

## 7. References

- (1) Hydraulic Analysis
- (2) Surge Analysis
- (3) Calculations for Wastewater Treatment Facilities
- (4) Outline Design Drawing



(1) Hydraulic Analysis





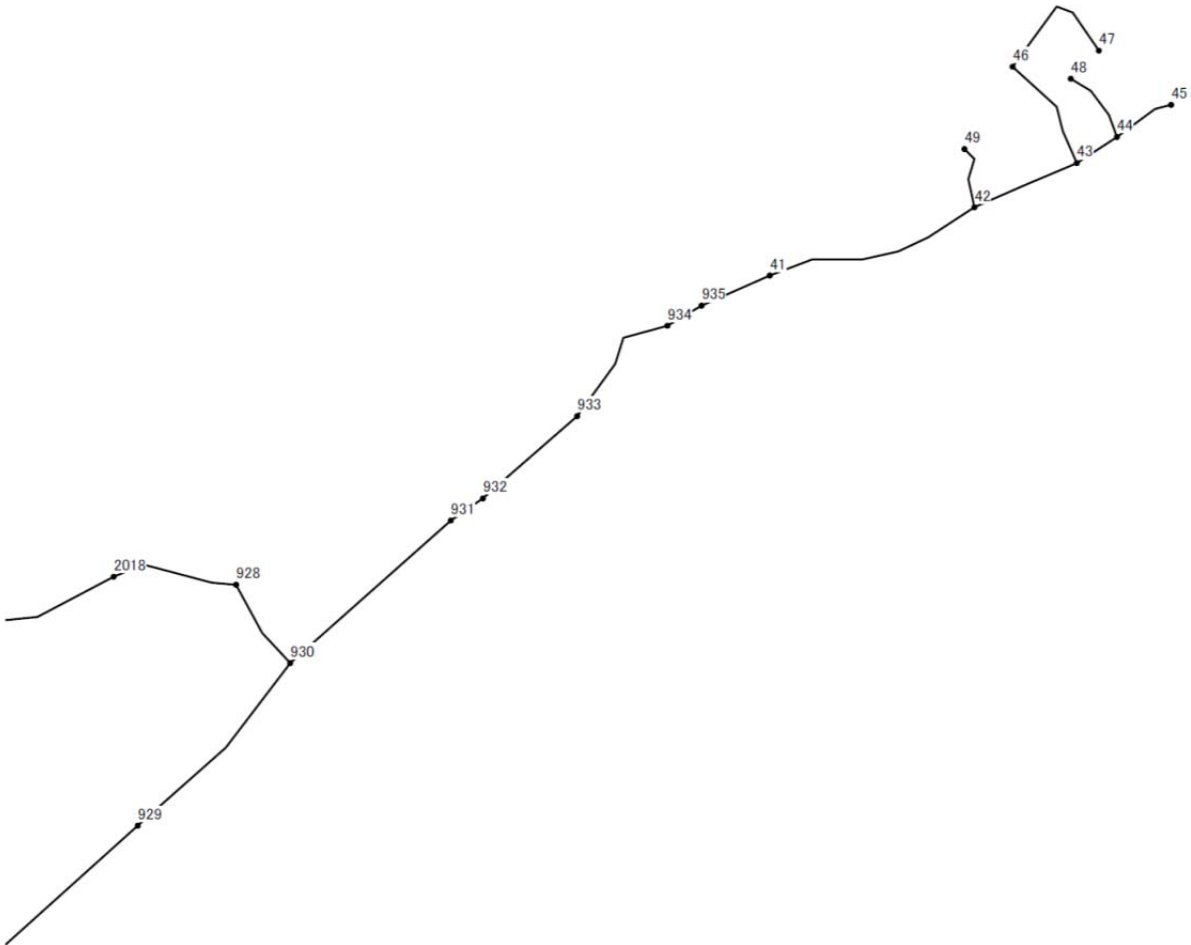
Hydraulic analysis conditions

Item	Condition	Comments
Calculation	Hazen Williams Equation $H=10.666 \times C^{-1.85} \times D^{-4.87} \times Q^{1.85} \times L$	H: Friction Loss (m) C: Pipe Roughness Coefficient (C value) D: Internal Diameter (m) Q: Flow Rate (m <sup>3</sup> /s) L: Pipe Length (m)
C Value	110	JWWA (2012) Design Criteria for Waterworks Facilities
Water demand	Day maximum	Lao standard: (MPWT (2009) Management and Technical Guidelines Water Supply)

General Map for hydraulic calculation



Map (Enlarged View 1/5)



Map (Enlarged View 2/5)



Map (Enlarged View 3/5)



Map (Enlarged View 4/5)





## Node data

Node ID	Elevation (m)	Demand (m3/d)	Head (m)	Pressure (m)
1	260.1	0	286.76	26.6
2	314.6	0	-	-
3	314.6	0	-	-
4	396.6	0	-	-
5	262.3	0	294.37	32.1
6	298.6	0	368.25	69.6
7	294.6	0	-	-
8	294.7	0	295.67	1.0
10	270.0	334	297.37	27.3
16	261.9	334	297.79	35.8
17	281.8	334	298.58	16.8
18	262.3	334	298.56	36.2
19	262.3	0	294.56	32.3
23	288.8	0	307.74	19.0
24	289.8	0	372.20	82.4
25	304.6	0	-	-
27	350.0	0	-	-
28	311.8	0	-	-
29	289.8	0	311.62	21.8
31	275.5	0	304.05	28.6
33	263.2	0	304.05	40.8
34	261.6	0	304.05	42.4
35	259.5	0	304.05	44.6
36	259.3	0	286.48	27.2
37	260.1	0	296.32	36.3
38	258.5	0	296.60	38.1
39	289.8	376	311.71	21.9
40	267.0	133	307.35	40.3
41	267.2	0	292.82	25.6
42	285.3	0	292.28	7.0
43	276.2	0	292.10	15.9
44	276.2	0	292.08	15.9
45	280.3	131	292.07	11.8
46	264.6	131	289.47	24.9
47	264.6	131	288.62	24.0
48	276.2	131	292.04	15.8
49	274.6	131	292.05	17.4
51	260.5	0	316.12	55.7
52	260.5	50	314.54	54.1
53	260.5	100	313.54	53.1
58	268.7	62	311.17	42.5
59	281.4	62	310.93	29.5
60	268.7	62	311.04	42.4
61	268.7	62	310.37	41.7
62	268.7	62	309.88	41.2
63	279.4	62	309.60	30.2
64	268.7	62	309.36	40.7
65	279.4	62	306.33	26.9
66	279.4	62	306.47	27.0
67	279.4	62	305.78	26.4

Node ID	Elevation (m)	Demand (m3/d)	Head (m)	Pressure (m)
68	272.0	0	310.86	38.9
69	289.9	80	309.59	19.7
70	289.9	100	309.15	19.2
71	289.9	0	309.58	19.7
72	289.9	50	309.46	19.5
73	305.5	0	366.71	61.2
74	314.6	50	365.51	50.9
75	324.6	100	364.62	40.0
76	324.6	100	363.77	39.2
78	261.9	0	293.50	31.6
79	261.9	0	293.78	31.8
80	264.5	200	302.24	37.8
84	315.2		370.26	55.1
99	259.7	0	295.25	35.6
101	261.2	137	286.48	25.3
102	261.1	137	286.48	25.4
103	262.0	137	286.51	24.5
104	260.6	137	286.53	25.9
105	260.1	137	286.76	26.6
106	255.2	137	286.62	31.4
107	259.3	137	286.53	27.2
108	260.3	137	286.52	26.2
109	259.2	137	286.50	27.3
110	255.1	137	286.60	31.5
111	256.5	137	286.53	30.0
112	256.9	137	286.50	29.6
113	259.3	137	286.48	27.2
117	265.2	0	295.92	30.8
119	265.2	0	295.91	30.7
140	272.8	191	302.81	30.0
141	266.3	0	294.60	28.3
201	261.3	137	286.78	25.5
202	261.5	137	286.87	25.4
203	260.7	159	287.15	26.5
204	256.2	137	286.93	30.7
205	263.3	237	287.62	24.3
208	258.7	137	286.67	28.0
209	256.8	137	286.83	30.0
210	257.3	137	286.67	29.3
211	258.0	159	286.94	28.9
212	260.4	137	286.86	26.5
301	256.9	159	287.03	30.2
302	262.5	159	287.14	24.7
303	262.5	159	287.08	24.6
304	261.0	114	286.97	26.0
305	260.7	114	286.96	26.3
306	261.4	215	286.85	25.4
307	260.4	78	287.11	26.7
308	260.0	78	287.46	27.5
309	261.0	78	287.56	26.6



Node ID	Elevation (m)	Demand (m3/d)	Head (m)	Pressure (m)
310	263.3	237	288.30	25.0
313	261.0	114	286.98	26.0
314	258.6	114	286.77	28.2
333	324.6	0	-	-
401	258.8	133	295.06	36.2
402	259.7	133	295.08	35.4
403	263.7	133	295.11	31.4
404	260.4	215	299.17	38.8
405	259.7	215	295.07	35.4
501	260.6	133	295.26	34.7
503	259.3	133	295.25	36.0
504	264.1	237	290.06	26.0
505	264.1	237	288.83	24.7
508	256.9	237	289.94	33.1
516	264.1	0	290.20	26.1
517	264.6	0	290.20	25.6
602	258.3	191	294.55	36.2
603	258.1	223	296.11	38.0
604	257.9	215	296.80	38.9
605	258.5	191	296.70	38.2
606	260.1	215	296.32	36.3
607	259.4	191	294.55	35.1
608	255.8	191	295.11	39.3
609	258.5	191	296.60	38.1
610	258.5	191	296.21	37.7
611	260.4	191	294.60	34.2
612	256.8	191	295.16	38.4
613	258.3	191	292.51	34.2
614	260.4	191	293.83	33.4
615	258.3	191	292.04	33.7
616	258.5	191	295.54	37.0
617	258.5	191	296.84	38.3
618	260.4	191	294.63	34.2
619	260.3	191	295.49	35.2
620	255.8	191	295.29	39.5
701	260.4	215	299.48	39.1
702	261.6	235	303.58	41.9
704	259.5	191	299.31	39.8
801	259.5	235	303.58	44.1
802	263.7	235	295.25	31.6
807	264.8	235	295.17	30.4
808	261.9	133	295.28	33.4
809	260.4	235	292.73	32.4
810	260.4	235	296.02	35.6
811	258.0	235	296.00	38.0
812	260.5	235	296.01	35.5
813	264.2	313	296.05	31.9
814	264.5	313	295.60	31.1
815	261.4	133	295.24	33.9
816	273.5	334	295.38	21.9

Node ID	Elevation (m)	Demand (m3/d)	Head (m)	Pressure (m)
817	259.2	133	295.35	36.2
818	260.6	133	295.28	34.7
819	265.2	133	295.15	29.9
820	260.7	133	295.64	35.0
821	263.2	235	303.84	40.6
822	272.3	313	304.39	32.1
823	284.5	113	304.39	19.9
824	272.4	334	296.66	24.3
825	274.4	0	299.38	25.0
826	261.9	0	300.78	38.9
827	261.5	520	300.70	39.2
828	269.3	0	314.78	45.5
829	261.9	0	301.01	39.1
833	261.9	235	295.27	33.4
834	258.0	0	292.55	34.6
835	261.9	0	291.47	29.6
836	275.5	313	304.64	29.1
901	260.8	85	294.10	33.3
902	261.7	4306	294.56	32.8
903	261.1	0	296.98	35.9
904	265.7	0	296.98	31.3
905	263.1	0	296.98	33.9
906	260.8	85	294.03	33.2
907	262.3	85	293.76	31.4
908	262.3	85	293.71	31.4
909	256.8	85	293.63	36.9
910	260.0	85	293.52	33.5
911	267.1	85	293.30	26.2
912	267.1	85	293.22	26.2
913	267.1	85	293.20	26.1
914	260.6	85	293.19	32.6
915	260.6	85	293.19	32.6
916	262.0	0	263.20	31.2
917	261.6	0	293.26	31.7
918	261.7	0	293.62	31.9
919	261.5	0	293.81	32.3
920	261.5	0	293.91	32.4
921	260.5	0	294.16	33.6
922	261.3	1000	294.68	33.4
924	261.2	142	301.3	40.0
925	263.8	0	301.3	37.4
928	273.7	3195	296.06	22.5
929	272.0	1688	301.31	29.3
930	283.1	203	297.25	14.2
931	269.5	155	295.01	25.5
932	268.0	155	294.74	26.8
933	276.7	157	293.88	17.2
934	267.2	155	293.13	25.9
935	267.2	279	292.97	25.7
1001	260.6	1337	290.76	30.2

Node ID	Elevation (m)	Demand (m3/d)	Head (m)	Pressure (m)
1002	258.0	1337	289.18	31.2
1003	261.5	80	289.10	27.6
1004	260.5	80	288.17	27.7
1005	258.8	1337	288.85	30.0
1006	264.1	80	289.09	25.0
1007	259.0	482	282.89	23.9
1008	269.6	0	289.09	19.5
2000	268.1	414	324.4	56.2
2001	258.8	414	324.3	65.5
2002	256.9	414	324.3	67.3
2003	301.7	473	323.0	21.3
2004	298.6	0	320.9	22.2
2005	284.6	473	319.6	35.0
2006	264.1	767	317.5	53.4
2007	256.7	460	316.1	59.4
2008	260.1	460	314.9	54.8
2009	261.4	460	314.3	52.9
2011	261.5	0	317.5	55.9
2012	261.7	383.5	317.0	55.3
2013	260.5	383.5	316.9	56.4
2014	260.5	0	316.9	56.4
2015	261.1	0	294.57	33.5
2016	266.3	0	294.60	28.3
2017	263.8	0	302.83	39.0
2018	262.2	0	295.85	33.7
3001	259.0	0	286.49	27.5
3002	255.8	0	286.52	30.7
3003	255.2	0	287.02	31.8
3004	254.6	0	286.49	31.9
3005	256.8	0	286.48	29.7
3008	258.9	0	301.90	43.0
3009	265.2	133	295.26	30.0
3010	264.8	0	295.27	30.5
2010.57	264.0	0	313.1	49.1

Link data

Pipe ID	Node start	Node end	Length (m)	Diameter (mm)	C value	Status	Flow(m <sup>3</sup> /day)	Velocity (m/s)
0	924	925	520.4	200	110	Open	0	0
1	333	2000	1119.3	300	110	Open	1,242	0.2
2	2000	2001	636.6	300	110	Open	828	0.14
3	2001	2002	728.3	300	110	Open	414	0.07
4	333	2003	528.6	300	110	Open	4,860	0.8
5	2003	2004	870	300	110	Open	4,387	0.72
6	2004	2005	506.5	300	110	Open	4,387	0.72
7	2005	2006	1026.1	300	110	Open	3,914	0.64
8	2006	2007	271.8	200	110	Open	2,230	0.82
9	2007	2008	356.6	200	110	Open	1,770	0.65
10	2008	2009	352	200	110	Open	1,310	0.48
11	2009	2010_57	1380.6	200	110	Open	850	0.31
12	2006	2011	469.8	300	110	Open	917	0.15
13	2011	2012	471.2	200	110	Open	917	0.34
14	2012	2013	347.8	200	110	Open	534	0.2
15	2013	2014	275.3	200	110	Open	0	0
16	28	40	1161.4	400	120	Open	13,158	1.21
17	40	2017	1317.8	300	110	Open	5,214	0.85
18	2017	924	457.4	300	110	Open	5,214	0.85
19	924	903	1310.8	300	110	Open	5,072	0.83
20	903	904	338.5	200	110	Open	0	0
21	904	905	351.7	200	110	Open	0	0
22	903	902	739.3	300	110	Open	5,072	0.83
23	902	2015	199.1	150	110	Open	-58	0.04
24	902	19	595	200	110	Open	0	0
25	902	5	237.5	200	110	Open	824	0.3
26	5	901	330.5	200	110	Open	824	0.3
27	2015	141	1455.6	150	110	Open	-58	0.04
28	141	2016	246.5	150	110	Open	0	0
29	141	922	3141.3	150	110	Open	-58	0.04
30	922	2018	755.4	200	110	Open	-1,169	0.43
31	2018	928	582.9	250	110	Open	-1,169	0.28
32	928	930	442.2	300	110	Open	-4,364	0.71
33	40	929	977.9	300	120	Open	7,811	1.28
34	929	930	1030.6	300	120	Open	6,123	1
35	930	931	995.3	200	120	Open	1,556	0.57
36	931	932	171.7	200	130	Open	1,401	0.52
37	932	933	580.5	200	120	Open	1,246	0.46
38	933	934	640.6	200	120	Open	1,089	0.4
39	934	935	182.6	200	120	Open	934	0.34
40	901	906	111.5	200	110	Open	739	0.27
41	906	907	507.1	200	110	Open	654	0.24
42	907	908	112.8	200	110	Open	569	0.21
43	908	909	278.4	200	110	Open	484	0.18
44	909	910	501.7	200	110	Open	399	0.15
45	910	911	394.4	150	110	Open	314	0.21
46	911	912	273.9	150	110	Open	229	0.15
47	912	913	183	150	110	Open	144	0.09
48	913	914	300	150	110	Open	59	0.04
49	914	915	194.5	150	110	Open	-26	0.02
50	915	916	177.6	150	110	Open	-111	0.07
51	916	917	633.3	150	110	Open	-111	0.07
52	917	918	622.7	100	110	Open	-111	0.16
53	918	919	320.3	100	110	Open	-111	0.16
54	919	920	181.7	100	110	Open	-111	0.16
55	920	921	420	100	110	Open	-111	0.16
56	921	922	888.6	100	110	Open	-111	0.16
57	3005	101	126.7	150	110	Open	22	0.01
58	101	3004	77.2	150	110	Open	-96	0.06
59	3004	3001	102.8	150	110	Open	41	0.03

Pipe ID	Node start	Node end	Length (m)	Diameter (mm)	C value	Status	Flow(m3/day)	Velocity (m/s)
60	3005	3001	231.8	150	110	Open	-41	0.03
61	113	3005	157	150	110	Open	-18	0.01
62	3002	3004	288.8	150	110	Open	136	0.09
63	102	101	124	150	110	Open	19	0.01
64	113	102	169.6	150	110	Open	-14	0.01
65	103	3002	62.1	200	110	Open	-316	0.12
66	103	102	167.4	150	110	Open	170	0.11
67	112	113	170.9	150	110	Open	105	0.07
68	112	109	68.1	150	110	Open	-107	0.07
69	109	103	120.7	150	110	Open	-127	0.08
70	111	112	266	150	110	Open	135	0.09
71	111	107	58.9	150	110	Open	-17	0.01
72	107	108	112.6	150	110	Open	131	0.09
73	108	109	153.5	150	110	Open	117	0.08
74	108	104	131.7	150	110	Open	-123	0.08
75	104	103	154.6	150	110	Open	118	0.08
76	3003	3002	461.8	150	110	Open	452	0.3
77	105	104	303.4	150	110	Open	378	0.25
78	110	111	206.7	150	110	Open	255	0.17
79	106	107	198.1	150	110	Open	285	0.19
80	110	106	69.5	150	110	Open	-182	0.12
81	105	106	155	150	110	Open	418	0.27
82	3003	105	92.8	150	110	Open	754	0.49
83	301	204	374.9	150	110	Open	217	0.14
84	204	209	272.2	150	110	Open	252	0.16
85	209	210	221.3	150	110	Open	352	0.23
86	210	110	266.3	150	110	Open	210	0.14
87	210	208	36.4	150	110	Open	5	0
88	208	106	267.2	150	110	Open	186	0.12
89	204	211	88.8	150	110	Open	-172	0.11
90	211	212	276.9	150	110	Open	229	0.15
91	209	212	95.1	150	110	Open	-237	0.15
92	208	201	181.9	150	110	Open	-318	0.21
93	212	202	133.5	150	110	Open	-145	0.1
94	211	203	129.2	150	110	Open	-559	0.37
95	301	302	144.3	150	110	Open	-376	0.25
96	302	303	130.6	200	110	Open	631	0.23
97	303	313	265.3	200	110	Open	527	0.19
98	313	304	77.2	200	110	Open	342	0.13
99	314	304	109.1	80	110	Open	-114	0.26
100	313	306	172.7	80	110	Open	71	0.16
101	303	307	190.6	100	110	Open	-55	0.08
102	307	308	112.3	100	110	Open	-277	0.41
103	306	307	271.5	100	110	Open	-144	0.21
104	306	606	338.8	80	110	Closed	0	0
105	308	820	224.6	100	110	Closed	0	0
106	308	309	134.9	150	110	Open	-355	0.23
107	302	309	328.4	200	110	Open	-1,044	0.38
108	309	817	236	100	110	Closed	0	0
109	202	203	278.6	200	110	Open	-916	0.34
110	201	202	192.9	200	110	Open	-634	0.23
111	203	205	142.5	200	110	Open	-1,756	0.65
112	302	203	343.9	200	110	Open	-122	0.04
113	205	310	161.7	200	110	Open	-1,993	0.73
114	310	505	119.8	250	110	Open	-3,707	0.87
115	505	504	247.3	250	110	Open	-3,944	0.93
116	504	508	50.6	100	110	Open	237	0.35
120	517	516	76	350	110	Open	0	0
121	516	504	23.7	250	110	Open	4,418	1.04
122	516	3003	475.6	150	110	Open	1,207	0.79

Pipe ID	Node start	Node end	Length (m)	Diameter (mm)	C value	Status	Flow(m3/day)	Velocity (m/s)
123	504	503	263.1	250	110	Closed	0	0
124	516	835	678.5	350	110	Open	-5,625	0.68
125	503	501	256.4	200	110	Open	-151	0.06
126	808	818	123.5	250	110	Open	133	0.03
127	501	833	163.6	200	110	Open	-284	0.1
128	833	808	24.4	250	110	Open	-1,040	0.25
129	833	809	368.5	80	110	Open	235	0.54
130	808	810	221.6	200	110	Open	-1,761	0.65
131	835	834	576.6	350	110	Open	-5,625	0.68
132	833	807	215.1	150	110	Open	286	0.19
133	808	3010	209.2	250	110	Open	455	0.11
134	807	819	193.3	150	110	Open	126	0.08
135	503	99	130.4	250	110	Open	18	0
136	310	815	267.8	200	110	Closed	0	0
140	817	402	135.2	100	110	Open	213	0.31
141	817	815	282.7	150	110	Open	248	0.16
142	309	310	308.9	200	110	Open	-1,477	0.54
143	820	817	163.8	150	110	Open	594	0.39
144	820	405	122.8	80	110	Open	189	0.43
145	405	402	207.8	100	110	Open	-26	0.04
146	402	401	125	100	110	Open	54	0.08
147	401	403	135.9	100	110	Open	-79	0.12
148	403	819	182.5	150	110	Open	-212	0.14
149	3009	802	181.5	250	110	Open	235	0.06
150	819	815	318.5	150	110	Open	-219	0.14
151	810	17	526.8	200	110	Open	-2,164	0.8
152	810	811	448.6	200	110	Open	169	0.06
153	811	812	182	200	110	Open	-141	0.05
154	812	813	244	200	110	Open	-376	0.14
155	813	814	115.3	100	110	Open	313	0.46
156	813	824	523.1	200	110	Open	-1,002	0.37
157	824	816	288	100	110	Open	334	0.49
158	824	10	461.2	200	110	Open	-1,162	0.43
159	824	16	834.3	150	110	Open	-508	0.33
160	10	16	504.3	250	110	Open	-1,496	0.35
161	16	17	418.6	250	110	Open	-2,338	0.55
162	17	18	325.4	250	110	Open	334	0.08
163	17	825	502.1	350	110	Open	-5,170	0.62
164	825	826	878.5	350	110	Open	-5,170	0.62
165	826	829	141.4	350	110	Open	-5,170	0.62
166	829	827	222.6	150	110	Open	520	0.34
167	25	3008	1424.4	350	110	Open	5,690	0.68
168	3008	829	469	350	110	Open	5,690	0.68
169	2	828	103.2	350	110	Open	6,000	0.72
170	828	27	3021.8	350	110	Open	6,000	0.72
171	2	8	2500.8	250	110	Open	5,000	1.18
172	7	79	449.1	350	110	Open	5,625	0.68
173	834	78	508.4	350	110	Open	-5,625	0.68
174	78	79	153	350	110	Open	-5,625	0.68
175	4	24	3504.4	200	110	Open	2,629	0.97
176	24	84	609.2	300	110	Open	5,000	0.82
178	1005	1007	676.9	100	110	Open	482	0.71
179	1005	1002	766.1	150	110	Open	-276	0.18
180	1002	1003	1035.1	200	110	Open	240	0.09
181	1003	1004	993.7	80	110	Open	80	0.18
182	1003	1006	453.1	200	110	Open	80	0.03
183	1006	1008	667.4	100	110	Open	0	0
184	3	39	556.2	350	110	Open	9,807	1.18
185	3	29	517.2	200	110	Open	2,383	0.88
186	39	836	1456.1	350	110	Open	9,431	1.13

