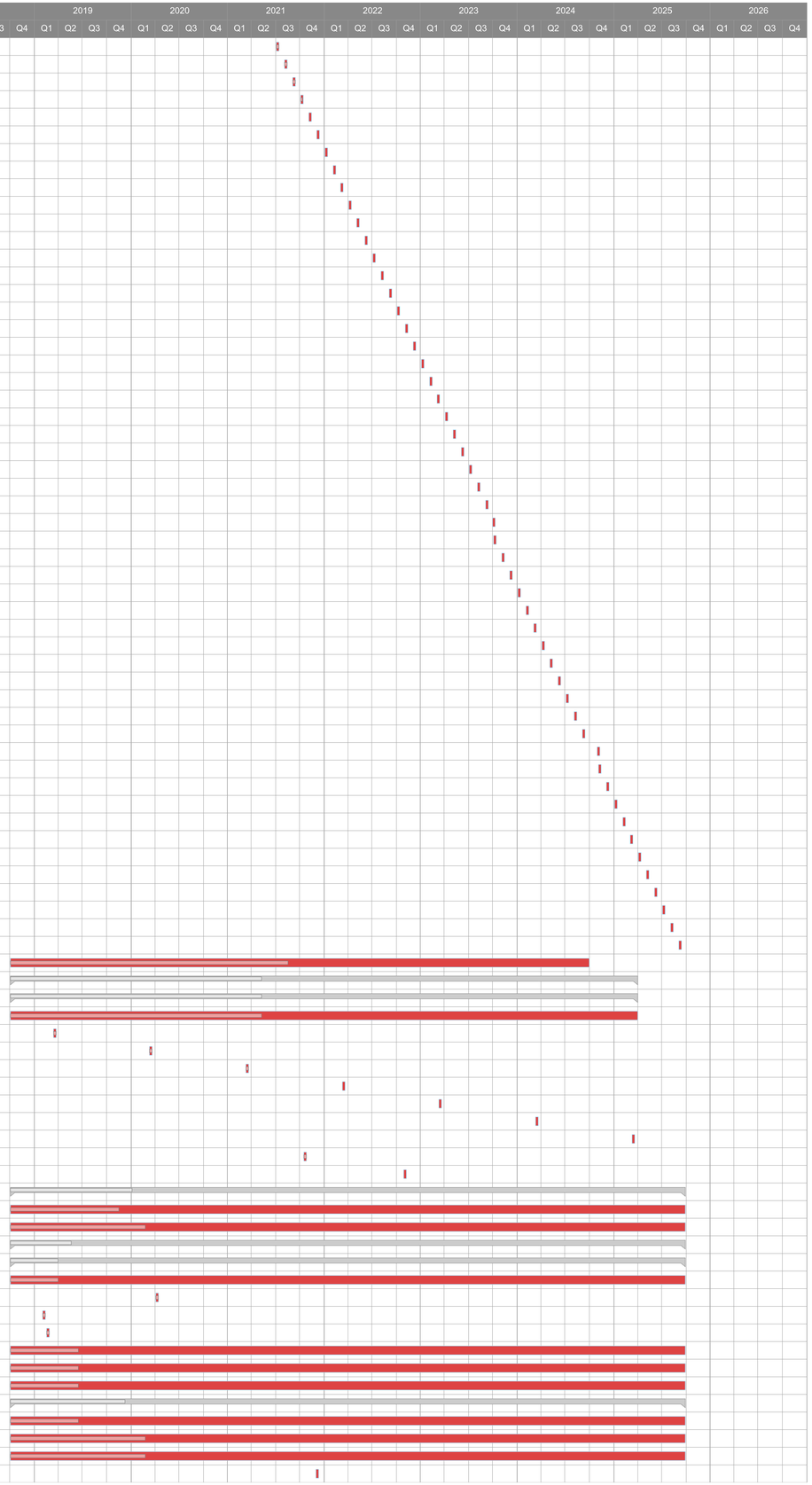
	WBS	Task Name	Start Date	End Date	Predecessor WBS
1		NSF Upgrade Funding Monthly EV Actuals			
2		$439,586.15			
3		$150,759.80			
4		$125,258.50			
5		$5,284.43			
6		$121,854.63			
7		$329.11			
8		$36,099.68			
9					
10	1	IceCube Phase 1 Upgrade Project	06/01/18	09/28/26	
11	1.1	Project Office	10/01/18	09/29/25	
12	1.1.1	Project Management	10/01/18	09/29/25	
13	1.1.1.1	Project Administration	10/01/18	09/26/25	
14	1.1.1.2	Annual Report	10/01/19	09/29/25	
15	*1.1.1.2.1*	*Annual Report 1*	*10/01/19*	*10/01/19*	
16	1.1.1.2.2	Annual Report 2	10/01/20	10/01/20	
17	1.1.1.2.3	Annual Report 3	10/01/21	10/01/21	
18	1.1.1.2.4	Annual Report 4	10/01/22	10/01/22	
19	1.1.1.2.5	Annual Report 5	09/29/23	09/29/23	
20	1.1.1.2.6	Annual Report 6	09/29/24	09/29/24	
21	1.1.1.2.7	Annual Report 7	09/29/25	09/29/25	
22	*1.1.1.3*	*Partnership Agreements (MoUs) Signed*	*03/01/19*	*03/01/19*	
23	1.1.1.4	Project Execution Plan (PEP)	10/01/18	09/25/24	
24	1.1.1.4.1	Project Execution Plan (PEP) 1	10/01/18	10/01/18	
25	1.1.1.4.2	Project Execution Plan (PEP) 2	09/25/19	09/25/19	
26	1.1.1.4.3	Project Execution Plan (PEP) 3	09/25/20	09/25/20	
27	1.1.1.4.4	Project Execution Plan (PEP) 4	09/25/21	09/25/21	
28	1.1.1.4.5	Project Execution Plan (PEP) 5	09/25/22	09/25/22	
29	1.1.1.4.6	Project Execution Plan (PEP) 6	09/25/23	09/25/23	
30	1.1.1.4.7	Project Execution Plan (PEP) 7	09/25/24	09/25/24	
31	1.1.2	Project Controls	10/01/18	09/29/25	
32	1.1.2.1	EVMS	10/01/18	09/05/25	
33	1.1.2.1.1	EVMS Operational	10/01/18	10/01/18	
34	1.1.2.1.2	Project Financial and EV Monthly Report	10/05/18	09/05/25	
35	1.1.2.1.2.1	Project Financial and EV Monthly Report 1	10/05/18	10/05/18	
36	1.1.2.1.2.2	Project Financial and EV Monthly Report 2	11/05/18	11/05/18	
37	1.1.2.1.2.3	Project Financial and EV Monthly Report 3	12/05/18	12/05/18	
38	1.1.2.1.2.4	Project Financial and EV Monthly Report 4	01/05/19	01/05/19	
39	1.1.2.1.2.5	Project Financial and EV Monthly Report 5	02/05/19	02/05/19	
40	1.1.2.1.2.6	Project Financial and EV Monthly Report 6	03/05/19	03/05/19	
41	1.1.2.1.2.7	Project Financial and EV Monthly Report 7	04/05/19	04/05/19	
42	1.1.2.1.2.8	Project Financial and EV Monthly Report 8	05/05/19	05/05/19	
43	1.1.2.1.2.9	Project Financial and EV Monthly Report 9	06/05/19	06/05/19	
44	1.1.2.1.2.10	Project Financial and EV Monthly Report 10	07/05/19	07/05/19	
45	1.1.2.1.2.11	Project Financial and EV Monthly Report 11	08/05/19	08/05/19	
46	1.1.2.1.2.12	Project Financial and EV Monthly Report 12	09/05/19	09/05/19	
47	1.1.2.1.2.13	Project Financial and EV Monthly Report 13	10/05/19	10/05/19	
48	1.1.2.1.2.14	Project Financial and EV Monthly Report 14	11/05/19	11/05/19	
49	1.1.2.1.2.15	Project Financial and EV Monthly Report 15	12/05/19	12/05/19	
50	1.1.2.1.2.16	Project Financial and EV Monthly Report 16	01/05/20	01/05/20	
51	1.1.2.1.2.17	Project Financial and EV Monthly Report 17	02/05/20	02/05/20	
52	1.1.2.1.2.18	Project Financial and EV Monthly Report 18	03/05/20	03/05/20	
53	1.1.2.1.2.19	Project Financial and EV Monthly Report 19	04/05/20	04/05/20	
54	1.1.2.1.2.20	Project Financial and EV Monthly Report 20	05/05/20	05/05/20	
55	1.1.2.1.2.21	Project Financial and EV Monthly Report 21	06/05/20	06/05/20	
56	1.1.2.1.2.22	Project Financial and EV Monthly Report 22	07/05/20	07/05/20	
57	1.1.2.1.2.23	Project Financial and EV Monthly Report 23	08/05/20	08/05/20	
58	1.1.2.1.2.24	Project Financial and EV Monthly Report 24	09/05/20	09/05/20	
59	1.1.2.1.2.25	Project Financial and EV Monthly Report 25	10/05/20	10/05/20	
60	1.1.2.1.2.26	Project Financial and EV Monthly Report 26	11/05/20	11/05/20	
61	1.1.2.1.2.27	Project Financial and EV Monthly Report 27	12/05/20	12/05/20	
62	1.1.2.1.2.28	Project Financial and EV Monthly Report 28	01/05/21	01/05/21	
63	1.1.2.1.2.29	Project Financial and EV Monthly Report 29	02/05/21	02/05/21	
64	1.1.2.1.2.30	Project Financial and EV Monthly Report 30	03/05/21	03/05/21	
65	1.1.2.1.2.31	Project Financial and EV Monthly Report 31	04/05/21	04/05/21	
66	1.1.2.1.2.32	Project Financial and EV Monthly Report 32	05/05/21	05/05/21	
67	1.1.2.1.2.33	Project Financial and EV Monthly Report 33	06/05/21	06/05/21	
68	1.1.2.1.2.34	Project Financial and EV Monthly Report 34	07/05/21	07/05/21	
69	1.1.2.1.2.35	Project Financial and EV Monthly Report 35	08/05/21	08/05/21	
70	1.1.2.1.2.36	Project Financial and EV Monthly Report 36	09/05/21	09/05/21	
71	1.1.2.1.2.37	Project Financial and EV Monthly Report 37	10/05/21	10/05/21	
72	1.1.2.1.2.38	Project Financial and EV Monthly Report 38	11/05/21	11/05/21	
73	1.1.2.1.2.39	Project Financial and EV Monthly Report 39	12/05/21	12/05/21	
74	1.1.2.1.2.40	Project Financial and EV Monthly Report 40	01/05/22	01/05/22	
75	1.1.2.1.2.41	Project Financial and EV Monthly Report 41	02/05/22	02/05/22	
76	1.1.2.1.2.42	Project Financial and EV Monthly Report 42	03/05/22	03/05/22	
77	1.1.2.1.2.43	Project Financial and EV Monthly Report 43	04/05/22	04/05/22	
78	1.1.2.1.2.44	Project Financial and EV Monthly Report 44	05/05/22	05/05/22	
79	1.1.2.1.2.45	Project Financial and EV Monthly Report 45	06/05/22	06/05/22	
80	1.1.2.1.2.46	Project Financial and EV Monthly Report 46	07/05/22	07/05/22	
81	1.1.2.1.2.47	Project Financial and EV Monthly Report 47	08/05/22	08/05/22	
82	1.1.2.1.2.48	Project Financial and EV Monthly Report 48	09/05/22	09/05/22	



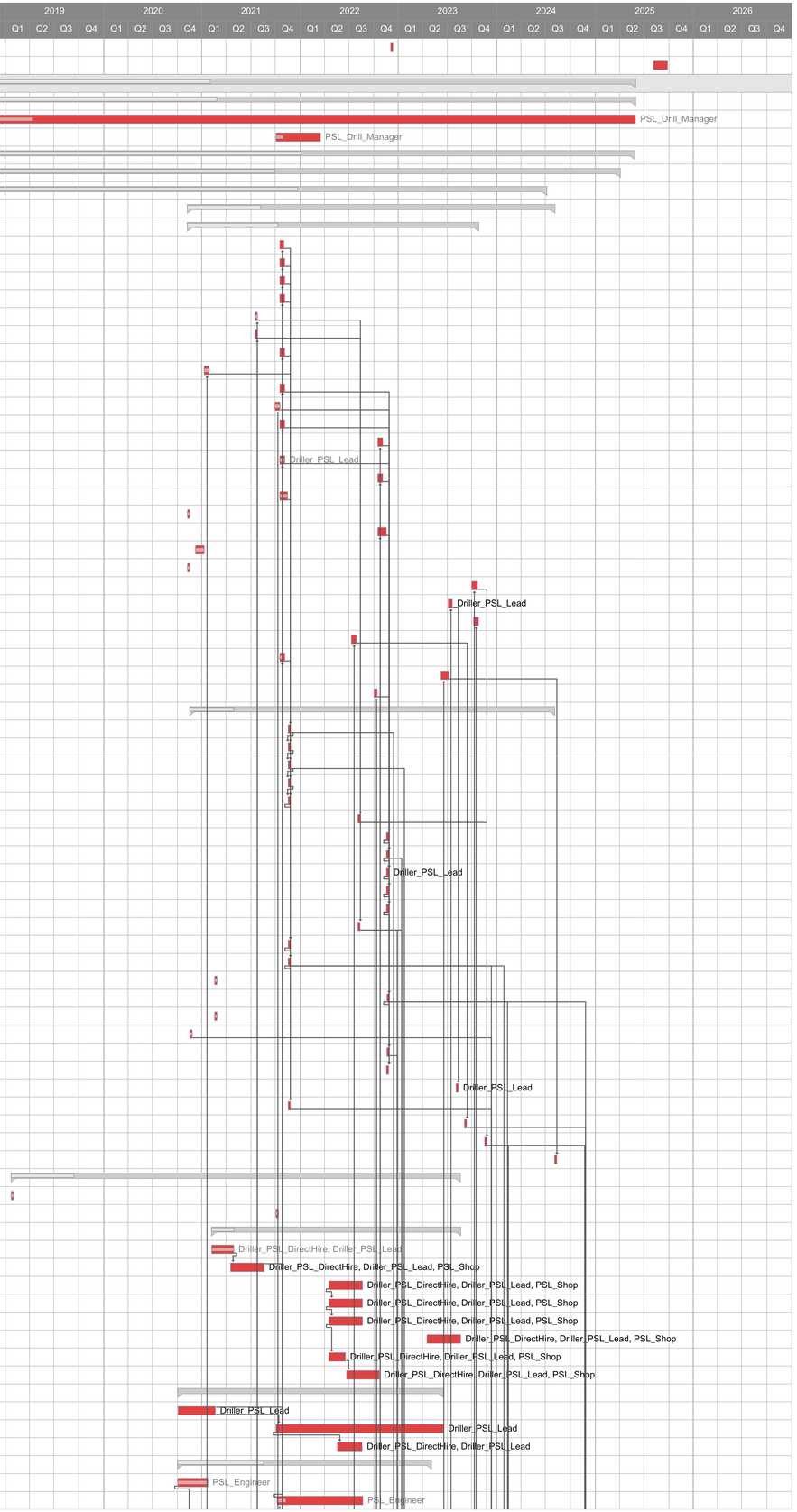
	WBS	Task Name	Start Date	End Date	Predecessor WBS
83	1.1.2.1.2.49	Project Financial and EV Monthly Report 49	10/05/22	10/05/22	
84	1.1.2.1.2.50	Project Financial and EV Monthly Report 50	11/05/22	11/05/22	
85	1.1.2.1.2.51	Project Financial and EV Monthly Report 51	12/05/22	12/05/22	
86	1.1.2.1.2.52	Project Financial and EV Monthly Report 52	01/05/23	01/05/23	
87	1.1.2.1.2.53	Project Financial and EV Monthly Report 53	02/05/23	02/05/23	
88	1.1.2.1.2.54	Project Financial and EV Monthly Report 54	03/05/23	03/05/23	
89	1.1.2.1.2.55	Project Financial and EV Monthly Report 55	04/05/23	04/05/23	
90	1.1.2.1.2.56	Project Financial and EV Monthly Report 56	05/05/23	05/05/23	
91	1.1.2.1.2.57	Project Financial and EV Monthly Report 57	06/05/23	06/05/23	
92	1.1.2.1.2.58	Project Financial and EV Monthly Report 58	07/05/23	07/05/23	
93	1.1.2.1.2.59	Project Financial and EV Monthly Report 59	08/05/23	08/05/23	
94	1.1.2.1.2.60	Project Financial and EV Monthly Report 60	09/05/23	09/05/23	
95	1.1.2.1.2.61	Project Financial and EV Monthly Report 61	10/05/23	10/05/23	
96	1.1.2.1.2.62	Project Financial and EV Monthly Report 62	11/05/23	11/05/23	
97	1.1.2.1.2.63	Project Financial and EV Monthly Report 63	12/05/23	12/05/23	
98	1.1.2.1.2.64	Project Financial and EV Monthly Report 64	01/05/24	01/05/24	
99	1.1.2.1.2.65	Project Financial and EV Monthly Report 65	02/05/24	02/05/24	
100	1.1.2.1.2.66	Project Financial and EV Monthly Report 66	03/05/24	03/05/24	
101	1.1.2.1.2.67	Project Financial and EV Monthly Report 67	04/05/24	04/05/24	
102	1.1.2.1.2.68	Project Financial and EV Monthly Report 68	05/05/24	05/05/24	
103	1.1.2.1.2.69	Project Financial and EV Monthly Report 69	06/05/24	06/05/24	
104	1.1.2.1.2.70	Project Financial and EV Monthly Report 70	07/05/24	07/05/24	
105	1.1.2.1.2.71	Project Financial and EV Monthly Report 71	08/05/24	08/05/24	
106	1.1.2.1.2.72	Project Financial and EV Monthly Report 72	09/05/24	09/05/24	
107	1.1.2.1.2.73	Project Financial and EV Monthly Report 73	10/05/24	10/05/24	
108	1.1.2.1.2.74	Project Financial and EV Monthly Report 74	11/05/24	11/05/24	
109	1.1.2.1.2.75	Project Financial and EV Monthly Report 75	12/05/24	12/05/24	
110	1.1.2.1.2.76	Project Financial and EV Monthly Report 76	01/05/25	01/05/25	
111	1.1.2.1.2.77	Project Financial and EV Monthly Report 77	02/05/25	02/05/25	
112	1.1.2.1.2.78	Project Financial and EV Monthly Report 78	03/05/25	03/05/25	
113	1.1.2.1.2.79	Project Financial and EV Monthly Report 79	04/05/25	04/05/25	
114	1.1.2.1.2.80	Project Financial and EV Monthly Report 80	05/05/25	05/05/25	
115	1.1.2.1.2.81	Project Financial and EV Monthly Report 81	06/05/25	06/05/25	
116	1.1.2.1.2.82	Project Financial and EV Monthly Report 82	07/05/25	07/05/25	
117	1.1.2.1.2.83	Project Financial and EV Monthly Report 83	08/05/25	08/05/25	
118	1.1.2.1.2.84	Project Financial and EV Monthly Report 84	09/05/25	09/05/25	
119	**1.1.2.2**	**Subaward Management**	**10/01/18**	**09/29/25**	
120		Parent Duration Buffer	10/01/18	09/29/25	
121		Parent Duration Buffer	09/29/25	09/29/25	
122	*1.1.2.2.1*	*Setup subagreements w US institutions*	*01/30/19*	*01/30/19*	
123	**1.1.2.2.2**	**Distributed Funding to Sub-Awardees**	**10/01/18**	**09/29/25**	
124		Parent Duration Buffer	09/29/25	09/29/25	
125	*1.1.2.2.2.1*	*Distributed Funding to Sub-Awardees 1*	*10/01/18*	*10/01/18*	
126	*1.1.2.2.2.2*	*Distributed Funding to Sub-Awardees 2*	*10/01/19*	*10/01/19*	
127	*1.1.2.2.2.3*	*Distributed Funding to Sub-Awardees 3*	*10/01/20*	*10/01/20*	
128	*1.1.2.2.2.4*	*Distributed Funding to Sub-Awardees 4*	*10/01/21*	*10/01/21*	
129	1.1.2.2.2.5	Distributed Funding to Sub-Awardees 5	10/01/22	10/01/22	
130	1.1.2.2.2.6	Distributed Funding to Sub-Awardees 6	10/01/23	10/01/23	
131	1.1.2.2.2.7	Distributed Funding to Sub-Awardees 7	10/01/24	10/01/24	
132	**1.1.2.2.3**	**Monthly Tracking**	**11/03/18**	**09/03/25**	
133	*1.1.2.2.3.1*	*Monthly Tracking 1*	*11/03/18*	*11/03/18*	
134	*1.1.2.2.3.2*	*Monthly Tracking 2*	*12/03/18*	*12/03/18*	
135	*1.1.2.2.3.3*	*Monthly Tracking 3*	*01/03/19*	*01/03/19*	
136	*1.1.2.2.3.4*	*Monthly Tracking 4*	*02/03/19*	*02/03/19*	
137	*1.1.2.2.3.5*	*Monthly Tracking 5*	*03/03/19*	*03/03/19*	
138	*1.1.2.2.3.6*	*Monthly Tracking 6*	*04/03/19*	*04/03/19*	
139	*1.1.2.2.3.7*	*Monthly Tracking 7*	*05/03/19*	*05/03/19*	
140	*1.1.2.2.3.8*	*Monthly Tracking 8*	*06/03/19*	*06/03/19*	
141	*1.1.2.2.3.9*	*Monthly Tracking 9*	*07/03/19*	*07/03/19*	
142	*1.1.2.2.3.10*	*Monthly Tracking 10*	*08/03/19*	*08/03/19*	
143	*1.1.2.2.3.11*	*Monthly Tracking 11*	*09/03/19*	*09/03/19*	
144	*1.1.2.2.3.12*	*Monthly Tracking 12*	*10/03/19*	*10/03/19*	
145	*1.1.2.2.3.13*	*Monthly Tracking 13*	*11/03/19*	*11/03/19*	
146	*1.1.2.2.3.14*	*Monthly Tracking 14*	*12/03/19*	*12/03/19*	
147	*1.1.2.2.3.15*	*Monthly Tracking 15*	*01/03/20*	*01/03/20*	
148	*1.1.2.2.3.16*	*Monthly Tracking 16*	*02/03/20*	*02/03/20*	
149	*1.1.2.2.3.17*	*Monthly Tracking 17*	*03/03/20*	*03/03/20*	
150	*1.1.2.2.3.18*	*Monthly Tracking 18*	*04/03/20*	*04/03/20*	
151	*1.1.2.2.3.19*	*Monthly Tracking 19*	*05/03/20*	*05/03/20*	
152	*1.1.2.2.3.20*	*Monthly Tracking 20*	*06/03/20*	*06/03/20*	
153	*1.1.2.2.3.21*	*Monthly Tracking 21*	*07/03/20*	*07/03/20*	
154	*1.1.2.2.3.22*	*Monthly Tracking 22*	*08/03/20*	*08/03/20*	
155	*1.1.2.2.3.23*	*Monthly Tracking 23*	*09/03/20*	*09/03/20*	
156	*1.1.2.2.3.24*	*Monthly Tracking 24*	*10/03/20*	*10/03/20*	
157	*1.1.2.2.3.25*	*Monthly Tracking 25*	*11/03/20*	*11/03/20*	
158	*1.1.2.2.3.26*	*Monthly Tracking 26*	*12/03/20*	*12/03/20*	
159	*1.1.2.2.3.27*	*Monthly Tracking 27*	*01/03/21*	*01/03/21*	
160	*1.1.2.2.3.28*	*Monthly Tracking 28*	*02/03/21*	*02/03/21*	
161	*1.1.2.2.3.29*	*Monthly Tracking 29*	*03/03/21*	*03/03/21*	
162	*1.1.2.2.3.30*	*Monthly Tracking 30*	*04/03/21*	*04/03/21*	
163	*1.1.2.2.3.31*	*Monthly Tracking 31*	*05/03/21*	*05/03/21*	
164	*1.1.2.2.3.32*	*Monthly Tracking 32*	*06/03/21*	*06/03/21*	



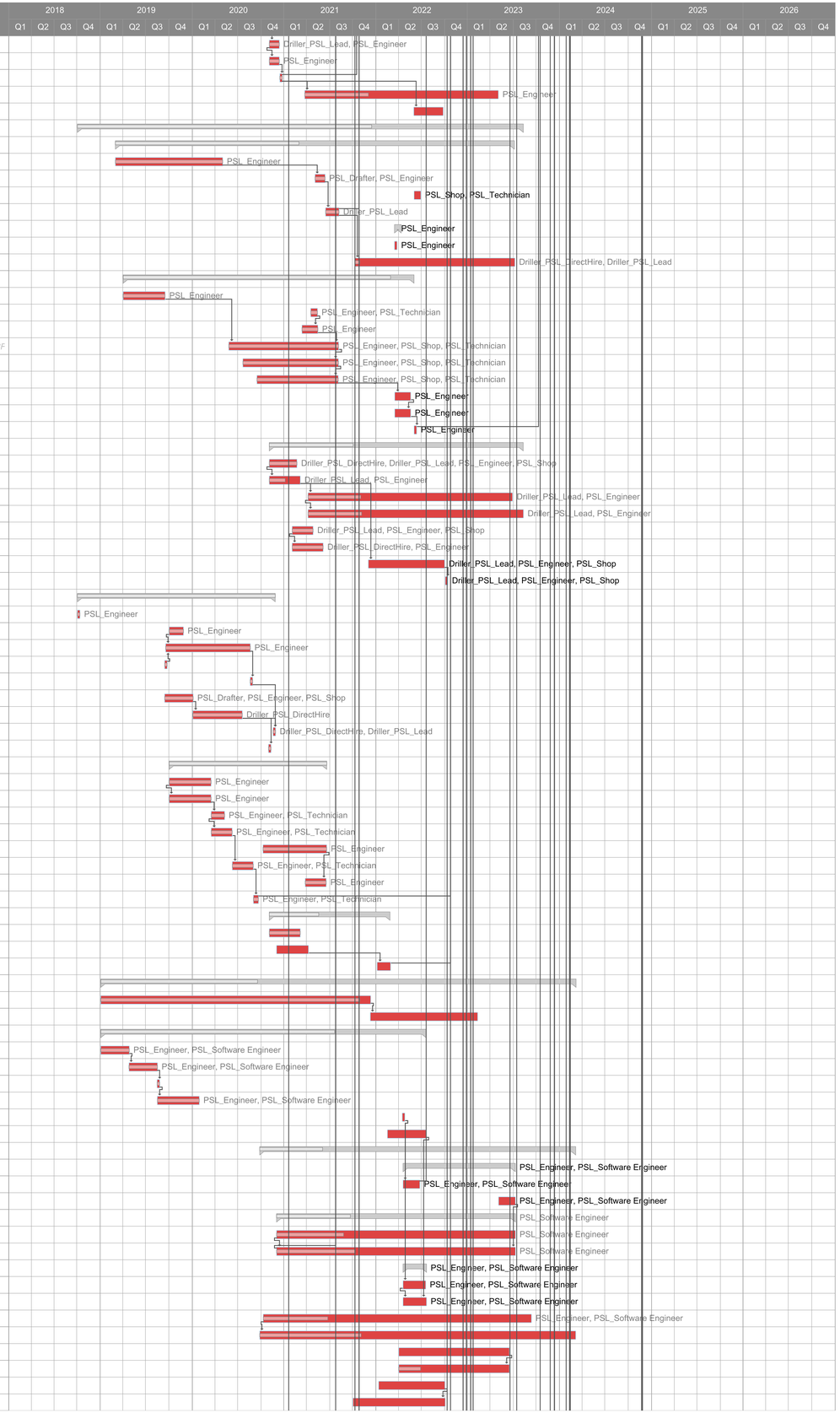
	WBS	Task Name	Start Date	End Date	Predecessor WBS
165	*1.1.2.2.3.33*	*Monthly Tracking 33*	*07/03/21*	*07/03/21*	
166	*1.1.2.2.3.34*	*Monthly Tracking 34*	*08/03/21*	*08/03/21*	
167	*1.1.2.2.3.35*	*Monthly Tracking 35*	*09/03/21*	*09/03/21*	
168	1.1.2.2.3.36	Monthly Tracking 36	10/03/21	10/03/21	
169	1.1.2.2.3.37	Monthly Tracking 37	11/03/21	11/03/21	
170	1.1.2.2.3.38	Monthly Tracking 38	12/03/21	12/03/21	
171	1.1.2.2.3.39	Monthly Tracking 39	01/03/22	01/03/22	
172	1.1.2.2.3.40	Monthly Tracking 40	02/03/22	02/03/22	
173	1.1.2.2.3.41	Monthly Tracking 41	03/03/22	03/03/22	
174	1.1.2.2.3.42	Monthly Tracking 42	04/03/22	04/03/22	
175	1.1.2.2.3.43	Monthly Tracking 43	05/03/22	05/03/22	
176	1.1.2.2.3.44	Monthly Tracking 44	06/03/22	06/03/22	
177	1.1.2.2.3.45	Monthly Tracking 45	07/03/22	07/03/22	
178	1.1.2.2.3.46	Monthly Tracking 46	08/03/22	08/03/22	
179	1.1.2.2.3.47	Monthly Tracking 47	09/03/22	09/03/22	
180	1.1.2.2.3.48	Monthly Tracking 48	10/03/22	10/03/22	
181	1.1.2.2.3.49	Monthly Tracking 49	11/03/22	11/03/22	
182	1.1.2.2.3.50	Monthly Tracking 50	12/03/22	12/03/22	
183	1.1.2.2.3.51	Monthly Tracking 51	01/03/23	01/03/23	
184	1.1.2.2.3.52	Monthly Tracking 52	02/03/23	02/03/23	
185	1.1.2.2.3.53	Monthly Tracking 53	03/03/23	03/03/23	
186	1.1.2.2.3.54	Monthly Tracking 54	04/03/23	04/03/23	
187	1.1.2.2.3.55	Monthly Tracking 55	05/03/23	05/03/23	
188	1.1.2.2.3.56	Monthly Tracking 56	06/03/23	06/03/23	
189	1.1.2.2.3.57	Monthly Tracking 57	07/03/23	07/03/23	
190	1.1.2.2.3.58	Monthly Tracking 58	08/03/23	08/03/23	
191	1.1.2.2.3.59	Monthly Tracking 59	09/03/23	09/03/23	
192	1.1.2.2.3.60	Monthly Tracking 60	09/29/23	09/29/23	
193	1.1.2.2.3.61	Monthly Tracking 61	10/03/23	10/03/23	
194	1.1.2.2.3.62	Monthly Tracking 62	11/03/23	11/03/23	
195	1.1.2.2.3.63	Monthly Tracking 63	12/03/23	12/03/23	
196	1.1.2.2.3.64	Monthly Tracking 64	01/03/24	01/03/24	
197	1.1.2.2.3.65	Monthly Tracking 65	02/03/24	02/03/24	
198	1.1.2.2.3.66	Monthly Tracking 66	03/03/24	03/03/24	
199	1.1.2.2.3.67	Monthly Tracking 67	04/03/24	04/03/24	
200	1.1.2.2.3.68	Monthly Tracking 68	05/03/24	05/03/24	
201	1.1.2.2.3.69	Monthly Tracking 69	06/03/24	06/03/24	
202	1.1.2.2.3.70	Monthly Tracking 70	07/03/24	07/03/24	
203	1.1.2.2.3.71	Monthly Tracking 71	08/03/24	08/03/24	
204	1.1.2.2.3.72	Monthly Tracking 72	09/03/24	09/03/24	
205	1.1.2.2.3.73	Monthly Tracking 73	10/29/24	10/29/24	
206	1.1.2.2.3.74	Monthly Tracking 74	11/03/24	11/03/24	
207	1.1.2.2.3.75	Monthly Tracking 75	12/03/24	12/03/24	
208	1.1.2.2.3.76	Monthly Tracking 76	01/03/25	01/03/25	
209	1.1.2.2.3.77	Monthly Tracking 77	02/03/25	02/03/25	
210	1.1.2.2.3.78	Monthly Tracking 78	03/03/25	03/03/25	
211	1.1.2.2.3.79	Monthly Tracking 79	04/03/25	04/03/25	
212	1.1.2.2.3.80	Monthly Tracking 80	05/03/25	05/03/25	
213	1.1.2.2.3.81	Monthly Tracking 81	06/03/25	06/03/25	
214	1.1.2.2.3.82	Monthly Tracking 82	07/03/25	07/03/25	
215	1.1.2.2.3.83	Monthly Tracking 83	08/03/25	08/03/25	
216	1.1.2.2.3.84	Monthly Tracking 84	09/03/25	09/03/25	
217	1.1.2.3	Financial Reporting	10/01/18	09/27/24	
218	**1.1.2.4**	**Project Reviews**	**10/01/18**	**03/31/25**	
219	**1.1.2.4.1**	**Annual NSF Review**	**10/01/18**	**03/31/25**	
220		Parent Duration Buffer	10/01/18	03/31/25	
221	*1.1.2.4.1.1*	*Annual NSF Review 1*	*03/13/19*	*03/13/19*	
222	*1.1.2.4.1.2*	*Annual NSF Review 2*	*03/10/20*	*03/10/20*	
223	*1.1.2.4.1.3*	*Annual NSF Review 3*	*03/10/21*	*03/10/21*	
224	1.1.2.4.1.4	Annual NSF Review 4	03/10/22	03/10/22	
225	1.1.2.4.1.5	Annual NSF Review 5	03/10/23	03/10/23	
226	1.1.2.4.1.6	Annual NSF Review 6	03/10/24	03/10/24	
227	1.1.2.4.1.7	Annual NSF Review 7	03/10/25	03/10/25	
228	*1.1.2.4.2*	*Instrumentation Pre-Shipment Review*	*10/15/21*	*10/15/21*	
229	1.1.2.4.3	Instrumentation Deployment Readiness Review	10/28/22	10/28/22	
230	**1.1.3**	**Quality and Safety**	**10/01/18**	**09/26/25**	
231	1.1.3.1	Risk Management	10/01/18	09/26/25	
232	1.1.3.2	Document Control Systems	10/01/18	09/26/25	
233	**1.1.4**	**Project Engineering**	**10/01/18**	**09/26/25**	
234	**1.1.4.1**	**System Engineering**	**10/01/18**	**09/26/25**	
235	1.1.4.1.1	System Engineering Support	10/01/18	09/26/25	
236	*1.1.4.1.2*	*Upgrade String Design Complete*	*04/03/20*	*04/03/20*	
237	*1.1.4.1.3*	*Configuration Management Plan*	*01/31/19*	*01/31/19*	
238	*1.1.4.1.4*	*Configuration Management Process Implemented*	*02/15/19*	*02/15/19*	
239	1.1.4.2	Production Management	10/01/18	09/26/25	
240	1.1.4.3	Risk Management	10/01/18	09/26/25	
241	1.1.4.4	Reliability and Quality Assurance	10/01/18	09/26/25	
242	**1.1.5**	**Polar Operations**	**10/01/18**	**09/26/25**	
243	1.1.5.1	Logistics	10/01/18	09/26/25	
244	1.1.5.2	Antarctic Support Contractor	10/01/18	09/26/25	
245	1.1.5.3	Environment, Health, and Safety	10/01/18	09/26/25	
246	1.1.5.4	IDF is Delivered to Upgrade Project from ASC	11/30/21	11/30/21	