Pipe ID	Node start	Node end	Length (m)	Diameter (mm)	C value	Status	Flow(m3/day)	Velocity (m/s)
187	836	822	184.7	350	110	Open	4,687	0.56
188	822	823	382.2	150	110	Open	12	0.01
189	23	823	911.4	100	110	Open	301	0.44
190	836	140	296.1	250	110	Open	4,430	1.04
191	140	1005	1323.9	150	110	Open	1,543	1.01
192	140	619	1029.2	250	110	Open	4,779	1.13
193	822	821	469.3	350	110	Open	4,362	0.52
194	821	702	303.3	300	110	Open	2,467	0.4
195	821	704	375.3	150	110	Open	1,660	1.09
196	704	701	235.9	80	110	Open	-68	0.16
197	702	801	129.5	250	110	Open	235	0.06
198	701	404	153.1	100	110	Open	215	0.32
199	404	401	492.8	100	110	Closed	0	0
200	801	802	555.1	250	110	Closed	0	0
201	701	702	241.7	150	110	Open	-1,997	1.31
202	704	617	236.3	150	110	Open	1,537	1.01
203	701	604	267.7	150	110	Open	1,499	0.98
204	604	606	329.5	200	110	Open	1,131	0.42
205	603	604	383.3	150	110	Open	-594	0.39
206	305	603	252.5	200	110	Closed	0	0
207	305	304	356.8	200	110	Open	-114	0.04
208	607	305	164.5	200	110	Closed	0	0
209	607	608	242	80	110	Open	-130	0.3
210	608	620	43.6	100	110	Open	-321	0.47
211	620	603	151.7	100	110	Open	-371	0.55
212	620	616	279.7	100	110	Open	-141	0.21
213	616	610	151.7	100	110	Open	-332	0.49
214	610	605	46.9	100	110	Open	-523	0.77
215	605	617	36.2	150	110	Open	-905	0.59
216	617	604	141.1	200	110	Open	441	0.16
217	605	609	58.1	100	110	Open	191	0.28
218	619	612	309.6	150	110	Open	453	0.3
219	602	612	213	100	110	Open	-262	0.39
220	615	613	99.6	80	110	Open	-191	0.44
221	613	602	119.9	80	110	Open	-382	0.88
222	602	607	229.9	200	110	Open	61	0.02
223	611	602	264.5	200	110	Open	371	0.14
224	614	611	162.7	80	110	Open	-191	0.44
225	618	611	41.4	200	110	Open	753	0.28
226	618	619	159.7	250	110	Open	-4,135	0.97
227	1001	618	388	200	110	Open	-3,190	1.18
228	1002	1001	431.6	200	110	Open	-1,853	0.68
229	823	80	1245.4	100	110	Open	200	0.29
230	29	23	667.5	200	110	Open	2,383	0.88
231	23	31	815	200	110	Open	2,082	0.77
232	31	33	646.8	150	110	Open	0	0
233	33	34	301.6	150	110	Open	0	0
234	34	35	122	150	110	Open	0	0
235	31	140	274.6	200	110	Open	2,082	0.77
236	609	38	5.4	80	110	Open	0	0
237	113	36	65.9	80	110	Open	0	0
238	606	37	39.5	80	110	Open	0	0
239	201	105	286.4	200	110	Open	178	0.07
240	606	820	169.6	150	110	Open	916	0.6
241	4	24	3525.8	200	110	Open	2,621	0.97
242	935	41	342.3	200	120	Open	655	0.24
243	41	42	1016.5	200	110	Open	655	0.24
244	42	43	511.1	200	110	Open	524	0.19
245	43	44	220.9	200	110	Open	262	0.1
246	44	45	300.5	200	110	Open	131	0.05

Pipe ID	Node start	Node end	Length (m)	Diameter (mm)	C value	Status	Flow(m3/day)	Velocity (m/s)
247	42	49	287.3	100	110	Open	131	0.19
248	43	46	552.8	90	110	Open	262	0.48
249	46	47	641.8	90	110	Open	131	0.24
250	44	48	348.4	150	110	Open	131	0.09
252	73	74	460.45	100	110	Open	250	0.37
253	74	75	511.13	100	110	Open	200	0.29
254	75	76	601	80	110	Open	100	0.23
255	2013	51	732.4	100	110	Open	150	0.22
256	51	53	184.3	50	110	Open	100	0.59
257	51	52	405.4	50	110	Open	50	0.29
258	2010 57	68	984.2	100	110	Open	230	0.34
259	68	69	567.7	100	110	Open	230	0.34
260	69	70	312.1	80	110	Open	100	0.23
261	69	71	34	80	110	Open	50	0.12
262	71	72	303.9	80	110	Open	50	0.12
263	2010 57	58	971.3	150	110	Open	620	0.41
264	58	60	100.6	150	110	Open	496	0.32
265	60	61	116.6	50	110	Open	62	0.37
266	60	62	212.2	100	110	Open	372	0.55
267	62	64	34	50	110	Open	105	0.62
268	63	62	156.8	100	110	Open	-205	0.3
269	63	64	151.5	50	110	Open	31	0.18
270	66	63	181.1	50	110	Open	-112	0.66
271	66	65	36.4	50	110	Open	50	0.29
272	65	67	95.9	50	110	Open	62	0.37
273	65	64	378.3	50	110	Open	-74	0.44
274	58	59	411.8	80	110	Open	62	0.14
275	99	3010	367.6	150	110	Open	-87	0.06
276	811	117	280.8	100	110	Open	75	0.11
277	117	119	49.7	100	110	Open	75	0.11
278	119	807	882.4	80	110	Open	75	0.17
279	3010	3009	123.8	250	110	Open	368	0.09
280	99	815	237.5	250	110	Open	105	0.02
117	105	1	0.1	65	110	Open	0	0
118	73	6	590	100	110	Open	-250	0.37
119	24	6	1511.52	100	110	Open	250	0.37



## (2) Surge Analysis



Study Target: From Namkhan WTP to New Reservoir

Result: Shown in following Figure

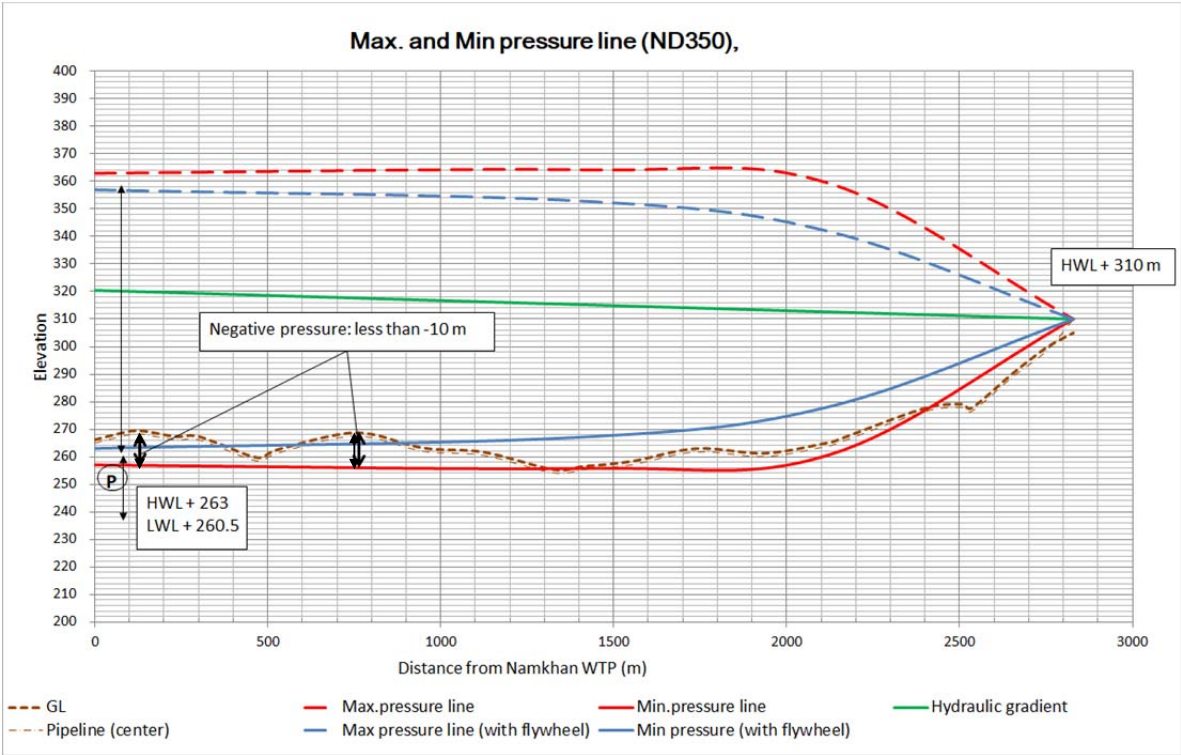


Figure Result of surge analysis

- In case of no countermeasures (red line in the above figure), negative pressure which is under -10 m will happen by sudden stop of transmission pump. The negative pressure under -10 m causes water column separation.
- The application of flywheel to the transmission pump soften the negative pressure (blue line in the above figure) and the minimum pressure will be about -5 m. Therefore, the water column separation will not be happened by application of flywheel.



### (3) Calculations for Wastewater Treatment Facilities



3-1) Capacity of wastewater treatment facility

Each of capacity for wastewater treatment facility is shown in the following table.

Table Capacity of wastewater treatment facility

Item	Capacity	Facility Plan
Wastewater basin	320m <sup>3</sup> (160×2)	The volume of wastewash water is 40 m <sup>3</sup> per time for one filter (Total 8 filters are operated). Filter will be washed every 48 hours. 4 times of washing per day are required. Therefore, capacity of 160 m <sup>3</sup> is required for one day. In order to drain supernatant, capacity for 2 days are considered.
Sludge Basin	130m <sup>3</sup> (65×2)	The capacity for the sludge is calculated from amount of water treatment and turbidity. The calculation sheet is shown below. Based on the calculation, the capacity of 65 m <sup>3</sup> is required for one day. In order to match the wastewater basin, capacity for 2 days is considered.
Lagoon	324m <sup>3</sup> (40.5×8)	The capacity for the lagoon is calculated from amount of water treatment and turbidity. The required capacity is 324 m <sup>3</sup> . The calculation sheet is shown below.

## Calculation of capacity for Sludge basin

Dry Sludge Mass Balance in Namkhan WTP

### 1. Total Dry Sludge

1) Treatment Volume	Q =	125 l/s	10,800 m <sup>3</sup> /d
2) Turbidity	T <sub>max</sub> =		1,000
	T <sub>ave</sub> =		50
	T <sub>mini</sub> =		10
3) PAC Dosage	D <sub>max</sub> =		40
	D <sub>ave</sub> =		10
	D <sub>min</sub> =		2.5
4) Sludge Factor, Tu to Dry Sludge			1

### 5) Dry Sludge

$$\text{Dry Sludge Max} \quad DS_{\text{max}} = 10,800 \times (1000 \times 1.0 + 40 \times (156/102)) \times 10^{-6} = 11.46 \text{ t/d}$$

$$\text{Dry Sludge Ave} \quad DS_{\text{ave}} = 10,800 \times (50 \times 1.0 + 10 \times (156/102)) \times 10^{-6} = 0.705176 \text{ t/d}$$

$$\text{Dry Sludge Min} \quad DS_{\text{ave}} = 10,800 \times (10 \times 1.0 + 2.5 \times (156/102)) \times 10^{-6} = 0.149294 \text{ t/d}$$

### 2 Turbidity of Settled Water and Filtered Water

Settled water turbidity is determined as 5 NTU

Filtered water turbidity is determined as 1 NTU

### 3 Sludge Extraction from Sedimentation Basin

#### 3.1 Dry Sludge Weight, DSS extracted from sedimentation basin

$$\text{DSS max is} \quad Ds_{\text{max}} \times (1000-5)/1000 = 11.4034 \text{ t/d}$$

$$\text{DSS ave is} \quad Ds_{\text{ave}} \times (50-5)/125 = 0.63466 \text{ t/d}$$

$$\text{DSS min is} \quad Ds_{\text{min}} \times (10-5)/10 = 0.07465 \text{ t/d}$$

#### 3.2 Sludge volume, SV Stored in Pits (from Pit A) of Sedimentation Basin

Concentration of sludge extracted from sedimentation basin is estimated as

Concentration of sludge based on SV is 4 %

$$\text{SV max is} \quad DSS_{\text{max}} \times (100/4) = 285.085 \text{ m}^3/\text{d}$$

$$\text{SV deave is} \quad DSS_{\text{ave}} \times (100/4) = 15.8665 \text{ m}^3/\text{d}$$

$$\text{SV min is} \quad DSS_{\text{min}} \times (100/4) = 1.86618 \text{ m}^3/\text{d}$$



### 3.3 Sludge Volume Extracted from Sedimentation Basin (from Pit), SVE

#### a. Sludge Volume

Concentration of sludge based on SV is 1.5 %

<b>SVE max is</b>	DSS max (100/1.5)	<b>760.227</b> m <sup>3</sup> /d
<b>SVE ave is</b>	DSS ave x (100/1.5)	<b>42.3106</b> m <sup>3</sup> /d
<b>SVE min is</b>	DSS min x (100/1.5)	<b>4.97647</b> m <sup>3</sup> /d

#### b. Sludge Basin Capacity

Considering settling velocity of sludge from sedimentation basin; 1 hour, detention time of sludge basin is designed to have 1 hours with having allowance of 50%. Thus, capacity of sludge basin, Vsb is

$$V_{sb} = SVE \text{ max.} \times 1.0/24 = \text{63.3522 m}^3$$

Say **65 m<sup>3</sup>**

### Calculation of capacity for Lagoon

Amount of Solid and Required Size of Sludge Lagoon

	Item	Value	Unit	Remarks
①	Water treatment capacity	10,800	m <sup>3</sup> /day	
②	Raw water turbidity	49	NTU	Average (2017)
③	PAC dosage rate in average	10	mg/L	
④	SS conversion factor	1.0	mg/L/NTU	
⑤	Dry solid	0.55	t/day	
⑥	Concentration of thickened sludge	5	%	Expected water content: 95%
⑦	Amount of thickened sludge	11	m <sup>3</sup> /day	
⑧	Amount of thickened sludge	3,906	m <sup>3</sup> /year	
⑨	Depth of sludge feeding	1	m	
⑩	Turnover of sludge lagoon usage	12	time/year	
⑪	Required area	324	m <sup>2</sup>	

$$\text{⑤} = \text{①} \times (\text{②} \times \text{④} + \text{③} \times 0.15 \times 156/102) \times 10^{-6} \quad \text{t/Day}$$

0.15: Content of Al<sub>2</sub>O<sub>3</sub> in Alum

156: Molecular weight of 2Al(OH)<sub>3</sub>

102: Molecular weight of Al<sub>2</sub>O<sub>3</sub>

#### 3-2) Disposal of Dry Sludge

##### 3-2-1) Moisture Content of Drying Sludge

Required moisture content for disposal of dry sludge is not defined in Lao PDR<sup>1</sup>. The waste disposal law in Japan requires to make moisture content under 85% for disposal of dry sludge.

The study is carried out if the planned lagoon could make the moisture content under 85%.

##### 3-2-2) Estimation of Moisture Content of Dry Sludge

<sup>1</sup> Regulation on industrial waste discharge (No.180/ Ministry of Industry and Handicraft, 1994)

< Estimation Condition >

Sludge Loading: 50kg/m<sup>2</sup>

Moisture Content: 95% (beginning at lagoon)

Relation of moisture content and necessary days for drying is shown in following table.

Table Relation between moisture content and necessary days in drying sludge

Moisture content	Necessary days	Remarks
50%	Approx. 70 days	Sludge loading: 50kg/m <sup>2</sup> Initial moisture content: 95%
60%	Approx. 55 days	"
70%	Approx. 26 days	"
80%	Approx. 11days	"

Source: Based on Japan Water Research Center (2010) Guideline of Water Treatment Technology

11 days are required to make moisture content under 85%.

The study is carried out to estimate the maximum days for drying sludge by the lagoon.

Table Conditions to estimate the maximum days for drying sludge

Item	Condition	Remarks
Number of room	8	
Volume of one room	40.5m <sup>3</sup>	9m × 4.5m × 1m
Total volume of lagoon	324m <sup>3</sup>	40.5m <sup>3</sup> × 8 rooms
Operation method of lagoon	Sludge is transferred to 4 rooms out of 8. The remaining 4 rooms are used for drying sludge.	
Solids content	0.55 ton/day	

Solids content per one day is 0.55 ton. Sludge volume in each moisture content is shown in the following table.

Table Sludge weight and volume in each moisture content

Moisture content	Sludge weight	Sludge volume	Necessary days
50%	2Ws= 1.10 t/day	0.92 m <sup>3</sup> /day	Approx. 70 days
60%	2.5Ws= 1.38 t/day	1.15 m <sup>3</sup> /day	Approx. 55 days
70%	3.33Ws= 1.83 t/day	1.53 m <sup>3</sup> /day	Approx. 26 days
80%	5Ws= 2.75 t/day	2.29 m <sup>3</sup> /day	Approx. 11 days
85%	6.67Ws= 3.67 t/day	3.06 m <sup>3</sup> /day	Approx. 5-10 days
95%	20Ws= 11.0 t/day	9.17m <sup>3</sup> /day	0 day

< Estimation Result of Moisture Content >

The study is carried out to estimate the maximum days for drying sludge by the lagoon.

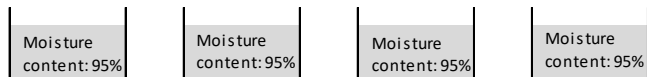
The result to estimate the maximum days for drying sludge is shown in the next page.

Based on the result, 38 days will be assured for drying sludge. The 38 days makes moisture content under 70%.

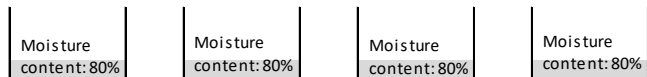
Effective volume per 1 pond 40.5 m<sup>3</sup>  
 Sludge Quantity (Moisture content 95%) 9.17 m<sup>3</sup>/day  
 Days for sludge charging per 1 pond  $40.5 \div 9.17 = 4.42$  days/pond



Breakdown: Days for sludge charging per 1 pond 4.42 days 4.42 days 4.42 days 4.42 days  
①Total of days for sludge charging 17.7 days



Settling days of sludge per 1 pond  $17.7 - 4.42 = 13.2$  days  
 Change of moisture content  $95\% \rightarrow 80\%$



Dumped sludge volume (moisture content 80%)  $2.29 \times 4.42 = 10.1$  m<sup>3</sup>  
 Quantity of sludge charging per 1 pond  $40.5 - 10.1 = 30.4$  m<sup>3</sup>  
 Days for sludge charging per 1 pond  $30.4 \div 9.17 = 3.31$  days/pond

Breakdown: Days for sludge charging per 1 pond 3.31 days 3.31 days 3.31 days 3.31 days  
②Total of days for sludge charging 13.3 days



Settling days of sludge per 1 pond  $13.3 - 3.31 = 9.94$  days  
 Change of moisture content  $95\% \rightarrow 85\%$



Dumped sludge volume (moisture content 85%)  $3.06 \times (4.42 + 3.31) = 23.7$  m<sup>3</sup>  
 Quantity of sludge charging per 1 pond  $40.5 - 23.7 = 16.8$  m<sup>3</sup>  
 Days for sludge charging per 1 pond  $16.8 \div 9.17 = 1.84$  days/pond

Breakdown: Days for sludge charging per 1 pond 1.84 days 1.84 days 1.84 days 1.84 days  
③Total of days for sludge charging 7.35 days

Total days for sludge charging (4ponds:①+②+③)  $17.7 + 13.3 + 7.35 = 38.3$  days  
Total days for sludge charging per 1 pond  $4.42 + 3.31 + 1.84 = 9.57$  days