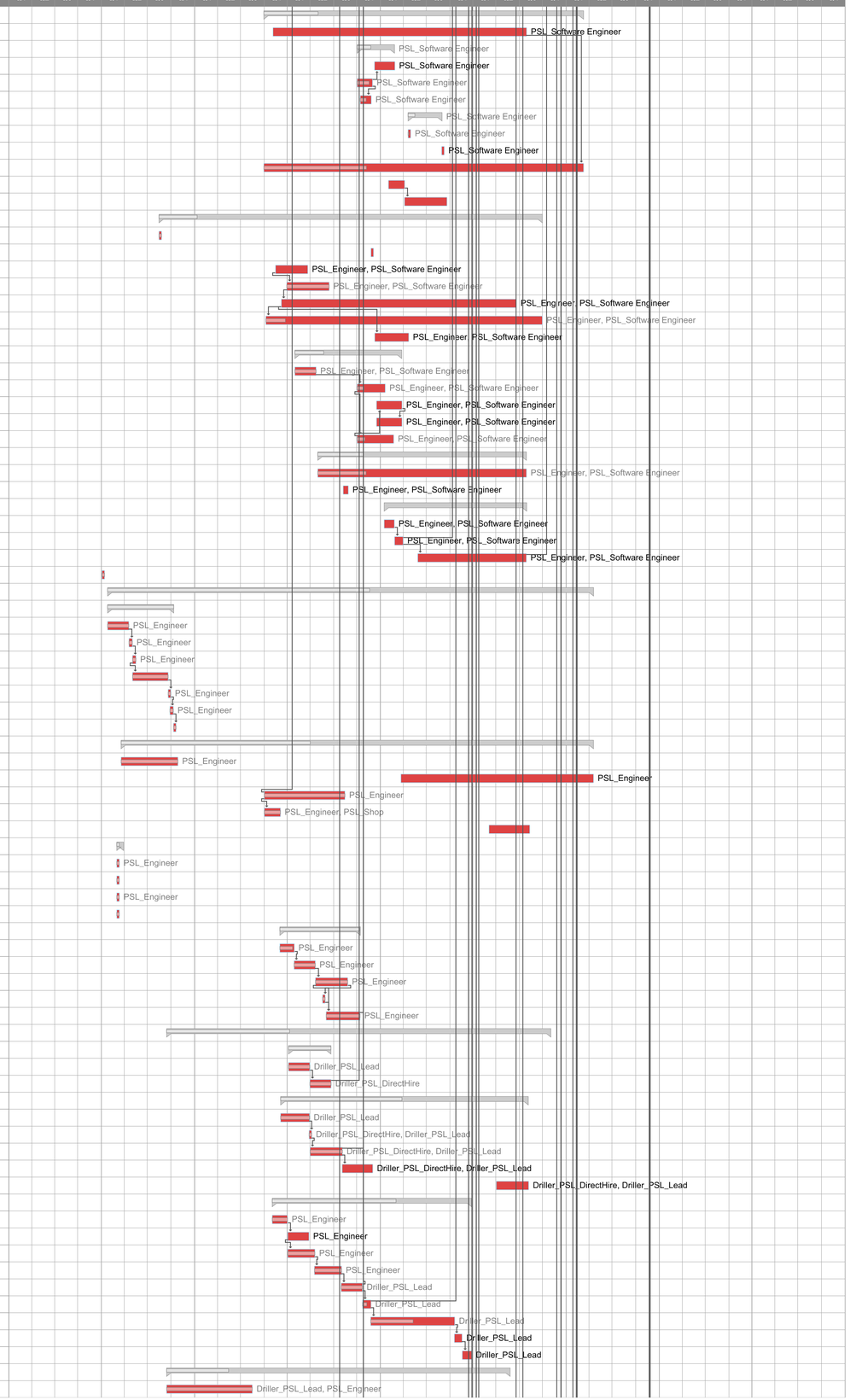
	WBS	Task Name	Start Date	End Date	Predecessor WBS
247	1.1.5.5	ICL Readied by ASC for Upgrade String Comissioning	12/01/22	12/01/22	
248	1.1.6	Upgrade Project Completion Report	08/04/25	09/26/25	
249	**1.2**	**EHWD Drill Upgrade**	**10/01/18**	**05/28/25**	
250	**1.2.1**	**Drill Management & Systems Engineering**	**10/01/18**	**05/28/25**	
251	1.2.1.1	EHWD Project Management and Controls	10/01/18	05/28/25	
252	1.2.1.2	Logistics Review and Rebaselining Support (Drill Manager)	10/01/21	03/17/22	
253	**1.2.1.2**	**Systems Engineering**	**10/01/18**	**05/26/25**	
273	**1.2.1.3**	**Drill Quality and Safety**	**10/01/18**	**04/01/25**	
281	**1.2.1.4**	**Travel**	**10/01/18**	**07/03/24**	
288	**1.2.1.5**	**Transportation and Logistics**	**11/06/20**	**08/01/24**	
289	**1.2.1.5.1**	**Crating/Stowage/Load-up of containers**	**11/06/20**	**10/24/23**	
290	1.2.1.5.1.1	Crate MHP Replacements & Spares to PTH (Vessel)	10/15/21	11/01/21	347FS +41d
291	1.2.1.5.1.2	Crate PHS Replacements & Spares to PTH (Vessel)	10/15/21	11/04/21	355FS +170d
292	1.2.1.5.1.3	Crate Fuel Systems & Tower Components to PTH (Vessel)	10/15/21	11/04/21	360SS +8d
293	1.2.1.5.1.4	Crate TOS Components & Spares to PTH (Vessel)	10/15/21	11/04/21	371FS +49d
294	1.2.1.5.1.5	Crate Control Systems Components to PTH (Comsur)	07/15/21	07/23/21	433SS +162d
295	1.2.1.5.1.6	Crate ARA Drill Subsystem Parts to PTH (Comsur)	07/15/21	07/23/21	538SS +76d
296	1.2.1.5.1.7	Crate Shop Parts - Hose Crimper, Spares, etc. to PTH (Vessel)	10/15/21	11/04/21	552FS +14d
297	*1.2.1.5.1.8*	*Crate GEN-2, 3, PDM - Ship Components, Repair Parts to PTH (Vessel)*	*01/07/21*	*01/27/21*	*489SS +70d*
298	1.2.1.5.1.9	Crate Elect. Distribution System Components to PTH (Vessel)	10/15/21	11/04/21	502FS +2d
299	*1.2.1.5.1.10*	*Crate WT Repair Parts, Replacements to PTH (Vessel)*	*09/27/21*	*10/15/21*	*506FS +70d*
300	1.2.1.5.1.11	Crate MDS Internal Hoses & Spares to PTH (Vessel)	10/15/21	11/04/21	535SS +205d
301	1.2.1.5.1.12	Crate Condensate Management Components to PTH (Vessel)	10/14/22	11/03/22	519FS +233d
302	1.2.1.5.1.13	Crate Pump Repair/Replace Components to PTH (Vessel)	10/15/21	11/04/21	510FS +53d
303	1.2.1.5.1.14	Crate Hose Reel Heating System to PTH (Vessel)	10/14/22	11/01/22	416FS +164d
304	*1.2.1.5.1.15*	*Prepare: Cable Reels Main and RWCR to PTH (Vessel)*	*10/15/21*	*11/12/21*	
305	*1.2.1.5.1.16*	*Prepare Surface Hose to PTH (2021-22) Outdoor Storage MCM (Vessel)*	*11/06/20*	*11/16/20*	
306	1.2.1.5.1.17	Crate Spare Main Drill & Combo Cables to PTH (Vessel)	10/14/22	11/16/22	412FS +539d
307	*1.2.1.5.1.18*	*Prepare GEN-2, 3, PDM - Skis (2021-22) from to PTH (Vessel)*	*12/06/20*	*01/06/21*	
308	*1.2.1.5.1.19*	*Crate Generator Hoods (2021-22) to PTH (Vessel)*	*11/06/20*	*11/16/20*	
309	1.2.1.5.1.20	Crate Drill Heads, Spare Parts to PTH (Vessel) Store in ICL - DNF	09/28/23	10/20/23	384FS +345d
310	1.2.1.5.1.21	Crate Repair/Replacement Components to PTH (Comsur)	07/03/23	07/20/23	554FS +2d
311	1.2.1.5.1.22	Crate SES Interconnect Materials/Parts to PTH (Vessel)	10/05/23	10/24/23	475FS +49d
312	1.2.1.5.1.23	Crate Control Systems Components to PTH (Comsur)	07/08/22	07/27/22	429FS +11d
313	1.2.1.5.1.24	Crate Drill Filtration Equipment to PTH (Vessel)	10/15/21	11/04/21	518FS -5d
314	1.2.1.5.1.25	Crate: Resupply to PTH (Comsur)	06/06/23	07/04/23	568FS -148d
315	1.2.1.5.1.26	Crate SES Interconnect Materials/Parts to PTH (2022-23) ((Vessel)	09/30/22	10/13/22	474FS +132d
316	**1.2.1.5.2**	**Shipping**	**11/15/20**	**08/01/24**	
317	1.2.1.5.2.1	Ship MHP Replacements & Spares to PTH (Vessel)	11/15/21	11/15/21	290FS +9d
318	1.2.1.5.2.2	Ship PHS Replacements & Spares to PTH (Vessel)	11/15/21	11/15/21	291FS +6d, 317FF
319	1.2.1.5.2.3	Ship Fuel Systems & Tower Components to PTH (Vessel)	11/15/21	11/15/21	292, 318FF
320	1.2.1.5.2.4	Ship TOS Components & Spares to PTH (Vessel)	11/15/21	11/15/21	293, 319FF
321	1.2.1.5.2.5	Ship GEN-2, 3, PDM - Ship Components, Repair Parts to PTH (Vessel)	11/15/21	11/15/21	297, 320FF
322	1.2.1.5.2.6	Ship Control Systems Components to PTH (Comsur)	08/01/22	08/01/22	294FS +265d
323	1.2.1.5.2.7	Ship Elec. Distribution System to PTH (Vessel)	11/15/22	11/15/22	298FS +267d
324	1.2.1.5.2.8	Ship WT Repair Parts, Replacements to PTH (Vessel)	11/15/22	11/15/22	299, 323SS
325	1.2.1.5.2.9	Ship Pump Repair/Replace Components to PTH (Vessel)	11/15/22	11/15/22	302, 324SS
326	1.2.1.5.2.10	Ship Condensate Management Components to PTH (Vessel)	11/15/22	11/15/22	301, 325SS
327	1.2.1.5.2.11	Ship MDS Internal Hoses & Spares to PTH (Vessel)	11/15/22	11/15/22	300, 326SS
328	1.2.1.5.2.12	Ship ARA Drill Subsystem Parts to PTH (Comsur)	08/01/22	08/01/22	295FS +265d
329	1.2.1.5.2.13	Ship Shop Parts - Crimper, Spares, etc. to PTH (Vessel)	11/15/21	11/15/21	296, 321SS
330	1.2.1.5.2.14	Ship Cable Reels Main and RWCR to PTH (Vessel)	11/15/21	11/15/21	304, 329SS
331	*1.2.1.5.2.15*	*Ship Surface Hose to PTH Outdoor Storage MCM (Vessel)*	*02/15/21*	*02/15/21*	
332	1.2.1.5.2.16	Ship Spare Main Drill & Combo Cables to PTH (Vessel)	11/17/22	11/17/22	306, 327SS
333	*1.2.1.5.2.17*	*Ship GEN-2, 3, PDM - Skis from to PTH (Vessel)*	*02/15/21*	*02/15/21*	
334	*1.2.1.5.2.18*	*Ship Generator Hoods to PTH (Vessel)*	*11/15/20*	*11/15/20*	
335	1.2.1.5.2.19	Ship Hose Reel Heating System to PTH (Vessel)	11/17/22	11/17/22	303, 332SS
336	1.2.1.5.2.20	Ship SES Interconnect Materials/Parts to PTH (Vessel)	11/15/22	11/15/22	315, 327SS
337	1.2.1.5.2.21	Ship Repair/Replacement Components to PTH (Comsur)	08/01/23	08/01/23	310FS +7d
338	1.2.1.5.2.22	Ship Drill Filtration Equipment to PTH (Vessel)	11/15/21	11/15/21	313, 330SS
339	1.2.1.5.2.23	Ship Control Systems Components to PTH (Comsur)	09/01/23	09/01/23	312FS +286d
340	1.2.1.5.2.24	Ship Drill Heads, Spare Parts to PTH (Vessel) Store in ICL (Vessel)	11/15/23	11/15/23	309FS +17d
341	1.2.1.5.2.25	Ship: Drill Season Resupply (Comsur)	08/01/24	08/01/24	314FS +281d
342	**1.2.2**	**Thermal Plant**	**01/21/19**	**08/17/23**	
343		*Parent Duration Buffer*	*01/21/19*	*01/21/19*	
344		*Parent Duration Buffer*	*10/01/21*	*10/01/21*	
345	**1.2.2.1**	**Main Heating Plants**	**02/04/21**	**08/17/23**	
346	*1.2.2.1.1*	*Identify Upgrade-Replacements, Spares*	*02/04/21*	*04/28/21*	
347	1.2.2.1.2	Procure MHP Components (2021-22)	04/15/21	08/18/21	346FS -10d
348	1.2.2.1.3	Assemble and Test Components (flowmeters. PRV, control boxes)	04/15/22	08/18/22	
349	1.2.2.1.4	Design and Construct MHP Flush & Pressure Test Kit	04/15/22	08/18/22	348SS
350	1.2.2.1.5	Build Electronics Kit for MHP1, Heater 7	04/15/22	08/18/22	349SS
351	1.2.2.1.6	Procure Upgrade, Sub-Components, Spares (2022-23)	04/15/23	08/17/23	
352	1.2.2.1.7	Develop HPU2 Integrate Plan	04/15/22	06/17/22	350SS
353	1.2.2.1.8	Procure and Assemble HPU2 Integration Components	06/20/22	10/21/22	352
354	**1.2.2.2**	**Pre-Heat System**	**10/02/20**	**06/16/23**	
355	1.2.2.2.1	Refine PHS Plumbing Upgrade Design	10/02/20	02/18/21	355FS +160d
356	1.2.2.2.2	Identify Upgrade, Replacements & Spares Components	10/01/21	06/16/23	355FS +160d
357	1.2.2.2.3	Procure and Upgrade Control Boxes	05/17/22	08/17/22	356SS +162d
358	**1.2.2.3**	**Fuel Storage and Delivery**	**10/01/20**	**05/02/23**	
359	*1.2.2.3.1*	*Fuel Systems: Review & Redesign (5k Tank-Tower)*	*10/01/20*	*01/20/21*	
360	1.2.2.3.2	Procurement (Hose, Valves, Sensors, Controls Etc.)	10/05/21	08/19/22	363FS +210d



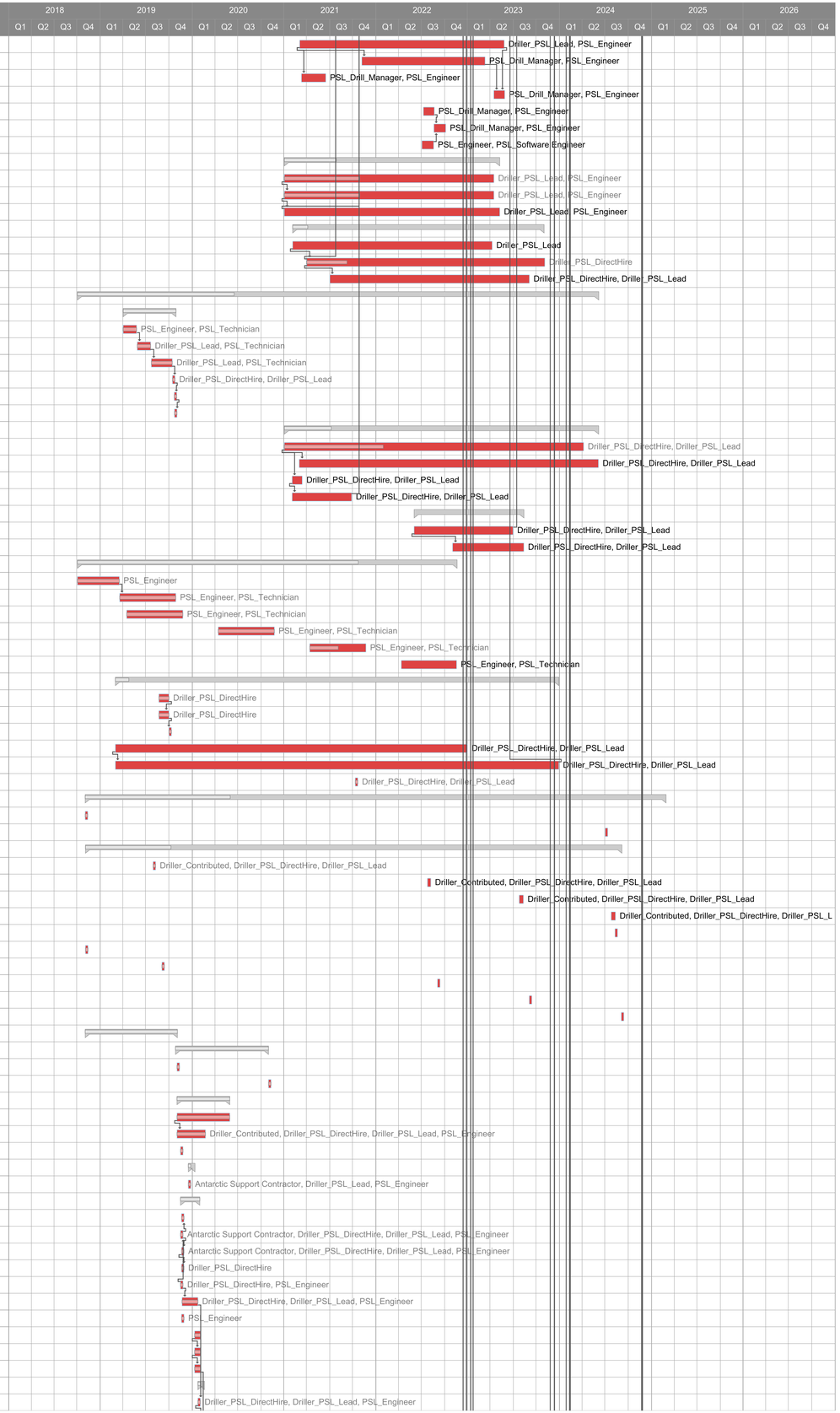
	WBS	Task Name	Start Date	End Date	Predecessor WBS
361	*1.2.2.3.3*	*Fuel Tower: Review Design & Specs, Field Inputs - Develop Plan*	*11/02/20*	*12/11/20*	*359SS +22d*
362	*1.2.2.3.4*	*Fuel Tower: Redesign Components*	*11/02/20*	*12/11/20*	*361SS*
363	*1.2.2.3.5*	*Fuel Tower: Final Design Review*	*12/14/20*	*12/14/20*	*362*
364	1.2.2.3.6	Fuel Tower: Procure Upgrade-Replacements, Spares	03/23/21	05/02/23	363FS +70d
365	1.2.2.3.7	Fuel Sled Panel Updates - Interface Integration	05/31/22	09/22/22	363FS +380d
366	**1.2.3**	**Tower Operations Site**	**10/01/18**	**08/08/23**	
367	**1.2.3.1**	**Tower Operations Structures (TOS and Tower)**	**03/01/19**	**07/04/23**	
368	*1.2.3.1.1*	*Reassess Down Hole Loads - String/DOM Configurations*	*03/01/19*	*05/01/20*	
369	1.2.3.1.2	Perform Structural Review of Tower & Components	05/03/21	06/11/21	368FS +260d
370	1.2.3.1.3	Crescent & Belt Refurbishment (4 ea)	06/01/22	06/28/22	
371	*1.2.3.1.4*	*Procure Replacement Tower Hoist*	*06/14/21*	*08/06/21*	*369*
372	**1.2.3.1.5**	**Procure Replacement Load Cells & Encoders**	**03/15/22**	**03/15/22**	
373	1.2.3.1.5.1	Tower Operations Structures: Load Cells & Encoders Procured	03/15/22	03/15/22	
374	1.2.3.1.6	Identify/Procure: TOS & Tower Hardware, Repair Parts	10/08/21	07/04/23	371FS +44d
375	**1.2.3.2**	**Drillheads**	**04/01/19**	**06/01/22**	
376	*1.2.3.2.1*	*Initial assessment of 3 drillheads*	*04/01/19*	*09/13/19*	
377	1.2.3.2.2	Drillhead and software subsystem testing	04/16/21	05/13/21	
378	1.2.3.2.3	Rework/rewrite drillhead software	03/12/21	05/13/21	377FF
379	*1.2.3.2.4*	*Recondition and calibrate Drillhead 1*	*05/25/20*	*08/02/21*	*376FS +180d, 378F*
380	*1.2.3.2.5*	*Recondition and calibrate Drillhead 2*	*07/20/20*	*08/02/21*	*379FF*
381	*1.2.3.2.6*	*Recondition and calibrate Drillhead 3*	*09/14/20*	*08/02/21*	*380FF*
382	1.2.3.2.7	Update Drillheads for Cable	03/16/22	05/17/22	381FS +161d
383	1.2.3.2.8	Pressure Test Drillhead Hanger & Spare Hose	03/16/22	05/17/22	382FF
384	1.2.3.2.9	Drillheads: Drillheads Updated and Hose Pressure Tested	06/01/22	06/01/22	383FS +10d
385	**1.2.3.3**	**Reels & Winches**	**11/02/20**	**08/08/23**	
386	*1.2.3.3.1*	*Main Drill Cable Reel (at PSL): Rebuild, Upgrade, Test*	*11/02/20*	*02/19/21*	
387	1.2.3.3.2	Return Water Cable Reel (at PSL): Rebuild, Upgrade, Test	11/02/20	03/05/21	386SS
388	1.2.3.3.3	Main Supply Hose Reel (Big Red at NPX) - Procure Replacement Parts	04/05/21	06/27/23	387FS +20d
389	1.2.3.3.4	Return Water Hose Reel (at NPX) - Procure Replacement Parts	04/05/21	08/08/23	388SS
390	*1.2.3.3.5*	*TU-20 Winches (at NPX) - Plan/Procure Replacement Parts. Design/Fabricate New Axles*	*02/01/21*	*04/23/21*	
391	*1.2.3.3.6*	*Cable Tensioner (at PSL) - Procure Repair Parts*	*02/01/21*	*06/04/21*	*390SS*
392	1.2.3.3.7	Main Drill Cable Reel/Main Hose Reel Load Sharing Testing	12/01/21	09/30/22	387FS +192d
393	1.2.3.3.8	Reels & Winches: Reel Load Sharing Testing Complete	10/03/22	10/03/22	392
394	*1.2.3.4*	*Downhole Main Drill Hose*	*10/01/18*	*11/23/20*	
395	*1.2.3.4.1*	*Request Budgetary Cost Estimate*	*10/01/18*	*10/03/18*	
396	*1.2.3.4.2*	*Confirm & Specify Drill Hose*	*10/01/19*	*11/25/19*	
397	*1.2.3.4.3*	*Procure drill hose (Manufacture by IVG)*	*09/17/19*	*08/17/20*	*398, 396SS -10d*
398	*1.2.3.4.4*	*Procurement - Down Payment (~20%)*	*09/13/19*	*09/13/19*	
399	*1.2.3.4.5*	*Procurement - Final Payment (Remainder), Ship to PSL*	*08/18/20*	*08/18/20*	*397*
400	*1.2.3.4.6*	*Manufacture Strain Reliefs (at PSL)*	*09/13/19*	*01/02/20*	
401	*1.2.3.4.7*	*Ship Strain Reliefs to Italy (Mnftr Install on Hose)*	*01/03/20*	*07/16/20*	*400*
402	*1.2.3.4.8*	*Prepare Hose at PSL, Crate for Shipment, Hold 1 Year*	*11/17/20*	*11/23/20*	*401FS +87d, 399*
403	*1.2.3.4.9*	*Ship Drill Hose from IVG (ComSur-CHC, Vessel-ZCM, Outdoor storage ZCM)*	*10/30/20*	*10/30/20*	*401FS +75d*
404	*1.2.3.5*	*Downhole Main Cables*	*10/01/19*	*06/16/21*	
405	*1.2.3.5.1*	*Main Drill Cable Spec Review & Revisions*	*10/01/19*	*03/13/20*	
406	*1.2.3.5.2*	*Combo Cable - Spec Review & Revisions*	*10/01/19*	*03/13/20*	*405SS*
407	*1.2.3.5.3*	*Test Combo Cable (2 at PSL)*	*03/16/20*	*05/08/20*	*406*
408	*1.2.3.5.4*	*Test Main Drill Cable & Unjacketed Spare*	*03/16/20*	*06/05/20*	*407SS*
409	*1.2.3.5.5*	*Procure Main Drill Cable*	*10/08/20*	*06/16/21*	
410	*1.2.3.5.6*	*Jacket Spare Cable (by vendor, currently at PSL)*	*06/08/20*	*08/28/20*	*408*
411	*1.2.3.5.7*	*Connectors - Procure & Install, Both Cables (at vendor)*	*03/25/21*	*06/16/21*	*409FF*
412	*1.2.3.5.8*	*Spool Main Drill Cable onto Winch/Spool*	*08/31/20*	*09/18/20*	*410*
413	**1.2.3.6**	**Design and Construct Main Hose Reel Heating System**	**11/02/20**	**02/25/22**	
414	*1.2.3.6.1*	*Design, Fabricate and Test Hose Reel Heating System*	*11/02/20*	*03/05/21*	
415	1.2.3.6.2	Procure Components for Hose Reel Heating System (Insulated Blankets & Tarps)	12/01/20	04/05/21	
416	1.2.3.6.3	Hose Reel Heating System Testing	01/05/22	02/25/22	415FS +196d
417	**1.2.4**	**Computing and Control System**	**01/02/19**	**03/06/24**	
418		Parent Duration Buffer	01/02/19	12/08/21	
419		Parent Duration Buffer	12/09/21	02/09/23	418
420	**1.2.4.1**	**Architecture**	**01/02/19**	**07/18/22**	
421	*1.2.4.1.1*	*Evaluate EHWD system*	*01/02/19*	*04/23/19*	
422	*1.2.4.1.2*	*ICUD Requirements & Architecture Plan*	*04/24/19*	*08/13/19*	*421*
423	*1.2.4.1.3*	*Control Systems - Preliminary Design Review*	*08/14/19*	*08/14/19*	*422*
424	*1.2.4.1.4*	*System Design*	*08/15/19*	*01/29/20*	*423*
425	1.2.4.1.5	Control Systems - Final Design Review	04/15/22	04/15/22	
426	1.2.4.1.6	Control Systems - Electrical Schematic Update 1	02/15/22	07/18/22	
427	**1.2.4.2**	**Control System Hardware**	**09/25/20**	**03/04/24**	
428	**1.2.4.2.1**	**PLC Motor Controllers and Readouts**	**04/18/22**	**07/07/23**	
429	1.2.4.2.1.1	Design, build and test new PLC and network box for HPP	04/18/22	06/22/22	425
430	1.2.4.2.1.2	Design, build and test RWCR control box	05/03/23	07/07/23	
431	**1.2.4.2.2**	**Sensors**	**12/01/20**	**07/07/23**	
432	1.2.4.2.2.1	HPP sensor box testing	12/01/20	07/07/23	
433	1.2.4.2.2.2	Specify, Procure and Test Water Tank depth and temp sensor box testing	12/01/20	07/07/23	432SS, 430FF
434	**1.2.4.2.3**	**Network Controllers**	**04/18/22**	**07/18/22**	
435	1.2.4.2.3.1	Plan MHP network box upgrade	04/18/22	07/15/22	425
436	1.2.4.2.3.2	Redesign, build and test network box for PHS	04/18/22	07/18/22	435SS, 426FF
437	1.2.4.2.4	Indoor Cables (sensor and network)	10/09/20	09/08/23	
438	1.2.4.2.5	Infrastructure Repair & Upgrade (w/sub-tasks)	09/25/20	03/04/24	437SS -10d
439	1.2.4.2.6	Return Water Pump Noise Mitigation Subsys. testing	04/01/22	06/14/23	
440	1.2.4.2.7	TOS pendant I/O box rebuild and testing - (one finished, 7 remaining)	04/01/22	06/14/23	439FF
441	1.2.4.2.8	TOS and DCC PLC box design, build, test (three new boxes)	01/11/22	09/30/22	
442	1.2.4.2.9	Rodwell Control Interface Definition, - (New I/O box for this Unit)	10/01/21	09/30/22	441FF



	WBS	Task Name	Start Date	End Date	Predecessor WBS
443	**1.2.4.3**	**Control System Software**	**09/29/20**	**03/06/24**	
444	1.2.4.3.1	Motor Controllers and Readouts	11/04/20	07/26/23	
445	**1.2.4.3.2**	**Data Acquisition**	**10/01/21**	**02/24/22**	
446	1.2.4.3.2.1	DGH Programming, Testing and Cataloging	12/08/21	02/24/22	447FS +5d
447	1.2.4.3.2.2	Payout Encoder Specify, Procure, and Test	10/01/21	11/30/21	
448	1.2.4.3.2.3	HPP Sensor DGH Box Testing	10/13/21	11/23/21	447FF -5d
449	1.2.4.3.3	System Operator Functions - SW/HW Trial in Testbed	04/19/22	08/29/22	
450		Parent Duration Buffer	04/19/22	04/19/22	
451	1.2.4.3.3.1	Control System Software: System Operator Functions - PY4 software/hardware trials completed	08/29/22	08/29/22	
452	1.2.4.3.4	PLC & Software Development (w/sub-tasks)	09/29/20	03/06/24	444FF +160d
453	1.2.4.3.5	SCADA Monitoring Software and Server Procurement	02/01/22	04/04/22	
454	1.2.4.3.6	SCADA Screen Development	04/05/22	09/19/22	453
455	**1.2.4.4**	**Motor Drives**	**08/14/19**	**09/27/23**	
456		*Parent Duration Buffer*	*08/14/19*	*08/14/19*	
457		Parent Duration Buffer	11/24/21	11/24/21	
458	1.2.4.4.1	Requirements, Functional	11/14/20	03/18/21	
459	*1.2.4.4.2*	*Requirements, Electrical*	*12/28/20*	*06/11/21*	*458SS +30d*
460	1.2.4.4.3	Specify and Procure	12/07/20	06/16/23	459SS -15d
461	1.2.4.4.4	Programming and Testing at PSL	10/07/20	09/27/23	460SS -43d
462	1.2.4.4.5	Plan Installations of New Motor Drives in Former Unico Locations	12/09/21	04/19/22	460SS +263d
463	**1.2.4.5**	**E-Stop System**	**01/29/21**	**03/24/22**	
464	*1.2.4.5.1*	*Evaluate EHWD system*	*01/29/21*	*04/22/21*	
465	1.2.4.5.2	Define Requirements	10/01/21	01/19/22	464FS +115d
466	1.2.4.5.3	TOS E-stop Box Analysis, Documentation Updates	12/16/21	03/24/22	468SS +54d
467	1.2.4.5.4	System E-stop Controller Redesign, Build, Test	12/16/21	03/24/22	466FF
468	1.2.4.5.5	TOS E-stop Controller Redesign, Build, Test	10/01/21	02/21/22	465SS
469	**1.2.4.6**	**Drill Control Center**	**04/29/21**	**07/27/23**	
470	1.2.4.6.1	Computing System	04/29/21	07/27/23	
471	1.2.4.6.2	Electrical Improvements - Heater Upgrade Design and Procure	08/07/21	08/26/21	
472	**1.2.4.7**	**Outdoor Cables**	**01/15/22**	**07/27/23**	
473	1.2.4.7.1	Evaluate/inventory SES & SES to TOS Cables - Signal	01/15/22	02/24/22	
474	1.2.4.7.2	Design and Procure Replacement Components - Signal	02/25/22	03/29/22	473
475	1.2.4.7.3	Fabricate and Test SES & SES to TOS Cables - Signal	05/27/22	07/27/23	474FS +42d
476	*1.2.4.8*	*Misc Components*	*01/02/19*	*01/02/19*	
477	**1.2.5**	**Electrical Generation and Distribution System**	**01/24/19**	**04/16/24**	
478	*1.2.5.1*	*Generator 1*	*01/24/19*	*10/10/19*	
479	*1.2.5.1.1*	*GEN-1: Arrange Retro from McMurdo to PTH (Vessel)*	*01/24/19*	*04/17/19*	
480	*1.2.5.1.2*	*GEN-1: Transport from PTH to CAT Vendor*	*04/18/19*	*05/01/19*	*479*
481	*1.2.5.1.3*	*GEN-1: Specify SOW and Integration*	*05/02/19*	*05/15/19*	*480*
482	*1.2.5.1.4*	*GEN-1: Generator Overhaul by Vendor*	*05/02/19*	*09/18/19*	*481SS*
483	*1.2.5.1.5*	*GEN-1: Acceptance Testing (at vendor)*	*09/19/19*	*09/25/19*	*482*
484	*1.2.5.1.6*	*GEN-1: Transport from Vendor to PTH*	*09/26/19*	*10/09/19*	*483*
485	*1.2.5.1.7*	*GEN-1: Ship from PTH (VSL-ZCM, Traverse-NPX)*	*10/10/19*	*10/10/19*	*484*
486	**1.2.5.2**	**Generators 2, 3, and PDM**	**03/18/19**	**04/16/24**	
487	*1.2.5.2.1*	*GEN-2, 3, PDM - Arrange Testing/Repairs at McMurdo*	*03/18/19*	*10/25/19*	
488	1.2.5.2.2	GEN-2, 3, PDM - Write/implement Subcontract for Cat Gen Tech & Electrician	03/22/22	04/16/24	
489	*1.2.5.2.3*	*GEN-2, 3, PDM - Procure Testing Equipment/Repair Parts*	*10/01/20*	*08/13/21*	
490	*1.2.5.2.4*	*GEN 1, 2, 3, PDM - Procure/Fabricate Aluminum Skis*	*10/01/20*	*12/02/20*	*489SS*
491	1.2.5.2.5	GEN-2, 3, PDM - Procure Repair Parts	03/03/23	08/08/23	
492	*1.2.5.3*	*ISO-3 Sled (Task removed - left here as place holder w/ Notes Intact)*	*03/01/19*	*03/01/19*	
493	*1.2.5.3.1*	*ISO-3 Sled: Design Review & Custom Specification*	*03/01/19*	*03/01/19*	
494	*1.2.5.3.2*	*ISO-3 Sled: Final Design Review*	*03/01/19*	*03/01/19*	
495	*1.2.5.3.3*	*ISO-3 Sled: Procurement & Fabrication*	*03/01/19*	*03/01/19*	
496	*1.2.5.3.4*	*ISO-3 Sled: Ship from vendor (Air-ZCM)*	*03/01/19*	*03/01/19*	
497	**1.2.5.4**	**System Electrical Distribution**	**12/01/20**	**10/12/21**	
498	1.2.5.4.1	System Elec Dist: Evaluate EHWD system	12/01/20	01/25/21	
499	*1.2.5.4.2*	*System Elec Dist: Define Requirements*	*01/26/21*	*04/19/21*	*498*
500	*1.2.5.4.3*	*System Elec Dist: Design & Procure*	*04/20/21*	*08/23/21*	*499*
501	*1.2.5.4.4*	*System Elec Dist: Design Review*	*05/18/21*	*05/18/21*	*500FS -70d*
502	*1.2.5.4.5*	*System Elec Dist: Build and Test Subcomponents*	*06/01/21*	*10/12/21*	*501, 500SS +30d*
503	**1.2.6**	**Water Handling Systems**	**09/13/19**	**10/31/23**	
504	*1.2.6.1*	*Water Tanks*	*01/04/21*	*06/18/21*	
505	*1.2.6.1.1*	*Identify Upgrades-Replacements and Spares*	*01/04/21*	*03/26/21*	
506	*1.2.6.1.2*	*Procure Repair Parts, Replacements (2020-21)*	*03/29/21*	*06/18/21*	*505*
507	**1.2.6.2**	**Pumps**	**12/04/20**	**08/03/23**	
508	*1.2.6.2.1*	*Identify Upgrades-Replacements and Spares*	*12/04/20*	*03/25/21*	
509	*1.2.6.2.2*	*Procure Repair/Replacement Components (2020-21)*	*03/26/21*	*03/29/21*	*508*
510	*1.2.6.2.3*	*Configure Pumps/Plumbing*	*03/30/21*	*08/02/21*	*509*
511	1.2.6.2.4	Charge Pump Soft-starter Box Rebuild (four units)	08/03/21	11/30/21	510
512	1.2.6.2.5	Procure Repair/Replacement Components (2022-23)	04/01/23	08/03/23	
513	**1.2.6.3**	**Filtration and Condensate Management**	**11/01/20**	**12/22/22**	
514	*1.2.6.3.1*	*Define Requirements & Research Methodologies*	*11/01/20*	*12/31/20*	
515	1.2.6.3.2	Confirm w/ASC & NSF - Disposal of Condensate (14,000 gals)	01/01/21	03/25/21	514
516	*1.2.6.3.3*	*Develop Drilling Algorithms*	*01/01/21*	*04/15/21*	*515SS*
517	*1.2.6.3.4*	*Review & Identify Filtration Sub-System Upgrades*	*04/16/21*	*07/29/21*	*516*
518	*1.2.6.3.5*	*Procure Filtration Upgrade-Replacement Components*	*07/30/21*	*10/21/21*	*517*
519	1.2.6.3.6	Build & Test Filtration System	10/22/21	11/22/21	518
520	1.2.6.3.7	Design Condensate Collection, Treatment, and Disposal System	11/23/21	10/17/22	519
521	1.2.6.3.8	Procure Condensate Disposal System Components	10/18/22	11/17/22	520
522	1.2.6.3.9	Construct/Test Condensate Disposal System	11/18/22	12/22/22	521
523	**1.2.6.4**	**Interconnects - External**	**09/13/19**	**05/25/23**	
524	*1.2.6.4.1*	*Procure Replacements and Spares/Unheated (IVG Hose)*	*09/13/19*	*08/13/20*	

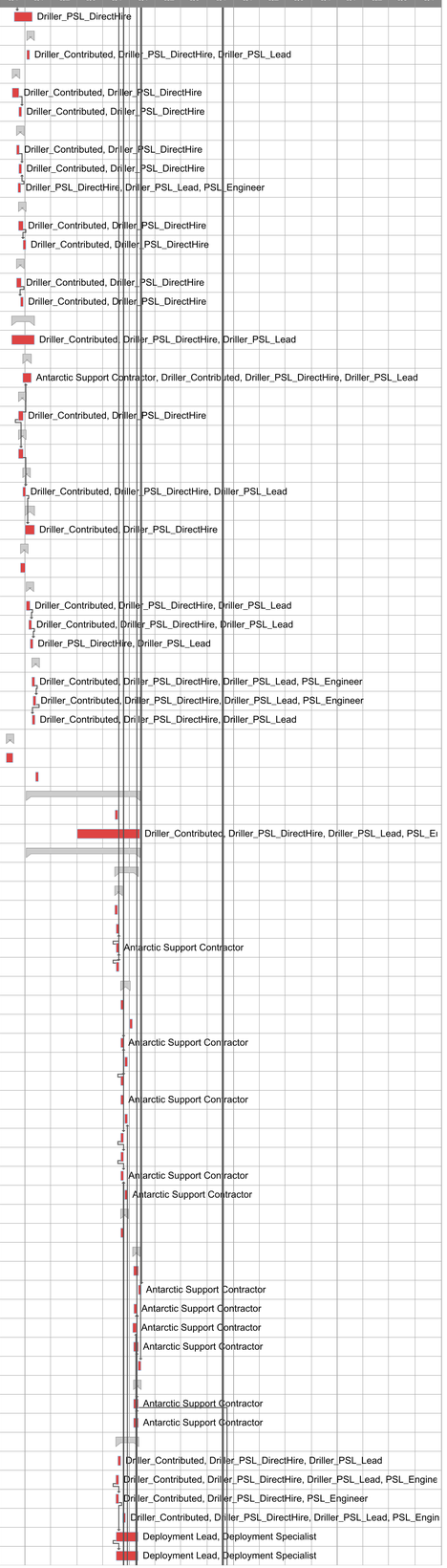


	WBS	Task Name	Start Date	End Date	Predecessor WBS
525	1.2.6.4.2	Identify/Spec Replacements and Spare Heated Hose	03/03/21	05/25/23	
526	1.2.6.4.3	Procure Replacements and Spares	11/05/21	03/09/23	525SS +177d
527	1.2.6.4.4	Procure Remaining Materials & Fabricate Heated Hose	03/10/21	06/15/21	525SS +5d
528	1.2.6.4.5	Assemble Hose End Ball Valves	04/14/23	05/25/23	525FF, 526
529	1.2.6.4.6	Finalize Design Gen Water Loop	07/08/22	08/18/22	
530	1.2.6.4.7	Procure Gen Water Loop Materials & Assemble	08/19/22	10/03/22	529, 531
531	1.2.6.4.8	Procure Camp and Surface Hose Insulation	07/02/22	08/18/22	
532	**1.2.6.5**	**MDS Internal Hoses**	**01/01/21**	**05/05/23**	
533	1.2.6.5.1	Evaluate Water Hoses (1-1/2", 3/4", and 1/2" Hose)	01/01/21	04/14/23	
534	1.2.6.5.2	Evaluate Fuel Hoses	01/01/21	04/14/23	533SS
535	1.2.6.5.3	Procure Replacements and Spares	01/01/21	05/05/23	534SS
536	**1.2.6.6**	**ARA Hot Water Drill Subsystem**	**02/03/21**	**10/31/23**	
537	1.2.6.6.1	Identify Upgrade-Replacements	02/03/21	04/06/23	
538	1.2.6.6.2	Procure Repair Parts, Replacements, Spares	03/31/21	10/31/23	537SS +40d
539	1.2.6.6.3	Subsystem Assembly, Integration, & Testing at PSL	07/01/21	09/01/23	538SS +66d
540	**1.2.7**	**Support Equipment**	**10/01/18**	**06/03/24**	
541	*1.2.7.1*	***Independent Fim Drill***	***04/01/19***	***10/28/19***	
542	*1.2.7.1.1*	*System Evalation & Testing at PSL*	*04/01/19*	*05/24/19*	
543	*1.2.7.1.2*	*Identify & Procure Upgrade-Replacements, Spares*	*05/27/19*	*07/19/19*	*542*
544	*1.2.7.1.3*	*Final Install & Testing at PSL*	*07/22/19*	*10/11/19*	*543*
545	*1.2.7.1.4*	*Prepare to Ship*	*10/14/19*	*10/18/19*	*544*
546	*1.2.7.1.5*	*Ship IFD to McMurdo (VSL-ZCM, Traverse-NPX)*	*10/21/19*	*10/21/19*	*545*
547	*1.2.7.1.6*	*Procure Brake Solenoid*	*10/22/19*	*10/28/19*	*546*
548	**1.2.7.2**	**Maintenance/Repair Inventory**	**01/01/21**	**06/03/24**	
549	1.2.7.2.1	Identify Spares and Replacements	01/01/21	04/05/24	
550	1.2.7.2.2	Procure Spares and Replacements	03/01/21	06/03/24	549SS +41d
551	1.2.7.2.3	Procure Hose Stock and Fittings	02/01/21	03/12/21	549SS +21d
552	1.2.7.2.4	Spare Parts Inventory and Catalog - Electrical/Controls	02/01/21	09/24/21	551SS
553	**1.2.7.3**	**Shops (MECC, SEW, TOW, OML)**	**06/01/22**	**08/11/23**	
554	1.2.7.3.1	Identify Upgrade-Replacements, Spares	06/01/22	06/28/23	
555	1.2.7.3.2	Procure Upgrade-Replacements, Spares	11/01/22	08/11/23	554SS +109d
556	**1.2.7.4**	**TestBed**	**10/01/18**	**11/17/22**	
557	*1.2.7.4.1*	*Commissioning for Motor Drive Testing (2018)*	*10/01/18*	*03/15/19*	
558	*1.2.7.4.2*	*Identify & Procure Upgrade & Replacement Parts*	*03/18/19*	*10/25/19*	*557*
559	*1.2.7.4.3*	*Commission/Maintainence/Decommission (2019)*	*04/15/19*	*11/22/19*	
560	*1.2.7.4.4*	*Commission/Maintainence/Decommission (2020)*	*04/13/20*	*11/20/20*	
561	1.2.7.4.5	Commission/Maintenance/Decommission (2021)	04/12/21	11/19/21	
562	1.2.7.4.6	Commission/Maintenance/Decommission (2022)	04/11/22	11/17/22	
563	**1.2.7.5**	**Tools and Equipment**	**03/01/19**	**12/28/23**	
564	*1.2.7.5.1*	*Procure 287B Skidsteer (or similar)*	*08/21/19*	*09/30/19*	
565	*1.2.7.5.2*	*Procure 2 Snowmobiles*	*08/21/19*	*09/30/19*	*564FF*
566	*1.2.7.5.3*	*Ship 2 Snowmobiles*	*09/30/19*	*09/30/19*	*565FF*
567	1.2.7.5.4	Identify Tools & Equipment, & Consumables	03/01/19	12/28/22	
568	1.2.7.5.5	Procure Tools & Equipment, & Consumables	03/01/19	12/28/23	567SS
569	*1.2.7.5.6*	*Complete Hose Crimper Calibration*	*10/10/21*	*10/18/21*	
570	**1.2.8**	**Drill Field Seasons**	**11/01/18**	**02/27/25**	
571		*Parent Duration Buffer*	*11/01/18*	*11/01/18*	
572		Parent Duration Buffer	06/30/24	06/30/24	
573	**1.2.8.1**	**Seasonal Staffing & Training, Off-Ice Coordination**	**11/02/18**	**09/02/24**	
574	*1.2.8.1.1*	*2019 Off-Ice EHWD & Safety Training - 12 Drillers*	*07/29/19*	*08/02/19*	
575	1.2.8.1.2	2022-23 Off-Ice EHWD & Safety Training - 10 Drillers (8-primary 2-alternates)	07/24/22	08/05/22	
576	1.2.8.1.3	2023-24 Off-Ice EHWD & Safety Training - 16 Drillers (14 - Primary 2 - alternates)	07/24/23	08/07/23	
577	1.2.8.1.4	2024-25 Off-Ice EHWD & Safety Training - 32 Drillers (28 - primary 4 - alternates)	07/24/24	08/07/24	
578	1.2.8.1.5	2024-25 Off-Ice Logging Winch Training with IDP (2 Drillers 1 day)	08/08/24	08/09/24	
579	*1.2.8.1.6*	*2018-19 Season Readiness Review*	*11/02/18*	*11/02/18*	
580	*1.2.8.1.7*	*2019-20 Season Readiness Review*	*09/02/19*	*09/02/19*	
581	1.2.8.1.8	2022-23 Field Season Readiness Review	09/02/22	09/02/22	
582	1.2.8.1.9	2023-24 Field Season Readiness Review	09/02/23	09/02/23	
583	1.2.8.1.10	2024-25 Field Season Readiness Review	09/02/24	09/02/24	
584	*1.2.8.2*	***2018/19 On-Ice Activities***	***11/01/18***	***10/31/19***	
607	*1.2.8.3*	***2019/20 On-Ice Activities***	***10/26/19***	***10/30/20***	
608		*Parent Duration Buffer*	*11/01/19*	*11/01/19*	
609		*Parent Duration Buffer*	*10/30/20*	*10/30/20*	
610	*1.2.8.3.1*	***General***	***11/01/19***	***05/29/20***	
611	*1.2.8.3.1.1*	*Cargo Retro (19/20)*	*11/01/19*	*05/29/20*	
612	*1.2.8.3.1.2*	*Deployment Travel & PQ Costs (19/20)*	*11/01/19*	*02/20/20*	*611SS*
613	*1.2.8.3.2*	*START NPX 2019/20 Season - Team (8) Arrives [ReC/Fire/Life Safety]*	*11/15/19*	*11/15/19*	
614	*1.2.8.3.3*	***ASC/CRREL Ground Penetrating Radar***	***12/16/19***	***12/18/19***	
615	*1.2.8.3.3.1*	*Perform GPR - Map Area to be drilled/instrumented*	*12/16/19*	*12/18/19*	
616	*1.2.8.3.4*	***EHWD: Upgrade & Replacement Work***	***11/15/19***	***01/31/20***	
617	*1.2.8.3.4.1*	*EHWD Air Shipment Arrives, Upgrade Parts*	*11/19/19*	*11/19/19*	*618*
618	*1.2.8.3.4.2*	*Excavate EHWD & Equip Berms, Compact Temp-SES (ASC)*	*11/15/19*	*11/18/19*	*621SS*
619	*1.2.8.3.4.3*	*Deliver MECC, Power, Heat, Outhouse to EHWD Berm*	*11/19/19*	*11/20/19*	*618*
620	*1.2.8.3.4.4*	*Deliver & Layout Test SES for Cable/Hose Review*	*11/19/19*	*11/22/19*	*619SS*
621	*1.2.8.3.4.5*	*Connect Temporary Station Power throughout SES*	*11/15/19*	*11/20/19*	
622	*1.2.8.3.4.6*	*EHWD: REPAIRS & UPGRADES THROUGHOUT*	*11/21/19*	*01/22/20*	*621*
623	*1.2.8.3.4.7*	*Perform Structural Analysis of Drill Towers*	*11/19/19*	*11/25/19*	
624	*1.2.8.3.4.8.A*	*ICL: Inspect and develop plan for cable access into east tower (ASC)*	*01/10/20*	*01/31/20*	
625	*1.2.8.3.4.8.B*	*Pre-compact new ICL road relocation (ASC)*	*01/10/20*	*01/31/20*	*624SS*
626	*1.2.8.3.4.8.C*	*Survey & Pre-Compact SES*	*01/10/20*	*01/31/20*	*625SS*
627	*1.2.8.3.5*	***End of NPX Season Close-Out Work***	***01/23/20***	***01/29/20***	
628	*1.2.8.3.5.1*	*Document, Photograph Equip & Upgrade Work, Further Req's*	*01/23/20*	*01/29/20*	*622*

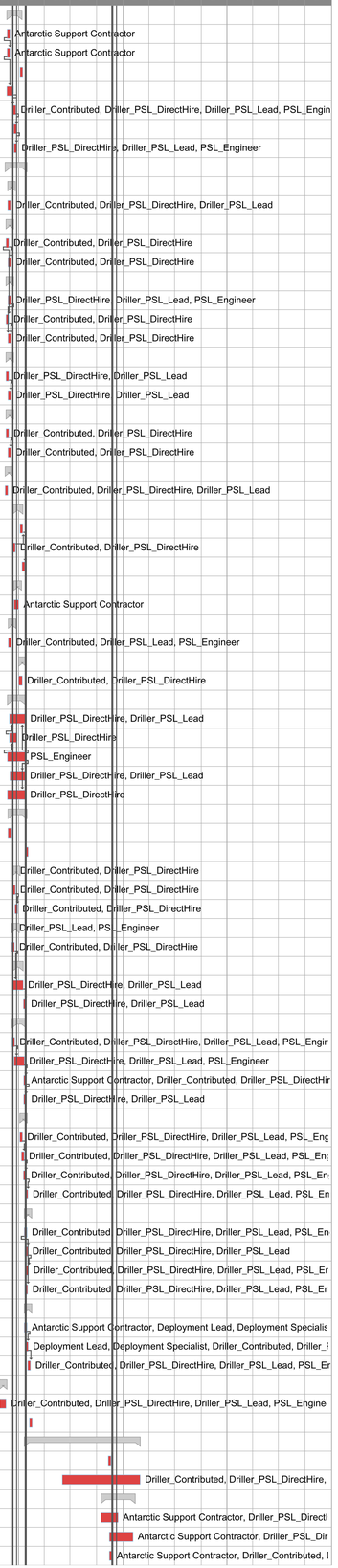


	WBS	Task Name	Start Date	End Date	Predecessor WBS
629	*1.2.8.3.5.2*	*Winterize/Close/Store all EHWD Equipment*	*01/23/20*	*01/24/20*	*628SS*
630	*1.2.8.3.5.3*	*Retro all components, crate, pack and deliver to cargo*	*01/23/20*	*01/24/20*	*629SS*
631	*1.2.8.3.6*	*END NPX 2019/20 Season*	*02/03/20*	*02/03/20*	*626*
632	*1.2.8.3.7*	*Other Field Activities (19/20)*	*10/26/19*	*02/03/20*	
633		*Parent Duration Buffer*	*11/01/19*	*02/03/20*	
634	*1.2.8.3.7.7*	*Prepare work pad (SPoTSA), provide power, fuel & support - McMurdo*	*10/26/19*	*10/31/19*	
635	*1.2.8.3.7.1*	*GEN 2, 3, PDM: Inspect/Test/Tune in McMurdo (incl subcontract)*	*11/18/19*	*12/18/19*	
636	*1.2.8.3.7.2*	*Generator-1: Arrives in ZCM (Winter Storage)*	*02/01/20*	*02/01/20*	
637	*1.2.8.3.7.3*	*Fuel Tower: Inspect & Test in McMurdo*	*11/01/19*	*12/02/19*	
638	*1.2.8.3.7.4*	*Cable Tensioner: Inspect & Test*	*11/01/19*	*12/02/19*	*637SS*
639	*1.2.8.3.7.5*	*Reel Container: Inspect & Inventory*	*11/01/19*	*12/02/19*	*638SS*
640	*1.2.8.3.7.6*	*IFD: Arrival (from PSL) & Storage in McMurdo (defunct)*	*02/01/20*	*02/01/20*	
641	*1.2.8.4*	*2020/21 & 2021/22 On-Ice Activities*	*03/01/21*	*03/01/21*	
643	**1.2.8.5**	**2022/23 On-Ice Activities**	**02/01/22**	**01/03/24**	
644	1.2.8.5.1	START NPX 2022/23 Season - Team Arrives [Headcount 8]	11/11/22	11/11/22	
645	1.2.8.5.2	Deployment Travel & PQ Costs (22/23)	06/02/22	02/24/23	
646	**1.2.8.5.3**	**ASC Support**	**10/15/22**	**01/03/24**	
647	1.2.8.5.3.1	Logistics Support - MCM (ASC)	10/15/22	12/14/22	
648	1.2.8.5.3.2	Provide Heaters (PolarTherm) (ASC)	11/15/22	02/08/23	
649	1.2.8.5.3.3	GPR Re-survey: Cable Routes & Hole Locations (ASC)	12/01/22	12/16/22	
650	1.2.8.5.3.4	Provide 287B Skidsteer & Snomo's (ASC)	11/15/22	11/15/22	
651	1.2.8.5.3.5	Re-establish SES Pad, Groom & Compact Roads Complete (ASC)	12/01/22	12/01/22	
652	1.2.8.5.3.6	MDS/Reel/Cargo Moves - Berms to Cryo & Cryo to SES (ASC)	11/15/22	01/16/23	
653	1.2.8.5.3.7	Excavate EHWD & Equipment Berms for Access (ASC)	11/07/22	11/15/22	
654	1.2.8.5.3.8	Deliver MECC & Fuel Tank, Shop, SEW to Cryo (ASC)	11/11/22	11/15/22	
655	1.2.8.5.3.9	Provide Temp Power for SES (CRELL or Onan Genset)	12/15/22	02/01/23	
656	1.2.8.5.3.10	Water Tank Doghouses Built (ASC)	11/15/22	11/15/22	
657	1.2.8.5.3.11	Cryo Worksite Set-up Complete (ASC)	11/15/22	11/15/22	
658	1.2.8.5.3.12	Crane Support Gens & Vertical Turbine Pump Lifts (ASC)	12/07/22	12/08/22	
659	1.2.8.5.3.13	Install Fall Restraint Towers X10 (ASC)	12/01/22	12/07/22	
660	1.2.8.5.3.14	Drill Hose & Main/RWCR Over-Winter Storage - McM (ASC)	02/01/23	02/07/23	
661	1.2.8.5.3.15	Surface Cable, Hose, & Reels Over-Winter Storage - MCM (ASC)	01/15/23	01/15/23	
662	1.2.8.5.3.16	Winter Storage Support: TOS 1 & 2 (ASC)	01/20/23	02/01/23	
663	1.2.8.5.3.17	Electrician Support - ICL Overwinter Storage & Rack Feeders (ASC)	12/05/23	01/03/24	
664	**1.2.8.5.4**	**Cargo**	**02/01/22**	**02/08/23**	
665	**1.2.8.5.4.1**	**Early Season Support MTLS Arrival - NPX**	**11/10/22**	**01/11/23**	
666	1.2.8.5.4.1.1	8' Refit Container Contents Arrive - NPX	11/15/22	11/15/22	
667	1.2.8.5.4.1.2	Fuel Systems & Tower Components Arrive - NPX	01/11/23	01/11/23	319FS +301d
668	1.2.8.5.4.1.3	Refit Container A Contents Arrives (Filtration, MHP/PHS, Gen, Pumps, etc) - NPX	12/01/22	12/01/22	317FS +272d
669	1.2.8.5.4.1.4	287 Loader Arrives - NPX	11/10/22	11/10/22	
670	1.2.8.5.4.1.5	Motor Drives and Control System Parts Arrive - NPX	12/01/22	12/01/22	322FS +87d
671	**1.2.8.5.4.2**	**Mid-Season Support MTLS arrival at NPX**	**12/01/22**	**01/02/23**	
672	1.2.8.5.4.2.1	Camp Hose Arrives - NPX	12/15/22	12/15/22	335FS +19d
673	1.2.8.5.4.2.3	287 Loader Arrives - NPX	12/01/22	12/01/22	
674	1.2.8.5.4.2.4	Container Skis (5 sets) Arrive - NPX	12/15/22	12/15/22	
675	1.2.8.5.4.2.5	Firn Drill Arrives - NPX	01/02/23	01/02/23	328FS +109d
676	1.2.8.5.4.2.6	IFD Drillhead & Sheave Arrives - NPX	01/01/23	01/01/23	
677	1.2.8.5.4.2.7	Refit Container B Arrives (cable trays, ladders, FRTs, VTPs, etc) - NPX	12/15/22	12/15/22	
678	1.2.8.5.4.2.8	ARA Drill Components and Trailer Arrive - NPX Move drill components to	12/15/22	12/15/22	328FS +97d
679	1.2.8.5.4.2.9	Main and Return Water Cable Reels Arrive - (NPX)	01/02/23	01/02/23	324FS +33d
680	**1.2.8.5.4.3**	**SPOT Support MTLS arrival at NPX**	**12/01/22**	**01/01/23**	
681	1.2.8.5.4.3.1	TBD MTLS Arrive - NPX	12/01/22	12/01/22	
682	1.2.8.5.4.3.2	GEN- 3 Arrives - NPX	12/01/22	12/01/22	
683	1.2.8.5.4.3.3	GEN-2 Arrives - NPX	01/01/23	01/01/23	
684	**1.2.8.5.4.4**	**END-Season MTLS / CARGO movements NPX**	**11/01/22**	**02/08/23**	
685	1.2.8.5.4.4.1	TBD MTLS Arrive - NPX	11/01/22	11/01/22	
686	1.2.8.5.4.4.2	TBD MTLS Arrive - NPX	11/15/22	11/15/22	
687	1.2.8.5.4.4.3	Cargo Retro (21/22)	12/01/22	02/08/23	
688	**1.2.8.5.4.5**	**MCM Cargo Arrivals**	**02/01/22**	**02/01/23**	
689	1.2.8.5.4.5.1	Drill Hose & Main/RWCR Arrival - McM	02/01/22	02/01/22	
690	1.2.8.5.4.5.2	Surface Cable and SBJs Arrive - MCM	02/01/23	02/01/23	
691	1.2.8.5.4.5.3	TBD	02/01/23	02/01/23	
692	1.2.8.5.4.5.4	DOM Handling Facility Arrives - MCM	02/01/22	02/01/22	
693	1.2.8.5.4.5.5	Refit Containers A and B, 8' containers A and B - MCM	02/01/22	02/01/22	
694	**1.2.8.5.5**	**Seasonal Equipment Site (SES) Setup**	**12/01/22**	**02/02/23**	
695	1.2.8.5.5.1	Drillers Support for SES layout	12/01/22	02/01/23	
696	1.2.8.5.5.2	Layout - Hoses, Cables, Interconnects & Cable Trays for SES etc.	01/03/23	02/01/23	695FF
697	**1.2.8.5.5.3**	**Fuel Tower: Install Upgrade Components at NPX**	**12/10/22**	**01/02/23**	
698	1.2.8.5.5.3.1	Fuel Tower: Deliver, Connect, & Test	12/10/22	01/02/23	
699	1.2.8.5.5.4	Temp power from backup generator (CRELL, ONAN)	12/01/22	02/01/23	696FF
700	1.2.8.5.5.5	SES Initial Setup Complete	02/02/23	02/02/23	699
701	**1.2.8.5.6**	**Generators & PDM**	**12/07/22**	**01/27/23**	
702	1.2.8.5.6.1	Set generators 1 & 3 onto Skis with Crane	12/07/22	12/08/22	
703	1.2.8.5.6.2	Generators 1, 3 & PDM Delivered to Cryo	12/09/22	12/09/22	702
704	1.2.8.5.6.3	Generators & PDM - Misc Repairs & Testing	12/12/22	01/13/23	703
705	1.2.8.5.6.4	Generators: Relocated from Cryo to SES	01/13/23	01/13/23	704FF
706	1.2.8.5.6.5	Preliminary GEN Testing & Winterization	01/16/23	01/27/23	705
707	1.2.8.5.6.6	Set Generator 2 onto Skis with Crane	01/03/23	01/03/23	
708	**1.2.8.5.7**	**EHWD: Upgrade & Replacement Work**	**11/13/22**	**01/31/23**	
709	**1.2.8.5.7.1**	**Computing & Controls**	**11/22/22**	**01/23/23**	
710	1.2.8.5.7.1.1	Motor Drives: Install Retrofit Kits	11/22/22	01/23/23	
711	1.2.8.5.7.1.2	Misc Controls Tasking	12/01/22	01/23/23	710FF

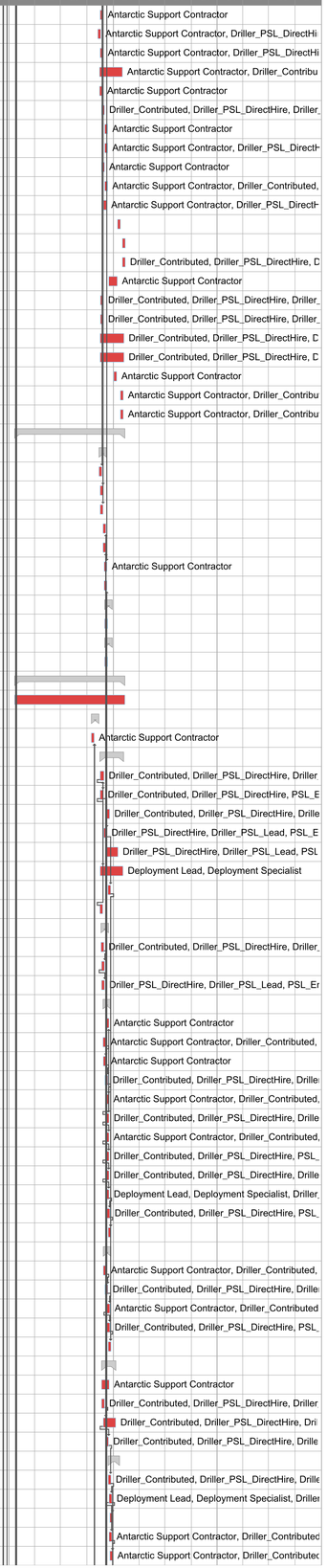
	WBS	Task Name	Start Date	End Date	Predecessor WBS
712	1.2.8.5.7.1.3	Motor Drives: Conduit Wiring	11/22/22	01/23/23	710SS
713	**1.2.8.5.7.2**	**Drill Control Center (DCC)**	**01/05/23**	**01/11/23**	
714	1.2.8.5.7.2.1	Repairs, Electrical Upgrades & Install Racks	01/05/23	01/11/23	
715	**1.2.8.5.7.3**	**Main Heating Plants**	**11/15/22**	**12/08/22**	
716	1.2.8.5.7.3.1	Retrofit MHPs in Field	11/15/22	12/07/22	
717	1.2.8.5.7.3.2	MHP Subsystem Evaluation	12/08/22	12/08/22	716
718	**1.2.8.5.7.4**	**Pre Heat System**	**11/30/22**	**12/08/22**	
719	1.2.8.5.7.4.1	Retrofit PHS in Field	11/30/22	12/07/22	
720	1.2.8.5.7.4.2	PHS Subsystem Evaluation	12/08/22	12/08/22	721, 719
721	1.2.8.5.7.4.3	Install Filtration System in PHS	12/05/22	12/07/22	
722	**1.2.8.5.7.5**	**Water Tanks & Handling Systems (VT & Submersible)**	**12/07/22**	**12/23/22**	
723	1.2.8.5.7.5.1	Retrofit Water Tanks in Field	12/07/22	12/23/22	
724	1.2.8.5.7.5.2	Water Tank Subsystem Evaluation	12/23/22	12/23/22	723FF
725	**1.2.8.5.7.6**	**HPP**	**11/30/22**	**12/14/22**	
726	1.2.8.5.7.6.1	Retrofit and Recondition Pumps in Field	11/30/22	12/14/22	
727	1.2.8.5.7.6.2	Pump Evaluated	12/14/22	12/14/22	726FF
728	**1.2.8.5.7.7**	**Shops, MECC, SEW, OML**	**11/13/22**	**01/31/23**	
729	1.2.8.5.7.7.1	Repair/Retrofit Shops, MECC	11/13/22	01/31/23	
730	**1.2.8.5.7.8**	**TOS & Towers**	**12/22/22**	**01/20/23**	
731	1.2.8.5.7.8.1	Repair/Retrofit TOS & Towers	12/22/22	01/20/23	733
732	**1.2.8.5.7.9**	**Main Supply Hose Reel (Big Red)**	**12/07/22**	**12/21/22**	
733	1.2.8.5.7.9.1	Repair/Replace Components, Energize & Test	12/07/22	12/21/22	
734	**1.2.8.5.7.10**	**Return Water Hose Reel**	**12/07/22**	**12/21/22**	
735	1.2.8.5.7.10.1	Repair/Replace Components, Energize & Test	12/07/22	12/21/22	733SS
736	**1.2.8.5.7.11**	**Winches (TU-15, TU-20s)**	**12/22/22**	**12/29/22**	
737	1.2.8.5.7.11.1	Repair/Retrofit Winches & Reels	12/22/22	12/29/22	735
738	**1.2.8.5.7.12**	**Drill Hoses, Cables, Misc**	**12/30/22**	**01/30/23**	
739	1.2.8.5.7.12.1	Inventory, Repair Hoses, Cables, Misc	12/30/22	01/30/23	737
740	**1.2.8.5.7.13**	**Independent Firn Drill**	**12/14/22**	**12/28/22**	
741	1.2.8.5.7.13.1	Repair/Refit/Test	12/14/22	12/28/22	
742	**1.2.8.5.7.14**	**Integrate ARA Drill into system (RodWell)**	**01/03/23**	**01/20/23**	
743	1.2.8.5.7.14.1	Repair and Upgrade ARA Drill	01/03/23	01/16/23	
744	1.2.8.5.7.14.2	Sub-system testing	01/12/23	01/16/23	743FS -3d
745	1.2.8.5.7.14.3	Winterize & Store ARA Drill	01/17/23	01/20/23	744
746	**1.2.8.5.8**	**End of NPX Season Close-Out Work**	**01/23/23**	**02/01/23**	
747	1.2.8.5.8.1	Document, Photograph Equip & Upgrade Work, Further Req's	01/23/23	01/26/23	
748	1.2.8.5.8.2	Winterize/Close/Store all EHWD Equipment	01/27/23	02/01/23	747
749	1.2.8.5.8.3	Retro all components, crate, pack and deliver to cargo	01/24/23	02/01/23	748FF
750	**1.2.8.5.9**	**Other Field Activities (22/23)**	**10/25/22**	**11/17/22**	
751	1.2.8.5.9.1	MCM Logistics Rep (Driller)	10/25/22	11/17/22	
752	1.2.8.5.10	END NPX 2022/23 Season	02/05/23	02/05/23	
753	**1.2.8.6**	**2023/24 On-Ice Activities**	**01/03/23**	**02/07/24**	
754	1.2.8.6.1	START NPX 2023/24 Season - Team Arrives [Comm/WTst/FirnDr]	11/11/23	11/11/23	
755	1.2.8.6.2	Deployment Travel & PQ Costs (23/24) Team (Headcount 14)	07/01/23	02/05/24	
756	**1.2.8.6.3**	**ASC Support**	**01/03/23**	**02/07/24**	
783	**1.2.8.6.4**	**Cargo**	**11/10/23**	**02/01/24**	
784	**1.2.8.6.4.1**	**Early Season Support MTLS arrival at NPX**	**11/10/23**	**11/15/23**	
785	1.2.8.6.4.1.1	TBD MTLS Arrive NPX	11/10/23	11/10/23	
786	1.2.8.6.4.1.3	8' Resupply Container Arrives - NPX	11/15/23	11/15/23	787SS
787	1.2.8.6.4.1.4	Refit Component Crate Arrives - NPX	11/15/23	11/15/23	788SS
788	1.2.8.6.4.1.5	Cargo Arrival: Computers, Motor Drives, All Hardware	11/15/23	11/15/23	322FS +336d
789	**1.2.8.6.4.2**	**Mid-Season Support MTLS arrival at NPX**	**12/01/23**	**01/01/24**	
790	1.2.8.6.4.2.1	Installation Materials Weights & SPAT Equipment Arrives - NPX	12/01/23	12/01/23	
791	1.2.8.6.4.2.2	UNL HPU Arrives - NPX	01/01/24	01/01/24	
792	1.2.8.6.4.2.3	Drill Cables (Main Cable and Return) Reels Arrive - NPX	12/01/23	12/01/23	330, 794SS
793	1.2.8.6.4.2.4	TBD - NPX	12/15/23	12/15/23	
794	1.2.8.6.4.2.5	Filtration/Degassing Components: Arrive NPX	12/01/23	12/01/23	338FS +533d
795	1.2.8.6.4.2.6	Drill Hose Arrives - NPX (DNDF)	12/01/23	12/01/23	
796	1.2.8.6.4.2.7	Weightstacks, Misc Crates Arrive - NPX	12/15/23	12/15/23	1074FS +120d
797	1.2.8.6.4.2.8	GEN hoods Arrive - NPX	12/01/23	12/01/23	334FS +794d
798	1.2.8.6.4.2.9	TU-20 shaft Arrive - NPX	12/01/23	12/01/23	797SS
799	1.2.8.6.4.2.10	Surface Cable Arrives, SJB, FieldHub electronics, ICL hardware - NPX	12/01/23	12/01/23	798SS, 1619, 1610,
800	1.2.8.6.4.2.11	DOM Handling Facility Arrives - NPX	12/15/23	12/15/23	
801	**1.2.8.6.4.3**	**SPOT Support MTLS arrival at NPX**	**12/01/23**	**12/01/23**	
802	1.2.8.6.4.3.1	GEN-1 Arrives - NPX	12/01/23	12/01/23	
803	**1.2.8.6.4.4**	**END-Season Support MTLS arrival at NPX**	**01/12/24**	**02/01/24**	
804	1.2.8.6.4.4.1	TBD MTLS Arrive - NPX	01/15/24	01/31/24	
805	1.2.8.6.4.4.2	Drill Heads Arrive - NPX (Store in ICL)	02/01/24	02/01/24	340FS +55d
806	1.2.8.6.4.4.3	Sensor delivery (Strings 87-88) Arrives - NPX	01/16/24	01/16/24	1427FS +100d, 134
807	1.2.8.6.4.4.4	Installation Hardware (all 7 strings) and Breakout cables Arrives fro str. 87 and 88- NPX	01/12/24	01/23/24	1074FS +140d
808	1.2.8.6.4.4.5	Pressure sensors (7) Arrives - NPX	01/15/24	01/31/24	1062FS +334d
809	1.2.8.6.4.4.6	Combo & Drill Cables Arrive - NPX	01/31/24	01/31/24	332FS +313d
810	**1.2.8.6.4.5**	**MCM Cargo Arrivals**	**01/15/24**	**01/31/24**	
811	1.2.8.6.4.5.1	Downhole cables (7) Arrive - MCM	01/15/24	01/31/24	330FS +564d, 1538
812	1.2.8.6.4.5.2	Installation Hardware Arrives - MCM (placeholder see 807)	01/15/24	01/31/24	
813	**1.2.8.6.5**	**Seasonal Equipment Site (SES) Setup**	**11/14/23**	**01/31/24**	
814	1.2.8.6.5.1	Fuel Tower: Connect, Test and Make Ready	11/21/23	11/22/23	
815	1.2.8.6.5.2	Make Ready all SES Modules (DCC, PHS, MHPs, MECC, WTs, All)	11/14/23	11/24/23	
816	1.2.8.6.5.3	Furnace Checkout & Fire Up (All Modules)	11/14/23	11/16/23	815SS
817	1.2.8.6.5.4	Perform Emergency Incident Drill & Safety Training	12/08/23	12/11/23	
818	1.2.8.6.5.5	SES Maintenance Activities	11/15/23	01/31/24	816FS -2d
819	1.2.8.6.5.6	SES Digout	11/15/23	01/31/24	818SS