(4) Outline Design Drawing

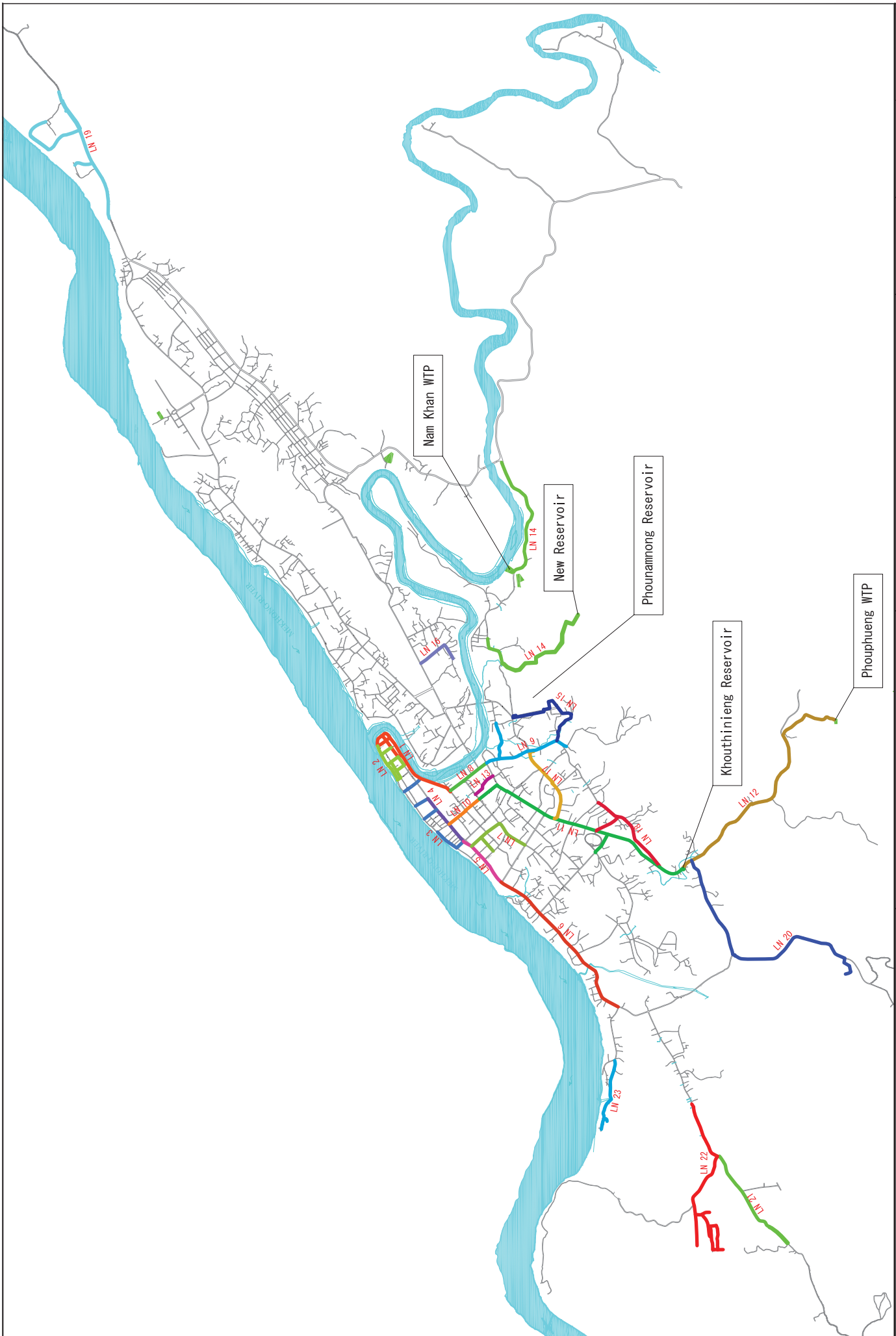


Table List of Outline Design Drawing

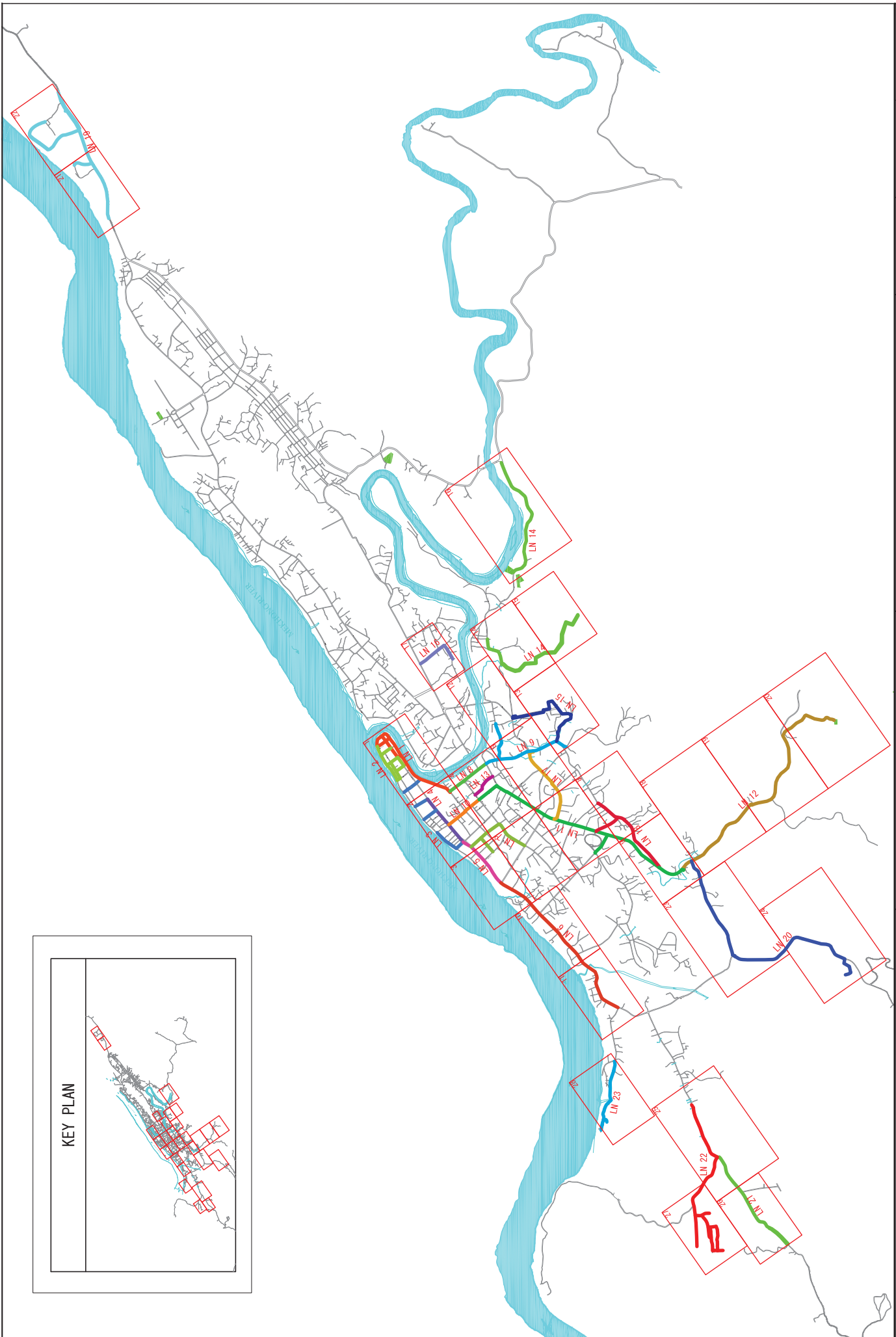
Site	Title of Drawings	Drawing No.	Scale
Pipeline Network	General Map for Pipeline Network	LPB-P-001	None
	Keymap Locations	LPB-P-002	None
	Pipeline Plan (1)	LPB-P-011	1:3000
	Pipeline Plan (2)	LPB-P-012	1:3000
	Pipeline Plan (3)	LPB-P-013	1:3000
	Pipeline Plan (4)	LPB-P-014	1:3000
	Pipeline Plan (5)	LPB-P-015	1:3000
	Pipeline Plan (6)	LPB-P-016	1:3000
	Pipeline Plan (7)	LPB-P-017	1:3000
	Pipeline Plan (8)	LPB-P-018	1:3000
	Pipeline Plan (9)	LPB-P-019	1:3000
	Pipeline Plan (10)	LPB-P-020	1:3000
	Pipeline Plan (11)	LPB-P-021	1:3000
	Pipeline Plan (12)	LPB-P-022	1:3000
	Pipeline Plan (13)	LPB-P-023	1:3000
	Pipeline Plan (14)	LPB-P-024	1:3000
	Pipeline Plan (15)	LPB-P-025	1:3000
	Pipeline Plan (16)	LPB-P-026	1:2500
	Pipeline Plan (17)	LPB-P-027	1:2000
	Pipeline Plan (18)	LPB-P-028	1:2000
	Pipeline Plan (19)	LPB-P-029	1:2000
	Pipeline Plan (20)	LPB-P-030	1:2000
	Pipeline Plan (21)	LPB-P-031	1:3000
	Pipeline Plan (22)	LPB-P-032	1:3000
	Pipeline Plan (23)	LPB-P-033	1:2500
	Pipeline Plan (24)	LPB-P-034	1:2500
	Pipeline Plan (25)	LPB-P-035	1:2500
	Pipeline Plan (26)	LPB-P-036	1:3000
	Pipeline Plan (27)	LPB-P-037	1:3000
	Pipeline Plan (28)	LPB-P-038	1:3000
	Typical Drawing for Pipe Laying (1) Earthwork	LPB-P-TYP-001	1:200
	Typical Drawing for Pipe Laying (2) Sluice Valve	LPB-P-TYP-002	1:200
	Typical Drawing for Pipe Laying (3) Air Valve	LPB-P-TYP-003	1:200
	Typical Drawing for Pipe Laying (4) Fire Hydrant	LPB-P-TYP-004	1:200
	Typical Drawing for Pipe Laying (5) Service Connection	LPB-P-TYP-005	None
Water Reservoir	General Layout of Water Reservoir Facility	LPB-C-R-001	1:250
	Ground Reservoir Structure (1)	LPB-C-R-002	1:100
	Ground Reservoir Structure (2)	LPB-C-R-003	1:100
	Flow Meter Chamber Structure	LPB-C-R-004	1:50
	General Plan of Water Reservoir Pipe Installation	LPB-C-R-005	1:250
Nam Khan Water Treatment Plant - Civil	General Layout of Nam Khan Water Treatment Plant	LPB-C-W-001	1:500
	Receiving and Mixing Well Structure (1)	LPB-C-W-002	1:50
	Receiving and Mixing Well Structure (2)	LPB-C-W-003	1:50
	Flocculation Basin, Sedimentation Basin Structure(1)	LPB-C-W-004	1:100
	Flocculation Basin, Sedimentation Basin Structure(2)	LPB-C-W-005	1:100
	Flocculation Basin, Sedimentation Basin Structure(3)	LPB-C-W-006	1:100
	Flocculation Basin, Sedimentation Basin Structure(4)	LPB-C-W-007	1:100, 1:20
	WWW Basin and Sludge Basin Structure (1)	LPB-C-W-008	1:100
	WWW Basin and Sludge Basin Structure (2)	LPB-C-W-009	1:100
	Lagoon Structure (1)	LPB-C-W-010	1:150
	Lagoon Structure (2)	LPB-C-W-011	1:50
	Lagoon Structure (3)	LPB-C-W-012	1:50
	General Plan of Nam Khan Water Treatment Plant Pipe Installation	LPB-C-W-013	1:300
Nam Khan Water Treatment Plant - Mech.	Nam Khan Water Treatment Plant Process Flow Diagram	LPB-M-W-01	None
	Layout of Raw Water Intake Tower Pump & Sludge Extraction Pump	LPB-M-W-02	None
	Raw Water Pump & Sludge Drain Pump Piping Schematic	LPB-M-W-03	None
	Receiving and Mixing Well Hypo Tank & PAC Feed Piping Detail	LPB-M-W-04	None
	Layout of Transmission Pump Station	LPB-M-W-05	None
	Filter Air Scouring Blower Piping Plan	LPB-M-W-06	None
	Transmission Pump & Air Scouring Blower Piping Schematic	LPB-M-W-07	None
	Chemical Building Tank Layout Plan & Section	LPB-M-W-08	None
Nam Khan Water Treatment Plant - Elec.	System Configuration Diagram	LPB-E-01	None
	Single Line Diagram of Equipment for Power Receiving	LPB-E-02	None
	Single Line Diagram of Raw Water Control Panel and Transmission Pump Control Panel	LPB-E-03	None
	Single Line Diagram of Wash Pump Control Panel	LPB-E-04	None
	Single Line Diagram of Chemical Feed Control Panel	LPB-E-05	None



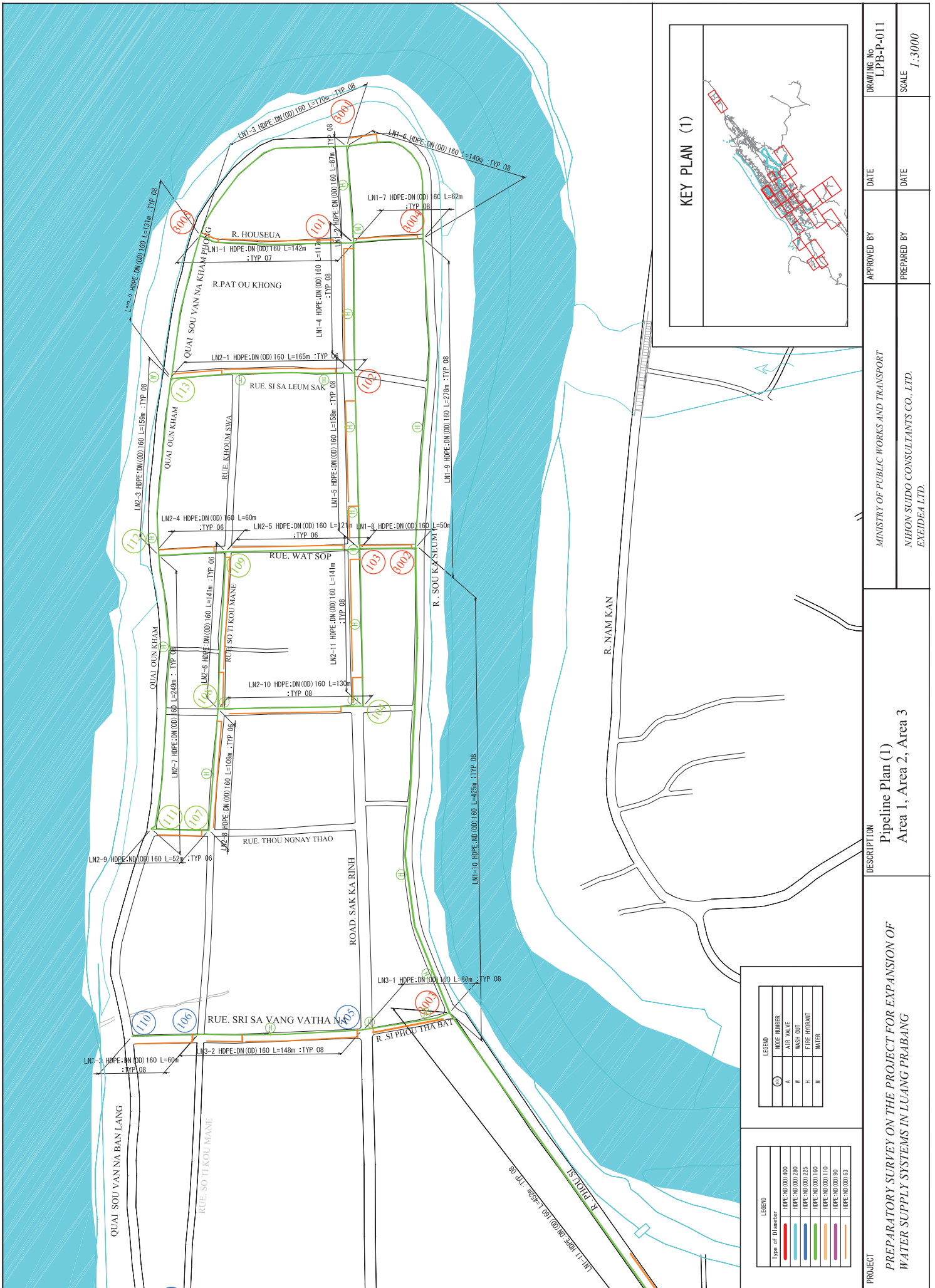




PROJECT	PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG		DESCRIPTION	General Map	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No	LTPB-P-001
					NHON SUDO CONSULTANTS CO., LTD.	PREPARED BY	DATE	SCALE	None



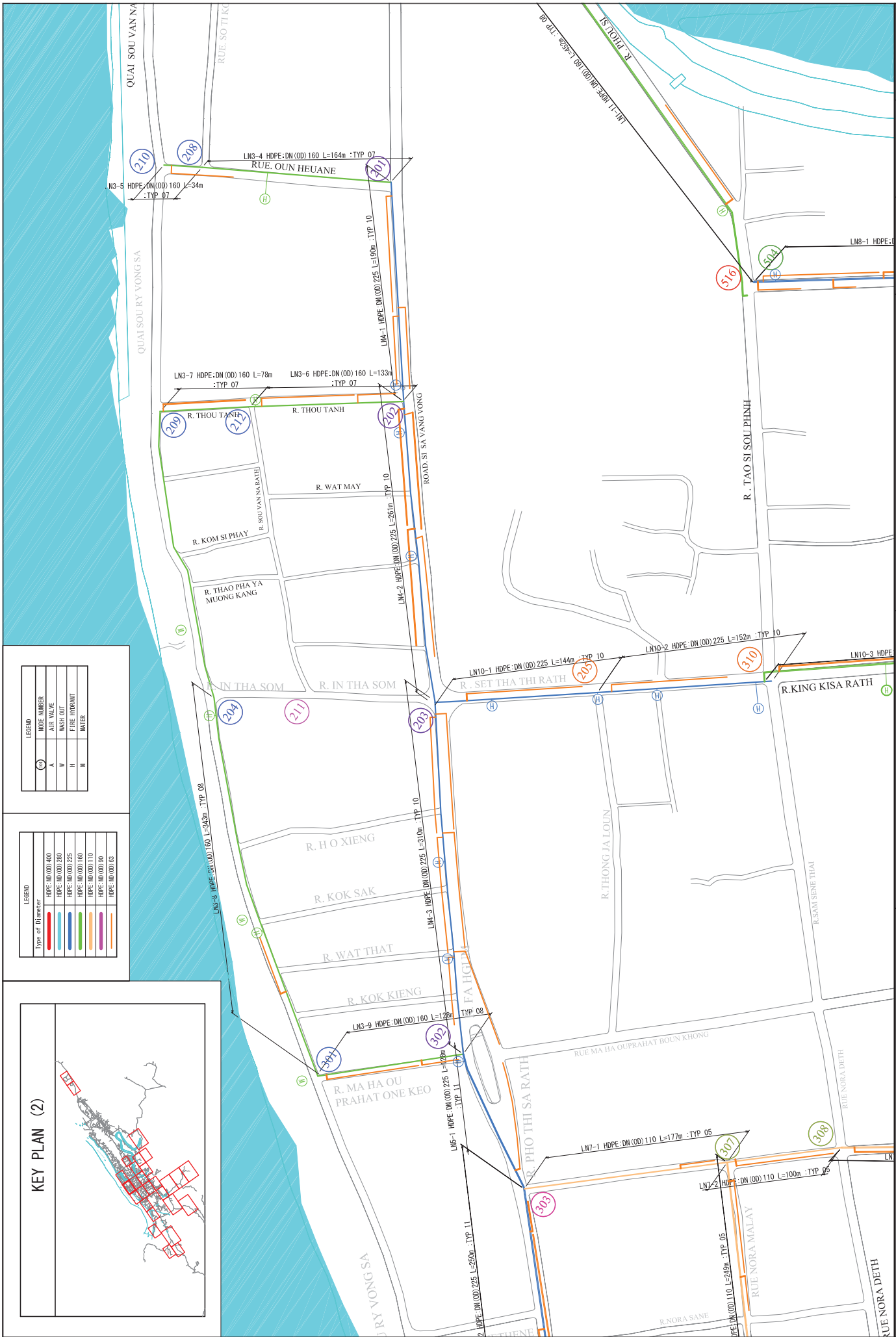
PROJECT <b>PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG</b>	DESCRIPTION <i>General Map for Pipeline Network</i>	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No <i>LTPB-P-002</i>
		<i>NIHON SUIDO CONSULTANTS CO., LTD.</i> <i>EXEIDEA LTD.</i>	PREPARED BY	DATE	SCALE <i>None</i>



Symbol	NAME
⊙	MANHOLE
A	AIR VALVE
W	WASH OUT
H	FIRE HYDRANT
W	WATER

Type of Diameter	HDPE (mm) (OD)	Length (m)	Type
Red	160	142	TYP 07
Blue	160	225	TYP 08
Green	160	190	TYP 08
Orange	160	110	TYP 08
Purple	160	130	TYP 08
Pink	160	165	TYP 08

PROJECT PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION Pipeline Plan (1) Area 1, Area 2, Area 3	APPROVED BY MINISTRY OF PUBLIC WORKS AND TRANSPORT	DATE	DRAWING No LPB-P-011
		PREPARED BY NIHOON SUIDO CONSULTANTS CO., LTD.	DATE	SCALE 1:3000

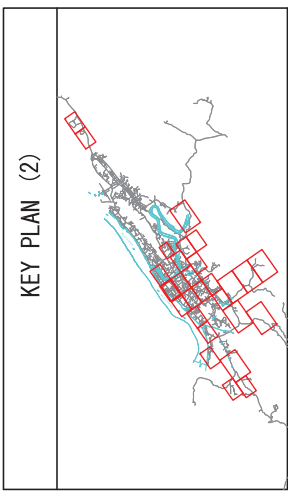


LEGEND

(C)	HOPE NUMBER
A	PIPE VALVE
W	WASH OUT
H	PIPE HYDRANT
M	WATER

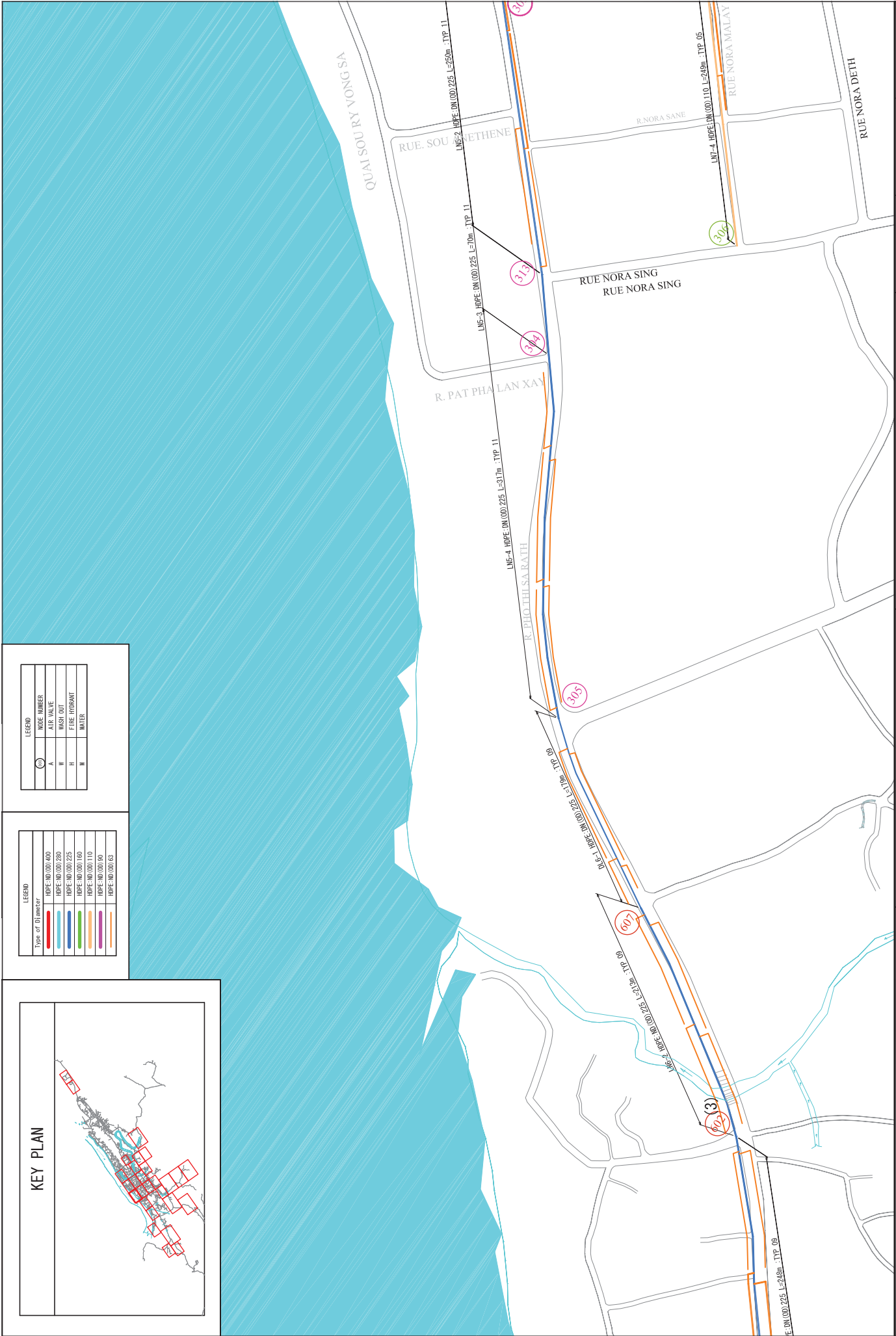
LEGEND

Type of Diameter	Color
HDPE:DN(OD)400	Red
HDPE:DN(OD)250	Blue
HDPE:DN(OD)225	Green
HDPE:DN(OD)160	Orange
HDPE:DN(OD)110	Purple
HDPE:DN(OD)90	Yellow
HDPE:DN(OD)63	Pink



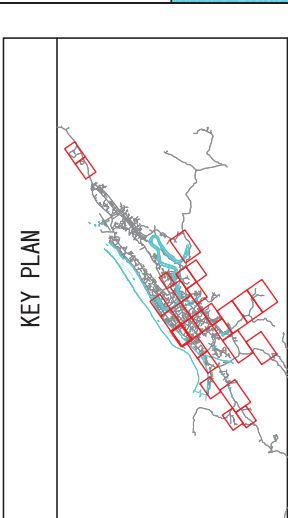
DATE	APPROVED BY	MINISTRY OF PUBLIC WORKS AND TRANSPORT
	PREPARED BY	NIHON SUDO CONSULTANTS CO., LTD.
DATE	DATE	DESCRIPTION
DATE	DATE	Pipeline Plan (2) LN 3, LN 4, LN 5, LN 7, LN 10
DRAWING No LPB-P-012	SCALE 1:3000	PROJECT PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG



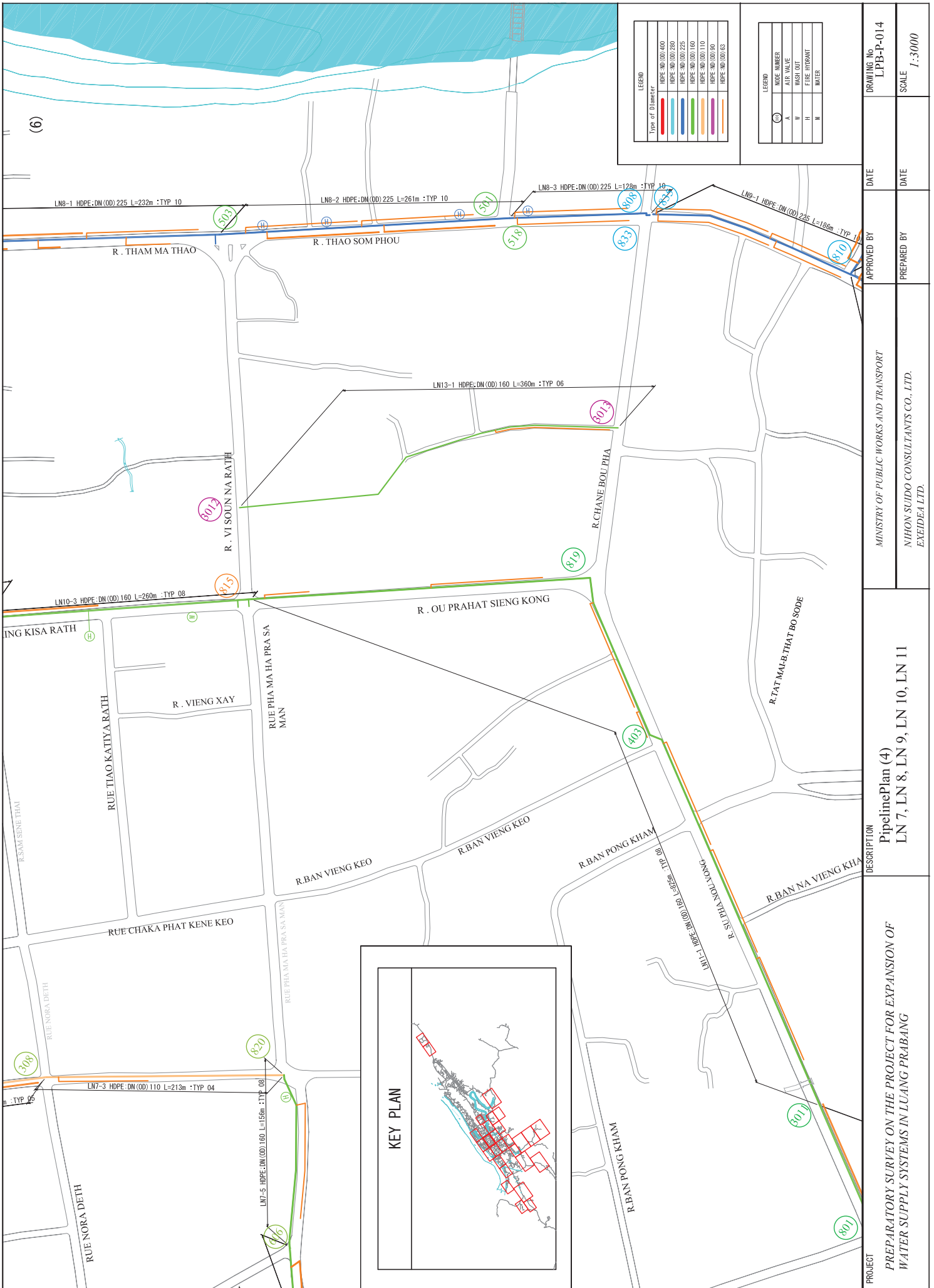


LEGEND	
(C)	PIPE NUMBER
A	AIR VALVE
W	WASH OUT
II	PIPE HYDRANT
III	WATER

LEGEND	
Line of Diameter	
HDPE DN(OD) 400	Blue
HDPE DN(OD) 300	Red
HDPE DN(OD) 225	Green
HDPE DN(OD) 150	Yellow
HDPE DN(OD) 110	Purple
HDPE DN(OD) 90	Orange
HDPE DN(OD) 63	Light Blue



PROJECT PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION Pipeline Plan (3) Area 5, Area 6, Area 7	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No LPB-P-013
		NIHON SUIDO CONSULTANTS CO., LTD. EXEIDEA LTD.	PREPARED BY	DATE	SCALE 1:3000



LEGEND	
Type of Diameter	
HDPE-DN(OD)400	[Red line]
HDPE-DN(OD)280	[Blue line]
HDPE-DN(OD)225	[Green line]
HDPE-DN(OD)160	[Orange line]
HDPE-DN(OD)110	[Purple line]
HDPE-DN(OD)90	[Yellow line]
HDPE-DN(OD)63	[Light blue line]

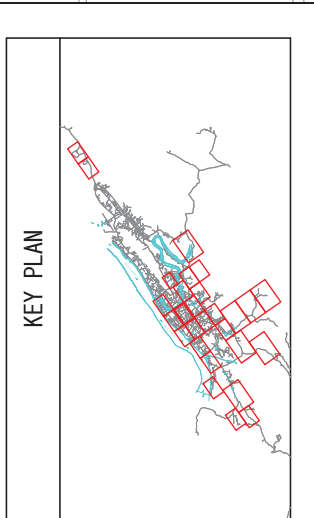
LEGEND	
HOPE NUMBER	
A	[Circle with A]
W	[Circle with W]
H	[Circle with H]
N	[Circle with N]

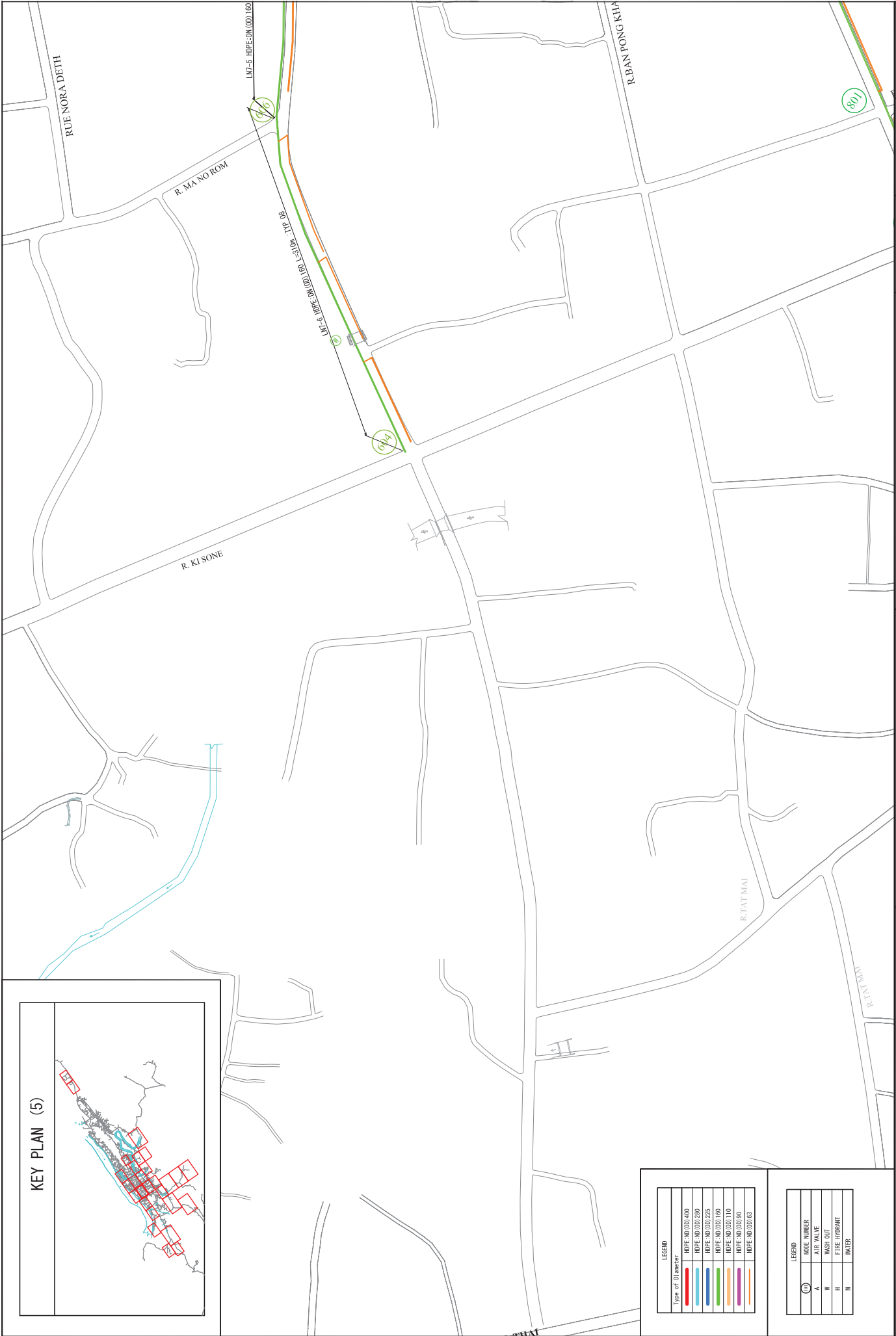
DATE	APPROVED BY	DRAWING No
		LPB-P-014
DATE	PREPARED BY	SCALE
		1:3000

MINISTRY OF PUBLIC WORKS AND TRANSPORT
NIHON SUDO CONSULTANTS CO., LTD.
EXEIDEA LTD.

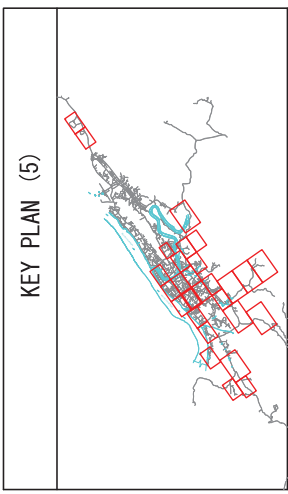
DESCRIPTION
Pipeline Plan (4) LN 7, LN 8, LN 9, LN 10, LN 11

PROJECT
PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRAHANG





KEY PLAN (5)



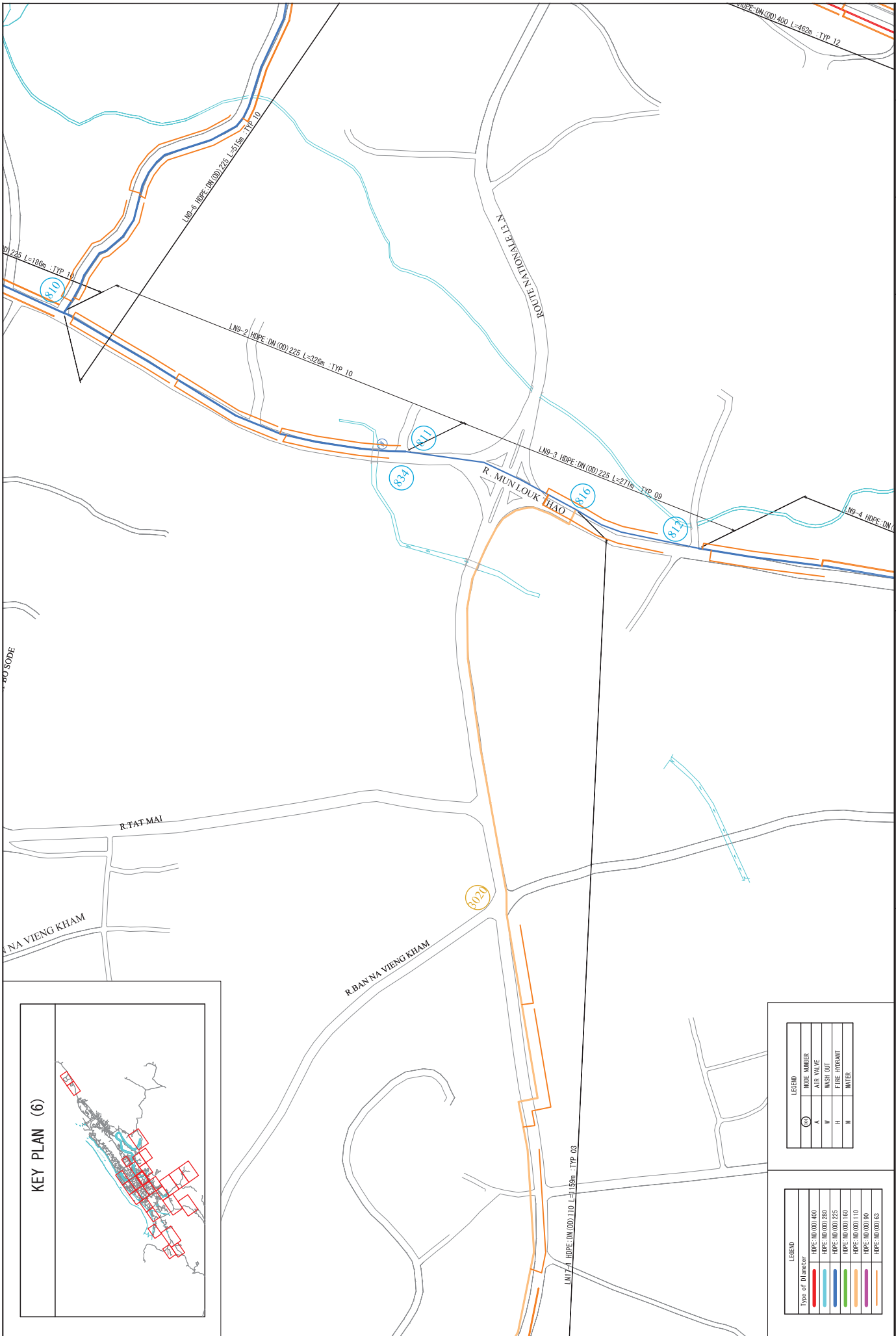
LEGEND

Type of Diameter	Color
HPPE-ND.000.400	Red
HPPE-ND.000.250	Blue
HPPE-ND.000.225	Green
HPPE-ND.000.160	Orange
HPPE-ND.000.110	Purple
HPPE-ND.000.90	Light Blue
HPPE-ND.000.83	Light Purple

LEGEND

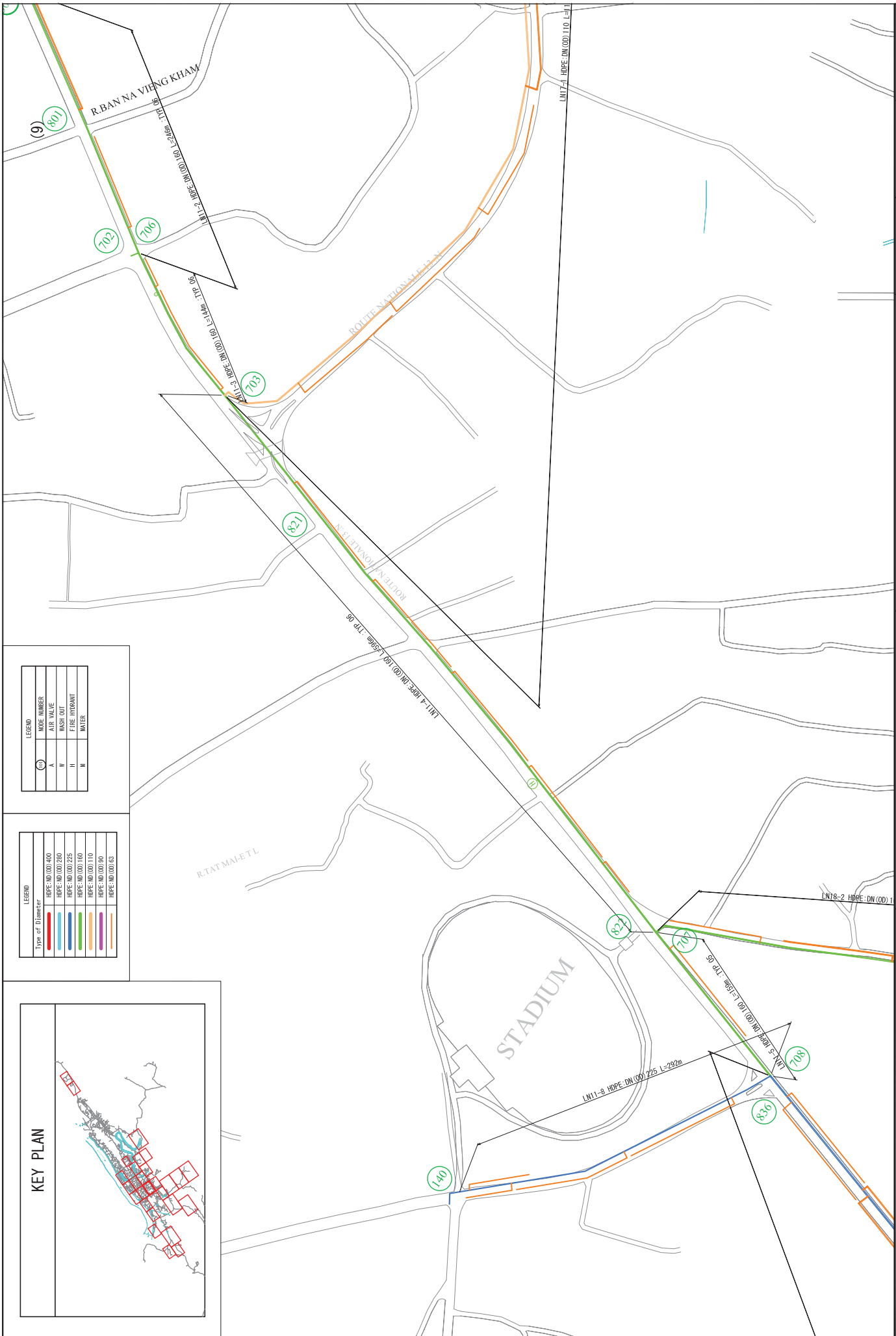
MODE NUMBER	Symbol
AIR VALVE	(A)
WASH OUT	(W)
FIRE HYDRANT	(H)
WATER	(M)

PROJECT	PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG		DESCRIPTION	Pipeline Plan (5) LN 7		APPROVED BY	DATE	DRAWING No LPB-P-015
	MINISTRY OF PUBLIC WORKS AND TRANSPORT			NIHON SUIDO CONSULTANTS CO., LTD.				

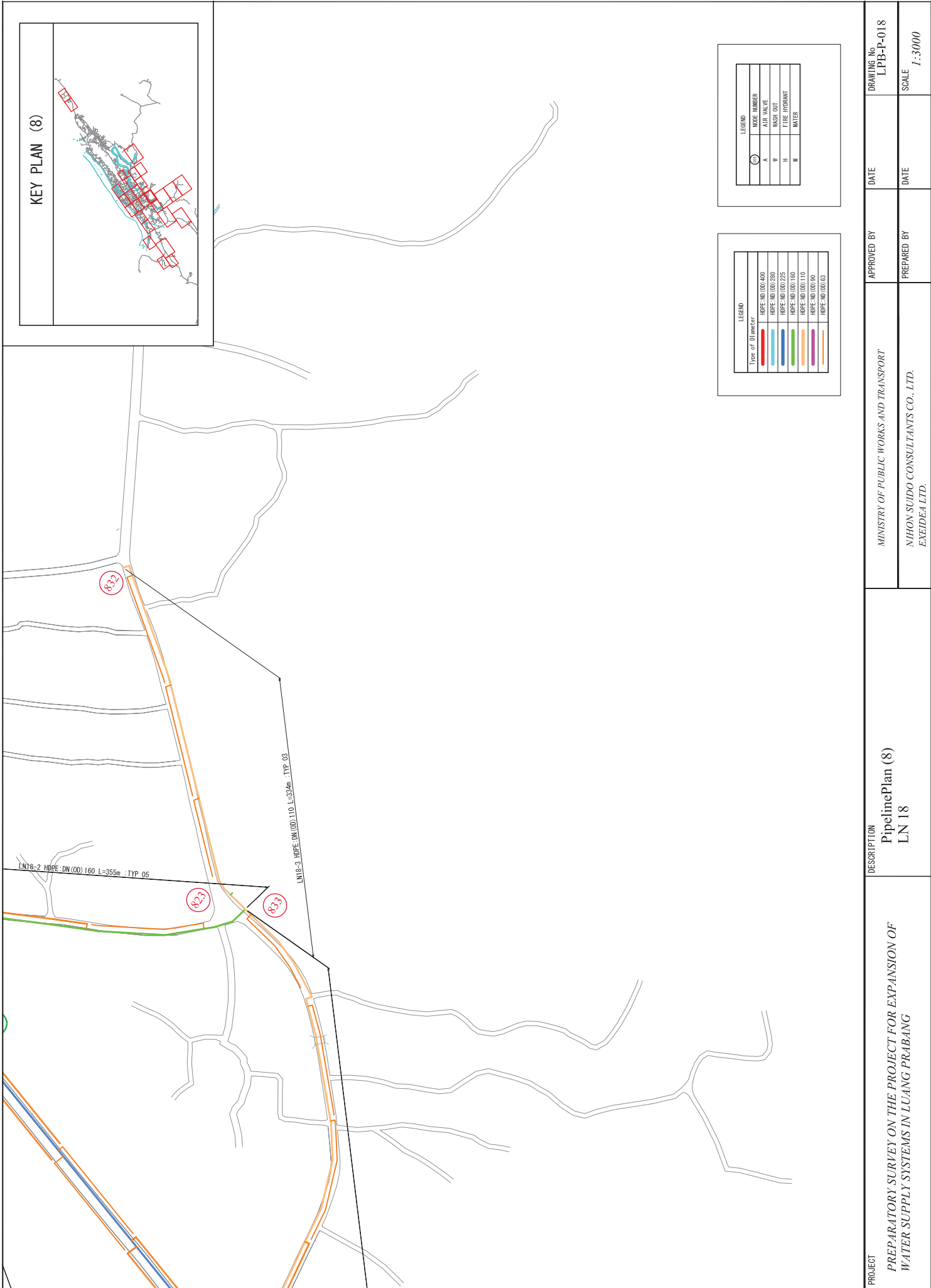


PROJECT <b>PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF          WATER SUPPLY SYSTEMS IN LUANG PRABANG</b>	DESCRIPTION <b>Pipeline Plan (6)          LN 9, LN 17</b>	APPROVED BY	DATE	DRAWING No <b>L/PB-P-016</b>
		PREPARED BY	DATE	SCALE <b>1:3000</b>