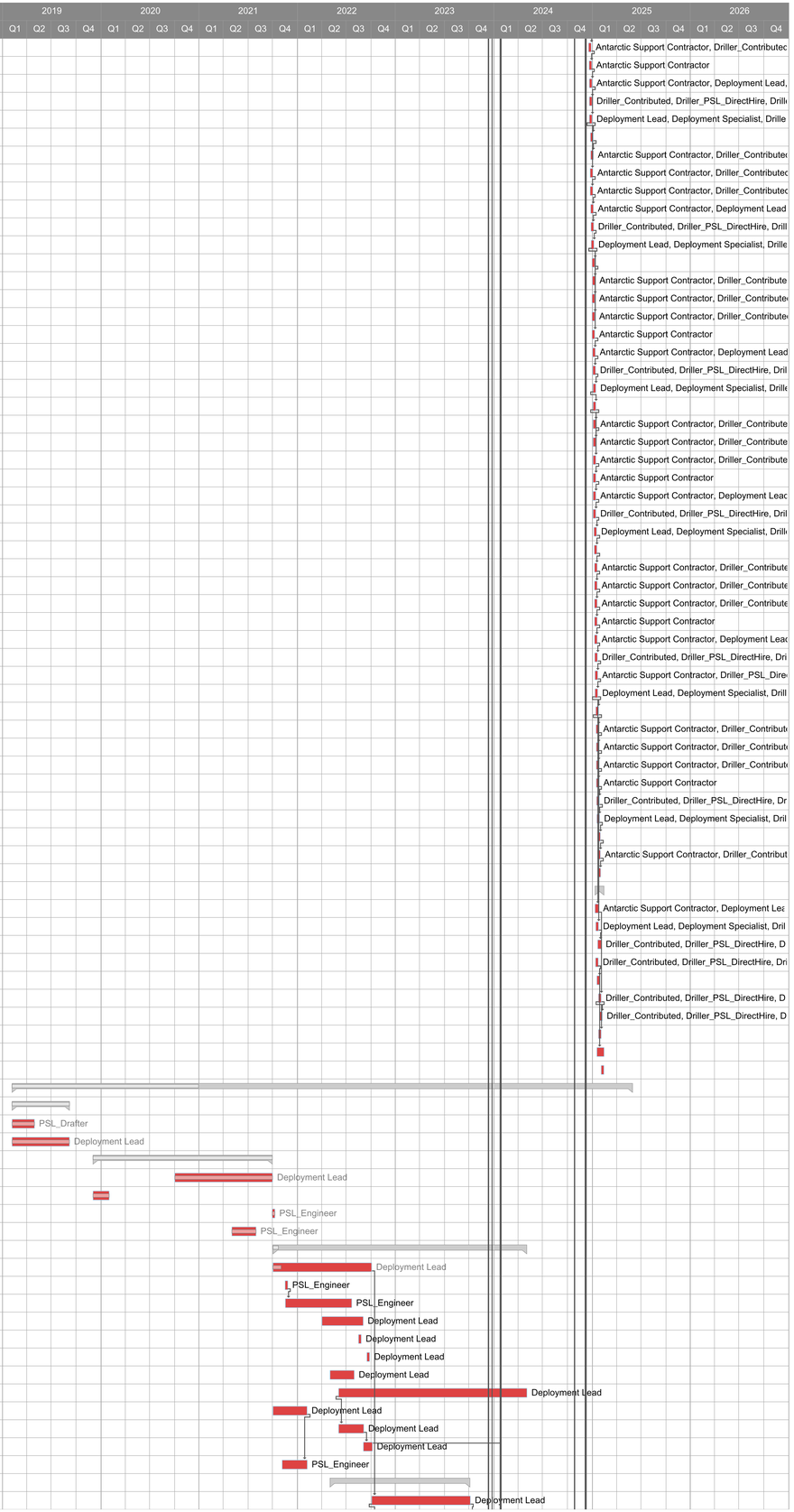
	WBS	Task Name	Start Date	End Date	Predecessor WBS
820	**1.2.8.6.6**	**Generators & PDM**	**11/20/23**	**01/11/24**	
821	1.2.8.6.6.1	Generators: Charge Generator Batteries	11/21/23	11/29/23	
822	1.2.8.6.6.2	Prime / Commission fuel system	11/21/23	11/29/23	821SS
823	1.2.8.6.6.3	GEN-1, 2, 3 - Install GEN hoods	01/05/24	01/11/24	
824	1.2.8.6.6.4	GEN-1, 2, 3, PDM - Repairs, Tests with Contract Tech Support	11/20/23	12/13/23	822SS -1d
825	1.2.8.6.6.5	Generator & PDM: Commission & Final Testing at NPX	12/12/23	12/13/23	824FF
826	1.2.8.6.6.6	Generators Ready	12/14/23	12/14/23	825
827	1.2.8.6.6.7	Change from Temporary Power to IceCube Grid	12/15/23	12/18/23	826
828	**1.2.8.6.7**	**EHWD: Final Upgrade & Replacement Work**	**11/14/23**	**01/30/24**	
829	**1.2.8.6.7.1**	**Drill Control Center (DCC)**	**11/23/23**	**11/28/23**	
830	1.2.8.6.7.1.1	Install Racks, Networks, Computers	11/23/23	11/28/23	
831	**1.2.8.6.7.2**	**Main Heating Plants**	**11/17/23**	**11/30/23**	
832	1.2.8.6.7.2.1	Final Upgrade & Replacement Activities	11/17/23	11/24/23	
833	1.2.8.6.7.2.2	Final Testing	11/24/23	11/30/23	832FS -1d
834	**1.2.8.6.7.3**	**Pre Heat System**	**11/17/23**	**11/30/23**	
835	1.2.8.6.7.3.1	Install Filters in H2O System	11/24/23	11/27/23	
836	1.2.8.6.7.3.2	Final Upgrade & Replacement Activities	11/17/23	11/24/23	832SS
837	1.2.8.6.7.3.3	Final Testing	11/24/23	11/30/23	836FS -1d, 835FF
838	**1.2.8.6.7.4**	**Water Tanks & Handling Systems (VT & Submersible)**	**11/17/23**	**11/30/23**	
839	1.2.8.6.7.4.1	Install Railing, Ladders, Pumps, Plumbing, Final Upgrades	11/17/23	11/24/23	
840	1.2.8.6.7.4.2	Integrate, Verify, Test	11/24/23	11/30/23	839FS -1d
841	**1.2.8.6.7.5**	**HPP**	**11/17/23**	**11/30/23**	
842	1.2.8.6.7.5.1	Final Upgrade & Replacement Activities	11/17/23	11/24/23	
843	1.2.8.6.7.5.2	Pump Testing	11/24/23	11/30/23	842FS -1d
844	**1.2.8.6.7.6**	**Shops, MECC (SEW, TOW, OML)**	**11/14/23**	**11/21/23**	
845	1.2.8.6.7.6.1	Final Upgrade/Retrofit Shops, MECC	11/14/23	11/21/23	
846	**1.2.8.6.7.7**	**Main Supply Hose Reel (Big Red)**	**12/10/23**	**01/16/24**	
847	1.2.8.6.7.7.1	Install Drill Hose on Reel	01/05/24	01/11/24	848FS +15d
848	1.2.8.6.7.7.2	Final Upgrades & Testing	12/10/23	12/14/23	
849	1.2.8.6.7.7.3	Install Blankets, Connect to Power, Heating Control & Test	01/12/24	01/16/24	847
850	**1.2.8.6.7.8**	**Winches & Reels**	**12/15/23**	**01/01/24**	
851	1.2.8.6.7.8.1	Winches and Reels Final Integration & Testing (TU-20, TU-15, RWCR, RWHR, MCR)	12/15/23	01/01/24	
852	**1.2.8.6.7.9**	**Fuel Storage and Delivery**	**11/25/23**	**11/29/23**	
853	1.2.8.6.7.9.1	Fuel Tower: Commission - NPX	11/25/23	11/29/23	
854	**1.2.8.6.7.10**	**TOS/Tower**	**12/31/23**	**01/12/24**	
855	1.2.8.6.7.10.1	TOS/Tower Equipment - Retrofit & Testing	12/31/23	01/12/24	
856	**1.2.8.6.7.11**	**Computing & Controls**	**11/22/23**	**01/23/24**	
857	1.2.8.6.7.11.1	Control Software: System Integration, Verification, Test - NPX	11/29/23	01/23/24	859FF, 858SS
858	1.2.8.6.7.11.2	Motor Drives: Testing and Programming - NPX	11/29/23	12/26/23	859SS +5d
859	1.2.8.6.7.11.3	Motor Drives: Install Retrofit Kits	11/22/23	01/23/24	
860	1.2.8.6.7.11.4	Misc Controls Tasking	12/01/23	01/23/24	859FF
861	1.2.8.6.7.11.5	Motor Drives: Conduit Wiring	11/22/23	01/23/24	859FF
862	**1.2.8.6.7.12**	**Commissioning ARA Drill**	**11/24/23**	**01/30/24**	
863	1.2.8.6.7.12.1	Integrate HPU-2 and Commission - NPX (Driller_PSL_Lead)	11/24/23	12/07/23	
864	1.2.8.6.7.12.2	Decommission & Store ARA Drill (Driller_PSL_Lead)	01/24/24	01/30/24	
865	**1.2.8.6.8**	**Assemble Sensor Handling Facility at NPX**	**12/10/23**	**12/20/23**	
866	1.2.8.6.8.1	Assemble Skis and Deck, Erect Walls, Construct Walls, Construct Roof	12/10/23	12/14/23	
867	1.2.8.6.8.2	Final Assembly with ASC Provided Crane	12/18/23	12/20/23	866FS +1d
868	**1.2.8.6.9**	**Develop Condensate Bulb**	**12/07/23**	**12/11/23**	
869	1.2.8.6.9.1	Drill and Pump Out Water	12/07/23	12/11/23	
870	**1.2.8.6.10**	**Develop Rod Well (Using ARA Drill)**	**12/11/23**	**01/17/24**	
871	1.2.8.6.10.1	Develop & Maintain RodWell (Using ARA Drill) Includes Snow Melting Activities	12/11/23	01/16/24	869FS -1d
872	1.2.8.6.10.2	Rod Well Activities Complete (Using ARA Drill)	01/17/24	01/17/24	871
873	**1.2.8.6.11**	**Firn Drilling - Independent Firn Drill (IFD)**	**12/08/23**	**01/25/24**	
874	1.2.8.6.11.1	Drill and CRREL Integration and Commissioning at NPX	12/08/23	12/15/23	
875	1.2.8.6.11.2	Drill 8 Firn Holes w/ Independent Firn Drill (IFD)	12/15/23	01/18/24	874FS -1d
876	1.2.8.6.11.3	8 Holes Drilled, Covered and Flagged	01/18/24	01/18/24	875FS -1d
877	1.2.8.6.11.4	Winterize & Store IFD	01/18/24	01/25/24	876FS -1d
878	**1.2.8.6.12**	**EHWD: Full Systems Wet Test**	**01/04/24**	**01/26/24**	
879	1.2.8.6.12.1	Readiness Review, Safety Refresher, Emergency & Safety Systems Tested	01/04/24	01/09/24	
880	1.2.8.6.12.2	Fire Boilers, Circulate Water or Glycol	01/10/24	01/18/24	879
881	1.2.8.6.12.3	Perform Systems Tests	01/17/24	01/22/24	880FS -2d
882	1.2.8.6.12.4	Blow Out Systems (need ASC compressor)	01/23/24	01/26/24	881
883	**1.2.8.6.13**	**Season Close-Out Work**	**01/20/24**	**02/01/24**	
884	1.2.8.6.13.1	Document, Photograph Equip & Upgrade Work, Further Req's	01/20/24	01/22/24	
885	1.2.8.6.13.2	Remove DNF, Computer Equip, Drives, Capacitors, Etc	01/22/24	01/25/24	884SS
886	1.2.8.6.13.3	Winterize/Close/Store all EHWD Equipment	01/25/24	01/30/24	885FS -1d
887	1.2.8.6.13.4	Prepare Retrograde for Shipment	01/22/24	01/30/24	884SS
888	**1.2.8.6.13.5**	**Winterize EHWD**	**01/20/24**	**02/01/24**	
889	1.2.8.6.13.5.1	Remove & Retro/Store All DNF	01/20/24	01/30/24	
890	1.2.8.6.13.5.2	Winterize SES & TOS, Disconnect All Cables Hoses, Connections	01/24/24	01/31/24	889FS -5d
891	1.2.8.6.13.5.3	All EHWD Equipment Winterized	02/01/24	02/01/24	890
892	**1.2.8.6.14**	**Other Field Activities (23/24)**	**10/25/23**	**11/17/23**	
893	1.2.8.6.14.1	MCM Logistics Rep (Driller)	10/25/23	11/17/23	
894	1.2.8.6.15	END NPX 2023/24 Season	02/07/24	02/07/24	
895	**1.2.8.7**	**2024/25 On-Ice Activities**	**01/20/24**	**02/27/25**	
896	1.2.8.7.1	START NPX 2024/25 Season - Team Arrives [Headcount 28]	11/09/24	11/09/24	
897	1.2.8.7.2	Deployment Travel & PQ Costs (24/25)	06/01/24	02/27/25	
898	**1.2.8.7.3**	**ASC Support**	**10/15/24**	**02/11/25**	
899	1.2.8.7.3.1	MCM Logistics Support (ASC)	10/15/24	12/13/24	
900	1.2.8.7.3.2	Provide Heaters (PolarTherm) (ASC)	11/13/24	02/03/25	
901	1.2.8.7.3.3	Excavate Winter Storage Berms & Deliver Equipment (ASC)	11/13/24	11/18/24	



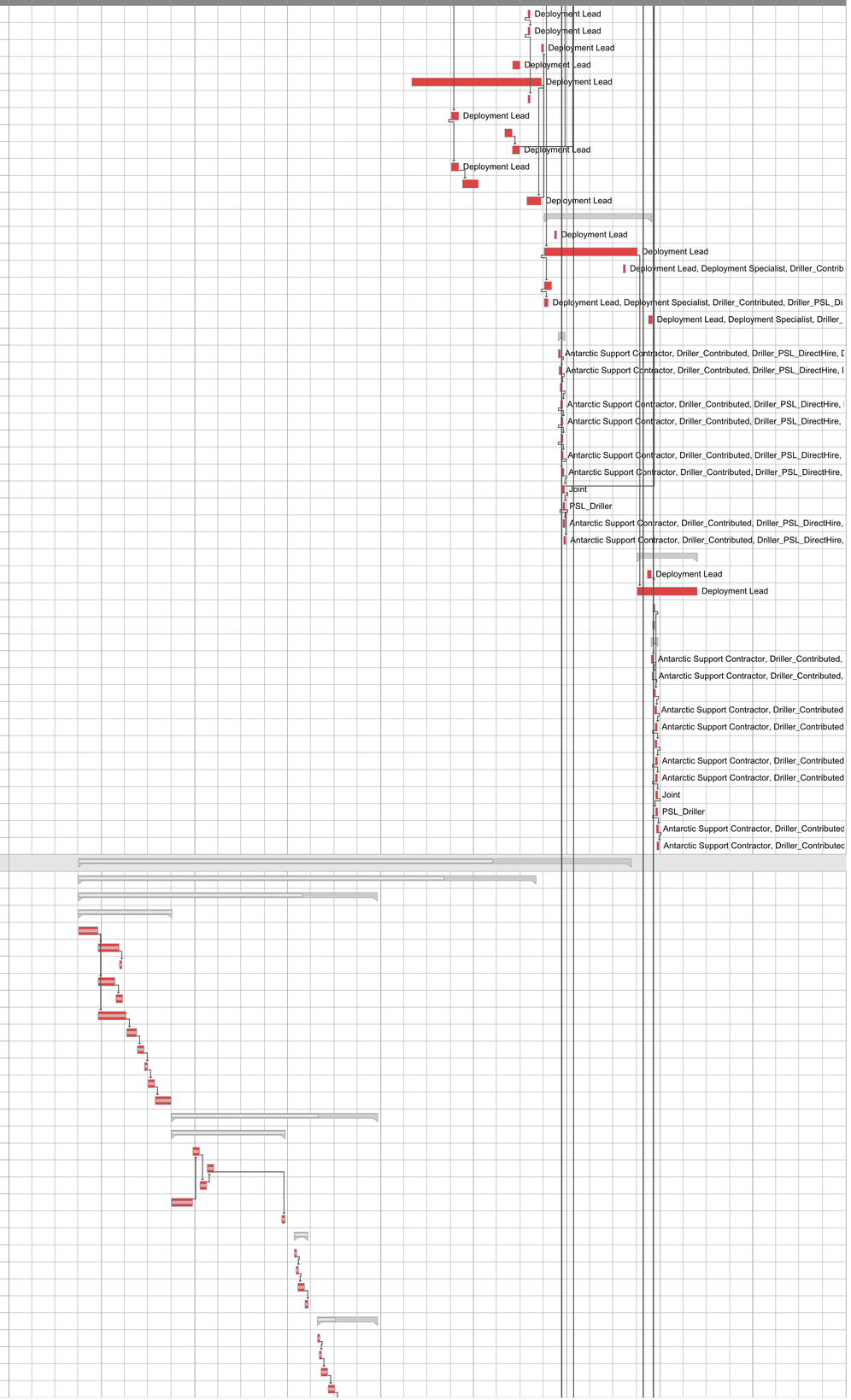
	WBS	Task Name	Start Date	End Date	Predecessor WBS
902	1.2.8.7.3.4	Built Ramp to Water Tank 1 (ASC)	11/15/24	11/15/24	
903	1.2.8.7.3.5	Re-establish SES Drill Pad, Excavate SES, and Roads, Groom & Compact Roads (ASC)	11/07/24	11/15/24	
904	1.2.8.7.3.6	SES Drill Pad Excavated & Established (ASC)	11/15/24	11/15/24	
905	1.2.8.7.3.7	Provide Support Generators (CRREL / Onan Genset) (ASC)	11/13/24	01/31/25	
906	1.2.8.7.3.8	Provide 953 Loader, 287B Skidsteer, Pax Van, & Snomo's (ASC)	11/13/24	11/13/24	
907	1.2.8.7.3.9	IT Activities for SES (ASC)	11/20/24	11/20/24	
908	1.2.8.7.3.10	Deliver Compressor to SES (ASC)	12/01/24	12/01/24	
909	1.2.8.7.3.11	Deliver & Warm Up Glycol Tank (ASC)	12/01/24	12/01/24	
910	1.2.8.7.3.12	Begin delivery - 5k Fuel Tanks (ASC)	11/20/24	11/20/24	
911	1.2.8.7.3.13	Deliver TOS1, TOS2, Drill Towers, DCC (to SES), Main Hose Reel (ASC)	12/01/24	12/03/24	
912	1.2.8.7.3.14	Deliver 3000 gals Seed Water from Station (ASC)	11/27/24	12/02/24	
913	1.2.8.7.3.15	Survey Support As-built Drawing (ASC)	01/15/25	01/22/25	
914	1.2.8.7.3.16	EHWD Storage Support (ASC)	02/01/25	02/11/25	
915	1.2.8.7.3.17	Demo Snow Ramp (ASC)	02/01/25	02/04/25	
916	1.2.8.7.3.18	Create Storage Berms (ASC), End-of-the-World and SES	12/15/24	01/13/25	
917	1.2.8.7.3.19	Receive Sensors 5 Strings and Deliver to SES (ASC)	11/16/24	11/16/24	
918	1.2.8.7.3.20	Receive Downhole Cables and Deliver to SES (ASC)	11/16/24	11/16/24	
919	1.2.8.7.3.21	Equipment Ops Support - Moves, TU-20 Loading, Season Snow Removal, Road Maint. (ASC)	11/15/24	02/05/25	
920	1.2.8.7.3.22	T&L Support - Cargo Deliveries (ASC)	11/15/24	02/05/25	
921	1.2.8.7.3.23	Create Storage Berms (ASC)	01/02/25	01/08/25	
922	1.2.8.7.3.24	Tow and Place EHWD onto Berms for Long-Term Storage (ASC)	01/25/25	01/28/25	
923	1.2.8.7.3.25	Demo Snow Ramp (ASC)	01/25/25	01/28/25	
924	**1.2.8.7.4**	**Cargo**	**01/20/24**	**02/07/25**	
925	**1.2.8.7.4.1**	**Early Season Support MTLS arrival at NPX**	**11/11/24**	**11/29/24**	
926	1.2.8.7.4.1.1	Spare Drill Cable Arrives - NPX	11/11/24	11/11/24	340FS +257d
927	1.2.8.7.4.1.2	Computing and Controls Hardware Arrival - NPX	11/15/24	11/15/24	339FS +314d
928	1.2.8.7.4.1.3	Driller Resupply, Spare Parts Arrive - NPX	11/15/24	11/15/24	332FS +520d
929	1.2.8.7.4.1.4	Dust logger Winch (IDP) Arrival - NPX	11/25/24	11/25/24	1879FS +41d
930	1.2.8.7.4.1.5	Sensors (5 strings) Arrive - NPX	11/25/24	11/25/24	1834FS +777d, 183
931	1.2.8.7.4.1.6	Downhole cables (7) Arrive - NPX	11/29/24	11/29/24	811FS +216d
932	1.2.8.7.4.1.7	Breakout Cables, strings 89-93 Arrival - NPX	11/29/24	11/29/24	1094FS +250d
933	**1.2.8.7.4.2**	**Mid-Season Support MTLS arrival at NPX**	**12/01/24**	**12/01/24**	
934	1.2.8.7.4.2.1	TBD MTLS Arrive - NPX	12/01/24	12/01/24	
935	**1.2.8.7.4.3**	**SPOT Support MTLS arrival at NPX**	**12/01/24**	**12/01/24**	
936	1.2.8.7.4.3.1	TBD MTLS Arrival - NPX	12/01/24	12/01/24	
937	**1.2.8.7.4.4**	**END-Season Retrograde MTLS departure from NPX**	**01/20/24**	**02/07/25**	
938	1.2.8.7.4.4.1	TBD MTLS Departure - NPX	01/20/24	02/07/25	
939	**1.2.8.7.4.5**	**MCM Cargo Arrivals**	**10/15/24**	**10/16/24**	
940	1.2.8.7.4.5.1	Sensors (5 strings) Arrive - MCM	10/15/24	10/16/24	1463FS +501d, 146
941	**1.2.8.7.5**	**Seasonal Equipment Site (SES) Setup**	**11/14/24**	**02/03/25**	
942	1.2.8.7.5.1	Make Ready all SES Modules (DCC, PHS, MHPs, MECC, WTs, All)	11/15/24	11/27/24	949SS +1d
943	1.2.8.7.5.2	Furnace Checkout & Fire Up (All modules)	11/15/24	11/20/24	942SS
944	1.2.8.7.5.3	Perform Emergency Incident Drill & Safety Training	12/08/24	12/10/24	
945	1.2.8.7.5.4	Ready ARA Drill for Service	11/28/24	12/04/24	943FS +5d
946	1.2.8.7.5.5	Re-establish and Maintain RodWell	12/04/24	01/16/25	
947	1.2.8.7.5.6	SES and Equipment Maintenance Activities	11/15/24	02/03/25	943SS
948	1.2.8.7.5.7	SES Ready for Drilling - (On Ice Final Readiness Assessment)	12/12/24	12/12/24	945FS +5d
949	1.2.8.7.5.8	SES Dig-out	11/14/24	11/18/24	
950	**1.2.8.7.6**	**Generators & PDM**	**11/18/24**	**11/22/24**	
951	1.2.8.7.6.1	Generator & PDM: Commission - NPX	11/18/24	11/20/24	
952	1.2.8.7.6.2	Generators Ready	11/20/24	11/21/24	951FS -1d
953	1.2.8.7.6.3	Change from Temp Power to Generators (Stand Alone)	11/20/24	11/22/24	952SS
954	**1.2.8.7.7**	**TOS1 / Tower1 Setup**	**11/25/24**	**12/16/24**	
955	1.2.8.7.7.1	Hole Excavation, Trench & Install Cable Anchor (Hole 1 & 2)	12/06/24	12/09/24	960SS
956	1.2.8.7.7.2	Position & Level TOS1/Tower1 at Hole 1	11/25/24	11/25/24	
957	1.2.8.7.7.3	Position Sensor Handling Structure	11/26/24	11/27/24	956
958	1.2.8.7.7.4	Hose & Cable Delivery & Layout SES-TOS	12/02/24	12/04/24	957FS +2d
959	1.2.8.7.7.5	Trench & Install Reel Anchors (Hole 1)	12/05/24	12/09/24	958
960	1.2.8.7.7.6	Position Hose & Cable Reels (Hole 1)	12/06/24	12/09/24	958FS +1d
961	1.2.8.7.7.7	Make TOS1 Operational, Deliver Fuel, Fire Furnace	12/06/24	12/09/24	960SS
962	1.2.8.7.7.8	TOS1 Network/Comms Install	12/06/24	12/09/24	961SS
963	1.2.8.7.7.9	Connect Hose Loop & Circulate Water	12/06/24	12/09/24	962SS
964	1.2.8.7.7.10	Prepare SFC-DOM Cable (Mount on TU20, test slip ring) X2	12/06/24	12/09/24	963SS
965	1.2.8.7.7.11	Pull Drill Heads from ICL & Final Testing in TOS	12/09/24	12/12/24	964FS -1d
966	1.2.8.7.7.12	TOS1/Tower1 Site Ready for Drilling	12/13/24	12/16/24	965, 948
967	**1.2.8.7.8**	**TOS2 / Tower2 Setup**	**11/26/24**	**12/16/24**	
968	1.2.8.7.8.1	Position & Level TOS 2/Tower 2 (Hole 2)	11/26/24	12/02/24	
969	1.2.8.7.8.2	Cable Layout SES to TOS 2	12/02/24	12/06/24	968FS -1d
970	1.2.8.7.8.3	Make TOS2 Operational, Deliver fuel, Fire Furnace	12/09/24	12/11/24	969
971	1.2.8.7.8.4	TOS2 Network/Comms Install	12/09/24	12/12/24	970SS
972	1.2.8.7.8.5	TOS2/Tower2 in Position & Heated	12/13/24	12/16/24	971, 948
973	**1.2.8.7.9**	**EHWD: Full System Wet-Test**	**11/20/24**	**01/08/25**	
974	1.2.8.7.9.1	Readiness Review/Safety Refresher	11/20/24	12/16/24	
975	1.2.8.7.9.2	Emergency & Safety Systems Tested	11/20/24	11/25/24	
976	1.2.8.7.9.3	Fire Boilers, Circulate Water	11/26/24	01/08/25	975
977	1.2.8.7.9.4	Perform Complete Systems Testing (Wet Test & Comm).	12/04/24	12/11/24	976SS +6d
978	**1.2.8.7.10**	**Deep Drilling 23/24**	**12/13/24**	**01/21/25**	
979	1.2.8.7.10.1	DRILL HOLE # 1	12/13/24	12/16/24	977FS +1d
980	1.2.8.7.10.2	Deployment - String 1	12/16/24	12/18/24	979FS -1d
981	1.2.8.7.10.3	String # 1 Deployed & Complete	12/19/24	12/20/24	980
982	1.2.8.7.10.4	Closeout & Relocate Tower & TOS to Hole 3	12/16/24	12/18/24	980SS
983	1.2.8.7.10.5	Trench & Install Reel Anchors (Hole 2)	12/19/24	12/23/24	982



	WBS	Task Name	Start Date	End Date	Predecessor WBS
984	1.2.8.7.10.6	Relocate Hose, Cable Reels, Sensor Handling Structure	12/17/24	12/19/24	979
985	1.2.8.7.10.7	Prepare SFC-DOM Cable (Mount on TU20, test slip ring) Prep for String 3	12/19/24	12/20/24	984FS -1d
986	1.2.8.7.10.8	Operational Debrief	12/20/24	12/20/24	985FS -1d
987	1.2.8.7.10.9	DRILL HOLE # 2	12/20/24	12/23/24	986FS -1d
988	1.2.8.7.10.10	Deployment - String 2	12/20/24	12/24/24	986FS -1d
989	1.2.8.7.10.11	String # 2 Deployed & Complete	12/24/24	12/25/24	988FS -1d
990	1.2.8.7.10.12	Closeout & Relocate Tower & TOS to Hole 4	12/25/24	12/25/24	989FS -1d
991	1.2.8.7.10.13	Trench & Install Reel Anchors (Hole 3)	12/23/24	12/23/24	988SS +1d
992	1.2.8.7.10.14	Relocate Hose, Cable Reels, Sensor Handling Structure	12/23/24	12/23/24	991FS -1d
993	1.2.8.7.10.15	Prepare SFC-DOM Cable (Mount on TU20, test slip ring) - Prep for String 4	12/25/24	12/25/24	992FS +1d
994	1.2.8.7.10.16	DRILL HOLE # 3	12/26/24	12/27/24	993
995	1.2.8.7.10.17	Deployment - String 3	12/27/24	12/30/24	994FS -1d
996	1.2.8.7.10.18	String # 3 Deployed & Complete	12/30/24	12/30/24	995FS -1d
997	1.2.8.7.10.19	Closeout & Relocate Tower & TOS for Hole 5	12/31/24	01/01/25	996
998	1.2.8.7.10.20	Trench & Install Reel Anchors (Hole 4)	12/30/24	12/30/24	995SS +1d
999	1.2.8.7.10.21	Relocate Hose, Cable Reels, Sensor Handling Structure	12/30/24	12/30/24	995SS +1d
1000	1.2.8.7.10.22	Hole Excavation, Trench & Install Cable Anchor (Hole 4)	12/30/24	12/31/24	995SS +1d
1001	1.2.8.7.10.23	Prepare SFC-Sensor Cable (Mount on TU20, test slip ring) - Prep for String 5	01/01/25	01/01/25	1000
1002	1.2.8.7.10.24	DRILL HOLE # 4	01/02/25	01/03/25	1001
1003	1.2.8.7.10.25	Deployment	01/03/25	01/03/25	1002FS -1d
1004	1.2.8.7.10.26	String # 4 Deployed & Complete	01/03/25	01/03/25	1003SS
1005	1.2.8.7.10.27	Closeout & Relocate Tower & TOS for Hole 6	01/03/25	01/03/25	1004FS -1d
1006	1.2.8.7.10.28	Trench & Install Reel Anchors (Hole 5)	01/03/25	01/03/25	1005FS -1d
1007	1.2.8.7.10.29	Relocate Hose, Cable Reels, Sensor Handling Structure	01/03/25	01/03/25	1004SS
1008	1.2.8.7.10.30	Hole Excavation, Trench & Install Cable Anchor (Hole 5)	01/03/25	01/03/25	1007FS -1d
1009	1.2.8.7.10.31	Prepare SFC-Sensor Cable (Mount on TU20, test slip ring) - Prep for String 6	01/03/25	01/03/25	1008FS -1d
1010	1.2.8.7.10.32	DRILL HOLE # 5	01/03/25	01/06/25	1009FS -1d
1011	1.2.8.7.10.33	Deployment - String 5	01/06/25	01/07/25	1010FS -1d
1012	1.2.8.7.10.34	String # 5 Deployed & Complete	01/07/25	01/07/25	1011FS -1d
1013	1.2.8.7.10.35	Closeout & Relocate Tower & TOS for Hole 7	01/08/25	01/08/25	1012
1014	1.2.8.7.10.36	Trench & Install Reel Anchors (Hole 6)	01/08/25	01/08/25	1013FS -1d
1015	1.2.8.7.10.37	Relocate Hose, Cable Reels, Sensor Handling Structure	01/08/25	01/08/25	1014FS -1d
1016	1.2.8.7.10.38	Hole Excavation, Trench & Install Cable Anchor (Hole 6)	01/08/25	01/08/25	1015FS -1d
1017	1.2.8.7.10.39	Prepare SFC-Sensor Cable (Mount on TU20, test slip ring) - Prep for String 7	01/08/25	01/08/25	1016FS -1d
1018	1.2.8.7.10.40	DRILL HOLE # 6	01/09/25	01/10/25	1017
1019	1.2.8.7.10.41	Driller Support for Dust Logging Activities	01/10/25	01/10/25	1018FS -1d
1020	1.2.8.7.10.42	Deployment - String 6	01/10/25	01/13/25	1019FS -1d
1021	1.2.8.7.10.43	String # 6 Deployed & Complete	01/13/25	01/13/25	1020FS -1d
1022	1.2.8.7.10.44	Closeout & Relocate Tower & TOS to Storage	01/14/25	01/14/25	1021
1023	1.2.8.7.10.45	Trench & Install Reel Anchors (Hole 7)	01/15/25	01/15/25	1022
1024	1.2.8.7.10.46	Relocate Hose & Cable Reels Change duration 1 day	01/15/25	01/15/25	1023FS -1d
1025	1.2.8.7.10.47	Hole Excavation, Trench & Install Cable Anchor (Hole 7)	01/15/25	01/15/25	1024FS -1d
1026	1.2.8.7.10.48	DRILL HOLE # 7	01/16/25	01/17/25	1025
1027	1.2.8.7.10.49	Deployment - String 7	01/17/25	01/20/25	1026FS -1d
1028	1.2.8.7.10.50	String # 7 Deployed & Complete	01/20/25	01/20/25	1027FS -1d
1029	1.2.8.7.10.51	Closeout & Relocate Tower & TOS to Storage Change duration 7 days	01/20/25	01/20/25	1028FS -1d
1030	1.2.8.7.10.52	Drilling & Installation Complete	01/21/25	01/21/25	1029
1031	**1.2.8.7.11**	**Decommission and Store EHWD**	**01/10/25**	**02/11/25**	
1032	1.2.8.7.11.1	Remove & Retro/Store All DNF	01/10/25	01/23/25	1020SS
1033	1.2.8.7.11.2	Decommission SES & TOS, Disconnect all cables hoses, connections	01/13/25	01/20/25	1021SS
1034	1.2.8.7.11.3	Winterize all EHWD equipment	01/20/25	01/31/25	1033FS -1d
1035	1.2.8.7.11.4	Remove Drill Hose from MSHR, Respool & Ship to ZCM	01/12/25	01/16/25	
1036	1.2.8.7.11.5	Shipment of Drill Hose to ZCM	01/17/25	01/17/25	1035
1037	1.2.8.7.11.6	Inventory & Photograph EHWD, Document Repairs needed	01/23/25	01/27/25	1032FS -1d
1038	1.2.8.7.11.7	UNL Equipment - Deliver to Cargo for Retro or Redistribution	01/27/25	01/29/25	1037FS -1d
1039	1.2.8.7.11.8	Crate and Deliver EHWD Equipment to Cargo for Retrograde or Redistribution	01/23/25	01/29/25	1037SS
1040	1.2.8.7.11.9	Cargo Retro (24/25)	01/17/25	02/11/25	1035
1041	1.2.8.7.12	NPX Activities Complete (24/25 Season)	02/02/25	02/02/25	
1042	**1.2.9**	**String/Cable Installation**	**02/04/19**	**05/27/25**	
1043	*1.2.9.1*	*2019-20*	*02/04/19*	*09/03/19*	
1044	*1.2.9.1.1*	*Site Plan Designs (TOS and SES)*	*02/04/19*	*04/26/19*	
1045	*1.2.9.1.2*	*Plan & Coordinate Installation*	*02/04/19*	*09/03/19*	
1046	*1.2.9.2*	*2020-21*	*12/02/19*	*09/28/21*	
1047	*1.2.9.2.1*	*Plan & Coordinate Installation*	*10/01/20*	*09/28/21*	
1048	*1.2.9.2.2*	*ICL/Tower Review and Initiate Plans for Cable Entry/Routing (ASC)*	*12/02/19*	*01/31/20*	
1049	*1.2.9.2.3*	*Installation Procedures Document Drafted*	*09/28/21*	*09/28/21*	
1050	*1.2.9.2.4*	*Design Sensor Handling Structure (Attached to TOS)*	*05/01/21*	*07/30/21*	
1051	**1.2.9.3**	**2021-22**	**10/01/21**	**05/01/24**	
1052	1.2.9.3.1	Plan & Coordinate Installation	10/01/21	09/30/22	
1053	1.2.9.3.2	Sensor Handling Process Defined	11/15/21	11/15/21	
1054	1.2.9.3.3	Procure & Fabricate Sensor Handling Structure	11/16/21	07/18/22	1053
1055	1.2.9.3.4	Installation Procedure Draft and Test - w/ PSL Support for Deployment Tower Ops	04/01/22	08/31/22	
1056	1.2.9.3.5	Procedures for Installation Document Complete	08/15/22	08/15/22	
1057	1.2.9.3.6	Procedure and Hardware Review	09/15/22	09/15/22	
1058	1.2.9.3.7	Hole Lifetime Evaluation	05/01/22	07/29/22	
1059	1.2.9.3.8	Deployment Connectivity Monitor Design, Procurement and Integration	06/02/22	05/01/24	
1060	1.2.9.3.10	Define Pressure Sensor Requirements	10/01/21	02/04/22	
1061	1.2.9.3.11	Finalize Sensor Handling Process & Procure Handling Equipment	06/02/22	09/01/22	1059SS
1062	1.2.9.3.12	Crate, Prepare & Ship Sensor Handling Structure	09/02/22	10/03/22	1061
1063	1.2.9.3.13	Procure Installation Hardware Samples	11/04/21	02/04/22	1060FF
1064	**1.2.9.4**	**2022-23**	**05/01/22**	**10/02/23**	
1065	1.2.9.4.1	Plan & Coordinate Installation	10/03/22	10/02/23	1052