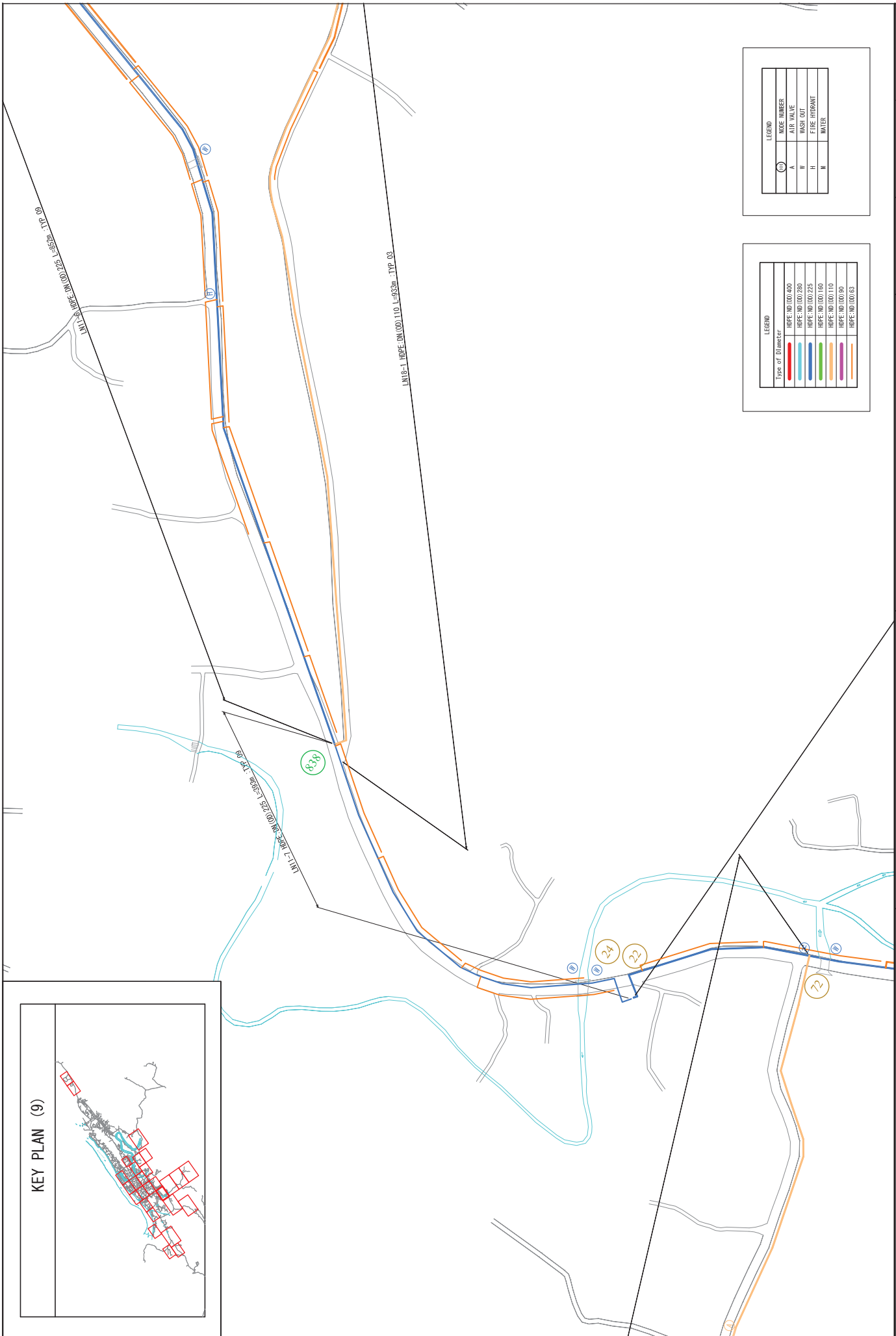
PROJECT	PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG		MINISTRY OF PUBLIC WORKS AND TRANSPORT		DRAWING No LPB-P-017
	Pipeline Plan (7) LN 12-1		APPROVED BY	DATE	SCALE 1:3000
DESCRIPTION		PREPARED BY		DATE	
		NIHON SUIDO CONSULTANTS CO., LTD.			
		EXEIDEA LTD.			



LEGEND	
Type of DI Element	HDPE NO (OD) L
Red line	HDPE: NO (OD) 400
Blue line	HDPE: NO (OD) 250
Green line	HDPE: NO (OD) 225
Orange line	HDPE: NO (OD) 160
Yellow line	HDPE: NO (OD) 110
Purple line	HDPE: NO (OD) 90
Light blue line	HDPE: NO (OD) 63

LEGEND	
Symbol	NODE NUMBER
Circle with 'A'	AIR VALVE
Circle with 'W'	WASH OUT
Circle with 'H'	FIRE HYDRANT
Circle with 'M'	METER

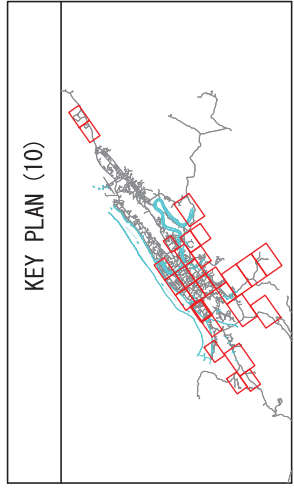
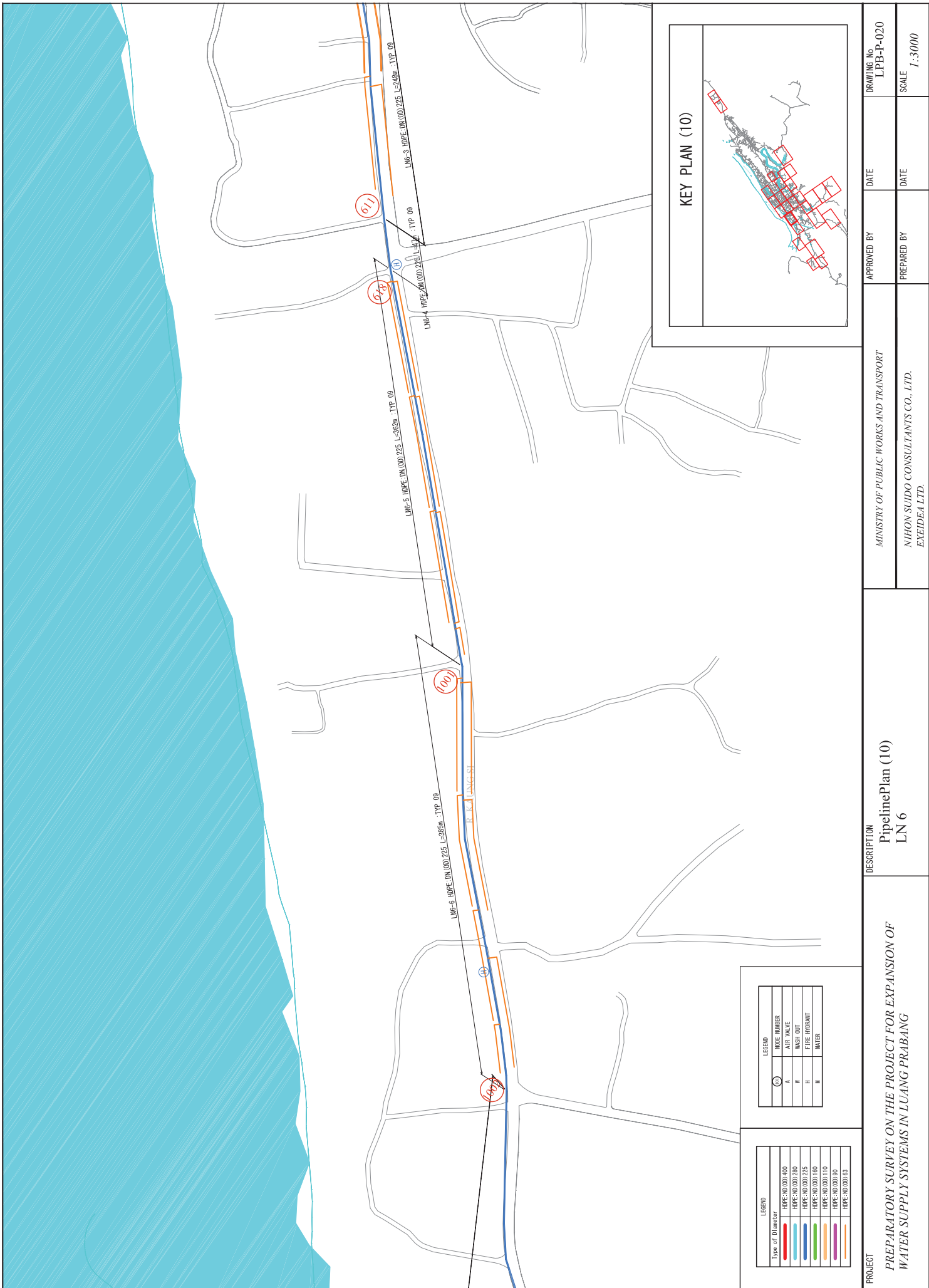
PROJECT PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION Pipeline Plan (8) LN 18	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No LPB-P-018
		NIHON SUIDO CONSULTANTS CO., LTD. EXEIDEA LTD.	PREPARED BY	DATE	SCALE 1:3000



LEGEND	
Type of Diameter	HDPE NO. (DN, L)
Red	HDPE NO. (100, 400)
Blue	HDPE NO. (100, 250)
Green	HDPE NO. (100, 225)
Orange	HDPE NO. (100, 160)
Purple	HDPE NO. (100, 110)
Yellow	HDPE NO. (100, 90)
Light Blue	HDPE NO. (100, 63)

LEGEND	
Symbol	Node Number
(A)	AIR VALVE
(W)	WASH OUT
(H)	FIRE HYDRANT
(M)	METER

PROJECT PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION Pipeline Plan (9) LN 12-1	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No. LPB-P-019
		NIHON SUIDO CONSULTANTS CO., LTD. EXEIDEA LTD.	PREPARED BY	DATE	SCALE 1:3000

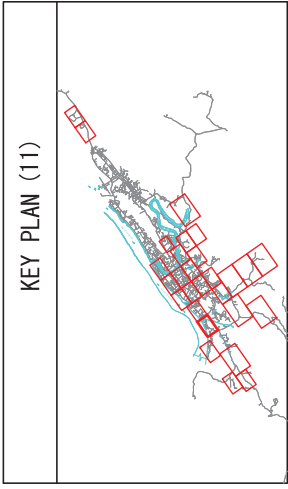
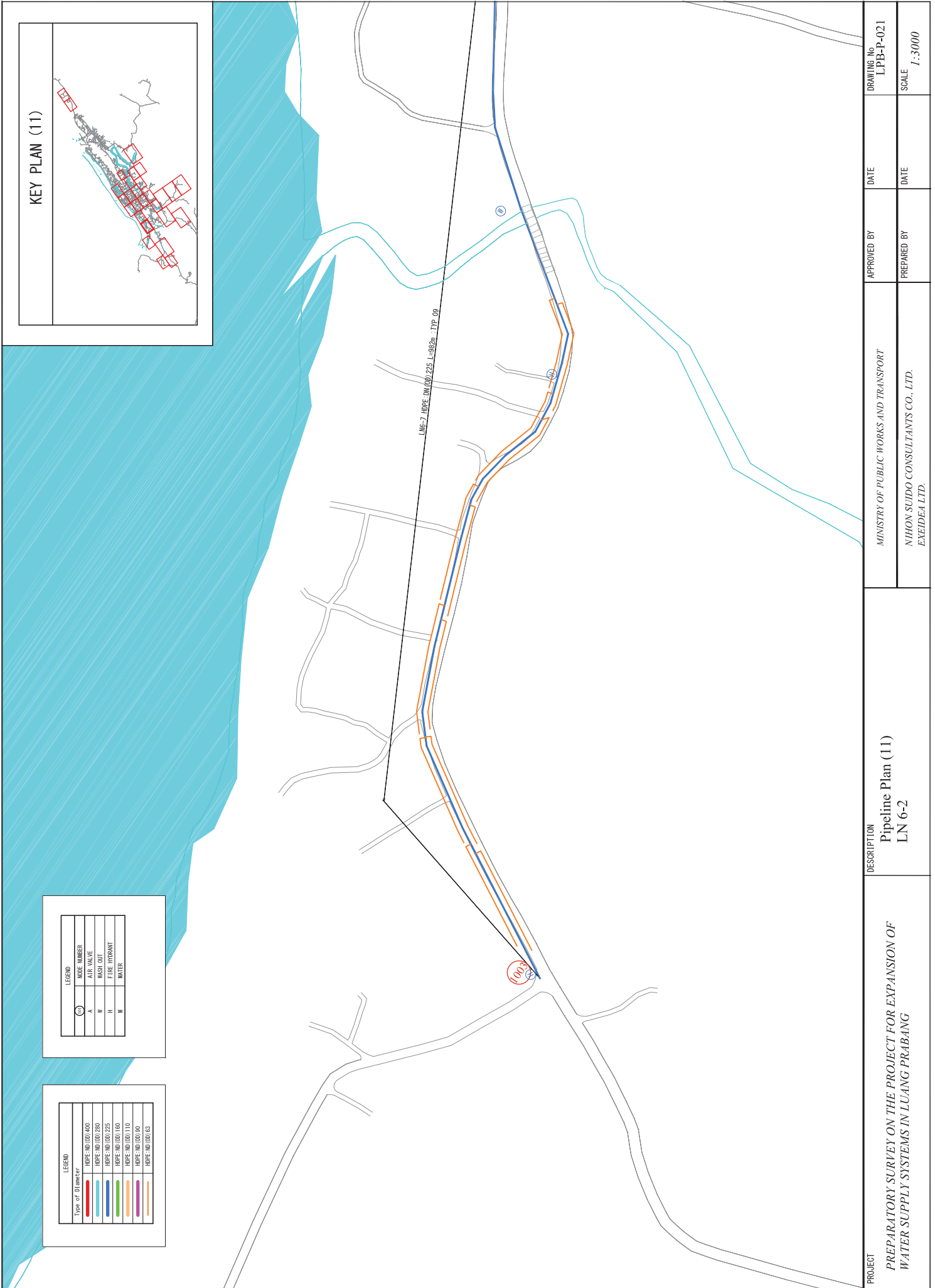


LEGEND	
Symbol	WORK NUMBER
(A)	AIR VALVE
(H)	HYDRANT
(FH)	FIRE HYDRANT
(V)	VALVE

LEGEND	
Type of Diameter	HOPE NO
Red	HOPE NO.001.600
Blue	HOPE NO.002.250
Green	HOPE NO.003.225
Yellow	HOPE NO.004.150
Purple	HOPE NO.005.110
Orange	HOPE NO.006.80
Pink	HOPE NO.007.63

<b>PROJECT</b> PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	<b>DESCRIPTION</b> Pipeline Plan (10) LN 6	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No LPB-P-020
		NINHON SUIDO CONSULTANTS CO., LTD. EXEIDEA LTD.	PREPARED BY	DATE	SCALE 1:3000



LEGEND

Symbol	Code	Symbol	Code
(C)	INDEX NUMBER	A	AIR VALVE
W	WASH OUT	II	FIRE HYDRANT
II	FIRE HYDRANT	III	WATER

LEGEND

Type of Diameter	Color
HDPE DN 1200	Red
HDPE DN 750	Blue
HDPE DN 750	Green
HDPE DN 750	Yellow
HDPE DN 750	Purple
HDPE DN 750	Orange

PROJECT	DESCRIPTION	APPROVED BY	DATE	DRAWING No
				L/PB-P-021
PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	Pipeline Plan (11) LN 6-2	PREPARED BY	DATE	SCALE
				1:3000
MINISTRY OF PUBLIC WORKS AND TRANSPORT		N/THON SUKDO CONSULTANTS CO., LTD.		
		EXEIDEA LTD.		

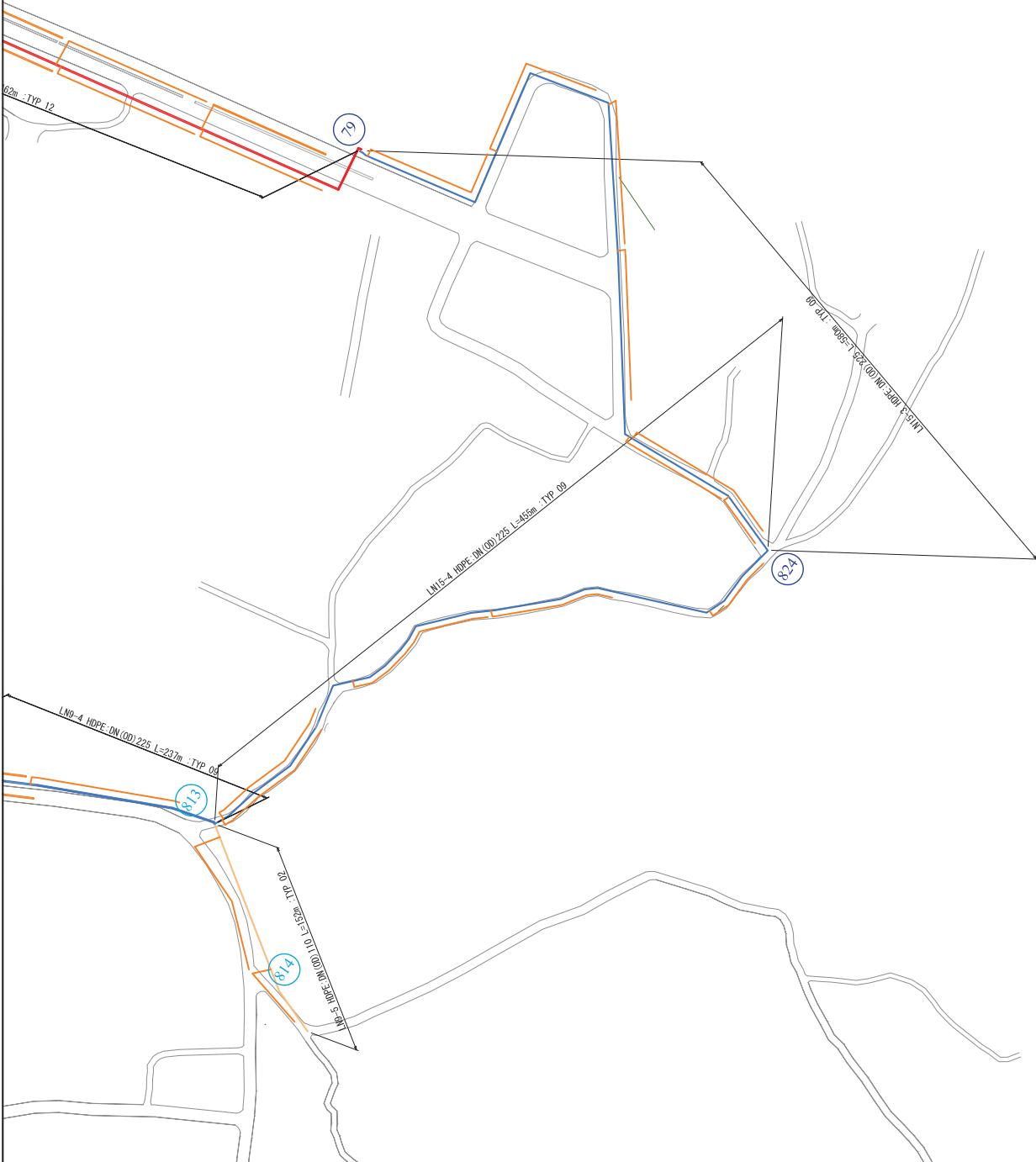
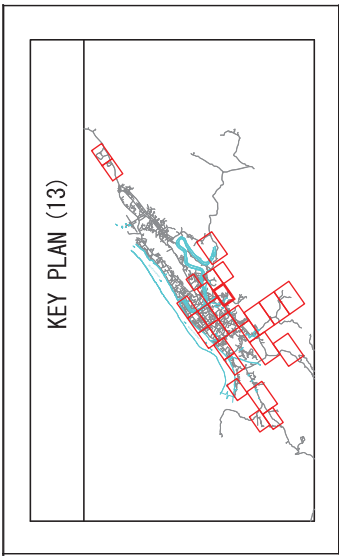


LEGEND	
Type of DI element	HOPE NO
Red line	HOPE: NO (00) 400
Blue line	HOPE: NO (00) 280
Green line	HOPE: NO (00) 225
Yellow line	HOPE: NO (00) 160
Purple line	HOPE: NO (00) 110
Orange line	HOPE: NO (00) 90
Light blue line	HOPE: NO (00) 63

LEGEND	
Symbol	NOPE NUMBER
Circle with 'A'	AIR VALVE
Circle with 'W'	WASH OUT
Circle with 'H'	FIRE HYDRANT
Circle with 'M'	METER

KEY PLAN (12)

PROJECT	PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION	Pipeline Plan (12)		APPROVED BY	DATE	DRAWING No LPB-P-022
			LN 14-1				
			NIHON SUDO CONSULTANTS CO., LTD.		PREPARED BY	DATE	SCALE 1:3000
			EXEIDEA LTD.				