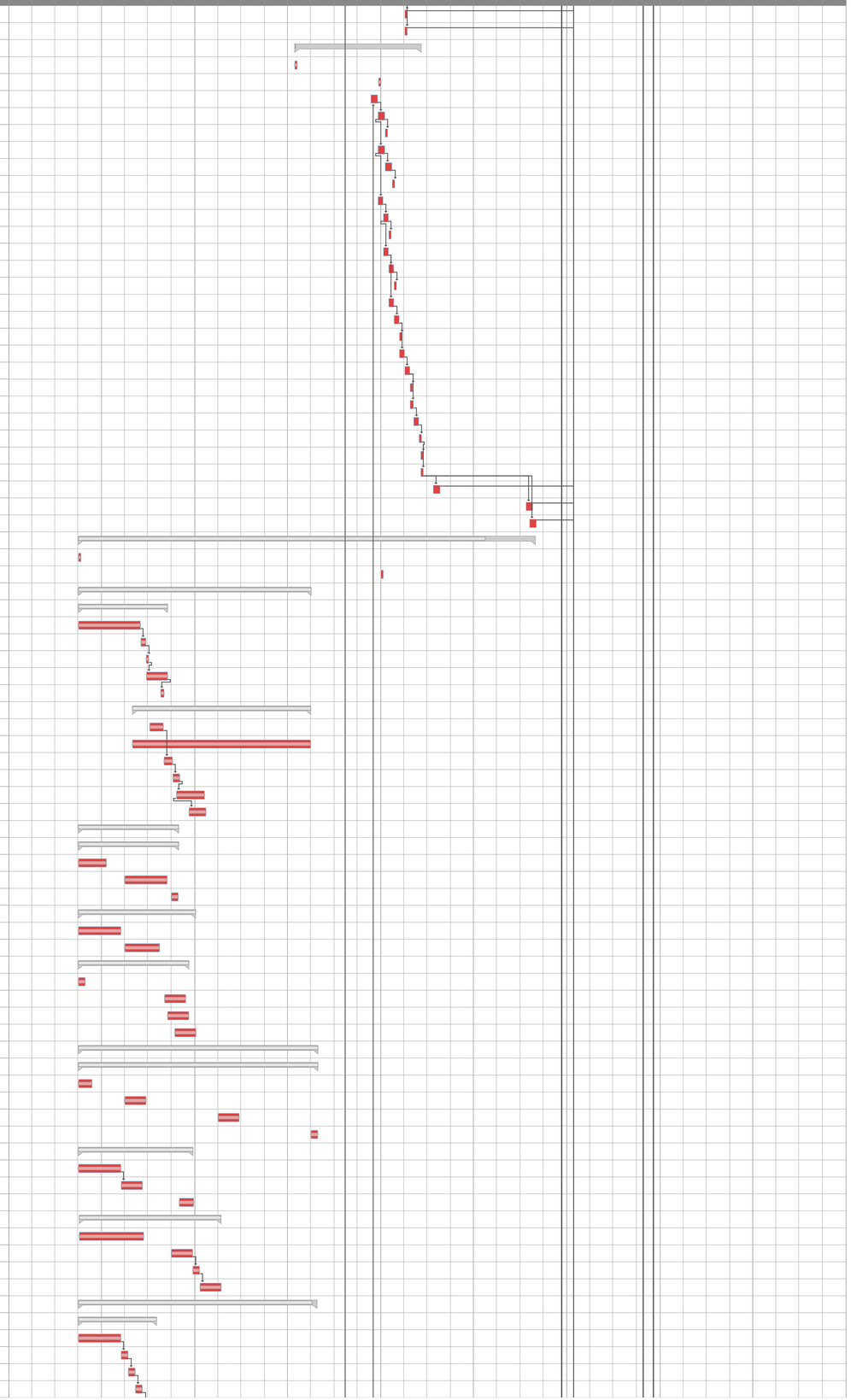
	WBS	Task Name	Start Date	End Date	Predecessor WBS
1066	1.2.9.4.2	Installation Review	07/31/23	08/07/23	
1067	1.2.9.4.3	Procure Installation Hardware Samples	07/31/23	07/31/23	1066SS
1068	1.2.9.4.4	South Pole Acceptance Testing (SPAT) Process & Support Requirements Defined	09/22/23	09/22/23	1077
1069	1.2.9.4.5	Procure Installation Kits and Weights	06/01/23	06/29/23	
1070	1.2.9.4.6	Procure Laser Rangers ($1k) & Pressure Sensors ($90k - 7 plus spares)	05/01/22	09/21/23	
1071	1.2.9.4.7	Deployment Connectivity Monitor Fabrication Complete	07/31/23	07/31/23	1067SS
1072	1.2.9.4.8	Refine Hole Lifetime Drill Modeling and Develop Drill Charts - update estimate	10/03/22	11/01/22	1065SS
1073	1.2.9.4.9	Crate Installation Kits Weights for Shipping	05/01/23	05/30/23	
1074	1.2.9.4.10	Ship Installation Kits and Weights	05/31/23	06/29/23	1073
1075	1.2.9.4.11	Modify Tower/Bridge & ICL for Cable Routing (ASC)	10/03/22	11/01/22	1072SS
1076	1.2.9.4.12	Construction of Sensor Sleds - ASC	11/16/22	01/17/23	1075FS +10d
1077	1.2.9.4.13	Logbook Requirements Defined and Design Completed	07/27/23	09/21/23	1070FF
1078	**1.2.9.5**	**2023-24**	**10/03/23**	**11/29/24**	
1079	1.2.9.5.0	Installation Team arrives (headcount 1)	11/12/23	11/12/23	
1080	1.2.9.5.1	Plan & Coordinate Installation	10/03/23	10/01/24	1065
1081	1.2.9.5.2	2024 Off-Ice Installation Training	08/08/24	08/12/24	
1082	1.2.9.5.3	South Pole Acceptance Testing (SPAT) Support Equipment Shipped	10/03/23	11/01/23	1080SS
1083	1.2.9.5.4	Ship Laser Rangers, Pressure Sensors & Deployment Connectivity Monitor	10/03/23	10/17/23	1082SS
1084	1.2.9.5.5	On-ice Sensor Handling Training	11/15/24	11/29/24	
1085	**1.2.9.5.6**	**Surface Cable Activities (SJB to ICL)**	**11/27/23**	**12/20/23**	
1086	1.2.9.5.6.1	Prep & Compact Surface Near ICL for Cable Install (ASC)	11/27/23	11/29/23	
1087	1.2.9.5.6.2	ICL: Open Tower, Bridge, and ICL Access (ASC)	11/30/23	12/04/23	1086
1088	1.2.9.5.6.3	Prep/Uncrate Cable Spools; Load onto TU20 (ASC/UW)	12/04/23	12/06/23	1087FS -1d
1089	1.2.9.5.6.4	Install 7 Surface Cables into ICL Tower, Across Bridge, into ICL (ASC & UW)	12/06/23	12/08/23	1088FS -1d
1090	1.2.9.5.6.5	Prep Cables & Attach to Grounding System in ICL (UW)	12/07/23	12/11/23	1089SS +1d
1091	1.2.9.5.6.6	Connect Surface Cables into ICL Patch Panels (UW)	12/07/23	12/11/23	1090SS
1092	1.2.9.5.6.7	Excavate Surface Junction Box Pits (ASC)	12/08/23	12/12/23	1091SS +1d
1093	1.2.9.5.6.8	Trench (mechanical) from SJB to ICL Tower (ASC)	12/11/23	12/12/23	1092FF
1094	1.2.9.5.6.9	Unspool & Lay Surface Cables from Tower to SJB Pits (ASC & UW)	12/13/23	12/14/23	1093
1095	1.2.9.5.6.10	Install SJB's in Pits (2); Connect cables (UW)	12/15/23	12/18/23	1094
1096	1.2.9.5.6.11	Build & Install Temp-Vault w/Lid (8'x10'x4'h) (ASC)	12/15/23	12/19/23	1095SS
1097	1.2.9.5.6.12	Survey, Backfill, and Flag Pits & Trenches (ASC)	12/18/23	12/20/23	1095FS -1d
1098	**1.2.9.6**	**2024-25**	**10/02/24**	**05/27/25**	
1099	1.2.9.6.0	Installation Team arrives (10)	11/11/24	11/25/24	
1100	1.2.9.6.1	Coordinate & Implement Installation Activities	10/02/24	05/27/25	1080
1101	1.2.9.6.2	On Ice Readiness Review for 1st Hole Drill / Deployment	12/02/24	12/02/24	
1102	1.2.9.6.3	Prep Sensor Testing Tent - ASC	12/01/24	12/03/24	
1103	**1.2.9.6.4**	**Surface Cable Activities (Hole to SJB)**	**11/26/24**	**12/20/24**	
1104	1.2.9.6.4.1	Prep & Compact Surface Near ICL for Cable Install (ASC)	11/26/24	11/28/24	1099
1105	1.2.9.6.4.2	ICL: Open Tower, Bridge, and ICL Access (ASC)	11/29/24	12/03/24	1104
1106	1.2.9.6.4.3	Prep/Uncrate Cable Spools; Load onto TU20 (ASC/UW)	12/04/24	12/06/24	1101, 1105
1107	1.2.9.6.4.4	Install 7 Surface Cables into ICL Tower, Across Bridge, into ICL (ASC & UW)	12/09/24	12/11/24	1106
1108	1.2.9.6.4.5	Prep Cables & Attach to Grounding System in ICL (UW)	12/11/24	12/13/24	1107FS -1d
1109	1.2.9.6.4.6	Connect Surface Cables into ICL Patch Panels (UW)	12/10/24	12/12/24	1108SS -1d
1110	1.2.9.6.4.7	Excavate Surface Junction Box Pits (ASC)	12/12/24	12/16/24	1109FS -1d
1111	1.2.9.6.4.8	Trench (mechanical) from SJB to ICL Tower (ASC)	12/12/24	12/13/24	1110SS
1112	1.2.9.6.4.9	Unspool & Lay Surface Cables from Tower to SJB Pits (ASC & UW)	12/13/24	12/16/24	1111SS +1d
1113	1.2.9.6.4.10	Install SJB's in Pits (2); Connect cables (UW)	12/13/24	12/16/24	1112FF
1114	1.2.9.6.4.11	Build & Install Temp-Vault w/Lid (8'x10'x4'h) (ASC)	12/16/24	12/18/24	1113SS +1d
1115	1.2.9.6.4.12	Survey, Backfill, and Flag Pits & Trenches (ASC)	12/18/24	12/20/24	1114FS -1d
1116	**1.3**	**Sensors**	**10/01/18**	**09/09/24**	
1117	**1.3.1**	**mDOM**	**10/01/18**	**09/01/23**	
1118	**1.3.1.1**	**mDOM DAQ Electronics**	**10/01/18**	**12/17/21**	
1119	*1.3.1.1.1*	*Preliminary design phase*	*10/01/18*	*09/30/19*	
1120	*1.3.1.1.1.1*	*Mainboard conceptual design*	*10/01/18*	*12/14/18*	
1121	*1.3.1.1.1.2*	*~~Schematic development~~*	*12/17/18*	*03/08/19*	*1120*
1122	*1.3.1.1.1.3*	*~~mDOM DAQ schematic ready~~*	*03/11/19*	*03/11/19*	*1121*
1123	*1.3.1.1.1.4*	*Build 4 ch. analog-front end (AFE) demonstrator board*	*12/17/18*	*02/22/19*	*1120*
1124	*1.3.1.1.1.5*	*Characterization of AFE performance*	*02/25/19*	*03/22/19*	*1123*
1125	*1.3.1.1.1.6*	*Test Mainboard (mDOT) schematic development*	*12/17/18*	*04/05/19*	*1120*
1126	*1.3.1.1.1.7*	*Test Mainboard (mDOT) layout*	*04/08/19*	*05/17/19*	*1125*
1127	*1.3.1.1.1.8*	*Test mainboard (mDOT) production*	*05/20/19*	*06/14/19*	*1126*
1128	*1.3.1.1.1.9*	*Test mainboard (mDOT) shipment to PSU*	*06/17/19*	*06/28/19*	*1127*
1129	*1.3.1.1.1.10*	*Test mainboard (mDOT) firmware development*	*07/01/19*	*07/26/19*	*1128*
1130	*1.3.1.1.1.11*	*Test mainboard (mDOT) characterization*	*07/29/19*	*09/30/19*	*1129*
1131	**1.3.1.1.2**	**Final design phase**	**10/01/19**	**12/17/21**	
1132	*1.3.1.1.2.1*	*mDOM Mainboard Rev1*	*10/01/19*	*12/18/20*	
1133	*1.3.1.1.2.1.1*	*Mainboard layout*	*12/24/19*	*01/20/20*	*1136*
1134	*1.3.1.1.2.1.2*	*Commissioning*	*02/18/20*	*03/16/20*	*1135*
1135	*1.3.1.1.2.1.4*	*Mainboard production*	*01/21/20*	*02/17/20*	*1133*
1136	*1.3.1.1.2.1.5*	*Mainboard schematic development*	*10/01/19*	*12/23/19*	
1137	*1.3.1.1.2.1.6*	*Ship Rev1 Mainboards to WIPAC and PSU*	*12/07/20*	*12/18/20*	*1134FS +189d*
1138	*1.3.1.1.2.2*	*mDOM Mainboard Rev2*	*01/25/21*	*03/19/21*	
1139	*1.3.1.1.2.2.1*	*Schematic changes*	*01/25/21*	*01/29/21*	
1140	*1.3.1.1.2.2.2*	*Layout changes*	*02/01/21*	*02/05/21*	*1139*
1141	*1.3.1.1.2.2.3*	*Production and assembly of 15 PCBs*	*02/08/21*	*03/05/21*	*1140*
1142	*1.3.1.1.2.2.4*	*Comissioning*	*03/08/21*	*03/19/21*	*1141*
1143	**1.3.1.1.2.3**	**mDOM Mainboard Rev3**	**04/26/21**	**12/17/21**	
1144	*1.3.1.1.2.3.1*	*Schematic changes*	*04/26/21*	*04/30/21*	
1145	*1.3.1.1.2.3.2*	*Layout changes*	*05/03/21*	*05/07/21*	*1144*
1146	*1.3.1.1.2.3.3*	*Production and assembly of test series*	*05/10/21*	*06/04/21*	*1145*
1147	*1.3.1.1.2.3.4*	*Comissioning and final design verification*	*06/07/21*	*07/02/21*	*1146*



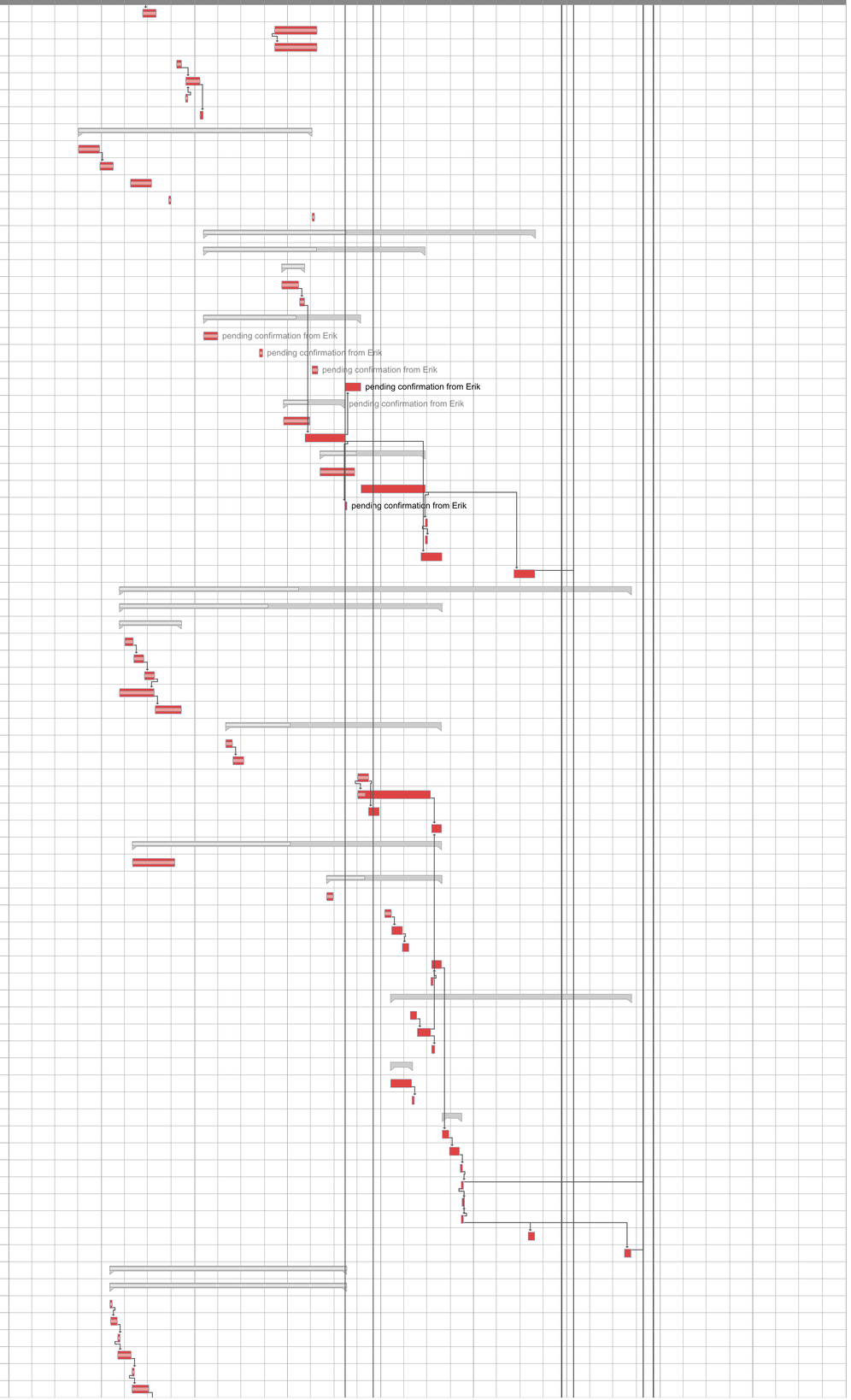
	WBS	Task Name	Start Date	End Date	Predecessor WBS
1148	1.3.1.1.2.3.5	Production and testing of 400 mDOM Mainboards	07/05/21	12/17/21	1147
1149	1.3.1.1.2.4	Design of mDOM Mainboard burn-in and acceptance testing	01/04/21	02/26/21	
1150	1.3.1.1.2.5	Construction and commissioning of mDOM Mainboard burn-in and acceptance testing	03/01/21	05/21/21	1149
1151	*1.3.1.1.3*	*mDOM Mainboard firmware development*	*01/02/20*	*09/30/21*	
1152	1.3.1.1.4	Tender and procurement (test production)	04/22/20	10/06/20	
1153	1.3.1.1.5	Tender and procurement (series production)	04/22/20	01/26/21	1152SS
1154	*1.3.1.2*	*mDOM PMT*	*10/01/18*	*12/18/20*	
1155	*1.3.1.2.1*	*Preliminary design phase*	*10/01/18*	*11/23/18*	
1156	*1.3.1.2.1.1*	*Qualification of Hamamatsu R12199*	*10/01/18*	*11/23/18*	
1157	*1.3.1.2.2*	*Final design phase*	*11/26/18*	*02/18/19*	
1158	*1.3.1.2.2.1*	*Delivery of 48 HZC PMTs*	*11/26/18*	*11/26/18*	*1156*
1159	*1.3.1.2.2.2*	*Qualification of HZC PMTs*	*11/26/18*	*02/15/19*	*1158SS*
1160	*1.3.1.2.2.3*	*Decision on baseline PMT*	*02/18/19*	*02/18/19*	*1159*
1161	*1.3.1.2.3*	*Procurement of PMTs for DVT*	*10/01/19*	*12/23/19*	
1162	*1.3.1.2.5*	*Tender and procurement (series production)*	*09/02/19*	*12/18/20*	
1163	*1.3.1.2.5.1*	*Publish tender*	*09/02/19*	*11/07/19*	
1164	*1.3.1.2.5.2*	*PMT Purchase Order placed*	*11/08/19*	*11/08/19*	*1163*
1165	*1.3.1.2.5.3*	*Production preparation by manufacturer*	*11/08/19*	*04/23/20*	*1164SS*
1166	*1.3.1.2.5.4*	*PMT Production Batch #1 (Qty. 1250)*	*04/24/20*	*05/20/20*	*1165*
1167	*1.3.1.2.5.5*	*PMT Production Batch #2 (Qty. 1250)*	*05/21/20*	*06/19/20*	*1166*
1168	*1.3.1.2.5.6*	*PMT Production Batch #3 (Qty. 1375)*	*06/22/20*	*07/20/20*	*1167*
1169	*1.3.1.2.5.7*	*PMT Production Batch #4 (Qty. 1375)*	*07/21/20*	*08/20/20*	*1168*
1170	*1.3.1.2.5.8*	*PMT Production Batch #5 (Qty. 1375)*	*08/21/20*	*09/18/20*	*1169*
1171	*1.3.1.2.5.9*	*PMT Production Batch #6 (Qty. 1375)*	*09/21/20*	*10/20/20*	*1170*
1172	*1.3.1.2.5.10*	*PMT Production Batch #7 (Qty. 2000)*	*10/21/20*	*11/20/20*	*1171*
1173	*1.3.1.2.5.11*	*PMT Production Batch #8 (Qty. 500)*	*11/23/20*	*12/18/20*	*1172*
1174	**1.3.1.2.6**	**Production of PMT+Base assembly**	**11/08/19**	**12/31/20**	
1175	*1.3.1.2.6.1*	*Preparation of soldering of PMT Base PCAs with PMT manufacturer*	*11/08/19*	*04/23/20*	
1176	*1.3.1.2.6.2*	*PMT+Base Assy. Production Batch #1 (Qty. 1250)*	*06/03/20*	*06/16/20*	*1175FS +28d*
1177	*1.3.1.2.6.3*	*PMT+Base Assy. Production Batch #2 (Qty. 1250)*	*06/17/20*	*06/30/20*	*1176*
1178	*1.3.1.2.6.4*	*PMT+Base Assy. Production Batch #3 (Qty. 1375)*	*07/01/20*	*07/14/20*	*1177*
1179	*1.3.1.2.6.5*	*PMT+Base Assy. Production Batch #4 (Qty. 1375)*	*07/24/20*	*08/06/20*	*1178FS +7d*
1180	*1.3.1.2.6.6*	*PMT+Base Assy. Production Batch #5 (Qty. 1375)*	*08/27/20*	*09/09/20*	*1179FS +14d*
1181	*1.3.1.2.6.7*	*PMT+Base Assy. Production Batch #6 (Qty. 1375)*	*10/09/20*	*10/22/20*	*1180FS +21d*
1182	1.3.1.2.6.8	PMT+Base Assy. Production Batch #7 (Qty. 2000)	11/18/20	12/01/20	1181FS +18d
1183	1.3.1.2.6.9	PMT+Base Assy. Production Batch #8 (Qty. 500)	12/18/20	12/31/20	1182FS +12d
1184	*1.3.1.2.7*	*Acceptance testing and calibration of incoming PMT+Base assemblies*	*01/01/19*	*03/03/21*	
1185	*1.3.1.2.7.1*	*Development and construction of test facilities*	*01/01/19*	*05/18/20*	
1186	*1.3.1.2.7.2*	*Incoming PMT+Base Test Batch #1 (Qty. 1250)*	*07/01/20*	*07/28/20*	
1187	*1.3.1.2.7.3*	*Incoming PMT+Base Test Batch #2 (Qty. 1250)*	*07/29/20*	*08/25/20*	*1186*
1188	*1.3.1.2.7.4*	*Incoming PMT+Base Test Batch #3 (Qty. 1375)*	*08/26/20*	*09/22/20*	*1187*
1189	*1.3.1.2.7.5*	*Incoming PMT+Base Test Batch #4 (Qty. 1375)*	*09/23/20*	*10/20/20*	*1188*
1190	*1.3.1.2.7.6*	*Incoming PMT+Base Test Batch #5 (Qty. 1375)*	*11/02/20*	*11/27/20*	*1189FS +8d*
1191	*1.3.1.2.7.7*	*Incoming PMT+Base Test Batch #6 (Qty. 1375)*	*12/02/20*	*12/29/20*	*1190FS +2d*
1192	*1.3.1.2.7.8*	*Incoming PMT+Base Test Batch #7 (Qty. 2000)*	*01/01/21*	*01/28/21*	*1191FS +2d*
1193	*1.3.1.2.7.9*	*Incoming PMT+Base Test Batch #8 (Qty. 500)*	*02/04/21*	*03/03/21*	*1192FS +4d*
1194	*1.3.1.3*	*mDOM High Voltage Subsystem*	*10/01/18*	*11/02/20*	
1195	*1.3.1.3.1*	*Preliminary design phase*	*10/01/18*	*03/15/19*	
1196	*1.3.1.3.2*	*Final design phase*	*02/18/19*	*12/06/19*	
1197	*1.3.1.3.4*	*Tender and procurement*	*10/01/19*	*11/02/20*	
1198	*1.3.1.3.4.1*	*Identification of contract manufacturer for PMT Base PCA*	*10/01/19*	*12/23/19*	
1199	*1.3.1.3.4.2*	*Development and construction of test station for PMT Base PCA*	*10/01/19*	*12/23/19*	*1198SS*
1200	*1.3.1.3.4.3*	*Production and test of 50 PMT Base PCAs*	*12/31/19*	*02/24/20*	*1199FS +5d*
1201	*1.3.1.3.4.4*	*PMT Base PCA Production Batch #1 (Qty. 3000)*	*02/25/20*	*05/18/20*	*1200*
1202	*1.3.1.3.4.5*	*Shipment of Batch #1 to PMT Manufacturer*	*05/19/20*	*06/01/20*	*1201*
1203	*1.3.1.3.4.6*	*PMT Base PCA Production Batch #2 (Qty. 3000)*	*05/19/20*	*07/13/20*	*1202SS*
1204	*1.3.1.3.4.7*	*Shipment of Batch #2 to PMT Manufacturer*	*07/14/20*	*07/27/20*	*1203*
1205	*1.3.1.3.4.8*	*PMT Base PCA Production Batch #3 (Qty. 3000)*	*07/14/20*	*09/07/20*	*1204SS*
1206	*1.3.1.3.4.9*	*Shipment of Batch #3 to PMT Manufacturer*	*09/08/20*	*09/21/20*	*1205*
1207	*1.3.1.3.4.10*	*PMT Base PCA Production Batch #4 (Qty. 2000)*	*09/08/20*	*10/19/20*	*1206SS*
1208	*1.3.1.3.4.11*	*Shipment of Batch #4 to PMT Manufacturer*	*10/20/20*	*11/02/20*	*1207*
1209	*1.3.1.3.5*	*mDOM High Voltage Subsystem Final Design Review*	*12/23/19*	*12/23/19*	*1199FF*
1210	*1.3.1.4*	*mDOM Pressure Vessel*	*10/01/18*	*01/26/21*	
1211	*1.3.1.4.1*	*Preliminary design phase*	*10/01/18*	*11/23/18*	
1212	*1.3.1.4.1.1*	*Qualification of Nautilus pressure vessels*	*10/01/18*	*11/23/18*	
1213	*1.3.1.4.2*	*Final design phase*	*11/26/18*	*08/02/19*	*1212*
1214	*1.3.1.4.3*	*Procurement of pressure vessels for DVT*	*08/05/19*	*10/25/19*	*1213*
1215	*1.3.1.4.4*	*Tender and procurement (test production)*	*04/22/20*	*10/06/20*	
1216	*1.3.1.4.5*	*Tender and procurement (series production)*	*04/22/20*	*01/26/21*	*1215SS*
1217	**1.3.1.5**	**mDOM PMT Support Structure and Reflector Rings**	**10/01/18**	**01/26/21**	
1218	*1.3.1.5.1*	*Preliminary design phase*	*10/01/18*	*11/23/18*	
1219	1.3.1.5.2	Final design phase	11/26/18	08/02/19	1218
1220	*1.3.1.5.3*	*Procurement of PMT support structures for DVT*	*08/05/19*	*10/25/19*	*1219*
1221	*1.3.1.5.4*	*Procurement of reflector rings for DVT*	*08/05/19*	*08/30/19*	*1220SS*
1222	1.3.1.5.5	Tender and procurement of support structures (test production)	04/22/20	10/06/20	
1223	1.3.1.5.6	Procurement of reflector rings (test production)	09/09/20	10/06/20	1222FF
1224	1.3.1.5.7	Tender and procurement of support structures (series production)	04/22/20	01/26/21	1222SS, 1216FF
1225	1.3.1.5.8	Procurement of reflector rings (series production)	12/02/20	01/26/21	1224FF
1226	*1.3.1.6*	*mDOM Optical Gel*	*10/01/18*	*01/26/21*	
1227	*1.3.1.6.1*	*Preliminary design phase*	*10/01/18*	*11/23/18*	
1228	*1.3.1.6.2*	*Final design phase*	*11/26/18*	*08/02/19*	*1227*
1229	*1.3.1.6.3*	*Procurement of optical gel for DVT*	*12/23/19*	*03/13/20*	*1228FS +100d*

	WBS	Task Name	Start Date	End Date	Predecessor WBS
1230	*1.3.1.6.4*	*Tender and procurement (test production)*	*04/13/20*	*09/25/20*	*1229FS +20d*
1231	*1.3.1.6.5*	*Tender and procurement (series production)*	*04/22/20*	*01/26/21*	*1230SS, 1224FF*
1232	*1.3.1.7*	*mDOM Harness*	***10/01/18***	***01/26/21***	
1233	*1.3.1.7.1*	*Preliminary design phase*	*10/01/18*	*11/23/18*	
1234	*1.3.1.7.2*	*Final design phase*	*11/26/18*	*10/25/19*	*1233*
1235	*1.3.1.7.3*	*Tender and procurement (test production)*	*04/22/20*	*10/06/20*	
1236	*1.3.1.7.4*	*Tender and procurement (series production)*	*04/22/20*	*01/26/21*	*1235SS, 1231FF*
1237	**1.3.1.8**	**Integrated mDOM**	**10/01/18**	**05/19/21**	
1238	**1.3.1.8.1**	**Integrated module design**	**10/01/18**	**12/06/19**	
1239	*1.3.1.8.1.1*	*Preliminary design phase*	*10/01/18*	*02/15/19*	
1240	1.3.1.8.1.2	Final design phase	02/18/19	12/06/19	1239
1241	*1.3.1.8.2*	*Packaging and shipping tools and procedures*	*11/06/19*	*04/21/20*	*1240FS -23d*
1242	*1.3.1.8.3*	*Deployment tools and procedures*	*11/06/19*	*04/21/20*	*1241SS*
1243	1.3.1.8.4	Build 10 modules for DVT	01/20/21	02/16/21	1242FS +188d, 123
1244	*1.3.1.8.5*	*DVT preparation using Rev. 1 Mainboard*	*02/17/21*	*03/30/21*	*1243*
1245	*1.3.1.8.6*	*Install Rev. 2 Mainboard in DVT mDOMs*	*03/31/21*	*04/06/21*	*1244*
1246	1.3.1.8.7	Design Verification Testing	04/07/21	05/04/21	1245
1247	1.3.1.8.8	mDOM Final Design Review	05/05/21	05/05/21	1246
1248	1.3.1.8.9	Ship DVT modules to NTS	05/06/21	05/19/21	1247
1249	**1.3.1.9**	**mDOM Production Facilities**	**02/18/19**	**12/10/21**	
1250	**1.3.1.9.1**	**DESY Production Facility**	**02/18/19**	**09/17/21**	
1251	**1.3.1.9.1.1**	**Set up facilities and hire personel**	**02/18/19**	**09/03/21**	
1252	**1.3.1.9.1.1.1**	**Production facilities**	**02/18/19**	**05/31/21**	
1253		*Parent Duration Buffer*	*02/18/19*	*01/21/20*	
1254	*1.3.1.9.1.1.1.1*	*Development of assembly procedures and tools*	*02/18/19*	*10/25/19*	*1253SS*
1255	*1.3.1.9.1.1.1.2*	*Tendering for HVAC*	*10/27/20*	*11/26/20*	
1256	1.3.1.9.1.1.1.3	Installation of HVAC in Schoenefeld	01/04/21	04/30/21	
1257	1.3.1.9.1.1.1.4	Production site installation	05/03/21	05/28/21	1256
1258	1.3.1.9.1.1.1.5	DESY production site ready	05/31/21	05/31/21	1257
1259	1.3.1.9.1.1.1.6	Development of logistics and packaging to transport mDOMs between production and FAT sites	01/04/21	03/26/21	1256SS
1260	**1.3.1.9.1.1.2**	**FAT facilities**	**10/30/19**	**05/24/21**	
1261	*1.3.1.9.1.1.2.1*	*Design room temperature FAT*	*10/05/20*	*01/01/21*	
1262	1.3.1.9.1.1.2.2	Build and commission room temperature FAT setup	01/04/21	03/26/21	1261
1263	*1.3.1.9.1.1.2.3*	*Update DFL shelving*	*10/30/19*	*01/21/20*	
1264	1.3.1.9.1.1.2.4	Verify DFL and production calibration	03/29/21	05/21/21	1262
1265	1.3.1.9.1.1.2.5	DESY DFL fully commissioned	05/24/21	05/24/21	1264
1266	*1.3.1.9.1.1.3*	*Personnel*	*08/01/19*	*07/01/20*	
1267	1.3.1.9.1.1.4	mDOM Production Readiness Review (in Germany)	09/03/21	09/03/21	
1268	1.3.1.9.1.2	Test production (Batch #0, Qty. 27)	06/14/21	07/23/21	
1269	1.3.1.9.1.3	FAT Test Production	08/02/21	09/10/21	1268, 1271, 1267FF
1270	1.3.1.9.1.4	Packing Test Production	09/13/21	09/17/21	1269
1271	1.3.1.9.1.5	Transfer equipment from temporary production site to Schoenefeld	07/26/21	07/30/21	
1272	**1.3.1.9.2**	**MSU Production Facility**	**08/01/19**	**12/10/21**	
1273	**1.3.1.9.2.1**	**Set up facilities and hire personel**	**08/01/19**	**12/03/21**	
1274	*1.3.1.9.2.1.1*	*Production Facilities*	*08/01/19*	*03/25/20*	
1275	*1.3.1.9.2.1.2*	*FAT Facilities*	*10/28/19*	*03/17/20*	
1276	*1.3.1.9.2.1.3*	*Personnel*	*08/01/19*	*07/01/20*	
1277	1.3.1.9.2.1.4	mDOM Production Readiness Review (in US at MSU)	12/03/21	12/03/21	
1278	1.3.1.9.2.2	Test production (Batch #0, Qty. 27)	09/13/21	10/22/21	
1279	1.3.1.9.2.3	FAT Test Production	10/25/21	12/03/21	1278, 1281SS, 127
1280	1.3.1.9.2.4	Packing Test Production	12/06/21	12/10/21	1279
1281	1.3.1.9.2.5	Improve production site and procedures	10/25/21	11/19/21	
1282	**1.3.1.10**	**mDOM Series Production**	**01/27/21**	**09/01/23**	
1283	**1.3.1.10.1**	**Series production**	**01/27/21**	**06/06/22**	
1284	**1.3.1.10.1.1**	**DESY Production Facility**	**01/27/21**	**04/04/22**	
1285		*Parent Duration Buffer*	*01/27/21*	*01/27/21*	
1286		*Parent Duration Buffer*	*09/01/21*	*09/01/21*	
1287	1.3.1.10.1.1.1	Production Batch #1 (Qty. 27) (Start)	08/02/21	09/10/21	1800FS +137d
1288	1.3.1.10.1.1.2	FAT Batch #1	09/13/21	10/22/21	1287
1289	1.3.1.10.1.1.3	Packing Batch #1	10/25/21	10/29/21	1288
1290	1.3.1.10.1.1.4	Production Batch #2 (Qty. 27)	09/13/21	10/08/21	
1291	1.3.1.10.1.1.5	FAT Batch #2	10/11/21	11/05/21	1290
1292	1.3.1.10.1.1.6	Packing Batch #2	11/08/21	11/12/21	1291
1293	1.3.1.10.1.1.7	Production Batch #3 (Qty. 27)	10/11/21	11/05/21	
1294	1.3.1.10.1.1.8	FAT Batch #3	11/08/21	12/03/21	1293
1295	1.3.1.10.1.1.9	Packing Batch #3	12/06/21	12/10/21	1294
1296	1.3.1.10.1.1.10	Production Batch #4 (Qty. 27)	11/08/21	11/26/21	
1297	1.3.1.10.1.1.11	FAT Batch #4	11/29/21	12/17/21	1296
1298	1.3.1.10.1.1.12	Packing Batch #4	12/20/21	12/24/21	1297
1299	1.3.1.10.1.1.13	Production Batch #5 (Qty. 27)	11/29/21	12/17/21	
1300	1.3.1.10.1.1.14	FAT Batch #5	12/20/21	01/07/22	1299
1301	1.3.1.10.1.1.15	Packing Batch #5	01/10/22	01/14/22	1300
1302	1.3.1.10.1.1.16	Production Batch #6 (Qty. 27)	01/10/22	01/28/22	
1303	1.3.1.10.1.1.17	FAT Batch #6	01/31/22	02/18/22	1302
1304	1.3.1.10.1.1.18	Packing Batch #6	02/21/22	02/25/22	1303
1305	1.3.1.10.1.1.19	Production Batch #7 (Qty. 27)	01/31/22	02/18/22	
1306	1.3.1.10.1.1.20	FAT Batch #7	02/21/22	03/11/22	1305
1307	1.3.1.10.1.1.21	Packing Batch #7	03/14/22	03/18/22	1306
1308	1.3.1.10.1.1.22	Production Batch #8 (Qty. 9)	02/21/22	03/04/22	
1309	1.3.1.10.1.1.23	FAT Batch #8	03/07/22	03/25/22	1308
1310	1.3.1.10.1.1.24	Packing Batch #8	03/28/22	04/01/22	1309
1311	1.3.1.10.1.1.25	128 mDOMs for Strings 87-88 ready to ship to CHC	01/14/22	01/14/22	1301FF

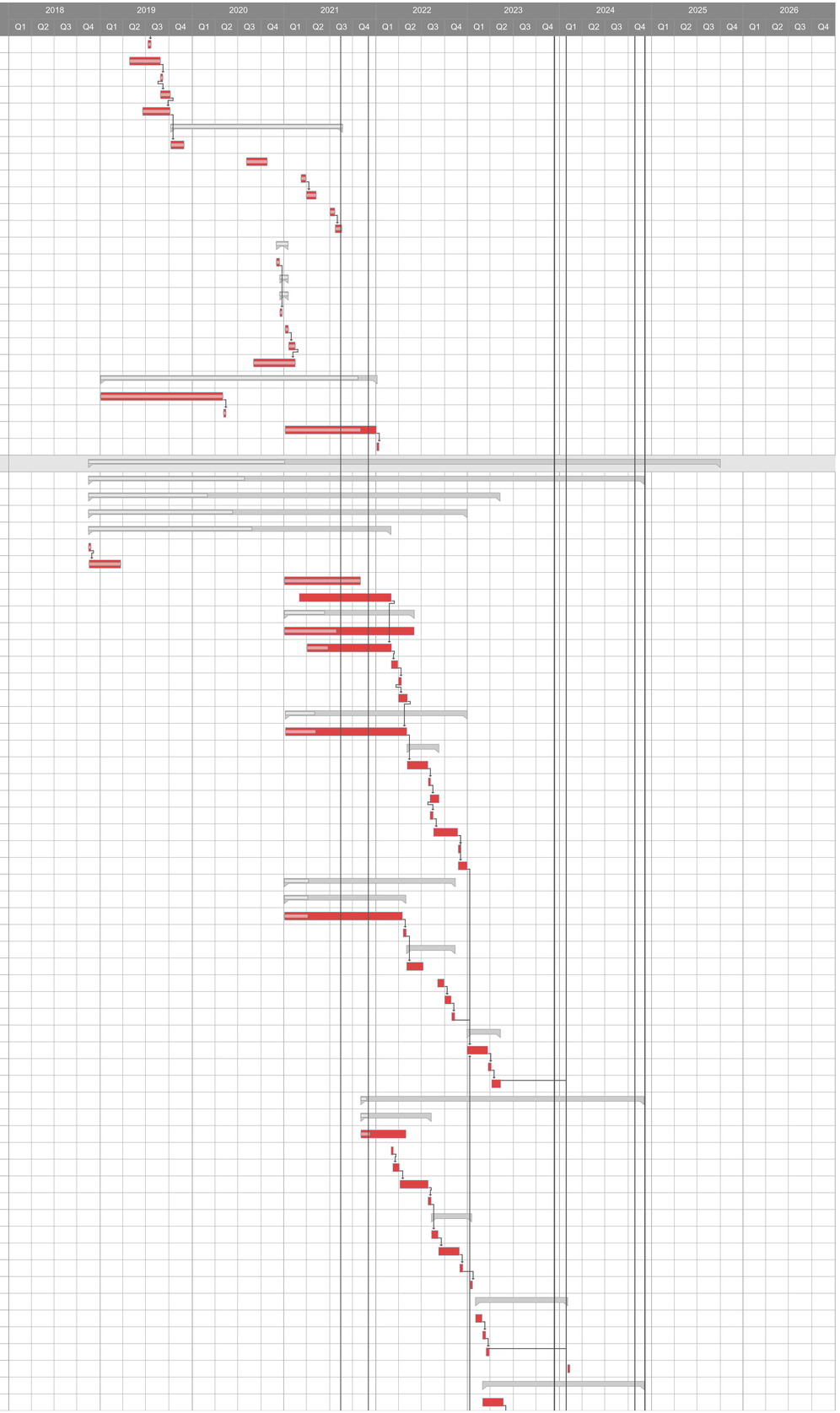
	WBS	Task Name	Start Date	End Date	Predecessor WBS
1312	1.3.1.10.1.1.26	96 mDOMs for Strings 89-93 ready to ship to CHC	04/04/22	04/04/22	1310
1313	1.3.1.10.1.1.27	Production of 225 mDOMs at DESY site completed	04/04/22	04/04/22	1310
1314	**1.3.1.10.1.2**	**MSU Production Facility**	**01/27/21**	**06/06/22**	
1315		*Parent Duration Buffer*	*01/27/21*	*01/27/21*	
1316		*Parent Duration Buffer*	*12/22/21*	*12/22/21*	
1317	1.3.1.10.1.2.1	Production Batch #1 (Qty. 27) (Start)	11/22/21	12/17/21	1815FS +41d
1318	1.3.1.10.1.2.2	FAT Batch #1	12/20/21	01/14/22	1317
1319	1.3.1.10.1.2.3	Packing Batch #1	01/17/22	01/21/22	1318
1320	1.3.1.10.1.2.4	Production Batch #2 (Qty. 27)	12/20/21	01/14/22	1318SS
1321	1.3.1.10.1.2.5	FAT Batch #2	01/17/22	02/11/22	1320
1322	1.3.1.10.1.2.6	Packing Batch #2	02/14/22	02/18/22	1321
1323	1.3.1.10.1.2.7	Production Batch #3 (Qty. 27)	12/20/21	01/07/22	1320SS
1324	1.3.1.10.1.2.8	FAT Batch #3	01/10/22	01/28/22	1323
1325	1.3.1.10.1.2.9	Packing Batch #3	01/31/22	02/04/22	1324
1326	1.3.1.10.1.2.10	Production Batch #4 (Qty. 27)	01/10/22	01/28/22	1324SS
1327	1.3.1.10.1.2.11	FAT Batch #4	01/31/22	02/18/22	1326
1328	1.3.1.10.1.2.12	Packing Batch #4	02/21/22	02/25/22	1327
1329	1.3.1.10.1.2.13	Production Batch #5 (Qty. 27)	01/31/22	02/18/22	1326
1330	1.3.1.10.1.2.14	FAT Batch #5	02/21/22	03/11/22	1329
1331	1.3.1.10.1.2.15	Packing Batch #5	03/14/22	03/18/22	1330
1332	1.3.1.10.1.2.16	Production Batch #6 (Qty. 27)	03/14/22	04/01/22	1330
1333	1.3.1.10.1.2.17	FAT Batch #6	04/04/22	04/22/22	1332
1334	1.3.1.10.1.2.18	Packing Batch #6	04/25/22	04/29/22	1333
1335	1.3.1.10.1.2.19	Production Batch #7 (Qty. 16)	04/25/22	05/06/22	1333
1336	1.3.1.10.1.2.20	FAT Batch #7	05/09/22	05/27/22	1335
1337	1.3.1.10.1.2.21	Packing Batch #7	05/30/22	06/03/22	1336
1338	1.3.1.10.1.2.22	200 mDOMs for Strings 89-93 ready to ship to Pt. Hueneme	06/06/22	06/06/22	1337
1339	1.3.1.10.1.2.23	Production of 205 mDOMs at MSU site completed	06/06/22	06/06/22	1337
1340	1.3.1.10.2	Ship 111 + 17 spare mDOMs for Strings 87-88 from DESY to CHC	07/25/22	08/19/22	1339FS +34d
1341	1.3.1.10.3	Ship 96 mDOMs for Strings 89-93 from DESY to CHC	07/24/23	08/18/23	1339FS +294d
1342	1.3.1.10.4	Ship 189 + 11 spare mDOMs for Strings 89-93 from MSU to Pt. Hueneme	08/07/23	09/01/23	1339FS +304d
1343	**1.3.2**	**D-Egg**	**10/01/18**	**08/28/23**	
1344		*Parent Duration Buffer*	*10/01/18*	*10/01/18*	
1345		Parent Duration Buffer	12/31/21	12/31/21	
1346	*1.3.2.1*	*D-Egg DAQ Electronics*	*10/01/18*	*03/31/21*	
1347	*1.3.2.1.1*	*Preliminary design phase*	*10/01/18*	*09/16/19*	
1348	*1.3.2.1.1.1*	*Rev. 2 mainboard schematics and layout*	*10/01/18*	*05/31/19*	
1349	*1.3.2.1.1.2*	*Rev. 2 mainboard production*	*06/03/19*	*06/21/19*	*1348*
1350	*1.3.2.1.1.3*	*Rev. 2 mainboard prototypes available*	*06/24/19*	*06/24/19*	*1349*
1351	*1.3.2.1.1.4*	*Rev. 2 mainboard testing*	*06/25/19*	*09/16/19*	*1350*
1352	*1.3.2.1.1.5*	*Rev. 2 mainboard communication tests*	*08/20/19*	*09/02/19*	*1351FF -10d*
1353	*1.3.2.1.2*	*Final design phase*	*05/01/19*	*03/31/21*	
1354	*1.3.2.1.2.1*	*Rev. 3 mainboard design*	*07/08/19*	*08/30/19*	
1355	*1.3.2.1.2.2*	*Firmware development*	*05/01/19*	*03/31/21*	
1356	*1.3.2.1.2.3*	*Production of 18 Rev. 3 mainboards for DVT*	*09/02/19*	*10/04/19*	*1354*
1357	*1.3.2.1.2.4*	*Commissioning and Design Verification*	*10/07/19*	*11/01/19*	*1356*
1358	*1.3.2.1.3*	*Production*	*10/21/19*	*02/07/20*	*1357FS -10d*
1359	*1.3.2.1.4*	*Testing*	*12/09/19*	*02/14/20*	*1358SS +35d*
1360	*1.3.2.2*	*D-Egg PMT*	*10/01/18*	*10/28/19*	
1361	*1.3.2.2.1*	*PMT Production*	*10/01/18*	*10/28/19*	
1362	*1.3.2.2.1.1*	*PMT Batch #1 (Qty. 300)*	*10/01/18*	*01/18/19*	
1363	*1.3.2.2.1.2*	*PMT Batch #2 (Qty. 300)*	*04/01/19*	*09/13/19*	
1364	*1.3.2.2.1.3*	*PMT Spares (Qty. 15)*	*10/01/19*	*10/28/19*	
1365	*1.3.2.3*	*D-Egg High Voltage Subsystem*	*10/01/18*	*01/03/20*	
1366	*1.3.2.3.1*	*Preliminary design phase*	*10/01/18*	*03/15/19*	
1367	*1.3.2.3.2*	*Final design phase*	*04/01/19*	*08/16/19*	
1368	*1.3.2.3.3*	*Tender and procurement*	*10/01/18*	*12/06/19*	
1369	*1.3.2.3.3.1*	*Ferrite core (Qty. 600)*	*10/01/18*	*10/26/18*	
1370	*1.3.2.3.3.2*	*HV generator (Qty. 600)*	*09/04/19*	*11/26/19*	
1371	*1.3.2.3.3.3*	*HV board (Qty. 600)*	*09/16/19*	*12/06/19*	
1372	*1.3.2.3.4*	*Acceptance testing*	*10/14/19*	*01/03/20*	
1373	*1.3.2.4*	*D-Egg Pressure Vessel*	*10/01/18*	*04/28/21*	
1374	*1.3.2.4.1*	*Pressure Vessel production*	*10/01/18*	*04/28/21*	
1375	*1.3.2.4.1.1*	*PV Batch #1 (Qty. 40)*	*10/01/18*	*11/23/18*	
1376	*1.3.2.4.1.2*	*PV Batch #2 (Qty. 130)*	*04/01/19*	*06/21/19*	
1377	*1.3.2.4.1.3*	*PV Batch #3 (Qty. 130)*	*04/01/20*	*06/23/20*	
1378	*1.3.2.4.1.4*	*PV Spare*	*04/01/21*	*04/28/21*	
1379	*1.3.2.5*	*D-Egg Optical Gel*	*10/01/18*	*12/25/19*	
1380	*1.3.2.5.1*	*Final design phase*	*10/01/18*	*03/15/19*	
1381	*1.3.2.5.2*	*Procurement of optical gel for DVT*	*03/18/19*	*06/07/19*	*1380*
1382	*1.3.2.5.3*	*Tender and procurement*	*11/01/19*	*12/25/19*	
1383	*1.3.2.6*	*D-Egg Harness*	*10/04/18*	*04/13/20*	
1384	*1.3.2.6.1*	*Final design phase*	*10/04/18*	*06/12/19*	
1385	*1.3.2.6.2*	*Construction of production tools*	*10/01/19*	*12/23/19*	
1386	*1.3.2.6.3*	*Production of harnesses for DVT*	*12/24/19*	*01/20/20*	*1385*
1387	*1.3.2.6.4*	*Tender and procurement*	*01/21/20*	*04/13/20*	*1386*
1388	**1.3.2.7**	**Integrated D-Egg**	**10/01/18**	**04/23/21**	
1389	*1.3.2.7.1*	*Integrated module design*	*10/01/18*	*08/02/19*	
1390	*1.3.2.7.1.1*	*Preliminary design phase*	*10/01/18*	*03/15/19*	
1391	*1.3.2.7.1.2*	*Final design phase*	*03/18/19*	*04/12/19*	*1390*
1392	*1.3.2.7.1.3*	*Construction of production tools for internal structure*	*04/15/19*	*05/10/19*	*1391*
1393	*1.3.2.7.1.4*	*Production of internal structures for DVT*	*05/13/19*	*06/07/19*	*1392*



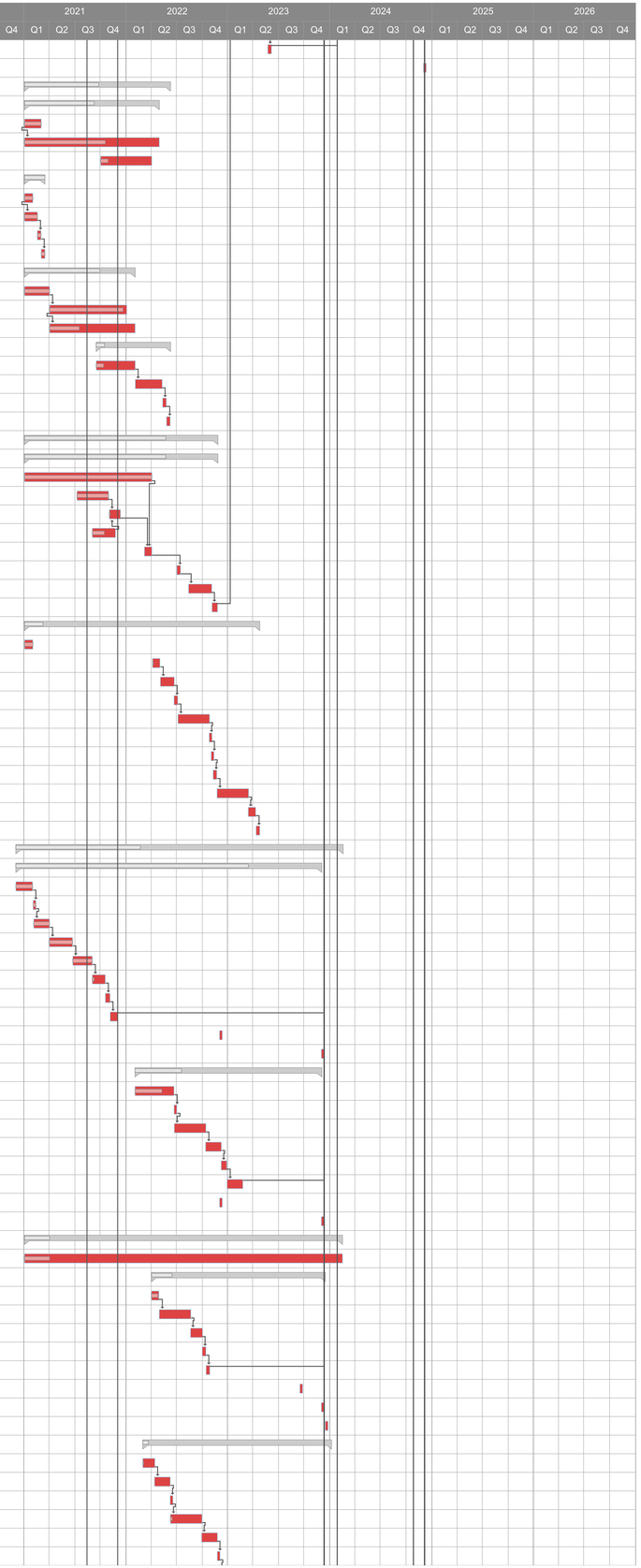
	WBS	Task Name	Start Date	End Date	Predecessor WBS
1394	*1.3.2.7.1.5*	*Tender and procurement of internal structures*	*06/10/19*	*08/02/19*	*1393*
1395	*1.3.2.7.2*	*Packaging and shipping tools and procedures*	*11/09/20*	*04/23/21*	
1396	*1.3.2.7.3*	*Deployment tools and and procedures*	*11/09/20*	*04/23/21*	*1395SS*
1397	*1.3.2.7.4*	*Build 10 modules for DVT*	*10/21/19*	*11/08/19*	
1398	*1.3.2.7.5*	*Design Verification Test*	*11/26/19*	*01/20/20*	*1397, 1399*
1399	*1.3.2.7.6*	*Integrated D-Egg Final Design Review*	*11/25/19*	*11/25/19*	
1400	1.3.2.7.7	Ship DVT modules to NTS	01/21/20	02/03/20	1398
1401	*1.3.2.8*	*D-Egg Production Facility*	***10/01/18***	***04/05/21***	
1402	*1.3.2.8.1*	*Set up facilities and hire personel*	*10/01/18*	*12/21/18*	
1403	*1.3.2.8.2*	*Test Production (Qty. 40 left D-Eggs)*	*12/24/18*	*02/15/19*	*1402*
1404	*1.3.2.8.3*	*Improve production site and procedures*	*04/23/19*	*07/15/19*	
1405	*1.3.2.8.4*	*Production facility audit for assembly, handling, and shipping*	*09/20/19*	*09/20/19*	
1406	*1.3.2.8.5*	*D-Egg Production Readiness Review*	*04/05/21*	*04/05/21*	
1407	**1.3.2.9**	**D-Egg Series Production**	**02/04/20**	**08/28/23**	
1408	**1.3.2.9.1**	**Series production**	**02/04/20**	**06/23/22**	
1409	*1.3.2.9.1.1*	*FAT rehearsal*	***12/07/20***	***03/05/21***	
1410	*1.3.2.9.1.1.1*	*Preparation, debugging*	*12/07/20*	*02/12/21*	
1411	*1.3.2.9.1.1.2*	*Dry-run with to be re-sealed D-Eggs*	*02/15/21*	*03/05/21*	*1410*
1412	**1.3.2.9.1.2**	**D-Egg Batch #1 (Qty. 50)**	**02/04/20**	**10/13/21**	
1413	*1.3.2.9.1.2.1*	*PMT potting, camera / flasher installation*	*02/04/20*	*03/30/20*	
1414	*1.3.2.9.1.2.2*	*Camera installation (Qty. 36)*	*09/10/20*	*09/22/20*	
1415	*1.3.2.9.1.2.3*	*MB / PCA installation, sealing*	*04/05/21*	*04/26/21*	
1416	1.3.2.9.1.2.4	FAT	08/12/21	10/13/21	1419
1417	**1.3.2.9.1.3**	**D-Egg Batch #2 (Qty. 110)**	**12/14/20**	**08/11/21**	
1418	*1.3.2.9.1.3.1*	*Integration at NME*	*12/14/20*	*03/26/21*	
1419	1.3.2.9.1.3.2	FAT	03/08/21	08/11/21	1411
1420	**1.3.2.9.1.4**	**D-Egg Batch #3 (Qty. 150)**	**05/06/21**	**06/23/22**	
1421	*1.3.2.9.1.4.1*	*Integration at NME*	*05/06/21*	*09/17/21*	
1422	1.3.2.9.1.4.2	FAT	10/14/21	06/23/22	
1423	1.3.2.9.1.5	78 + 18 spares D-Eggs for Strings 87-88 ready to ship to CHC	08/11/21	08/11/21	1419FF
1424	1.3.2.9.1.6	197 + 11 spare D-Eggs for Strings 89-93 ready to ship to CHC	06/23/22	06/23/22	1422FF
1425	1.3.2.9.1.7	Production of 310 D-Eggs completed	06/23/22	06/23/22	1424SS
1426	1.3.2.9.2	Ship 78 + 18 spare D-Eggs for Strings 87-88 to CHC	06/06/22	08/26/22	1419FS +212d
1427	1.3.2.9.3	Ship 197 + 11 spare D-Eggs for Strings 89-93 to CHC	06/06/23	08/28/23	1422FS +247d
1428	**1.3.3**	**PDOM**	**03/11/19**	**09/09/24**	
1429	**1.3.3.1**	**PDOM DAQ Electronics**	**03/11/19**	**08/26/22**	
1430	*1.3.3.1.1*	*PDOM Rev2 Mainboard*	***03/11/19***	***11/08/19***	
1431	*1.3.3.1.1.1*	*Update schematics*	*04/01/19*	*05/03/19*	
1432	*1.3.3.1.1.2*	*Layout*	*05/06/19*	*06/14/19*	*1431*
1433	*1.3.3.1.1.3*	*PDOM Rev2 Mainboard production (Qty. 10)*	*06/17/19*	*07/26/19*	*1432*
1434	*1.3.3.1.1.4*	*Firmware*	*03/11/19*	*07/26/19*	*1433FF*
1435	*1.3.3.1.1.5*	*Testing*	*07/29/19*	*11/08/19*	*1434*
1436	**1.3.3.1.2**	**PDOM Rev3 Mainboard**	**05/01/20**	**08/26/22**	
1437	*1.3.3.1.2.1*	*Update schematics*	*05/01/20*	*05/28/20*	
1438	*1.3.3.1.2.2*	*Layout*	*05/29/20*	*07/09/20*	*1437*
1439	*1.3.3.1.2.3*	*PDOM Rev3 Mainboard production (Qty. 15)*	*10/01/21*	*11/11/21*	
1440	1.3.3.1.2.6	Adapt D-Egg Firmware to PDOM Mainboard and verify design	10/01/21	07/15/22	1439SS
1441	1.3.3.1.2.4	Testing	11/12/21	12/23/21	1439
1442	1.3.3.1.2.5	PDOM Rev3 Mainboard production (Qty. 25)	07/18/22	08/26/22	1440, 1451
1443	**1.3.3.2**	**PDOM High Voltage Subsystem**	**05/01/19**	**08/26/22**	
1444	*1.3.3.2.1*	*PDOM HV System Preliminary Design*	*05/01/19*	*10/15/19*	
1445	**1.3.3.2.2**	**PDOM HV System Final Design**	**06/01/21**	**08/26/22**	
1446	*1.3.3.2.2.1*	*Update schematics*	*06/01/21*	*06/28/21*	
1447	*1.3.3.2.2.2*	*Layout*	*01/15/22*	*02/10/22*	
1448	1.3.3.2.2.3	PDOM HV System production (Qty. 15)	02/11/22	03/24/22	1447
1449	1.3.3.2.2.4	Testing	03/25/22	04/21/22	1448
1450	1.3.3.2.2.5	PDOM HV system production (Qty. 25)	07/18/22	08/26/22	1451, 1454
1451	1.3.3.3	PDOM Final Design Review	07/15/22	07/15/22	
1452	**1.3.3.4**	**IceCube DOM Refurbishment**	**02/07/22**	**09/09/24**	
1453	1.3.3.4.1	Refurbish 10 IceCube DOMs	04/25/22	05/20/22	
1454	1.3.3.4.2	Design Verification Test	05/23/22	07/15/22	1453
1455	1.3.3.4.3	Ship DVT modules to NTS	07/18/22	07/29/22	1454
1456	**1.3.3.4.4**	**Facilities**	**02/07/22**	**05/02/22**	
1457	1.3.3.4.4.1	Set up refurbishment Facility	02/07/22	04/29/22	
1458	1.3.3.4.4.2	DOM Refurbishment Facilities Ready	05/02/22	05/02/22	1457
1459	**1.3.3.4.5**	**Refurbish 20 IceCube DOMs with Rev3 Mainboards**	**08/29/22**	**11/14/22**	
1460	1.3.3.4.5.1	Refurbishment Batch #1 (Qty. 20)	08/29/22	09/23/22	1450
1461	1.3.3.4.5.2	FAT Batch #1	09/26/22	11/04/22	1460
1462	1.3.3.4.5.3	Packing Batch #1	11/07/22	11/11/22	1461
1463	1.3.3.4.5.4	2 + 2 spare PDOMs for Strings 87-88 ready to ship to Pt. Hueneme	11/11/22	11/11/22	1462FS -1d
1464	1.3.3.4.5.5	12 + 4 spare PDOMs for Strings 89-93 ready to ship to Pt. Hueneme	11/14/22	11/14/22	1463SS, 1465
1465	1.3.3.4.5.6	Refurbishment of 20 PDOMs completed	11/11/22	11/11/22	1463SS
1466	1.3.3.4.6	Ship 2 + 2 spare PDOMs for Strings 87-88 to Pt. Hueneme	08/01/23	08/28/23	1465FS +186d
1467	1.3.3.4.7	Ship 12 + 4 spare PDOMs for Strings 89-93 to Pt. Hueneme	08/13/24	09/09/24	1465FS +456d
1468	*1.3.4*	*Ice Comms Module*	*02/01/19*	*08/18/21*	
1469	*1.3.4.1*	*ICM Electronics*	*02/01/19*	*08/18/21*	
1470	*1.3.4.1.1*	*Interface of ICM to DOM mainboard defined*	*02/01/19*	*02/01/19*	
1471	*1.3.4.1.2*	*Schematic / BOM development*	*02/04/19*	*03/01/19*	*1470*
1472	*1.3.4.1.3*	*Conceptual design available*	*03/04/19*	*03/05/19*	*1471*
1473	*1.3.4.1.4*	*Preliminary design phase*	*03/04/19*	*04/26/19*	*1472SS*
1474	*1.3.4.1.5*	*First working prototype available*	*04/29/19*	*04/29/19*	*1473*
1475	*1.3.4.1.6*	*Production of Stand-alone PCBs for Cable Verification*	*04/29/19*	*07/05/19*	*1474SS*



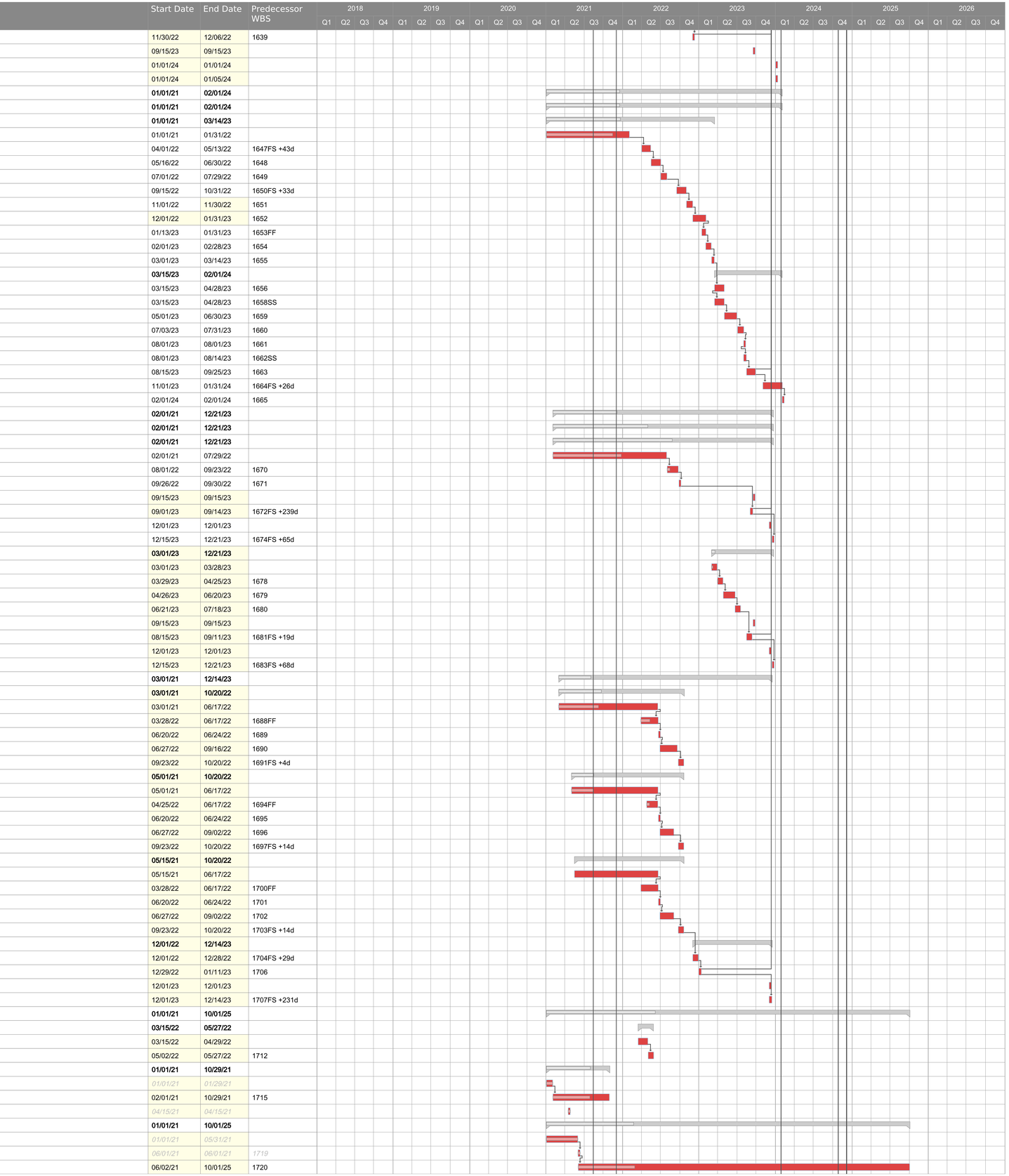
	WBS	Task Name	Start Date	End Date	Predecessor WBS
1476	*1.3.4.1.7*	*Shipping to NTS*	*07/08/19*	*07/19/19*	*1475*
1477	*1.3.4.1.8*	*Final design phase*	*04/26/19*	*08/26/19*	
1478	*1.3.4.1.9*	*Ice Comms Module FDR*	*08/27/19*	*08/27/19*	*1477*
1479	*1.3.4.1.10*	*Production of 15 ICMs for D-Egg DVT*	*08/27/19*	*10/04/19*	*1478SS*
1480	*1.3.4.1.11*	*Tender and Procurement (series production)*	*06/17/19*	*10/04/19*	*1479FF*
1481	*1.3.4.1.12*	*Production of 900 ICMs for in-ice modules*	*10/07/19*	*08/18/21*	
1482	*1.3.4.1.12.1*	*Production Batch #1 (Qty. 72)*	*10/07/19*	*11/29/19*	*1480*
1483	*1.3.4.1.12.2*	*Production Batch #2 (Qty. 264)*	*08/03/20*	*10/23/20*	
1484	*1.3.4.1.12.3*	*Production Batch #3 (Qty. 500)*	*03/08/21*	*03/26/21*	
1485	*1.3.4.1.12.4*	*Testing Batch #3 (Qty. 500)*	*03/29/21*	*05/07/21*	*1484*
1486	*1.3.4.1.12.5*	*Production Batch #4 (Qty. 200)*	*07/01/21*	*07/21/21*	
1487	*1.3.4.1.12.6*	*Testing Batch #4 (Qty. 200)*	*07/22/21*	*08/18/21*	*1486*
1488	*1.3.4.2*	*ICM Firmware*	*11/30/20*	*01/15/21*	
1489	*1.3.4.2.1*	*Parallel communication to multiple devices*	*11/30/20*	*12/11/20*	
1490	*1.3.4.2.3*	*RAPCAL Firmware*	*12/14/20*	*01/15/21*	
1491	*1.3.4.2.3.1*	*Implementation*	*12/14/20*	*01/15/21*	
1492	*1.3.4.2.3.1.1*	*Part 1 (before holidays)*	*12/14/20*	*12/18/20*	*1489*
1493	*1.3.4.2.3.1.2*	*Part 2 (after holidays)*	*01/04/21*	*01/15/21*	
1494	*1.3.4.2.3.2*	*Debugging*	*01/18/21*	*02/12/21*	*1493*
1495	*1.3.4.3*	*mini-FieldHub ICM Firmware*	*08/31/20*	*02/12/21*	*1494FF*
1496	**1.3.5**	**Special Devices**	**01/01/19**	**01/03/22**	
1497	*1.3.5.1*	*R&D module registration*	*01/01/19*	*05/01/20*	
1498	*1.3.5.2*	*R&D module mission review*	*05/04/20*	*05/04/20*	*1497*
1499	1.3.5.3	Allocation of R&D module resources	01/04/21	12/31/21	
1500	1.3.5.4	R&D modules deployment readiness review	01/03/22	01/03/22	1499
1501	**1.4**	**CPT**	**11/14/18**	**10/01/25**	
1502	**1.4.1**	**Downhole Cables**	**11/14/18**	**12/01/24**	
1503	**1.4.1.1**	**Main Cable Assembly**	**11/14/18**	**05/09/23**	
1504	**1.4.1.1.1**	**Main Cables**	**11/14/18**	**12/27/22**	
1505	**1.4.1.1.1.1**	**Main cable preliminary design phase**	**11/14/18**	**03/01/22**	
1506	*1.4.1.1.1.1.1*	*Main Cable RFI*	*11/14/18*	*11/15/18*	
1507	*1.4.1.1.1.1.2*	*Site visits to potential vendors*	*11/16/18*	*03/22/19*	*1506*
1508	*1.4.1.1.1.1.3*	*Procurement of sample quads*	*01/01/21*	*10/29/21*	
1509	1.4.1.1.1.1.4	Evaluation of sample quads	03/01/21	03/01/22	
1510	**1.4.1.1.1.2**	**Main Cable Final Design Phase**	**01/01/21**	**06/01/22**	
1511	1.4.1.1.1.2.1	Main cable final design	01/01/21	06/01/22	
1512	1.4.1.1.1.2.2	Prototype main cable production	04/01/21	03/01/22	1509FF
1513	1.4.1.1.1.2.3	Prototype main cable testing	03/02/22	03/29/22	1512
1514	1.4.1.1.1.2.4	Final design review	03/30/22	04/12/22	1513
1515	1.4.1.1.1.2.5	Prototype main cable shipping to breakout installation facility	03/30/22	05/03/22	1514SS
1516	**1.4.1.1.1.3**	**Main Cable Production**	**01/05/21**	**12/27/22**	
1517	1.4.1.1.1.3.1	Procurement	01/05/21	05/03/22	1515FF
1518	**1.4.1.1.1.3.2**	**Production of first article**	**05/04/22**	**09/06/22**	
1519	1.4.1.1.1.3.2.1	Fabrication	05/04/22	07/26/22	1517
1520	1.4.1.1.1.3.2.2	Electrical verification testing	07/27/22	08/02/22	1519
1521	1.4.1.1.1.3.2.4	First article shipping to breakout installation facility	08/03/22	09/06/22	1520
1522	1.4.1.1.1.3.3	Production readiness review	08/03/22	08/16/22	1521SS
1523	1.4.1.1.1.3.4	Production of final six main cables	08/17/22	11/22/22	1522
1524	1.4.1.1.1.3.5	Main Cable Production Complete	11/23/22	11/23/22	1523
1525	1.4.1.1.1.3.6	Production cable shipping to breakout installation facility	11/23/22	12/27/22	1523
1526	**1.4.1.1.2**	**Breakout connections**	**01/01/21**	**11/10/22**	
1527	**1.4.1.1.2.1**	**Breakout preliminary design phase**	**01/01/21**	**04/29/22**	
1528	1.4.1.1.2.1.1	Breakout preliminary design	01/01/21	04/15/22	
1529	1.4.1.1.2.1.2	Breakout preliminary design review	04/18/22	04/29/22	1528
1530	**1.4.1.1.2.2**	**Breakout final design phase**	**05/02/22**	**11/10/22**	
1531	1.4.1.1.2.2.1	Breakout final design	05/02/22	07/08/22	1529
1532	1.4.1.1.2.2.2	Breakout prototype production	09/02/22	09/29/22	
1533	1.4.1.1.2.2.3	Breakout prototype testing	09/30/22	10/27/22	1532
1534	1.4.1.1.2.2.4	Breakout final design review	10/28/22	11/10/22	1533
1535	**1.4.1.1.3**	**Main Cable Assembly production**	**12/28/22**	**05/09/23**	
1536	1.4.1.1.3.2	MCA production	12/28/22	03/21/23	1525, 1534, 1588
1537	1.4.1.1.3.3	Pre-ship review	03/22/23	04/04/23	1536
1538	1.4.1.1.3.4	Main Cable Assembly shipping to PTH (RDD 12/1/23 for FY23 vessel)	04/05/23	05/09/23	1537
1539	**1.4.1.2**	**Breakout Cable Assemblies**	**11/01/21**	**12/01/24**	
1540	**1.4.1.2.1**	**BCA preliminary design phase**	**11/01/21**	**08/08/22**	
1541	1.4.1.2.1.1	BCA preliminary design	11/01/21	04/29/22	
1542	1.4.1.2.1.2	BCA preliminary design review	03/01/22	03/07/22	
1543	1.4.1.2.1.3	Prototype procurement	03/08/22	04/04/22	1542
1544	1.4.1.2.1.4	BCA prototype production	04/05/22	07/25/22	1543
1545	1.4.1.2.1.5	BCA prototype evaluation	07/26/22	08/08/22	1544
1546	**1.4.1.2.2**	**BCA final design phase**	**08/09/22**	**01/16/23**	
1547	1.4.1.2.2.1	BCA final design	08/09/22	09/05/22	1545
1548	1.4.1.2.2.2	Final BCA prototype production	09/06/22	11/28/22	1547
1549	1.4.1.2.2.3	Final BCA prototype testing	11/29/22	12/12/22	1548
1550	1.4.1.2.2.4	BCA final design review	01/10/23	01/16/23	1549FS +20d
1551	**1.4.1.2.3**	**BCA production for first two strings**	**01/31/23**	**02/01/24**	
1552	1.4.1.2.3.1	BCA manufacturing	01/31/23	02/27/23	
1553	1.4.1.2.3.2	BCA pre-ship review	02/28/23	03/13/23	1552
1554	1.4.1.2.3.3	Shipping to PTH (FY24 ComSur, RDD 9/15/23)	03/14/23	03/27/23	1553
1555	1.4.1.2.3.4	ROS date (pre-position for deployment year)	02/01/24	02/01/24	
1556	**1.4.1.2.4**	**BCA production for final five strings**	**02/28/23**	**12/01/24**	
1557	1.4.1.2.4.1	BCA manufacturing	02/28/23	05/22/23	