LEGEND	
Type of DI Pipe/str	HDPE: NO.(OD) 400
Red	HDPE: NO.(OD) 400
Blue	HDPE: NO.(OD) 250
Green	HDPE: NO.(OD) 225
Orange	HDPE: NO.(OD) 160
Purple	HDPE: NO.(OD) 110
Yellow	HDPE: NO.(OD) 90
Light Blue	HDPE: NO.(OD) 63

LEGEND	
Symbol	NOPE NUMBER
Circle with A	AIR VALVE
Circle with W	WASH OUT
Circle with H	FIRE HYDRANT
Circle with M	METERS

PROJECT	PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION	Pipeline Plan (13)		APPROVED BY	DATE	DRAWING No
			LN 14-2				MINISTRY OF PUBLIC WORKS AND TRANSPORT
			NIHON SUIDO CONSULTANTS CO., LTD.		PREPARED BY	DATE	SCALE
			EXEIDEA LTD.				1:3000





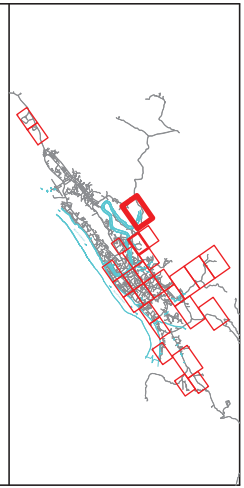
LEGEND

Type of Diameter	HOPE: DN (OD)
Red	400
Blue	280
Green	225
Yellow	160
Purple	110
Orange	90
Light Blue	63

LEGEND

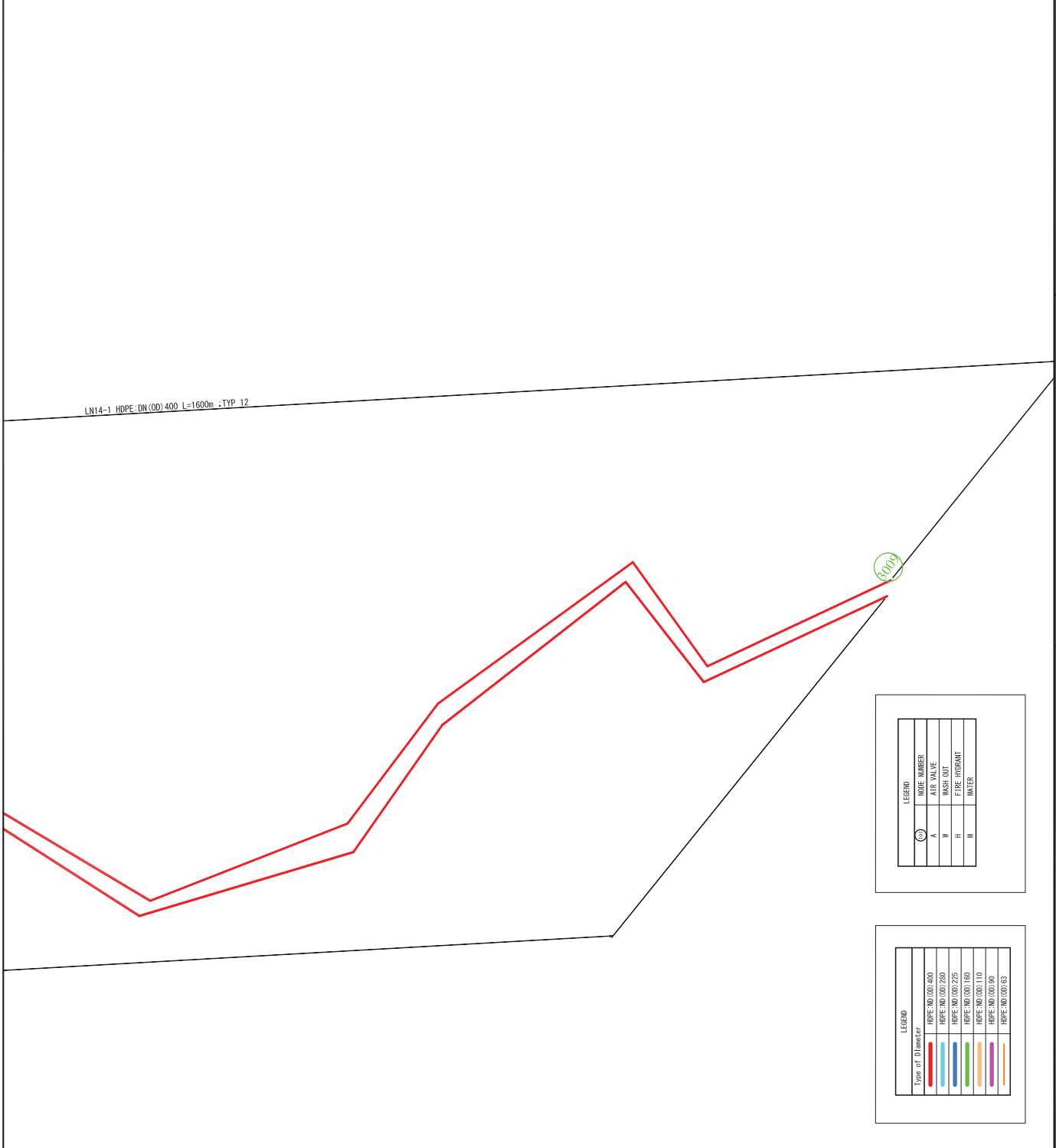
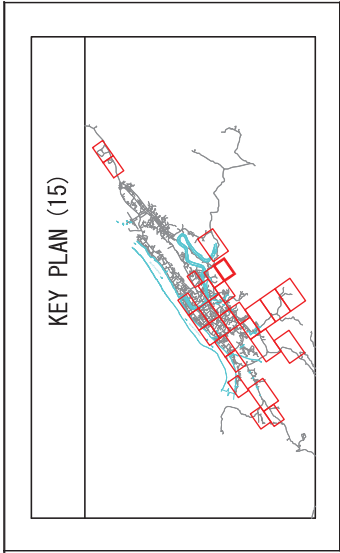
HOPE NUMBER	Symbol
A	Air Valve
W	Wash Out
H	Fire Hydrant
M	Water

KEY PLAN (14)



PROJECT PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION Pipeline Plan (14) LN 14-3	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No LPB-P-024
		NIHON SUDO CONSULTANTS CO., LTD. EXEIDEA LTD.	PREPARED BY	DATE	SCALE 1:3000





LEGEND	
(C)	HOPE NUMBER
A	AIR VALVE
W	WASH OUT
H	FIRE HYDRANT
M	METER

LEGEND	
Type of Diameter	Color
HDPE DN (OD) 400	Red
HDPE DN (OD) 280	Blue
HDPE DN (OD) 225	Green
HDPE DN (OD) 160	Orange
HDPE DN (OD) 110	Purple
HDPE DN (OD) 90	Yellow
HDPE DN (OD) 63	Pink

PROJECT <b>PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG</b>	DESCRIPTION <b>PipelinePlan (15) LN 15</b>	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No <b>LPB-P-025</b>
		<i>NIHON SUIDO CONSULTANTS CO., LTD.</i> <i>EXEIDEA LTD.</i>	PREPARED BY	DATE	SCALE <b>1:3000</b>

KEY PLAN (16)



LINE 4 PIPE (Ø100) (L1) (L2) (L3) (L4) (L5) (L6) (L7) (L8)

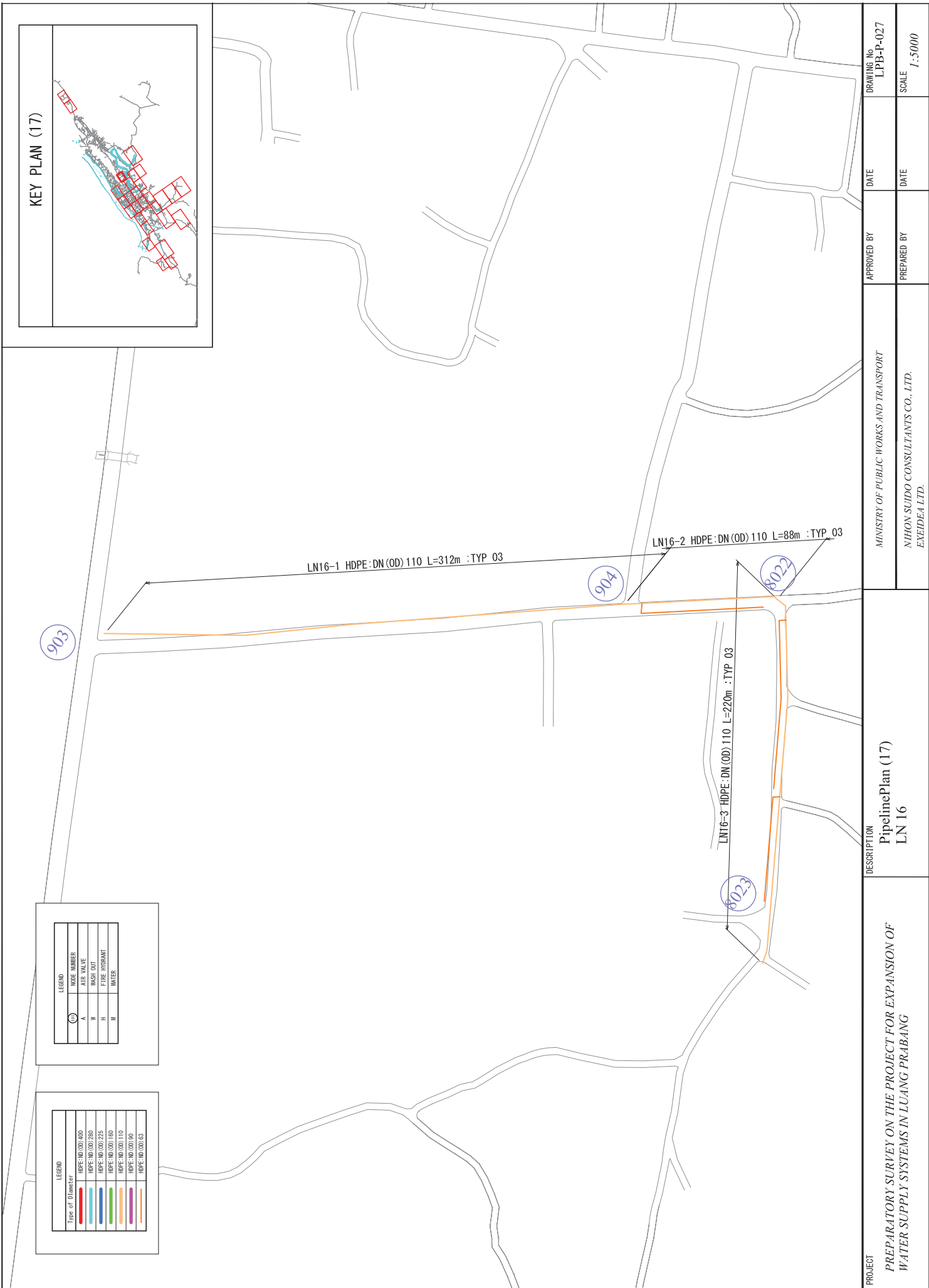
LEGEND

Type of Diameter	HPPE NO. (Ø) (L)
400	HPPE NO. (Ø) 400
280	HPPE NO. (Ø) 280
225	HPPE NO. (Ø) 225
160	HPPE NO. (Ø) 160
110	HPPE NO. (Ø) 110
90	HPPE NO. (Ø) 90
63	HPPE NO. (Ø) 63

LEGEND

⊙	PIPE NUMBER
A	AIR VALVE
W	WASH OUT
H	FIRE HYDRANT
M	MANHOLE

PROJECT	PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION	Pipeline Plan (16)		LN 19-1	MINISTRY OF PUBLIC WORKS AND TRANSPORT NIHON SUIDO CONSULTANTS CO., LTD. EXEIDEA LTD.	APPROVED BY	DATE	DRAWING No. LPB-P-026
			PREPARED BY	DATE			SCALE 1:2500		



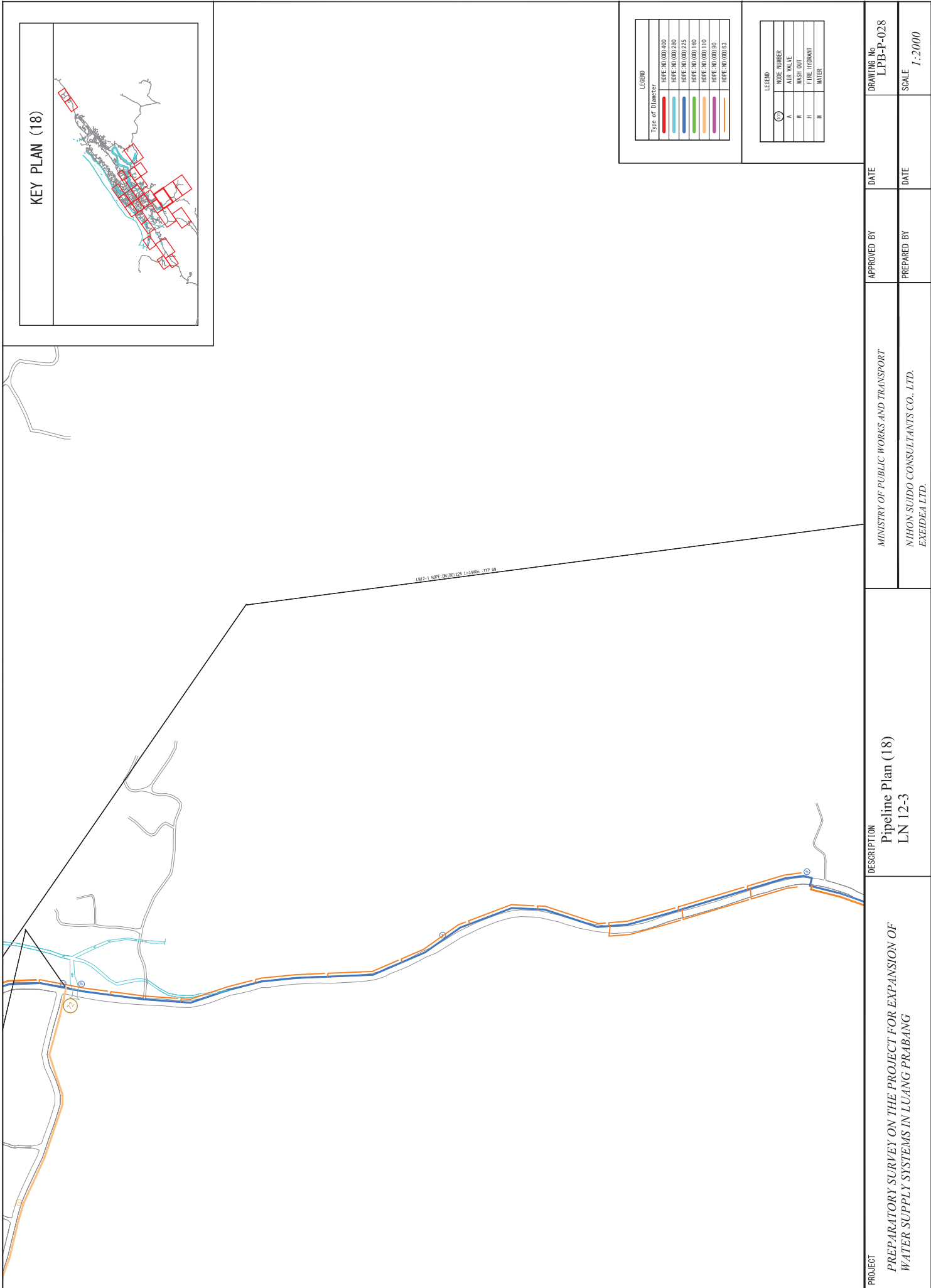
**LEGEND**

SYMBOL	PIPE NUMBER
(A)	AIR VALVE
(W)	WASH OUT
(H)	FIRE HYDRANT
(M)	WATER

**LEGEND**

Type of Diameter	HDPE:DN(OD)
Red	400
Blue	280
Green	225
Orange	160
Purple	110
Yellow	90
Pink	63

<b>PROJECT</b> PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	<b>DESCRIPTION</b> PipelinePlan (17) LN 16	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No LPB-P-027
		NIHON SUIDO CONSULTANTS CO., LTD. EXEIDEA LTD.	PREPARED BY	DATE	SCALE 1:5000



KEY PLAN (18)



LEGEND

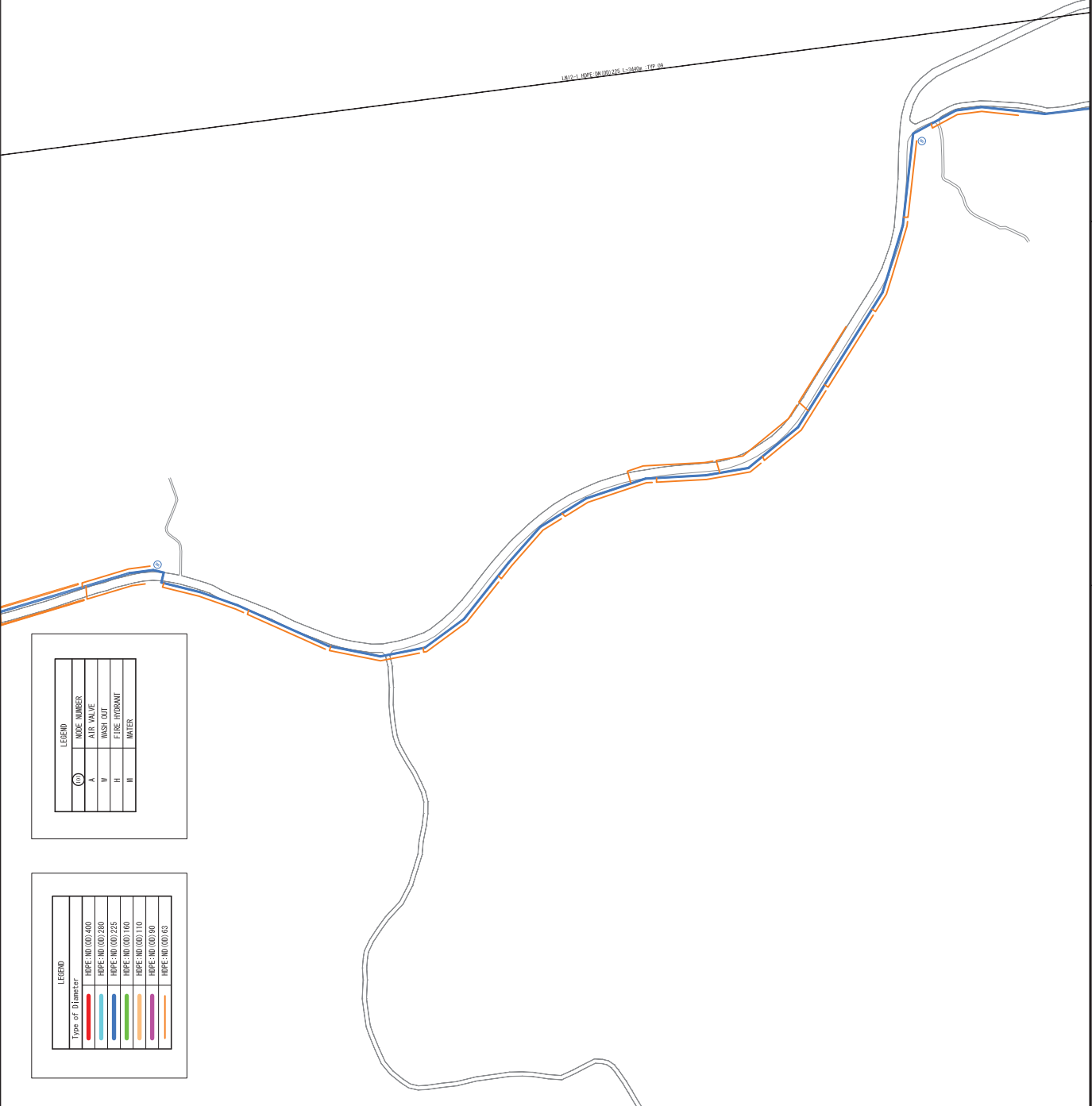
Type of Diameter	HPPE: W(00)400	HPPE: W(00)280	HPPE: W(00)225	HPPE: W(00)160	HPPE: W(00)110	HPPE: W(00)90	HPPE: W(00)63
	[Red line]	[Blue line]	[Green line]	[Orange line]	[Purple line]	[Yellow line]	[Light blue line]

LEGEND

MODE NUMBER	AIR VALVE	WASH OUT	FIRE HYDRANT	WATER
(A)	[Symbol]	[Symbol]	[Symbol]	[Symbol]

PROJECT PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION Pipeline Plan (18) LN 12-3	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No LPB-P-028
		NIHON SUIDO CONSULTANTS CO., LTD. EXEIDEA LTD.	PREPARED BY	DATE	SCALE 1:2000

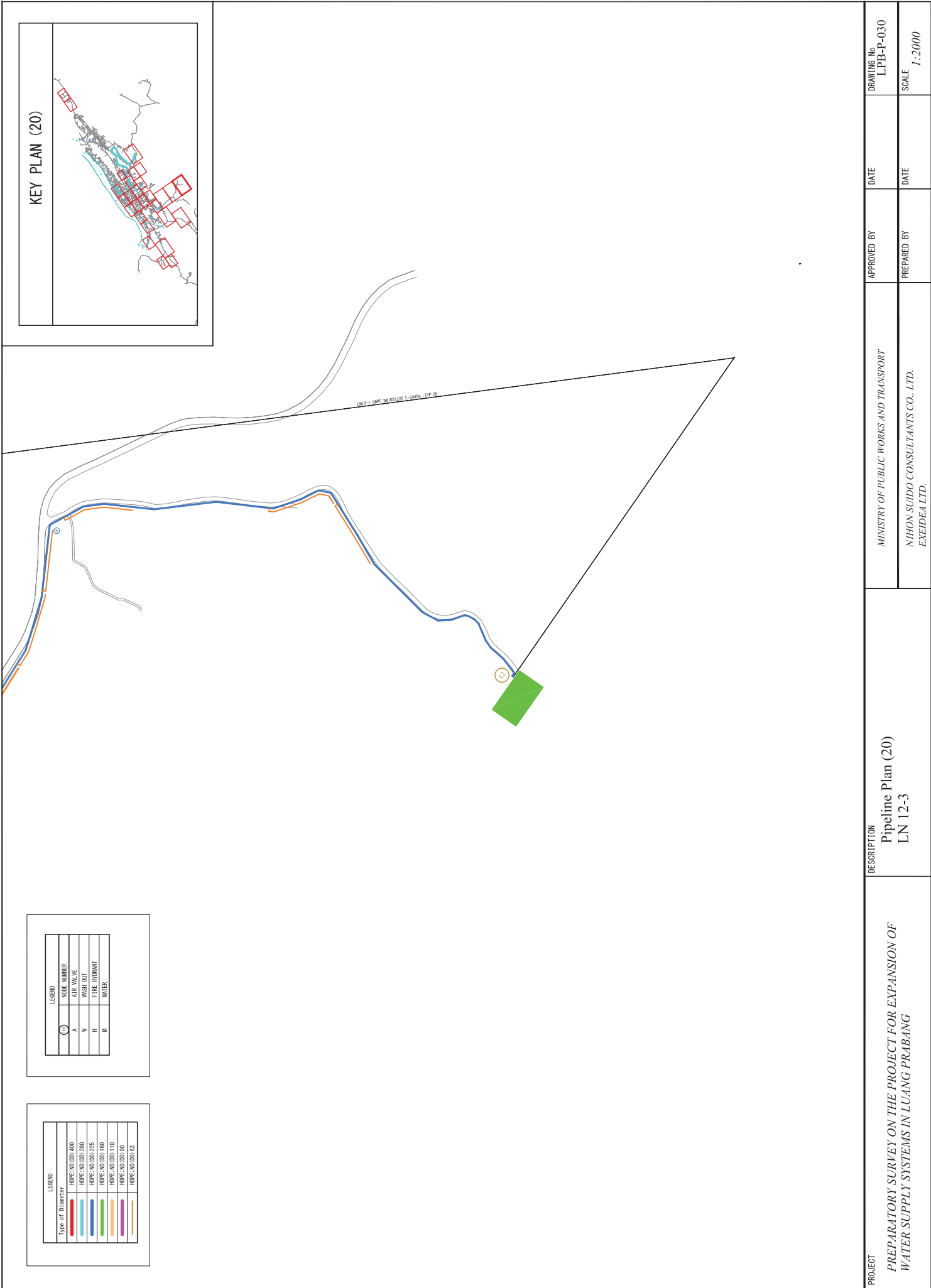
KEY PLAN (19)



LEGEND	
(C)	NODE NUMBER
A	AIR VALVE
W	WASH OUT
H	FIRE HYDRANT
M	WATER

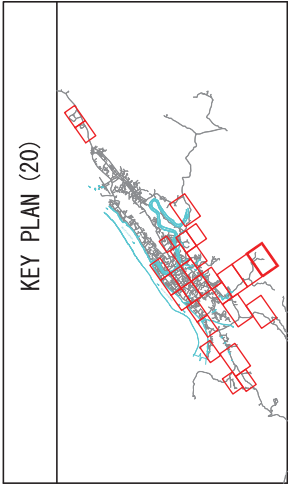
LEGEND	
Type of Diameter	
HPPE-ND-00D-400	[Red line]
HPPE-ND-00D-280	[Blue line]
HPPE-ND-00D-225	[Green line]
HPPE-ND-00D-160	[Purple line]
HPPE-ND-00D-110	[Orange line]
HPPE-ND-00D-90	[Yellow line]
HPPE-ND-00D-63	[Light Blue line]