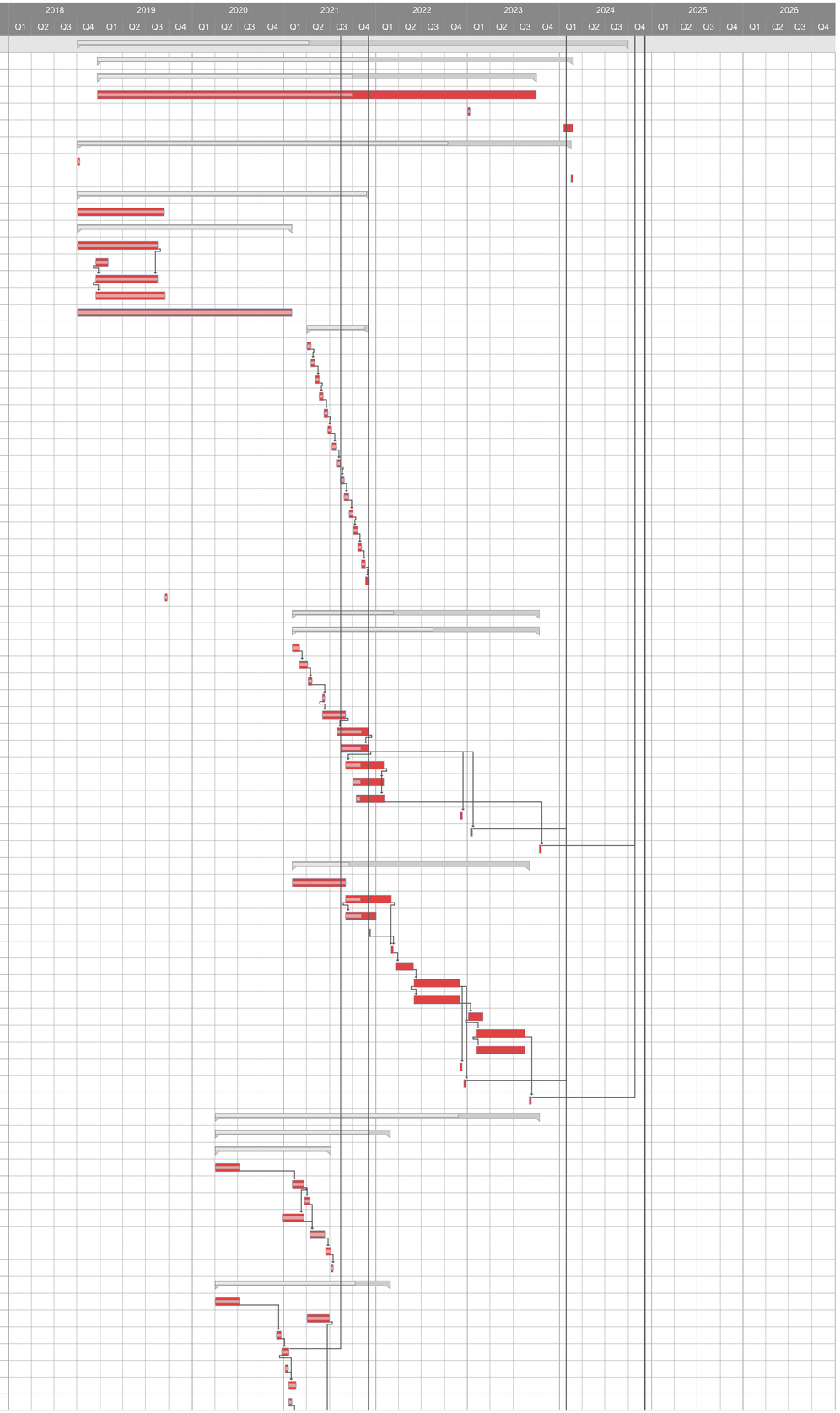
	WBS	Task Name	Start Date	End Date	Predecessor WBS
1558	1.4.1.2.4.2	Shipping to PTH or CHC (FY24 vessel, RDD 12/1/23)	05/23/23	06/05/23	1557
1559	1.4.1.2.4.3	ROS date	12/01/24	12/01/24	
1560	**1.4.1.3**	**Penetrator Cable Assembly**	**01/01/21**	**06/07/22**	
1561	**1.4.1.3.1**	**v1 PCAs (Harwin connectors)**	**01/01/21**	**04/29/22**	
1562	*1.4.1.3.1.1*	*v1 PCA fabrication*	*01/01/21*	*03/01/21*	
1563	1.4.1.3.1.2	v1 PCA shipping to DOM production facilities	01/01/21	04/29/22	1562SS
1564	1.4.1.3.1.3	v1 PCA restesting	10/01/21	03/31/22	
1565	*1.4.1.3.3*	*PCA mating cables for FAT*	*01/01/21*	*03/15/21*	
1566	*1.4.1.3.3.1*	*PCA mating cable design*	*01/01/21*	*01/29/21*	
1567	*1.4.1.3.3.2*	*PCA mating cable prototyping*	*01/01/21*	*02/15/21*	*1566SS*
1568	*1.4.1.3.3.3*	*PCA mating cable materials procurement*	*02/16/21*	*03/01/21*	*1567*
1569	*1.4.1.3.3.4*	*PCA mating cable materials shipping*	*03/02/21*	*03/15/21*	*1568*
1570	**1.4.1.3.2**	**v2 PCAs (Molex connectors)**	**01/01/21**	**01/31/22**	
1571	*1.4.1.3.2.1*	*v2 PCA design revisions*	*01/01/21*	*03/31/21*	
1572	1.4.1.3.2.2	v2 PCA fabrication	04/01/21	12/31/21	1571
1573	1.4.1.3.2.3	v2 PCA shipping to DOM production facilities	04/01/21	01/31/22	1572SS
1574	**1.4.1.3.4**	**PCA mating cables for SPAT**	**09/15/21**	**06/07/22**	
1575	1.4.1.3.4.1	SPAT cable design	09/15/21	02/01/22	
1576	1.4.1.3.4.2	SPAT cable materials procurement	02/02/22	05/10/22	1575
1577	1.4.1.3.4.3	SPAT cable production	05/11/22	05/24/22	1576
1578	1.4.1.3.4.4	SPAT cable shipping	05/25/22	06/07/22	1577
1579	**1.4.1.4**	**String Hardware and Support Rope**	**01/01/21**	**11/24/22**	
1580	**1.4.1.4.1**	**Main cable connections**	**01/01/21**	**11/24/22**	
1581	*1.4.1.4.1.1*	*Final design*	*01/01/21*	*04/01/22*	
1582	*1.4.1.4.1.2*	*Support rope prototype procurement*	*07/08/21*	*10/29/21*	
1583	1.4.1.4.1.3	Support rope prototype testing	11/01/21	12/10/21	1582, 1584FS -20d
1584	1.4.1.4.1.4	Cable knot tests	09/01/21	11/23/21	
1585	1.4.1.4.1.5	Rope plus cable pull tests	03/07/22	04/01/22	1581FF, 1583
1586	1.4.1.4.1.6	String hardware final design review	07/01/22	07/14/22	1585FS +64d
1587	1.4.1.4.1.7	String hardware procurement	08/12/22	11/03/22	1586FS +20d
1588	1.4.1.4.1.8	String hardware shipping to MCA production facility	11/04/22	11/24/22	1587
1589	**1.4.1.5**	**Cable emulators**	**01/01/21**	**04/24/23**	
1590	*1.4.1.5.1*	*Determine cable emulator requirements*	*01/01/21*	*01/29/21*	
1591	1.4.1.5.2	Cable emulator box design	04/05/22	05/02/22	
1592	1.4.1.5.3	Cable emulator PCB layout	05/03/22	06/20/22	1591
1593	1.4.1.5.4	Cable emulator PCB procurement	06/21/22	07/04/22	1592
1594	1.4.1.5.5	Procurement of prototype materials	07/05/22	10/24/22	1593
1595	1.4.1.5.6	Prototype assembly	10/25/22	10/31/22	1594
1596	1.4.1.5.7	Cable emulator testing	11/01/22	11/07/22	1595
1597	1.4.1.5.8	Cable emulator final design review	11/08/22	11/21/22	1596
1598	1.4.1.5.9	Procurement of materials for cable emulator production	11/22/22	03/13/23	1597
1599	1.4.1.5.10	Cable emulator assembly	03/14/23	04/10/23	1598
1600	1.4.1.5.11	Cable emulator shipping	04/11/23	04/24/23	1599
1601	**1.4.2**	**Surface Cables**	**12/01/20**	**02/15/24**	
1602	**1.4.2.1**	**Surface Cable Assemblies**	**12/01/20**	**12/01/23**	
1603	*1.4.2.1.1*	*Final design*	*12/01/20*	*01/29/21*	
1604	*1.4.2.1.2*	*Final design review*	*02/01/21*	*02/02/21*	*1603*
1605	*1.4.2.1.3*	*Procurement*	*02/03/21*	*03/30/21*	*1604*
1606	*1.4.2.1.4*	*Cable production*	*03/31/21*	*06/22/21*	*1605*
1607	*1.4.2.1.5*	*Shipping to connectorization facility*	*06/23/21*	*08/31/21*	*1606*
1608	1.4.2.1.6	Connectorization and testing	09/01/21	10/15/21	1607
1609	1.4.2.1.7	Pre-ship review	10/18/21	11/03/21	1608
1610	1.4.2.1.8	Shipping to PTH	11/04/21	12/01/21	1609
1611	1.4.2.1.9	Required delivery date PTH (FY23 vessel, RDD 12/1/22)	12/01/22	12/01/22	
1612	1.4.2.1.10	ROS date (installation under 1.2)	12/01/23	12/01/23	
1613	**1.4.2.2**	**Surface Junction Boxes**	**02/01/22**	**12/01/23**	
1614	1.4.2.2.1	Final design	02/01/22	06/20/22	
1615	1.4.2.2.2	Final design review	06/21/22	06/21/22	1614
1616	1.4.2.2.3	Procurement	06/22/22	10/11/22	1615
1617	1.4.2.2.4	Fabrication	10/12/22	12/06/22	1616
1618	1.4.2.2.5	Pre-ship review	12/07/22	12/27/22	1617
1619	1.4.2.2.6	Shipping to PTH	12/28/22	02/21/23	1618
1620	1.4.2.2.7	Required delivery date PTH (FY23 vessel to McM)	12/01/22	12/01/22	
1621	1.4.2.2.8	ROS date (installation under 1.2)	12/01/23	12/01/23	
1622	**1.4.2.3**	**ICL Upgrade**	**01/01/21**	**02/15/24**	
1623	1.4.2.3.1	ASC liaison	01/01/21	02/15/24	
1624	**1.4.2.3.2**	**Patch panels**	**04/01/22**	**12/15/23**	
1625	1.4.2.3.2.1	Final design	04/01/22	04/28/22	
1626	1.4.2.3.2.2	Procurement	04/29/22	08/18/22	1625
1627	1.4.2.3.2.3	Fabrication	08/19/22	09/29/22	1626
1628	1.4.2.3.2.4	Pre-ship review	09/30/22	10/13/22	1627
1629	1.4.2.3.2.5	Shipping to PTH (NB: small)	10/14/22	10/27/22	1628
1630	1.4.2.3.2.6	Required delivery date PTH	09/15/23	09/15/23	
1631	1.4.2.3.2.7	ROS date	12/01/23	12/01/23	
1632	1.4.2.3.2.8	Installation in ICL	12/15/23	12/15/23	
1633	**1.4.2.3.3**	**Patch cables**	**03/01/22**	**01/05/24**	
1634	1.4.2.3.3.1	Final design	03/01/22	04/11/22	
1635	1.4.2.3.3.2	Prototype production and evaluation	04/12/22	06/06/22	1634
1636	1.4.2.3.3.3	Final design review	06/07/22	06/07/22	1635
1637	1.4.2.3.3.4	Procurement	06/08/22	09/27/22	1636
1638	1.4.2.3.3.5	Production	09/28/22	11/22/22	1637
1639	1.4.2.3.3.6	Pre-ship review	11/23/22	11/29/22	1638



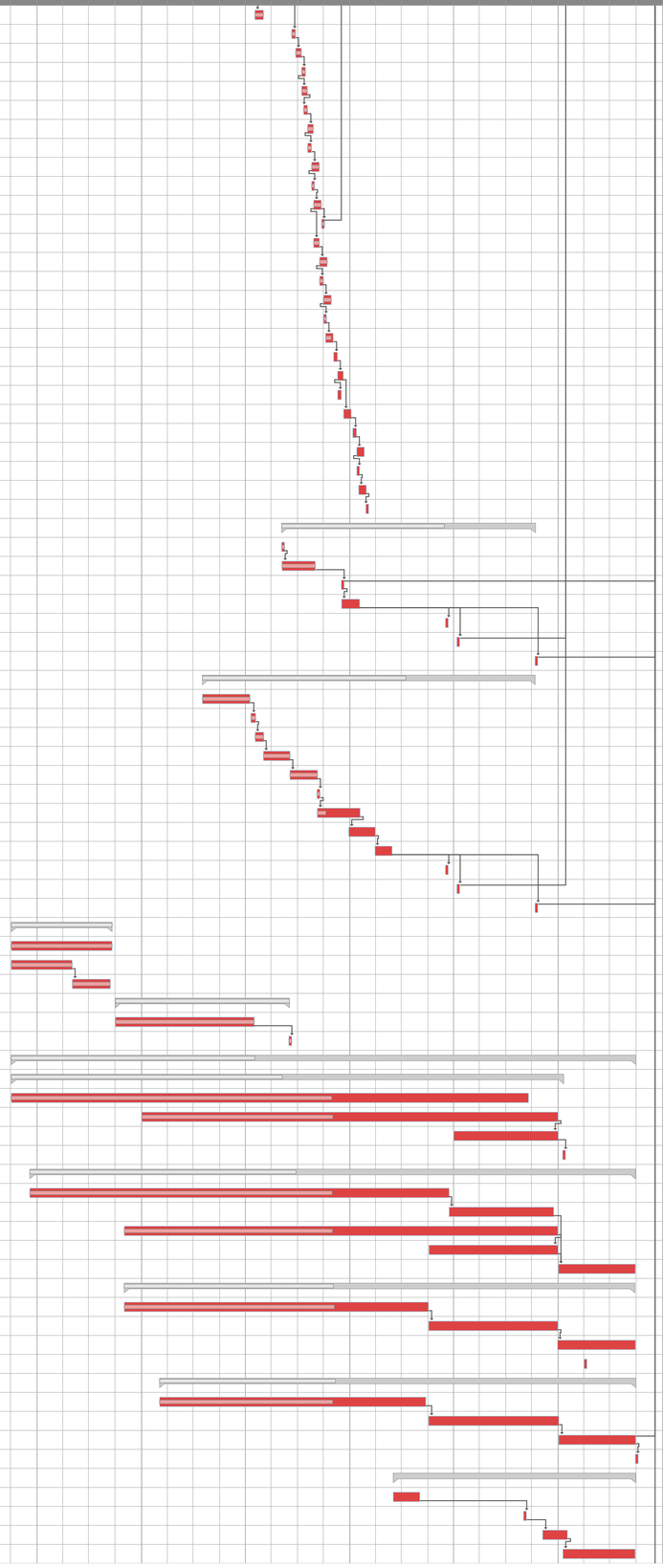
	WBS	Task Name	Start Date	End Date	Predecessor WBS
1640	1.4.2.3.3.7	Shipping to PTH	11/30/22	12/06/22	1639
1641	1.4.2.3.3.8	Required delivery date PTH	09/15/23	09/15/23	
1642	1.4.2.3.3.9	ROS date	01/01/24	01/01/24	
1643	1.4.2.3.3.10	Installation in ICL	01/01/24	01/05/24	
1644	**1.4.3**	**FieldHub**	**01/01/21**	**02/01/24**	
1645	**1.4.3.1**	**FieldHub Electronics**	**01/01/21**	**02/01/24**	
1646	**1.4.3.1.1**	**FieldHub Design**	**01/01/21**	**03/14/23**	
1647	1.4.3.1.1.1	FieldHub rev1 design	01/01/21	01/31/22	
1648	1.4.3.1.1.2	FieldHub rev1 prototype production	04/01/22	05/13/22	1647FS +43d
1649	1.4.3.1.1.3	FieldHub rev1 testing and installation at NTS	05/16/22	06/30/22	1648
1650	1.4.3.1.1.4	FieldHub rev2 design	07/01/22	07/29/22	1649
1651	1.4.3.1.1.5	FieldHub rev2 prototype production	09/15/22	10/31/22	1650FS +33d
1652	1.4.3.1.1.6	FieldHub rev2 testing and installation at NTS	11/01/22	11/30/22	1651
1653	1.4.3.1.1.7	FieldHub prototype installed in ICL (hand carry)	12/01/22	01/31/23	1652
1654	1.4.3.1.1.8	FieldHub final design review	01/13/23	01/31/23	1653FF
1655	1.4.3.1.1.9	FieldHub rev3 design	02/01/23	02/28/23	1654
1656	1.4.3.1.1.10	Production readiness review	03/01/23	03/14/23	1655
1657	**1.4.3.1.2**	**FieldHub Production**	**03/15/23**	**02/01/24**	
1658	1.4.3.1.2.1	Procurement	03/15/23	04/28/23	1656
1659	1.4.3.1.2.2	PCB fabrication	03/15/23	04/28/23	1658SS
1660	1.4.3.1.2.3	FieldHub assembly	05/01/23	06/30/23	1659
1661	1.4.3.1.2.4	FieldHub acceptance testing	07/03/23	07/31/23	1660
1662	1.4.3.1.2.5	FieldHub production complete	08/01/23	08/01/23	1661
1663	1.4.3.1.2.6	Pre-ship review	08/01/23	08/14/23	1662SS
1664	1.4.3.1.2.7	Shipping to CHC (Air to Pole, RDD?)	08/15/23	09/25/23	1663
1665	1.4.3.1.2.8	Installation and commissioning in ICL	11/01/23	01/31/24	1664FS +26d
1666	1.4.3.1.2.9	FieldHubs installed in ICL	02/01/24	02/01/24	1665
1667	**1.4.4**	**CPT Central Infrastructure**	**02/01/21**	**12/21/23**	
1668	**1.4.4.1**	**Communications and Timing Systems**	**02/01/21**	**12/21/23**	
1669	**1.4.4.1.1**	**Timing distribution system**	**02/01/21**	**12/21/23**	
1670	1.4.4.1.1.1	Procurement	02/01/21	07/29/22	
1671	1.4.4.1.1.2	Testing	08/01/22	09/23/22	1670
1672	1.4.4.1.1.3	Final design review	09/26/22	09/30/22	1671
1673	1.4.4.1.1.4	Required delivery date PTH	09/15/23	09/15/23	
1674	1.4.4.1.1.5	Shipping to PTH	09/01/23	09/14/23	1672FS +239d
1675	1.4.4.1.1.6	ROS date	12/01/23	12/01/23	
1676	1.4.4.1.1.7	Installation in ICL	12/15/23	12/21/23	1674FS +65d
1677	**1.4.4.1.2**	**Timing monitoring system**	**03/01/23**	**12/21/23**	
1678	1.4.4.1.2.1	Final design	03/01/23	03/28/23	
1679	1.4.4.1.2.2	Prototype production	03/29/23	04/25/23	1678
1680	1.4.4.1.2.3	Installation and testing at NTS/SPTS	04/26/23	06/20/23	1679
1681	1.4.4.1.2.4	Production of ICL system	06/21/23	07/18/23	1680
1682	1.4.4.1.2.5	Required delivery date PTH	09/15/23	09/15/23	
1683	1.4.4.1.2.6	Shipping to PTH	08/15/23	09/11/23	1681FS +19d
1684	1.4.4.1.2.7	ROS date	12/01/23	12/01/23	
1685	1.4.4.1.2.8	Installation in ICL	12/15/23	12/21/23	1683FS +68d
1686	**1.4.4.2**	**Power systems**	**03/01/21**	**12/14/23**	
1687	**1.4.4.2.1**	**DOM power supply**	**03/01/21**	**10/20/22**	
1688	1.4.4.2.1.1	Final design	03/01/21	06/17/22	
1689	1.4.4.2.1.2	Sample procurement and evaluation	03/28/22	06/17/22	1688FF
1690	1.4.4.2.1.3	Final design review	06/20/22	06/24/22	1689
1691	1.4.4.2.1.4	Procurement	06/27/22	09/16/22	1690
1692	1.4.4.2.1.5	Installation and testing at NTS	09/23/22	10/20/22	1691FS +4d
1693	**1.4.4.2.2**	**DOM power distribution**	**05/01/21**	**10/20/22**	
1694	1.4.4.2.2.1	Final design	05/01/21	06/17/22	
1695	1.4.4.2.2.2	Prototype production and evaluation	04/25/22	06/17/22	1694FF
1696	1.4.4.2.2.3	Final design review	06/20/22	06/24/22	1695
1697	1.4.4.2.2.4	Production	06/27/22	09/02/22	1696
1698	1.4.4.2.2.5	Installation and testing at NTS	09/23/22	10/20/22	1697FS +14d
1699	**1.4.4.2.3**	**DOM power control**	**05/15/21**	**10/20/22**	
1700	1.4.4.2.3.1	Final design	05/15/21	06/17/22	
1701	1.4.4.2.3.2	Prototype production and evaluation	03/28/22	06/17/22	1700FF
1702	1.4.4.2.3.3	Final design review	06/20/22	06/24/22	1701
1703	1.4.4.2.3.4	Production	06/27/22	09/02/22	1702
1704	1.4.4.2.3.5	Installation and testing at NTS	09/23/22	10/20/22	1703FS +14d
1705	**1.4.4.2.4**	**Power system shipping and installation**	**12/01/22**	**12/14/23**	
1706	1.4.4.2.4.1	Pre-ship review	12/01/22	12/28/22	1704FS +29d
1707	1.4.4.2.4.2	Shipping to PTH (ComAir? RDD 9/15/23)	12/29/22	01/11/23	1706
1708	1.4.4.2.4.3	ROS date	12/01/23	12/01/23	
1709	1.4.4.2.4.4	Installation in ICL	12/01/23	12/14/23	1707FS +231d
1710	**1.4.5**	**Northern Test System**	**01/01/21**	**10/01/25**	
1711	**1.4.5.2**	**NTS Cables**	**03/15/22**	**05/27/22**	
1712	1.4.5.2.1	Facility construction	03/15/22	04/29/22	
1713	1.4.5.2.2	Installation of NTS quads	05/02/22	05/27/22	1712
1714	**1.4.5.3**	**NTS dark boxes**	**01/01/21**	**10/29/21**	
1715	*1.4.5.3.1*	*Order materials*	*01/01/21*	*01/29/21*	
1716	1.4.5.3.2	Construction	02/01/21	10/29/21	1715
1717	*1.4.5.3.3*	*NTS dark boxes ready*	*04/15/21*	*04/15/21*	
1718	**1.4.5.4**	**NTS Operations**	**01/01/21**	**10/01/25**	
1719	*1.4.5.4.1*	*Commissioning*	*01/01/21*	*05/31/21*	
1720	*1.4.5.4.2*	*NTS Fully Operational*	*06/01/21*	*06/01/21*	*1719*
1721	1.4.5.4.3	NTS Operations	06/02/21	10/01/25	1720



	WBS	Task Name	Start Date	End Date	Predecessor WBS
1722	**1.5**	**Characterization and Calibration System**	**10/01/18**	**09/27/24**	
1723	**1.5.1**	**Module Calibration**	**12/19/18**	**02/23/24**	
1724	**1.5.1.1**	**Production Calibration**	**12/19/18**	**09/29/23**	
1725	1.5.1.1.1	Entry of Production Calibration Data into Database	12/19/18	09/29/23	
1726	*1.5.1.1.2*	*PSL Water Tank for Calibration Complete*	*12/31/22*	*12/31/22*	
1727	1.5.1.2	In-situ Sensor Response Calibration	01/16/24	02/23/24	
1728	**1.5.2**	**Calibration Assemblies**	**10/01/18**	**02/14/24**	
1729		*Parent Duration Buffer*	*10/01/18*	*10/01/18*	
1730		Parent Duration Buffer	02/14/24	02/14/24	
1731	**1.5.2.1**	**On-board LED Flashers**	**10/01/18**	**12/03/21**	
1732		*Parent Duration Buffer*	*10/01/18*	*09/12/19*	
1733	*1.5.2.1.1*	*D-egg Flashers*	*10/01/18*	*01/29/21*	
1734	*1.5.2.1.1.1*	*LED selection*	*10/01/18*	*08/15/19*	
1735	*1.5.2.1.1.2*	*Common Electrical interface to MB and Driver Circuit*	*12/13/18*	*01/31/19*	
1736	*1.5.2.1.1.3*	*Design of Opto-mechanical interface for D-egg*	*12/13/18*	*08/15/19*	*1735SS, 1734FF*
1737	*1.5.2.1.1.4*	*Design of Opto-mechanical interface for mDOM*	*12/13/18*	*09/13/19*	*1736SS*
1738	*1.5.2.1.1.5*	*D-egg Flasher Production and Testing*	*10/01/18*	*01/29/21*	
1739	**1.5.2.1.2**	**mDOM Flashers**	**04/01/21**	**12/03/21**	
1740	*1.5.2.1.2.1*	*mDOM Flasher DESY Batch 1 Production*	*04/01/21*	*04/15/21*	
1741	*1.5.2.1.2.2*	*mDOM Flasher DESY Batch 2 Production*	*04/16/21*	*05/03/21*	*1740*
1742	*1.5.2.1.2.3*	*mDOM Flasher DESY Batch 3 Production*	*05/04/21*	*05/18/21*	*1741*
1743	*1.5.2.1.2.4*	*mDOM Flasher DESY Batch 4 Production*	*05/19/21*	*06/04/21*	*1742*
1744	*1.5.2.1.2.5*	*mDOM Flasher DESY Batch 5 Production*	*06/07/21*	*06/21/21*	*1743*
1745	*1.5.2.1.2.6*	*mDOM Flasher DESY Batch 6 Production*	*06/22/21*	*07/08/21*	*1744*
1746	*1.5.2.1.2.7*	*mDOM Flasher DESY Batch 7 Production*	*07/09/21*	*07/23/21*	*1745*
1747	*1.5.2.1.2.8*	*mDOM Flasher DESY Batch 8 Production*	*07/26/21*	*08/10/21*	*1746*
1748	*1.5.2.1.2.9*	*mDOM Flasher MSU Batch 1 Production*	*08/11/21*	*08/25/21*	*1747*
1749	*1.5.2.1.2.10*	*mDOM Flasher MSU Batch 2 Production*	*08/26/21*	*09/14/21*	*1748*
1750	*1.5.2.1.2.11*	*mDOM Flasher MSU Batch 3 Production*	*09/15/21*	*09/29/21*	*1749*
1751	*1.5.2.1.2.12*	*mDOM Flasher MSU Batch 4 Production*	*09/30/21*	*10/18/21*	*1750*
1752	*1.5.2.1.2.13*	*mDOM Flasher MSU Batch 5 Production*	*10/19/21*	*11/02/21*	*1751*
1753	1.5.2.1.2.14	mDOM Flasher MSU Batch 6 Production	11/03/21	11/18/21	1752
1754	1.5.2.1.2.15	mDOM Flasher MSU Batch 7 Production	11/19/21	12/03/21	1753
1755	*1.5.2.1.4*	*Final Onboard Design Review (FDR)*	*09/14/19*	*09/14/19*	
1756	**1.5.2.2**	**Standalone Light Sources**	**02/01/21**	**10/11/23**	
1757	**1.5.2.2.1**	**POCAM**	**02/01/21**	**10/11/23**	
1758	*1.5.2.2.1.1*	*DVT Modules Built*	*02/01/21*	*03/01/21*	
1759	*1.5.2.2.1.2*	*Design verification testing*	*03/02/21*	*04/02/21*	*1758*
1760	*1.5.2.2.1.3*	*Update design*	*04/05/21*	*04/19/21*	*1759*
1761	*1.5.2.2.1.4*	*Design complete, FDR*	*06/01/21*	*06/01/21*	*1760FS +30d*
1762	*1.5.2.2.1.5*	*Batch 1 production (10)*	*06/01/21*	*09/01/21*	*1761SS*
1763	1.5.2.2.1.6	Batch 1 calibration	07/30/21	12/01/21	1762FS -24d
1764	1.5.2.2.1.7	Batch 1 FAT testing	08/13/21	12/01/21	1763FF
1765	1.5.2.2.1.8	Batch 2 production (20)	09/01/21	02/01/22	1764FS -66d
1766	1.5.2.2.1.9	Batch 2 calibration	10/01/21	02/01/22	1765FF
1767	1.5.2.2.1.10	Batch 2 FAT testing	10/13/21	02/01/22	1765FF
1768	1.5.2.2.1.11	Ship 1 module to NTS	12/01/22	12/01/22	1764FS +260d
1769	1.5.2.2.1.12	Ship Str. 87-88 Modules to CHC (4)	01/10/23	01/10/23	1764FS +288d
1770	1.5.2.2.1.13	Ship Str. 89-93 Modules to CHC (17)	10/11/23	10/11/23	1767FS +440d
1771	**1.5.2.2.2**	**Pencil Beam (at UW, Chris Wendt)**	**02/01/21**	**09/01/23**	
1772	*1.5.2.2.2.1*	*DVT Module(s) built*	*02/01/21*	*08/31/21*	
1773	1.5.2.2.2.2	Design verification testing	09/01/21	03/01/22	
1774	1.5.2.2.2.3	Update design	09/01/21	12/31/21	1773SS
1775	1.5.2.2.2.4	Final Design Review Mechanical, Motion, Control Board, Collimator, Spheres	12/01/21	12/01/21	
1776	1.5.2.2.2.5	Final Design Review LEDs, Laser, SIPM, Photodiode	03/01/22	03/01/22	1773FF, 1775
1777	1.5.2.2.2.6	Batch 1 production	03/18/22	05/30/22	1776FS +12d
1778	1.5.2.2.2.7	Batch 1 calibration	05/31/22	11/29/22	1777
1779	1.5.2.2.2.8	Batch 1 FAT testing	05/31/22	11/29/22	1778SS
1780	1.5.2.2.2.9	Batch 2 production	01/02/23	03/01/23	1779FS +23d
1781	1.5.2.2.2.10	Batch 2 calibration	02/01/23	08/15/23	1780SS +22d
1782	1.5.2.2.2.11	Batch 2 FAT testing	02/01/23	08/15/23	1781SS
1783	1.5.2.2.2.12	Ship 1 module to NTS	11/30/22	11/30/22	1778
1784	1.5.2.2.2.13	Ship Str. 87-88 Modules to PTH (4)	12/15/22	12/15/22	1778FS +11d
1785	1.5.2.2.2.14	Ship Str. 89-93 Modules to PTH (8)	09/01/23	09/01/23	1781FS +12d
1786	**1.5.2.3**	**Camera and Light Detection**	**04/01/20**	**10/11/23**	
1787	**1.5.2.3.1**	**Cameras in Photosensors**	**04/01/20**	**02/25/22**	
1788	*1.5.2.3.1.1*	*D-egg cameras*	*04/01/20*	*07/05/21*	
1789	*1.5.2.3.1.1.1*	*Camera D-egg batch 3.1 production*	*04/01/20*	*07/06/20*	
1790	*1.5.2.3.1.1.2*	*Camera D-egg batch 3.1 Calibration (CAT)*	*02/01/21*	*03/19/21*	*1789FS +149d*
1791	*1.5.2.3.1.1.3*	*Delivery of Camera D-egg batch 3.1 to Chiba*	*03/22/21*	*04/09/21*	*1790*
1792	*1.5.2.3.1.1.4*	*Camera D-egg batch 3.2 production*	*12/23/20*	*03/19/21*	*1790FF*
1793	*1.5.2.3.1.1.5*	*Camera D-egg batch 3.2 Calibration (CAT)*	*04/12/21*	*06/11/21*	*1791, 1792*
1794	*1.5.2.3.1.1.6*	*Delivery of Camera D-egg batch 3.2 to Chiba*	*06/14/21*	*07/02/21*	*1793*
1795	*1.5.2.3.1.1.7*	*Delivery of Camera D-egg to Chiba Finalized*	*07/05/21*	*07/05/21*	*1794*
1796	**1.5.2.3.1.2**	**mDOM Cameras**	**04/01/20**	**02/25/22**	
1797	*1.5.2.3.1.2.1*	*Camera mDOM batch 1-3 production*	*04/01/20*	*07/06/20*	
1798	*1.5.2.3.1.2.2*	*Camera mDOM batch 4-8 DESY / 1-7 MSU production*	*04/01/21*	*06/30/21*	
1799	*1.5.2.3.1.2.3*	*Camera mDOM DESY batch 1 Calibration (CAT)*	*11/30/20*	*12/18/20*	*1797FS +104d*
1800	*1.5.2.3.1.2.4*	*Delivery of Camera mDOM batch 1 to DESY*	*12/21/20*	*01/20/21*	*1799*
1801	*1.5.2.3.1.2.5*	*Camera mDOM DESY batch 2 Calibration (CAT)*	*01/04/21*	*01/15/21*	
1802	*1.5.2.3.1.2.6*	*Delivery of Camera mDOM batch 2 to DESY*	*01/18/21*	*02/17/21*	*1801, 1800SS*
1803	*1.5.2.3.1.2.7*	*Camera mDOM DESY batch 3 Calibration (CAT)*	*01/18/21*	*01/29/21*	