PROJECT PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION Pipeline Plan (19) LN 12-3	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No. LPB-P-029
		NIHON SUIDO CONSULTANTS CO., LTD. EXEIDEA LTD.	PREPARED BY	DATE	SCALE 1:2000



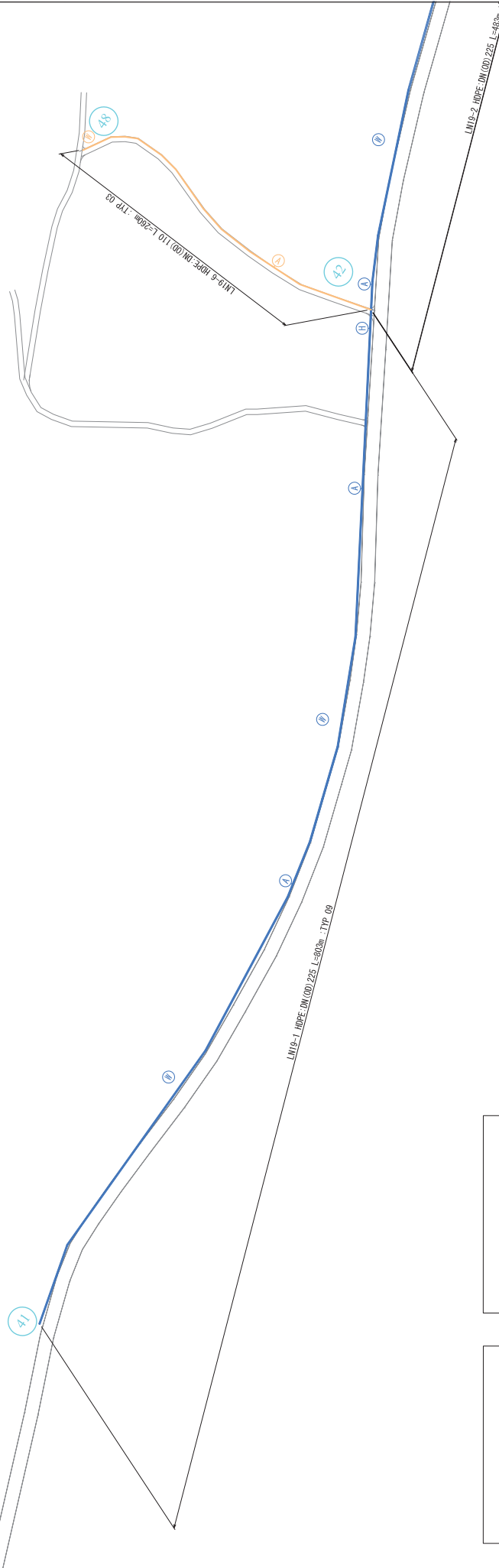
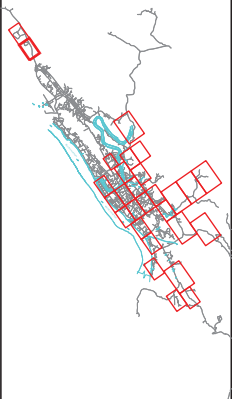
LEGEND	
(C)	NODE NUMBER
A	AIR VALVE
W	WASH OUT
H	FIRE HYDRANT
M	WATER

LEGEND	
Type of Diameter	
HPPE-ND-OD-400	[Red line]
HPPE-ND-OD-280	[Blue line]
HPPE-ND-OD-225	[Green line]
HPPE-ND-OD-160	[Orange line]
HPPE-ND-OD-110	[Purple line]
HPPE-ND-OD-90	[Yellow line]
HPPE-ND-OD-63	[Light Blue line]



PROJECT PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION Pipeline Plan (20) LN 12-3	APPROVED BY	DATE	DRAWING No LPB-P-030	
		PREPARED BY	DATE	SCALE 1:2000	
		MINISTRY OF PUBLIC WORKS AND TRANSPORT NINHON SUIDO CONSULTANTS CO., LTD. EXEIDEA LTD.			

KEY PLAN (21)

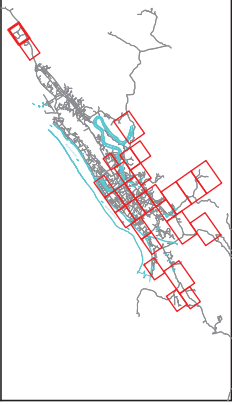


LEGEND	
Type of Diameter	Color
HDPE DN(OD) 400	Red
HDPE DN(OD) 280	Blue
HDPE DN(OD) 225	Green
HDPE DN(OD) 160	Yellow
HDPE DN(OD) 110	Purple
HDPE DN(OD) 90	Orange
HDPE DN(OD) 63	Light Blue

LEGEND	
Symbol	Function
(A)	HOPE NUMBER
A	AIR VALVE
W	WASH OUT
H	FIRE HYDRANT
M	METER

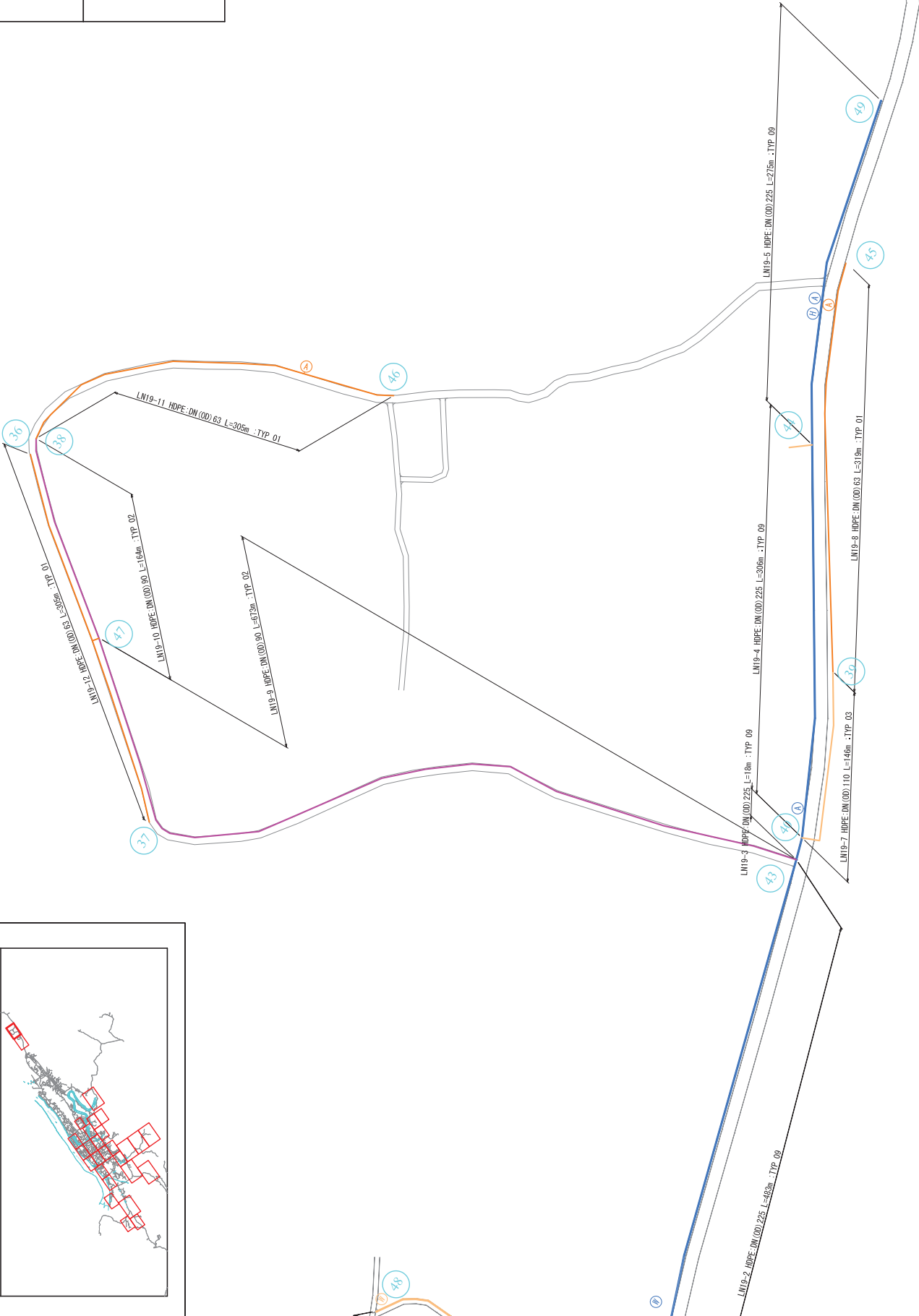
PROJECT PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION Pipeline Plan (21) LN 19-2	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No. LPB-P-031
		NHON SUIDO CONSULTANTS CO., LTD. EXEIDEA LTD.	PREPARED BY	DATE	SCALE 1:3000

KEY PLAN (18)



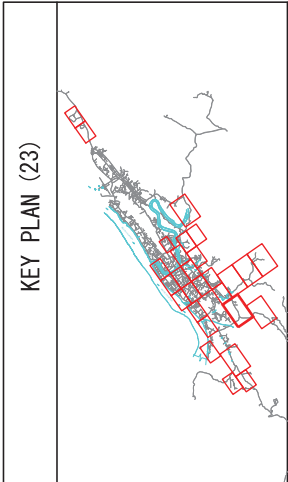
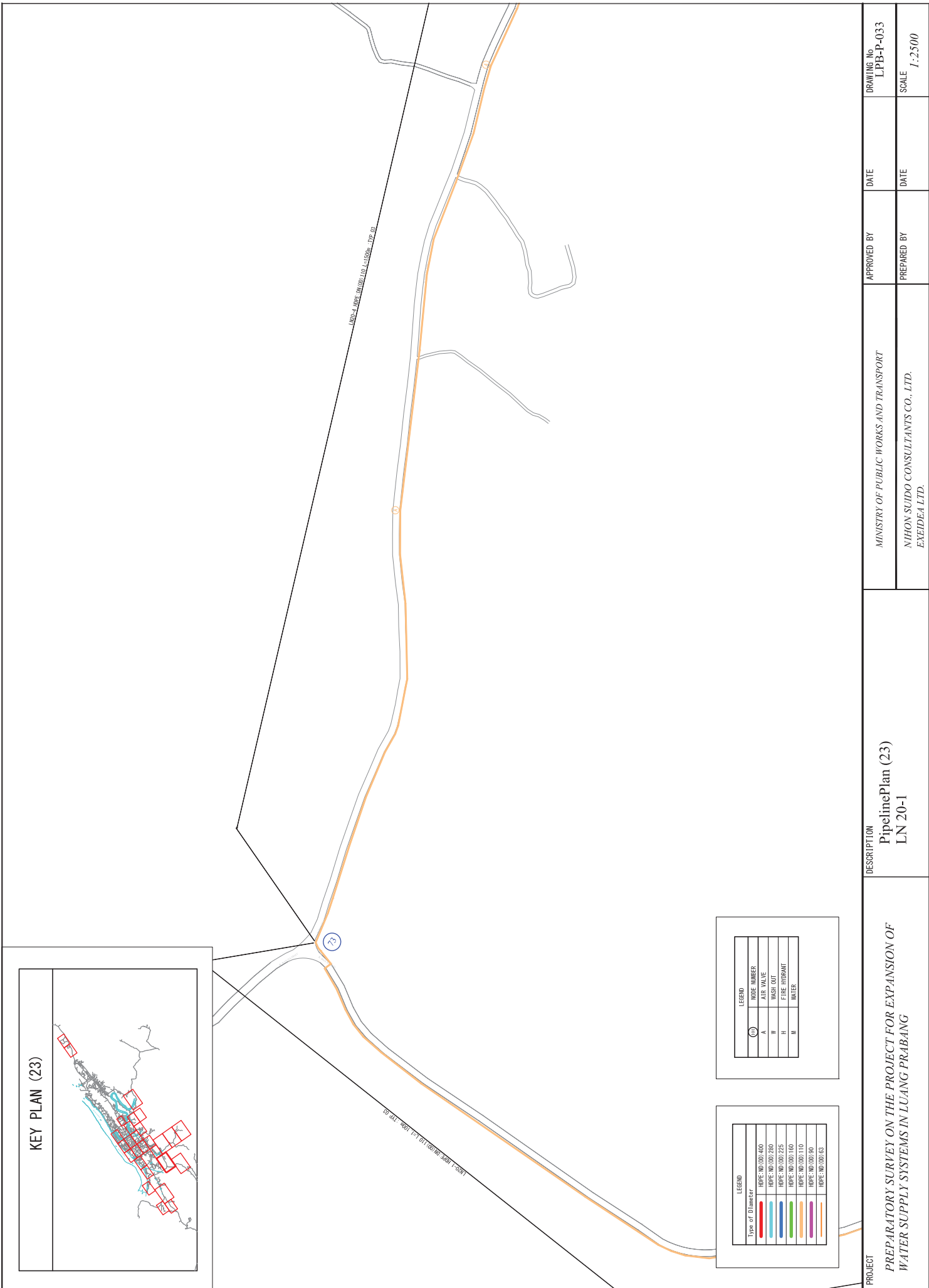
LEGEND	
Type of Diameter	
HDPE DN(OD)400	[Red line]
HDPE DN(OD)280	[Orange line]
HDPE DN(OD)225	[Blue line]
HDPE DN(OD)160	[Green line]
HDPE DN(OD)110	[Purple line]
HDPE DN(OD)90	[Pink line]
HDPE DN(OD)63	[Light blue line]

LEGEND	
NO	NODE NUMBER
A	AIR VALVE
W	WASH OUT
H	FIRE HYDRANT
M	MAN



PROJECT	PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION	Pipeline Plan (22) LN 19-2	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No LPB-P-032
				NIHON SUDO CONSULTANTS CO., LTD. EXEIDEA LTD.	PREPARED BY	DATE	SCALE 1:3000





**LEGEND**

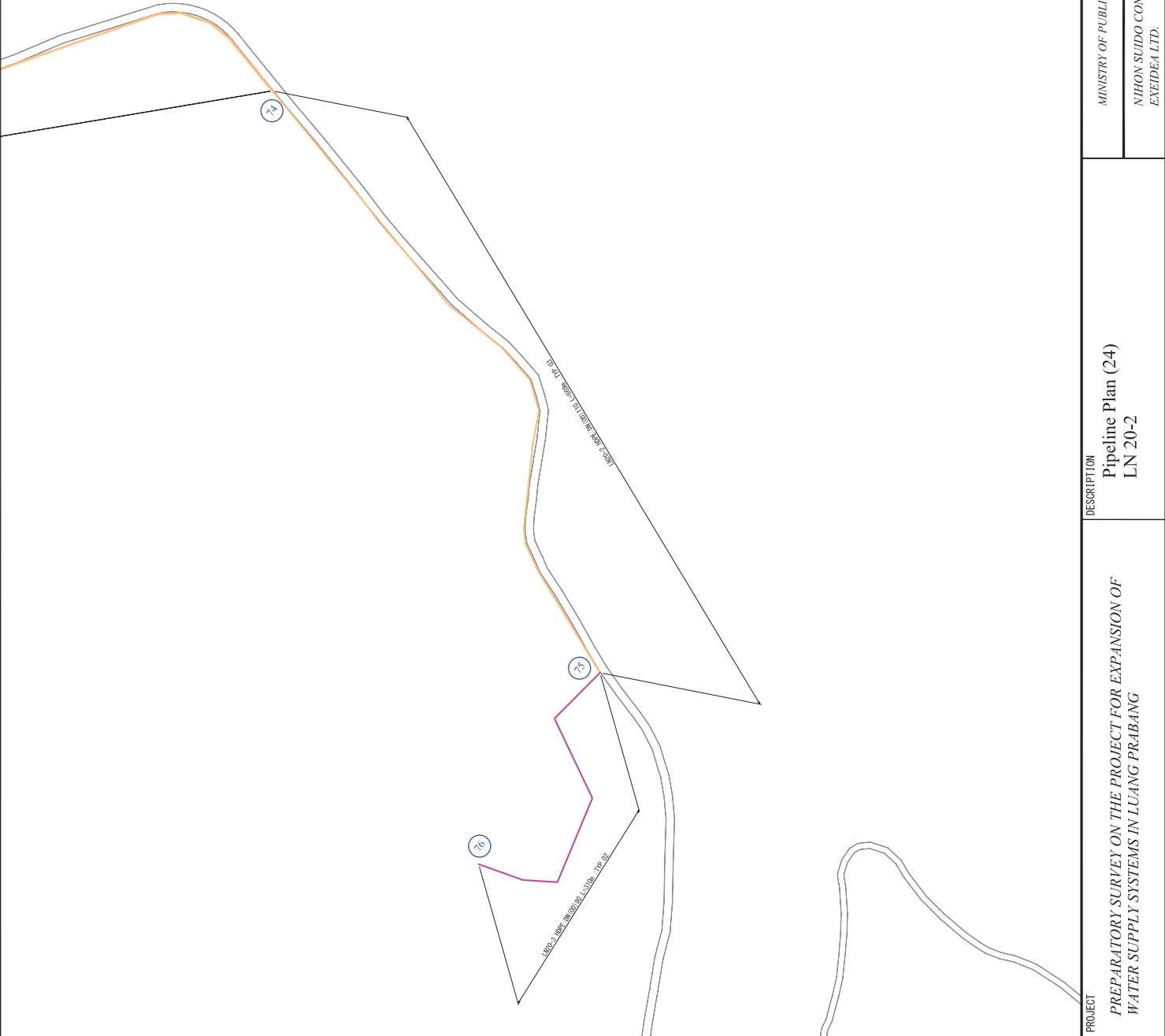
HOPE NUMBER
(23)
A
W
H
M

**LEGEND**

Type of Diameter	HOPE NO. (00) 400	HOPE NO. (00) 280	HOPE NO. (00) 225	HOPE NO. (00) 160	HOPE NO. (00) 110	HOPE NO. (00) 90	HOPE NO. (00) 63

PROJECT	PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION	Pipeline Plan (23)		APPROVED BY	DATE	DRAWING No.
			LN 20-1	MINISTRY OF PUBLIC WORKS AND TRANSPORT			L/PB-P-033
					PREPARED BY	DATE	SCALE
					NIHON SUIDO CONSULTANTS CO., LTD.		1:2500

KEY PLAN (24)



LEGEND

Type of DI	Color	DI (mm)
Water	Red	1000
Sanitary	Blue	1000
Fire	Green	1000
Other	Yellow	1000
Other	Purple	1000
Other	Orange	1000
Other	Pink	1000
Other	Light Blue	1000
Other	Light Green	1000
Other	Light Purple	1000
Other	Light Orange	1000
Other	Light Pink	1000
Other	Light Light Blue	1000
Other	Light Light Green	1000
Other	Light Light Purple	1000
Other	Light Light Orange	1000
Other	Light Light Pink	1000

LEGEND

Symbol	Node Number
Circle with 'A'	AIR VALVE
Circle with 'W'	WASH OUT
Circle with 'H'	FIRE HYDRANT
Circle with 'M'	METERS

PROJECT  
 PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF  
 WATER SUPPLY SYSTEMS IN LUANG PRABANG

DESCRIPTION  
 Pipeline Plan (24)  
 LN 20-2

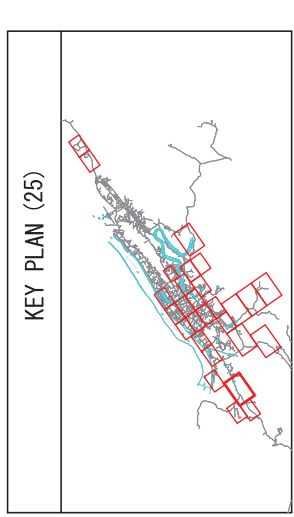
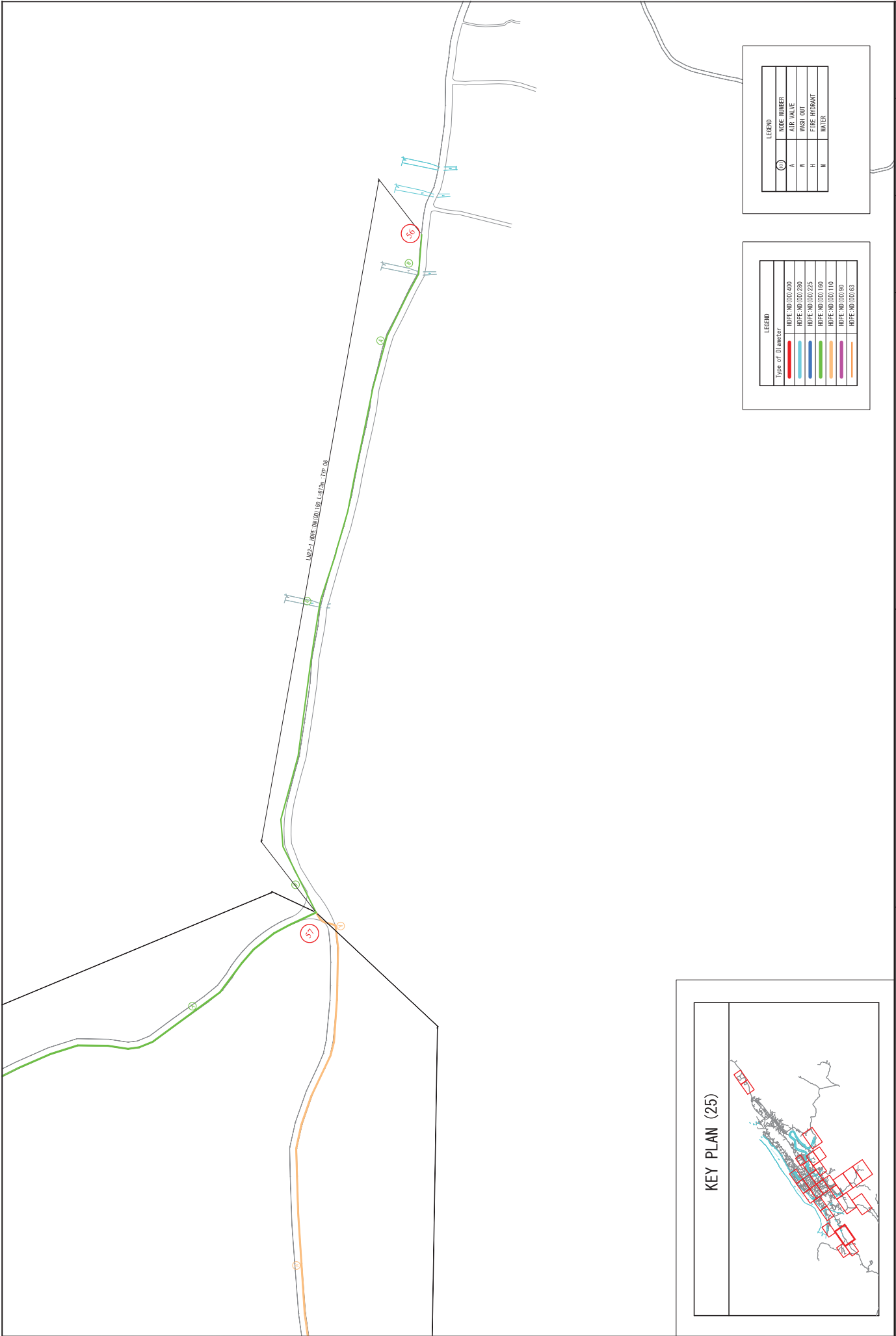
MINISTRY OF PUBLIC WORKS AND TRANSPORT  
 NIHON SUIDO CONSULTANTS CO., LTD.  
 EXEIDEA LTD.