	WBS	Task Name	Start Date	End Date	Predecessor WBS
1804	*1.5.2.3.1.2.8*	*Delivery of Camera mDOM batch 3 to DESY*	*02/01/21*	*03/01/21*	*1803*
1805	*1.5.2.3.1.2.9*	*Camera mDOM DESY batch 4 Calibration (CAT)*	*06/10/21*	*06/23/21*	*1798FS -15d*
1806	*1.5.2.3.1.2.10*	*Delivery of Camera mDOM batch 4 to DESY*	*06/24/21*	*07/14/21*	*1805*
1807	*1.5.2.3.1.2.11*	*Camera mDOM DESY batch 5 Calibration (CAT)*	*07/15/21*	*07/28/21*	*1806*
1808	*1.5.2.3.1.2.12*	*Delivery of Camera mDOM batch 5 to DESY*	*07/15/21*	*08/04/21*	*1807SS*
1809	*1.5.2.3.1.2.13*	*Camera mDOM DESY batch 6 Calibration (CAT)*	*07/22/21*	*08/04/21*	*1808FF*
1810	*1.5.2.3.1.2.14*	*Delivery of Camera mDOM batch 6 to DESY*	*08/05/21*	*08/25/21*	*1809*
1811	*1.5.2.3.1.2.15*	*Camera mDOM DESY batch 7 Calibration (CAT)*	*08/05/21*	*08/18/21*	*1810SS*
1812	*1.5.2.3.1.2.16*	*Delivery of Camera mDOM batch 7 to DESY*	*08/19/21*	*09/15/21*	*1811*
1813	1.5.2.3.1.2.17	Camera mDOM DESY batch 8 Calibration (CAT)	08/19/21	08/25/21	1812SS
1814	*1.5.2.3.1.2.18*	*Delivery of Camera mDOM batch 8 to DESY*	*08/26/21*	*09/22/21*	*1813*
1815	*1.5.2.3.1.2.19*	*Delivery of Camera mDOM to DESY Completed*	*09/23/21*	*09/23/21*	*1814*
1816	*1.5.2.3.1.2.20*	*Camera mDOM MSU batch 1 Calibration (CAT)*	*08/26/21*	*09/15/21*	*1814SS*
1817	*1.5.2.3.1.2.21*	*Delivery of Camera mDOM batch 1 to MSU*	*09/16/21*	*10/13/21*	*1816*
1818	*1.5.2.3.1.2.22*	*Camera mDOM MSU batch 2 Calibration (CAT)*	*09/16/21*	*09/29/21*	*1817SS*
1819	*1.5.2.3.1.2.23*	*Delivery of Camera mDOM batch 2 to MSU*	*09/30/21*	*10/27/21*	*1818*
1820	1.5.2.3.1.2.24	Camera mDOM MSU batch 3 Calibration (CAT)	09/30/21	10/06/21	1819SS
1821	1.5.2.3.1.2.25	Delivery of Camera mDOM batch 3 to MSU	10/07/21	11/03/21	1820
1822	1.5.2.3.1.2.26	Camera mDOM MSU batch 4 Calibration (CAT)	11/04/21	11/17/21	1821
1823	1.5.2.3.1.2.27	Delivery of Camera mDOM batch 4 to MSU	11/18/21	12/08/21	1822
1824	1.5.2.3.1.2.28	Camera mDOM MSU batch 5 Calibration (CAT)	11/18/21	12/01/21	1823SS
1825	1.5.2.3.1.2.29	Delivery of Camera mDOM batch 5 to MSU	12/09/21	01/05/22	1823
1826	1.5.2.3.1.2.30	Camera mDOM MSU batch 6 Calibration (CAT)	01/10/22	01/21/22	1825FS +2d
1827	1.5.2.3.1.2.31	Delivery of Camera mDOM batch 6 to MSU	01/24/22	02/18/22	1826
1828	1.5.2.3.1.2.32	Camera mDOM MSU batch 7 Calibration (CAT)	01/24/22	01/28/22	1827SS
1829	1.5.2.3.1.2.33	Delivery of Camera mDOM batch 7 to MSU	01/31/22	02/25/22	1828
1830	1.5.2.3.1.2.34	Delivery of Camera mDOM to MSU Completed	02/25/22	02/25/22	1829FF
1831	**1.5.2.3.2**	**Sweden Camera 2.0**	**05/06/21**	**10/11/23**	
1832	*1.5.2.3.2.1*	*Preliminary Design Review*	*05/06/21*	*05/06/21*	
1833	*1.5.2.3.2.2*	*Built DVT Module*	*05/07/21*	*09/01/21*	*1832*
1834	1.5.2.3.2.3	Final Design Review	12/01/21	12/01/21	1833FS +64d
1835	1.5.2.3.2.4	Production	12/02/21	02/01/22	1834
1836	1.5.2.3.2.5	Delivery of 1 Module to NTS	12/01/22	12/01/22	1835FS +216d
1837	1.5.2.3.2.6	Delivery of Str. 87-88 Modules to CHC (2)	01/10/23	01/10/23	1835FS +244d
1838	1.5.2.3.2.7	Delivery of Str. 89-93 Modules to CHC (3)	10/11/23	10/11/23	1835FS +440d
1839	**1.5.2.4**	**Acoustic Sensors**	**08/01/20**	**10/11/23**	
1840	*1.5.2.4.1*	*DVT Module(s) built*	*08/01/20*	*01/15/21*	
1841	*1.5.2.4.2*	*Pressure Testing*	*01/18/21*	*02/01/21*	*1840*
1842	*1.5.2.4.3*	*Design verification Testing*	*02/02/21*	*03/02/21*	*1841*
1843	*1.5.2.4.4*	*Update design*	*03/03/21*	*06/03/21*	*1842*
1844	*1.5.2.4.5*	*Electronic Update and test*	*06/04/21*	*09/06/21*	*1843*
1845	*1.5.2.4.6*	*Design complete, FDR*	*09/07/21*	*09/07/21*	*1844*
1846	1.5.2.4.7	Batch 1 production	09/08/21	02/04/22	1845
1847	1.5.2.4.8	Batch 1 calibration	12/27/21	03/28/22	1846FS -30d
1848	1.5.2.4.9	Batch 1 FAT testing	03/29/22	05/27/22	1847
1849	1.5.2.4.10	Ship one module to Northern Test System	12/01/22	12/01/22	1848FS +133d
1850	1.5.2.4.11	Ship String 87-88 modules to CHC (4)	01/10/23	01/10/23	1848FS +161d
1851	1.5.2.4.12	Ship String 89-93 modules to CHC (8)	10/11/23	10/11/23	1848FS +357d
1852	*1.5.2.5*	*Inclinometers and Compasses (UW, Mike)*	*10/01/18*	*09/17/19*	
1853		*Parent Duration Buffer*	*10/01/18*	*09/17/19*	
1854	*1.5.2.5.1*	*Design*	*10/01/18*	*05/02/19*	
1855	*1.5.2.5.2*	*Selection and testing of devices*	*05/03/19*	*09/13/19*	*1854*
1856	*1.5.2.6*	*Mini-Mainboard*	*10/01/19*	*05/31/21*	
1857	*1.5.2.6.1*	*Mini-Mainboard Design Complete*	*10/01/19*	*01/29/21*	
1858	*1.5.2.6.2*	*Mini-Mainboard V2 First Articles Delivered*	*05/31/21*	*05/31/21*	*1857FS +85d*
1859	**1.5.3**	**Array Calibration**	**10/01/18**	**09/27/24**	
1860	**1.5.3.1**	**Calibration Benchmarks**	**10/01/18**	**01/18/24**	
1861	1.5.3.1.1	Simulation Studies	10/01/18	09/18/23	
1862	1.5.3.1.2	Plan	01/01/20	12/29/23	
1863	1.5.3.1.3	Software Development	12/30/22	12/29/23	1862FF
1864	1.5.3.1.4	Execution	01/16/24	01/18/24	1863FS +11d
1865	**1.5.3.2**	**Timing Calibration**	**12/05/18**	**09/26/24**	
1866	1.5.3.2.1	Develop Flasher Plan w New Timing System	12/05/18	12/13/22	
1867	1.5.3.2.2	TEST Flasher in IceCube w New Timing System	12/14/22	12/15/23	1866
1868	1.5.3.2.3	Development of Timing Calibration Plan	11/01/19	12/29/23	
1869	1.5.3.2.4	Create Database Structure for Timing Calibration Data	10/04/22	12/29/23	1868FF
1870	1.5.3.2.5	Analyze Timing Calibration Data from Deployed Modules	01/01/24	09/26/24	1869, 1867
1871	**1.5.3.3**	**Geometry Calibration**	**11/01/19**	**09/25/24**	
1872	1.5.3.3.1	Develop Geometry Plan	11/01/19	09/30/22	
1873	1.5.3.3.2	Create Database Structure for Geometry Calibration Data	10/03/22	12/28/23	1872
1874	1.5.3.3.3	Analyze Geometry Calibration Data from Deployed Modules	12/29/23	09/25/24	1873
1875	1.5.3.3.4	Delivery of Preliminary Timimg and Geometry Calibration	03/31/24	03/31/24	
1876	**1.5.3.4**	**Ice Properties Calibration**	**03/04/20**	**09/27/24**	
1877	1.5.3.4.1	Plan	03/04/20	09/23/22	
1878	1.5.3.4.2	Software Development	10/03/22	01/01/24	1877FS +5d
1879	1.5.3.4.3	Execution of Array Calibration	01/02/24	09/26/24	1878
1880	1.5.3.4.4	Array Calibration Complete	09/27/24	09/27/24	1879
1881	**1.5.3.5**	**Pre-deployment Hole Measurement**	**06/01/22**	**09/26/24**	
1882	1.5.3.5.1	Testing of dust logger and IDP winch	06/01/22	08/31/22	
1883	1.5.3.5.2	Shipping of logger and winch to PTH	09/01/23	09/01/23	1882FS +261d
1884	1.5.3.5.3	Deployment of Hole Loggers	11/07/23	02/01/24	1883FS +46d
1885	1.5.3.5.4	Analyze Hole Log Data	01/17/24	09/26/24	1884FS -12d



	WBS	Task Name	Start Date	End Date	Predecessor WBS
1886	**1.5.4**	**Calibration Management and Organization**	**01/11/19**	**09/27/24**	
1887	1.5.4.1	Calibration management	01/11/19	09/27/24	
1888	1.5.4.2	Travel	01/11/19	09/27/24	
1889	**1.6**	**IceCube Data Systems Integration**	**06/01/18**	**09/28/26**	
1890	1.6.0	L2 Task Management	10/01/20	06/28/24	
1891	**1.6.1**	**Online Systems Software**	**06/01/18**	**06/28/24**	
1892	1.6.1.0	L3 Task Management	10/01/20	06/28/24	
1893	**1.6.1.1**	**DAQ Software**	**11/01/18**	**03/15/24**	
1894	**1.6.1.1.1**	**Interface to OM Sensors**	**11/01/18**	**01/08/24**	
1895	*1.6.1.1.1*	*DAQ-OM Interface Design*	*11/01/18*	*05/23/19*	
1896	*1.6.1.1.2*	*DAQ-OM Interface Documented*	*05/24/19*	*05/24/19*	*1895*
1897	*1.6.1.1.3*	*Testing minimal DAQ software tools developed for DVT testing*	*05/27/19*	*09/26/19*	*1896*
1898	*1.6.1.1.4*	*Testing minimal DAQ ready for sensor DVT testing*	*08/15/19*	*11/01/19*	
1899	*1.6.1.1.4.1*	*Define DAQ interface to FieldHub*	*08/15/19*	*11/01/19*	
1900	*1.6.1.1.5*	*Testing DAQ software implementation and testing for FATs*	*11/04/19*	*05/04/20*	*1899, 1897*
1901	*1.6.1.1.6*	*Testing DAQ software ready for FAT testing on DEgg*	*05/05/20*	*05/05/20*	*1900*
1902	*1.6.1.1.7*	*Extend DAQ testing software for all OM types (mDOM, pDOM)*	*05/06/20*	*03/22/21*	*1901*
1903	1.6.1.1.8	Support DAQ installation for all sensor testing	10/01/20	06/30/22	1902SS +106d
1904	1.6.1.1.9	Capture Upgrade high-level DAQ requirements	06/01/22	08/31/22	
1905	1.6.1.1.10	Review DAQ Operation plans for new modules	09/01/22	09/01/22	1904
1906	1.6.1.1.11	DAQ software implementation and testing for Production Systems	09/02/22	11/24/23	1905
1907	1.6.1.1.12	DAQ software ready for deployment including support for all new OMs	12/11/23	12/11/23	1906FS +10d
1908	1.6.1.1.13	DAQ software deployment at SPS	12/12/23	01/08/24	1907
1909	**1.6.1.2**	**Interface to Stand Alone calibration devices**	**11/01/20**	**03/15/24**	
1910	*1.6.1.2.1*	*DAQ-Calibraton device MMB Interface Design*	*11/01/20*	*05/15/21*	
1911	*1.6.1.2.2*	*DAQ-Calibration device MMB Interface Documented*	*04/16/21*	*04/16/21*	*1910*
1912	1.6.1.2.3	DAQ-Calibration MMB software implementation and testing for NTS	05/31/21	03/15/22	1911FS +30d
1913	1.6.1.2.4	NTS minimal DAQ ready for calibration device testing at NTS	03/16/22	03/16/22	1912
1914	1.6.1.2.5	Support DAQ installation for NTS calibration device testing	09/15/21	03/01/24	
1915	1.6.1.2.6	DAQ-Calibration device software implementation and testing for Production Systems	02/01/23	02/15/24	1913FS +229d
1916	1.6.1.2.7	DAQ software ready for deployment including support for all new Calibration devices	02/16/24	02/16/24	1915
1917	1.6.1.2.8	DAQ for calibration devices software deployment at SPS	02/19/24	03/15/24	1916
1918	**1.6.1.2**	**Experiment Control**	**06/01/18**	**03/14/24**	
1919	**1.6.1.2.1**	**Interface to OM sensors**	**06/01/18**	**02/09/24**	
1920	*1.6.1.2.1.1*	*Experiment control design for FAT testing*	*06/01/18*	*11/01/19*	
1921	*1.6.1.2.1.2*	*~~ExpControl- OM Sensor software Interface Documented~~*	*~~11/04/19~~*	*~~11/04/19~~*	*1920*
1922	*1.6.1.2.1.3*	*Minimal ExpControl for sensor testing development*	*06/19/19*	*10/21/19*	
1923	*1.6.1.2.1.4*	*Minimal ExpControl ready for sensor testing ready*	*10/22/19*	*10/22/19*	*1922*
1924	*1.6.1.2.1.5*	*Testing ExpControl software implementation and testing for FATs*	*10/23/19*	*04/22/20*	*1923*
1925	*1.6.1.2.1.6*	*Testing ExpControl software ready for FAT testing for DEgg*	*04/23/20*	*04/23/20*	*1924*
1926	*1.6.1.2.1.7*	*Extend testing ExpControl software to all OM types (mDOM, pDOM)*	*04/24/20*	*03/10/21*	*1925*
1927	1.6.1.2.1.8	Support ExpControl installation for sensor testing	10/01/20	06/30/22	
1928	1.6.1.2.1.9	Capture requirements for ExpControl - Upgrade OM	06/01/22	08/31/22	
1929	1.6.1.2.1.10	Review Experiment Control - Upgrade plans for new modules	09/15/22	09/15/22	1928FS +10d
1930	1.6.1.2.1.11	ExpControl-OM software Implementation and testing for Production System	09/16/22	12/08/23	1929
1931	1.6.1.2.1.12	ExpCont system for deployment - OM sensors support ready	01/12/24	01/12/24	1930FS +24d
1932	1.6.1.2.1.13	ExpControl deployment at SPS	01/15/24	02/09/24	1931
1933	**1.6.1.2.2**	**Interface to Stand Alone Calibration Devices**	**06/27/21**	**03/14/24**	
1934	1.6.1.2.2.1	Interface Design to Calibration Devices (ExpControl, Config, Calib)	06/27/21	12/09/21	
1935	1.6.1.2.2.2	ExpControl- Calibration Devices software Interface Documented	12/10/21	12/10/21	1934
1936	1.6.1.2.2.3	ExpControl - Calibration devices software Implementation and testing for NTS	12/13/21	09/12/22	1935
1937	1.6.1.2.2.4	NTS Minimal ExpControl ready for NTS calibration devices testing	09/13/22	09/13/22	1936
1938	1.6.1.2.2.5	Support ExpControl installation for NTS calibration sensor testing	09/14/22	02/14/24	1937
1939	1.6.1.2.2.6	ExpControl-Calibration devices software Implementation and testing for Production System	01/31/23	02/14/24	1938FF
1940	1.6.1.2.2.7	ExpCont system for deployment - Calibration devices support ready	02/15/24	02/15/24	1939
1941	1.6.1.2.2.8	ExpControl deployment at SPS	02/16/24	03/14/24	1940
1942	**1.6.1.3**	**Online Filtering**	**12/07/21**	**03/27/24**	
1943	1.6.1.3.1	Specify Online Filter Req'mts (New sensors / Calib Devices)	12/07/21	05/30/22	
1944	1.6.1.3.2	Design Filter Sys for unified DAQ readout of ALL sensors& Calib Devices	05/31/22	08/30/22	1943
1945	1.6.1.3.3	Review Online Filtering - Upgrade plans for new modules	08/31/22	08/31/22	1944
1946	1.6.1.3.4	Implement and testing of filtering SW for prod. systems	09/01/22	01/18/24	1945
1947	1.6.1.3.5	New Online Filter Sys for SPS (readout New Sensors& Calib Devices	01/19/24	01/19/24	1946
1948	1.6.1.3.6	New Online Filter Sys Deployment at SPS	02/29/24	03/27/24	1947FS +28d
1949	**1.6.1.4**	**OM Software**	**12/06/18**	**05/31/24**	
1950	*1.6.1.4.1*	*Develop OM hardware-software high-level design*	*12/06/18*	*01/15/19*	
1951	*1.6.1.4.2*	*Develop OM software development environment allowing cross-compilation on all OM types*	*01/16/19*	*04/12/19*	*1950*
1952	**1.6.1.4.3**	**OM testing software app**	**01/15/19**	**10/31/22**	
1953		*Parent Duration Buffer*	*01/15/19*	*12/31/19*	
1954	*1.6.1.4.3.1*	*Capture design requirements for OM testing app for DVT testing*	*01/16/19*	*03/04/19*	*1950*
1955	*1.6.1.4.3.2*	*Software design and prototyping of OM testing app*	*03/04/19*	*07/09/19*	
1956	*1.6.1.4.3.2.1*	*Specify and implement interfaces from MCU to In-OM devices*	*03/04/19*	*07/09/19*	
1957	*1.6.1.4.3.2.2*	*Specify and implanent interface to from MCU to ICM*	*03/04/19*	*05/22/19*	*1956SS*
1958	*1.6.1.4.3.3*	*Develop and test OM testing app for DV testing*	*05/01/19*	*10/21/19*	
1959	*1.6.1.4.3.4*	*OM testing app for DV testing ready*	*10/22/19*	*10/22/19*	*1958*
1960	*1.6.1.4.3.4.1*	*Capture design requirements for FAT testing OM software*	*10/23/19*	*01/22/20*	*1959*
1961	*1.6.1.4.3.5*	*Develop and test OM testing app for FAT testing*	*01/23/20*	*06/25/20*	*1960*
1962	*1.6.1.4.3.6*	*OM testing app for FAT testing ready*	*06/26/20*	*06/26/20*	*1961*
1963	*1.6.1.4.3.7*	*Extend OM testing app for mDOM, pDOM devices*	*06/29/20*	*11/27/20*	*1962*
1964	1.6.1.4.3.8	Support OM testing app thru FAT testing cycles	11/30/20	05/19/22	1963
1965	1.6.1.4.3.9	Develop SPAT testing software	08/31/22	10/31/22	1964FS +73d
1966	*1.6.1.4.4*	*OM calibration software app*	*02/03/20*	*01/04/21*	
1967	*1.6.1.4.4.1*	*Capture design requirements for OM calibration collection app*	*02/03/20*	*03/13/20*	

	WBS	Task Name	Start Date	End Date	Predecessor WBS
1968	*1.6.1.4.4.2*	*Software design and prototyping of OM data calibration app*	*03/16/20*	*05/01/20*	*1967*
1969	*1.6.1.4.4.3*	*Develop and test OM data calibration app*	*05/04/20*	*01/01/21*	*1968*
1970	*1.6.1.4.4.4*	*OM data calibration app ready for use*	*01/04/21*	*01/04/21*	*1969*
1971	**1.6.1.4.5**	**OM data collection app**	**12/01/20**	**05/31/24**	
1972	*1.6.1.4.5.1*	*xDOMapp design development*	*12/01/20*	*10/15/20*	
1973	1.6.1.4.5.2	xDOMapp software and firmware design review	10/29/21	10/29/21	1972FS +9d
1974	1.6.1.4.5.3	Prototype xDOMapp development and testing at NTS	11/01/21	01/14/22	1973
1975	1.6.1.4.5.4	Software design and prototyping of OM final data collection app	06/15/22	08/31/22	
1976	1.6.1.4.5.5	Review OM data collection app in detector operations	09/13/22	09/13/22	1975FS +8d
1977	1.6.1.4.5.6	Develop and test OM data collection app	09/14/22	06/19/23	1976
1978	1.6.1.4.5.7	OM data collection app ready for use at SPS	07/06/23	07/06/23	1977FS +12d
1979	1.6.1.4.5.8	Support xDOMapp through SPAT testing and deployment	12/01/22	05/31/24	
1980	**1.6.1.4.6**	**MMB support software**	**06/01/21**	**02/14/24**	
1981	*1.6.1.4.6.1*	*Develop and test MMB software package on prototype MMB*	*06/01/21*	*10/28/21*	
1982	*1.6.1.4.6.2*	*Review MMB xDOMapp design*	*11/01/21*	*11/01/21*	*1981*
1983	1.6.1.4.6.3	Complete MMB software support package for calibration devices	05/13/22	09/13/22	1982FS +138d
1984	1.6.1.4.6.4	MMB support in xDOMapp ready for calibration device testing at NTS	09/14/22	09/14/22	1983
1985	1.6.1.4.6.5	Support MMB-xDOMapp software for calibration devices	09/29/22	02/14/24	1984FS +10d, 1977
1986	**1.6.1.5**	**FieldHub Software**	**01/01/21**	**05/11/23**	
1987	1.6.1.5.1	maintenance of mini-FieldHub server software for FAT	01/01/21	12/31/21	
1988	*1.6.1.5.2*	*development and testing of FieldHub SBC OS and toolchain*	*06/01/21*	*07/30/21*	
1989	1.6.1.5.3	modification of FieldHub server software to support full FieldHub functionality	01/14/22	04/29/22	1987FS +9d, 1988
1990	1.6.1.5.4	review Field Hub software in Upgrade detector operations	09/15/22	09/15/22	1989FS +98d
1991	1.6.1.5.5	development of FieldHub monitoring software (IceCube Live interface)	09/29/22	11/28/22	1990, 1985SS
1992	1.6.1.5.6	development of FieldHub / pDAQ StringHub interface layer	11/14/22	05/11/23	1991FS -11d
1993	**1.6.1.6**	**mDOM - PSU**	**12/17/18**	**07/18/22**	
1994	**1.6.1.6.1**	**mDOM DAQ Electronics**	**12/17/18**	**09/30/21**	
1995	*1.6.1.6.1.1*	*Preliminary design phase*	*12/17/18*	*03/22/19*	
1996	*1.6.1.6.1.1.1*	*Build 4 ch. analog-front end (AFE) demonstrator board*	*12/17/18*	*02/22/19*	
1997	*1.6.1.6.1.1.2*	*Characterization of AFE performance*	*02/25/19*	*03/22/19*	*1996*
1998	*1.6.1.6.1.2*	*mDOM Mainboard firmware development*	*01/02/20*	*09/30/21*	
1999	*1.6.1.6.1.3*	*Pulsed Laser Test Stand for Design verification*	*06/07/21*	*07/02/21*	
2000	*1.6.1.6.1.4*	*Tender and procurement (series production)*	*04/22/20*	*01/26/21*	
2001	1.6.1.6.1.5	FAT Test Production	07/26/21	09/03/21	1999FS +15d, 2000
2002	*1.6.1.6.2*	*D-Egg - PSU*	*05/01/19*	*03/31/21*	
2003	*1.6.1.6.2.1*	*Firmware development*	*05/01/19*	*03/31/21*	
2004	*1.6.1.6.2.2*	*Testing*	*12/19/19*	*02/26/20*	
2005	*1.6.1.6.3*	*Integrated D-Egg - PSU*	*11/11/19*	*01/03/20*	
2006	*1.6.1.6.3.1*	*Design Verification Test*	*11/11/19*	*01/03/20*	
2007	*1.6.1.6.3.2*	*Integrated D-Egg Final Design Review*	*11/25/19*	*11/25/19*	
2008	**1.6.1.6.4**	**PDOM DAQ Electronics - PSU**	**03/01/19**	**07/18/22**	
2009	*1.6.1.6.4.1*	*Firmware*	*03/01/19*	*07/18/19*	
2010	*1.6.1.6.4.2*	*Testing - Rev2*	*07/19/19*	*10/31/19*	*2009*
2011	1.6.1.6.4.3	Testing - Rev3	11/12/21	12/23/21	2010FS +530d
2012	1.6.1.6.4.4	Adapt D-Egg Firmware to PDOM Mainboard and verify design	10/01/21	07/15/22	2010FS +500d, 200
2013	1.6.1.6.4.5	PDOM Final Design Review	07/18/22	07/18/22	2012
2014	**1.6.1.6.5**	**Special Devices - PSU**	**05/01/20**	**01/03/22**	
2015	*1.6.1.6.5.1*	*R&D module mission review*	*05/01/20*	*05/01/20*	
2016	1.6.1.6.5.2	R&D modules deployment readiness review	01/03/22	01/03/22	
2017	**1.6.2**	**Offline Systems**	**01/01/19**	**06/28/24**	
2018	1.6.2.0	L3 Task Management	10/01/20	06/28/24	
2019	**1.6.2.1**	**Core Software**	**12/24/19**	**05/01/23**	
2020	*1.6.2.1.1*	*Capture Required changes to IceTray software packages*	*12/24/19*	*01/27/20*	
2021	*1.6.2.1.2*	*Design updates to IceTray (support new optical sensor Data/Config/Calib Info)*	*01/28/20*	*03/02/20*	*2020*
2022	*1.6.2.1.3*	*Develop and test Updates to IceTray (support new optical sensor Data/Config/Calib Info)*	*03/03/20*	*10/28/21*	*2021*
2023	1.6.2.1.4	Core Software Release Supporting Upgrade	11/01/21	11/01/21	2022
2024	1.6.2.1.5	Extend Core Software to include support for new hardware readouts	03/01/23	04/28/23	2023FS +346d
2025	1.6.2.1.6	Core Software Release for hardware readout support ready	05/01/23	05/01/23	2024
2026	**1.6.2.2**	**Reconstruction**	**05/12/20**	**11/01/21**	
2027	*1.6.2.2.1*	*Capture Requirements for reconstruction software updates*	*05/12/20*	*06/15/20*	
2028	*1.6.2.2.2*	*Design changes to IceCube Event Reconstruction Algorithms (use data from New Sensors&Calibr Info)*	*06/16/20*	*07/20/20*	*2027*
2029	*1.6.2.2.3*	*Develop and test Updates to IceCube Event Reconstruction Algorithms (use data from New Sensors&Calibr Info)*	*07/21/20*	*10/28/21*	*2028*
2030	1.6.2.2.4	Reconstruction tools Release Supporting Upgrade	11/01/21	11/01/21	2029
2031	**1.6.2.3**	**Tools and Infrastructure**	**01/01/19**	**06/27/24**	
2032	*1.6.2.3.1*	*Evaluate readiness of Current IceCube SW Development Infrastructure to Support IceCube Upgrade SW Activities&TimeScales*	*01/01/19*	*03/29/19*	
2033	*1.6.2.3.2*	*Upgrade IceCube SW Development Infrastructure to support Upgrade activities*	*04/01/19*	*07/30/19*	*2032*
2034	1.6.2.3.3	Support Upgrade SW Development environment and infrastructure	07/31/19	06/27/24	2033
2035	**1.6.3**	**Simulation Software**	**11/01/18**	**06/28/24**	
2036	1.6.3.0	L3 Task Management	10/01/20	06/28/24	
2037	**1.6.3.1**	**Electronic readout and digitization simulation**	**05/28/20**	**05/29/24**	
2038	*1.6.3.1.1*	*Capture requirements for Optical Sensor Simulation Tools based on Final Designs*	*05/28/20*	*07/01/20*	
2039	*1.6.3.1.2*	*Design Optical Sensor Simulation Tools based on Final Designs*	*07/02/20*	*08/06/20*	*2038*
2040	**1.6.3.1.3**	**Version 1 - as designed**	**08/07/20**	**11/01/21**	
2041	1.6.3.1.3.1	Implementation and testing	08/07/20	10/29/21	2039
2042	1.6.3.1.3.2	Release v1 simulation tools	11/01/21	11/01/21	2041
2043	**1.6.3.1.4**	**Version 2 - as built**	**10/30/23**	**05/29/24**	
2044	1.6.3.1.4.1	Capture Improvements of OM device Simulation Tools (w/testing, deployment&initial data collection)	10/30/23	01/31/24	2042FS +519d
2045	1.6.3.1.4.2	Implementation and testing	02/01/24	05/28/24	2044
2046	1.6.3.1.4.3	Release v2 simulation tools	05/29/24	05/29/24	2045
2047	**1.6.3.2**	**Calibration Device simulation**	**03/01/22**	**05/29/24**	
2048	1.6.3.2.1	Capture requirements for Calibration device Simulation Tools based on Final Designs	03/01/22	04/04/22	
2049	1.6.3.2.2	Design Calibration Device Simulation Tools based on Final Designs	04/05/22	05/10/22	2048

	WBS	Task Name	Start Date	End Date	Predecessor WBS
2050	**1.6.3.2.3**	**Version 1 - as designed**	**05/11/22**	**08/23/22**	
2051	1.6.3.2.3.1	Implementation and testing	05/11/22	08/22/22	2049
2052	1.6.3.2.3.2	Release v1 calibration devicesimulation tools	08/23/22	08/23/22	2051
2053	**1.6.3.2.4**	**Version 2 - as built**	**10/30/23**	**05/29/24**	
2054	1.6.3.2.4.1	Capture Improvements of Calibration device Simulation Tools (w/testing, deployment&initial data collection)	10/30/23	01/31/24	2052FS +308d
2055	1.6.3.2.4.2	Implementation and testing	02/01/24	05/28/24	2054
2056	1.6.3.2.4.3	Release v2 calibration device simulation tools	05/29/24	05/29/24	2055
2057	**1.6.3.3**	**Simulation production**	**11/01/18**	**05/29/24**	
2058	*1.6.3.3.1*	*Initial Production of simulation samples for Design Studies*	*11/01/18*	*01/31/19*	
2059	*1.6.3.3.2*	*Design study simulation sample ready*	*02/01/19*	*02/01/19*	*2058*
2060	1.6.3.3.3	Produce"as designed" Simulation Samples (for analysis tool development)	11/01/21	01/21/22	
2061	1.6.3.3.4	"As designed" simulation sample ready	01/24/22	01/24/22	2060
2062	1.6.3.3.5	Produce"As -Built"Simulation Samples for Data Quality Verification Studies	04/29/24	05/28/24	2061FS +589d
2063	1.6.3.3.6	"As Built" simulation sample ready	05/29/24	05/29/24	2062
2064	**1.6.4**	**Computing Infrastructure**	**02/01/19**	**06/28/24**	
2065	1.6.4.0	L3 Task Management	10/01/20	06/28/24	
2066	**1.6.4.1**	**SPTS/NTS computing needs**	**02/01/19**	**06/28/24**	
2067	**1.6.4.1.1**	**NTS**	**02/01/19**	**06/28/24**	
2068	*1.6.4.1.1.1*	*Specify Requirements/Design NTS Computing Sys*	*02/01/19*	*02/28/19*	
2069	*1.6.4.1.1.2*	*Procure NTS Computing Hardware*	*03/01/19*	*03/29/19*	*2068*
2070	*1.6.4.1.1.3*	*Buildout NTS Computing System*	*04/01/19*	*05/31/19*	*2069*
2071	*1.6.4.1.1.4*	*NTS computing system complete*	*06/03/19*	*06/03/19*	*2070*
2072	1.6.4.1.1.5	Refresh NTS HW to match SPS	04/01/23	04/28/23	
2073	1.6.4.1.1.6	Support NTS System	09/15/19	06/28/24	
2074	*1.6.4.1.2*	*SPTS*	*01/06/20*	*10/04/21*	
2075	*1.6.4.1.2.1*	*Design/Specify SPTS Ext req'd to support Upgrade Activities*	*01/06/20*	*06/04/21*	
2076	*1.6.4.1.2.2*	*Procure Computing Hardware for SPTS Ext*	*06/05/21*	*08/04/21*	*2075*
2077	*1.6.4.1.2.3*	*Buildout SPTS Computing System for Ext(s)*	*08/05/21*	*10/01/21*	*2076*
2078	*1.6.4.1.2.4*	*SPTS computing system complete*	*10/04/21*	*10/04/21*	*2077*
2079	**1.6.4.2**	**SPS computing needs**	**05/01/19**	**01/17/24**	
2080	*1.6.4.2.1*	*Specify space and power needs for IDF design process*	*05/01/19*	*06/28/19*	
2081	1.6.4.2.9	Design/Specify SPS Computing Sys Extensions for Upgrade	02/01/23	04/03/23	
2082	1.6.4.2.10	Procure Computing Sys for SPSExt	04/04/23	05/02/23	2081
2083	1.6.4.2.11	Buildout and test SPS systems in North	05/03/23	07/04/23	2082
2084	1.6.4.2.12	Ship Computing Sys for SPS Ext to Pole	07/05/23	08/03/23	2083
2085	1.6.4.2.13	Computing HW for SPS Ext Arrival at NPX	12/13/23	12/13/23	
2086	1.6.4.2.14	Installation at Pole	12/14/23	01/16/24	2085
2087	1.6.4.2.15	SPS computing system complete	01/17/24	01/17/24	2086
2088	**1.6.4.3**	**Distributed computing needs**	**09/20/21**	**01/25/22**	
2089	1.6.4.3.1	Support Upgrade Distributed Mass Production	11/03/21	01/25/22	2090FS +10d
2090	*1.6.4.3.2*	*Support Distributed Mass Production for"As Built" Detector Verification*	*09/20/21*	*10/19/21*	
2091	**1.6.5**	**Upgrade String Commissioning**	**01/01/23**	**09/28/26**	
2092	1.6.5.0	L3 Task Management	01/01/23	09/28/26	
2093	**1.6.5.1**	**Upgrade OM module commissioning**	**06/01/23**	**04/02/24**	
2094	1.6.5.1.1	Develop and review OM module commissioning plan	06/01/23	08/01/23	
2095	1.6.5.1.2	Review OM module commissioning plan	08/02/23	08/02/23	2094
2096	1.6.5.1.3	Develop software needed for OM commissioning	08/03/23	10/03/23	2095
2097	1.6.5.1.4	Commission newly deployed OMs following deployment	01/01/24	04/01/24	2096FS +63d
2098	1.6.5.1.5	Deliver commissioned OMs to detector operations team for integration	04/02/24	04/02/24	2097
2099	**1.5.5.2**	**Upgrade calibration device commissioning**	**07/01/23**	**04/02/24**	
2100	1.6.5.2.1	Develop and review calibration device commissioning plan	07/01/23	09/01/23	
2101	1.6.5.2.2	Review calibration device commissioing plan	09/04/23	09/04/23	2100
2102	1.6.5.2.3	Develop software needed for calibration device commissioning	09/05/23	11/03/23	2101
2103	1.6.5.2.4	Commission newly deployed calibration devices following deployment	01/01/24	04/01/24	2102FS +40d
2104	1.6.5.2.5	Deliver commissioned calibration devices to detector operations team for integration	04/02/24	04/02/24	2103
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