APPROVED BY  
 PREPARED BY

DATE  
 DATE

DRAWING No  
 LPB-P-034

SCALE  
 1:2500



LEGEND

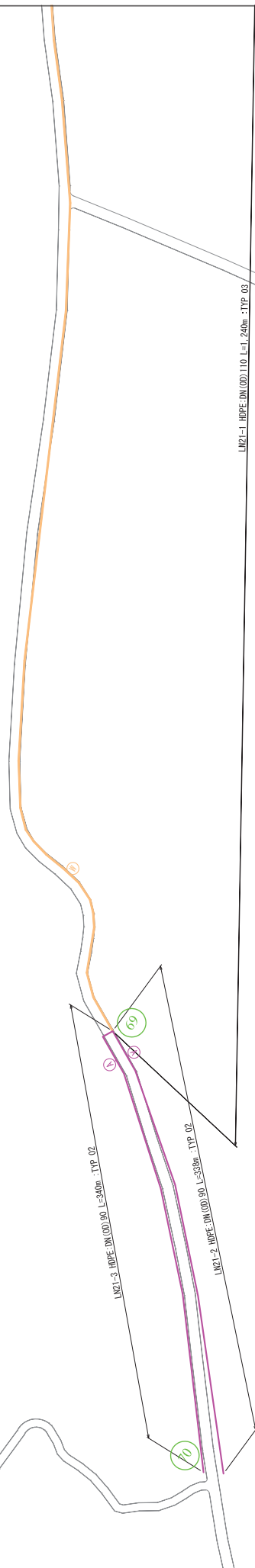
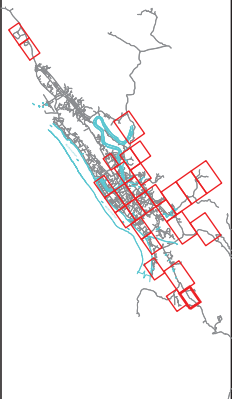
Type of Diameter	PIPE NO.000.400	PIPE NO.000.250	PIPE NO.000.225	PIPE NO.000.160	PIPE NO.000.110	PIPE NO.000.90	PIPE NO.000.63
100mm	150mm	200mm	250mm	300mm	350mm	400mm	

LEGEND

NO. NUMBER	AIR VALVE	WASH OUT	FIRE HYDRANT	METERS
VA	W	H	M	

PROJECT PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION Pipeline Plan (25) LN 20-4	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No LPB-P-035
		NIHON SUIDO CONSULTANTS CO., LTD. EXEIDEA LTD.	PREPARED BY	DATE	SCALE 1:2500

KEY PLAN (26)



LN21-1 HDPE DN(OD)110 L=1.240m :TYP. 03

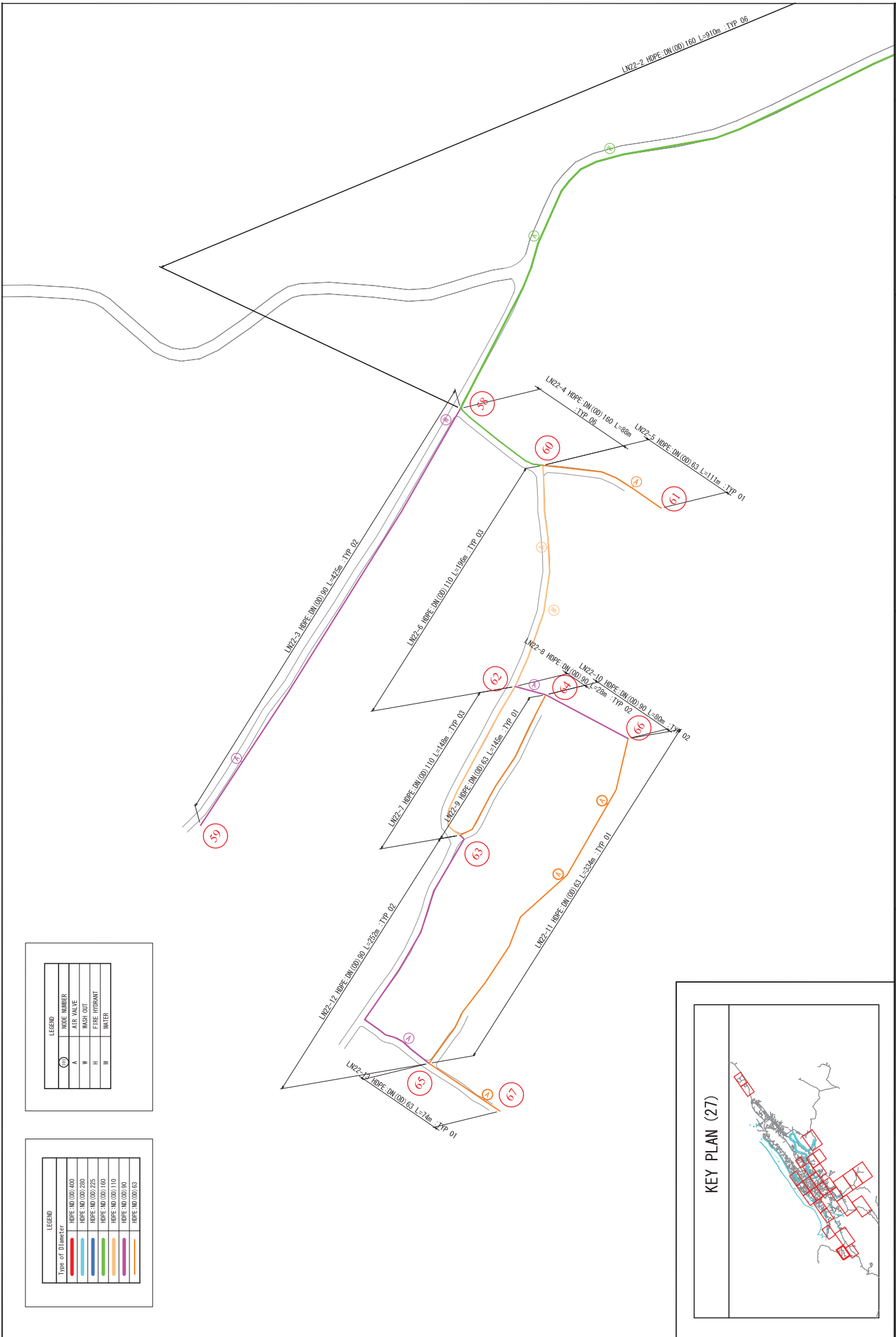
LN21-3 HDPE DN(OD)90 L=340m :TYP. 02

LN21-2 HDPE DN(OD)90 L=330m :TYP. 02

LEGEND	
Type of DI Element	HDPE NO.(OD) L
4" (100mm)	HDPE NO.000.400
6" (150mm)	HDPE NO.000.250
8" (200mm)	HDPE NO.000.225
10" (250mm)	HDPE NO.000.160
12" (300mm)	HDPE NO.000.110
15" (375mm)	HDPE NO.000.90
18" (450mm)	HDPE NO.000.63

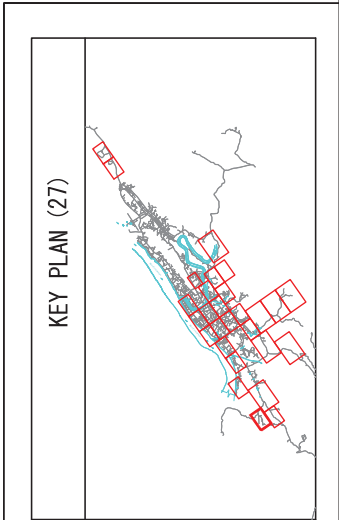
LEGEND	
Symbol	Node Number
(A)	AIR VALVE
(W)	WASH OUT
(H)	FIRE HYDRANT
(M)	METER

PROJECT PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION Pipeline Plan (26) LN 21	APPROVED BY	DATE	DRAWING No LPB-P-036
		MINISTRY OF PUBLIC WORKS AND TRANSPORT		
		PREPARED BY	DATE	SCALE 1:3000
		NIHON SUIDO CONSULTANTS CO., LTD.		
		EXEIDEA LTD.		

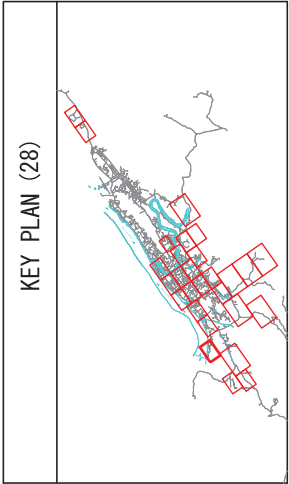
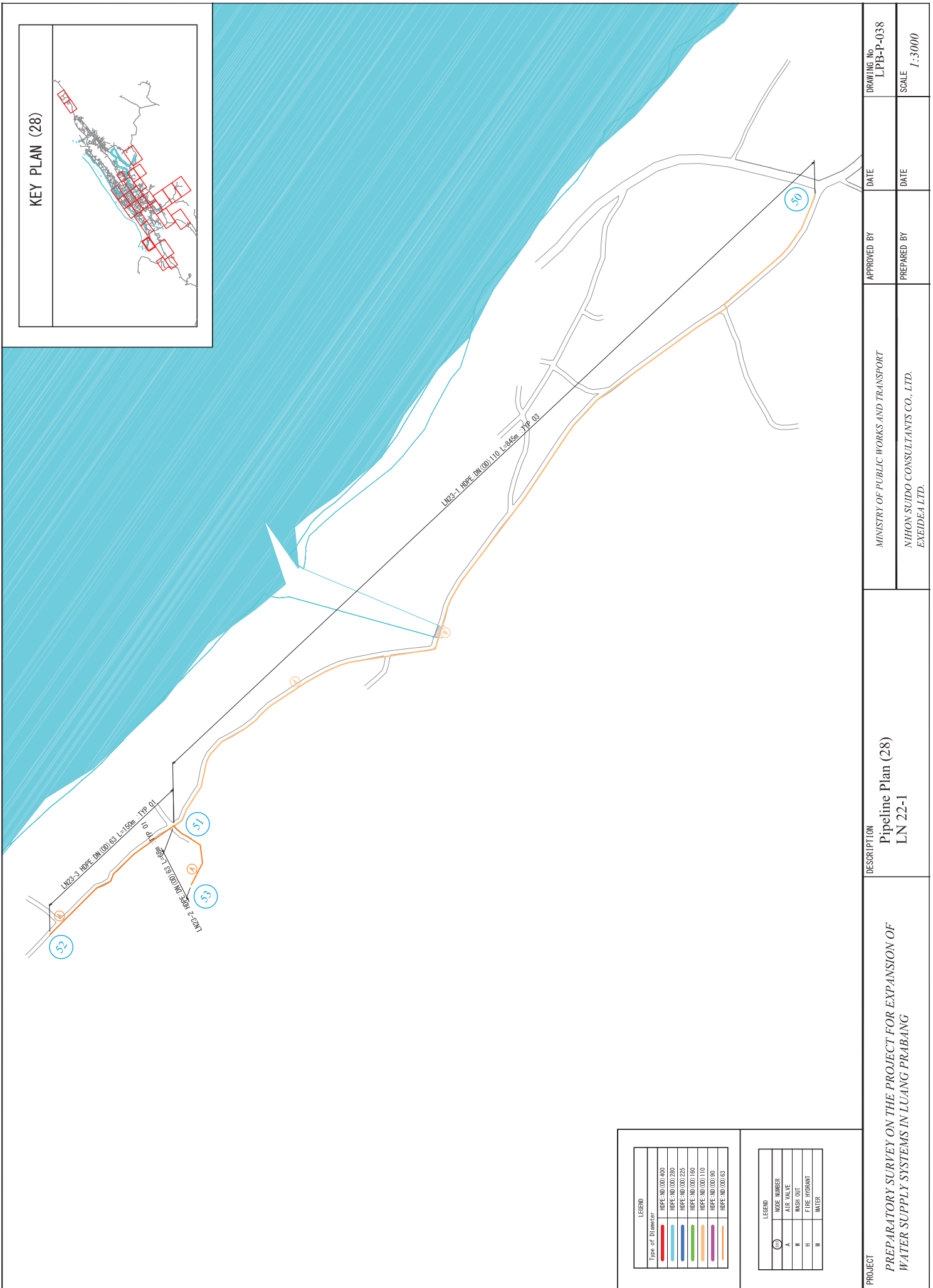


LEGEND	
Symbol	Node Number
(59)	59
(60)	60
(61)	61
(62)	62
(63)	63
(64)	64
(65)	65
(66)	66
(67)	67

LEGEND	
Type of Diameter	Color
HDPE DN(OD) 400	Red
HDPE DN(OD) 280	Blue
HDPE DN(OD) 225	Green
HDPE DN(OD) 160	Orange
HDPE DN(OD) 110	Purple
HDPE DN(OD) 90	Light Blue
HDPE DN(OD) 63	Light Purple



PROJECT	PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION	Pipeline Plan (27) LN 22-1		APPROVED BY	DATE	DRAWING No	L/PB-P-037
			MINISTRY OF PUBLIC WORKS AND TRANSPORT	NIHON SUIDO CONSULTANTS CO., LTD.			PREPARED BY	SCALE



LEGEND

Type of Diameter	HPPE No./000/400	HPPE No./000/250	HPPE No./000/225	HPPE No./000/160	HPPE No./000/110	HPPE No./000/90	HPPE No./000/83

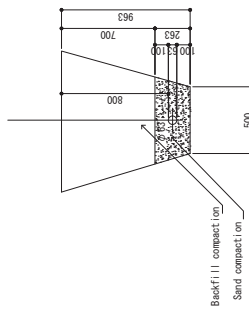
LEGEND

MODE NUMBER	(M)
A	AIR VALVE
W	WASH OUT
H	FIRE HYDRANT
M	WATER

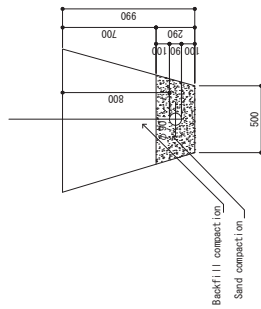
PROJECT	PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION	Pipeline Plan (28)		MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No	L/PB-P-038
			LN 22-1	LN 22-1				MINHON SUIDO CONSULTANTS CO., LTD.	PREPARED BY

# Typical Drawing for Pipe Laying

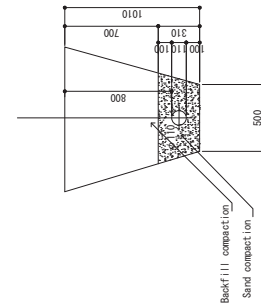
**TYP 01**  
φ 63, Road shoulder



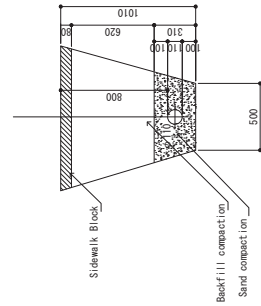
**TYP 02**  
φ 90, Road shoulder



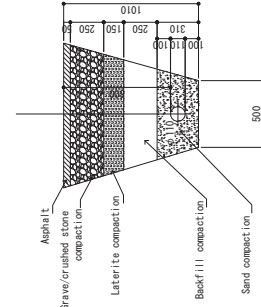
**TYP 03**  
φ 110, Road shoulder



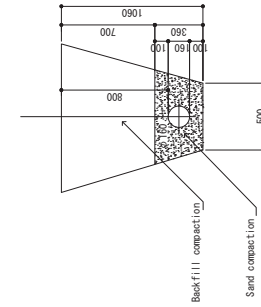
**TYP 04**  
φ 110, Walkway



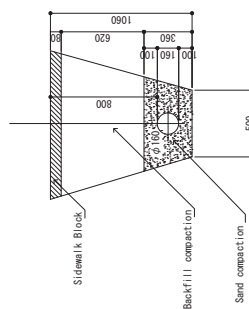
**TYP 05**  
φ 110, Municipal road



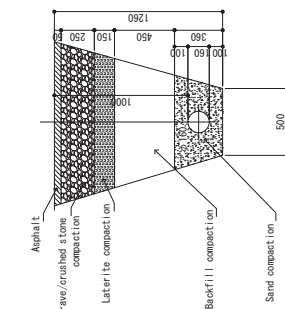
**TYP 06**  
φ 160, Road shoulder



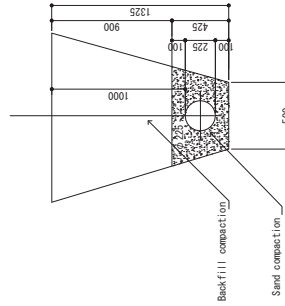
**TYP 07**  
φ 160, Walkway



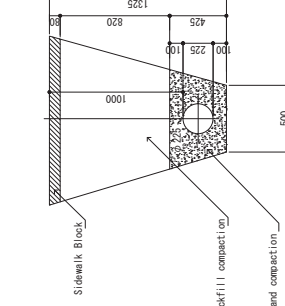
**TYP 08**  
φ 160, Municipal road



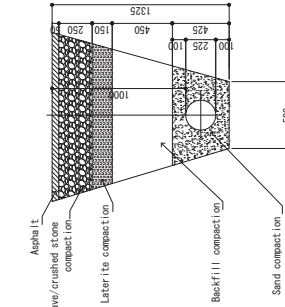
**TYP 09**  
φ 225, Road shoulder



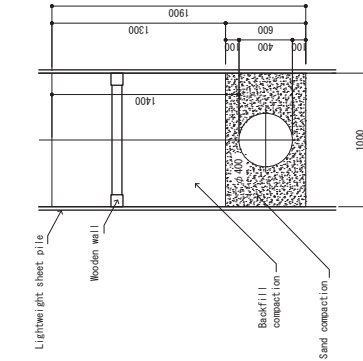
**TYP 10**  
φ 225, Walkway



**TYP 11**  
φ 225, Municipal road

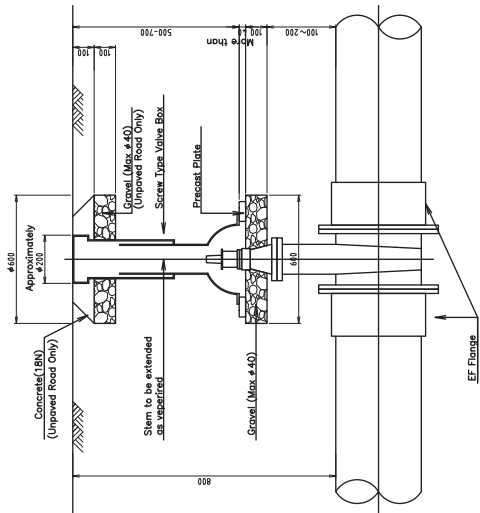


**TYP 12**  
φ 400, Road shoulder



<b>PROJECT</b> PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	<b>DESCRIPTION</b> Typical Drawing for Pipe Laying (1) Earthwork	<b>APPROVED BY</b> MINISTRY OF PUBLIC WORKS AND TRANSPORT	<b>DATE</b> _____	<b>DRAWING No</b> LBP-P-TYP-001
		<b>PREPARED BY</b> NI HON SUIDO CONSULTANTS CO., LTD.	<b>DATE</b> _____	<b>SCALE</b> 1:200

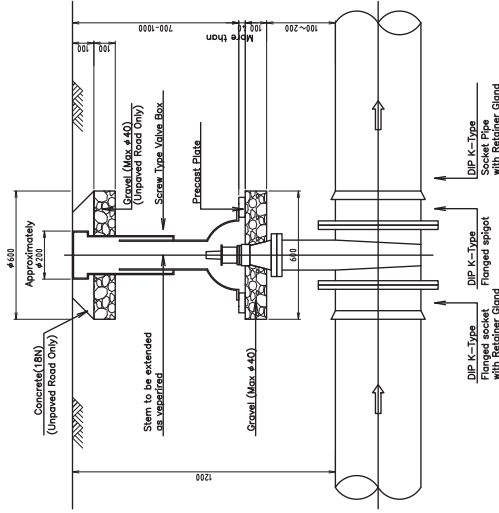
# Typical Drawing for Sluice Valve



SLUICE VALVE INSTALLATION  
(HDPE:ND(OD)63-225)

- NOTE**
1. ALL SLUICE VALVES LESS THAN 400mm DIA WILL HAVE NO CHAMBERS AND WILL BE INSTALLED SEMLER TO WASH OUT VALVES HEAVY-DUTY SURFACE BOXES AT THE ROAD LEVEL TO OPERATE THEM.
  2. ALL DIMENSIONS ARE IN mm.

PIPE	Material	Diameter DN (mm) / OD (mm)	Number
	Valve	80-500	1
	Flange Joint	80-500	2
DIP (T)	Flanged Socket	80-500	1
DIP (T)	Flanged Spigot	80-500	1
DIP (T)	Restrained Coupling	80-500	2



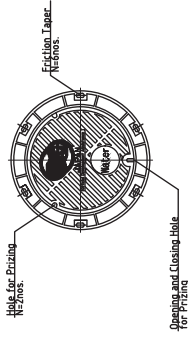
SLUICE VALVE INSTALLATION  
(DIP:ND250-400)

PIPE	Material	Diameter DN (mm) / OD (mm)	Number
	Valve	80-500	1
	Flange Joint	80-500	2
HDPE	Stub End	90-400	2
HDPE	EF Socket	90-400	2

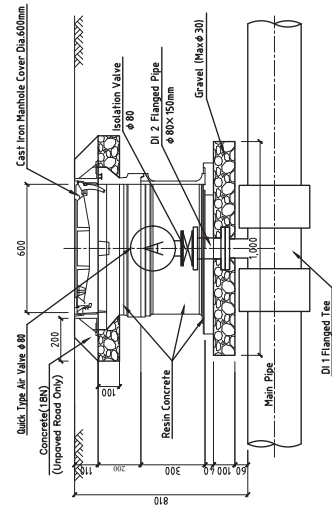
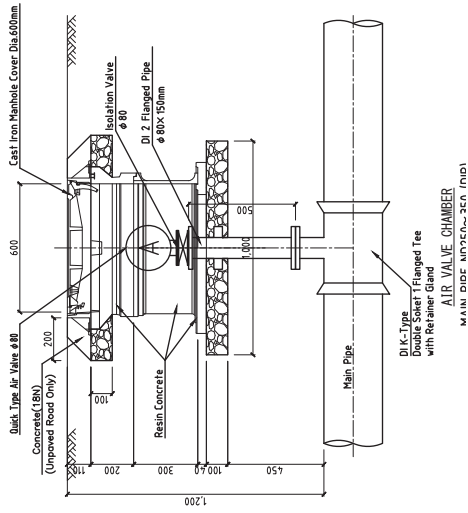
PROJECT <b>PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG</b>	DESCRIPTION <i>Typical Drawing for Pipe Laying (2) Sluice Valve</i>	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No <i>LBP-P-TYP-002</i>
		<i>NIHON SUIDO CONSULTANTS CO., LTD. EXEIDEA LTD.</i>	PREPARED BY	DATE	SCALE <i>1:200</i>



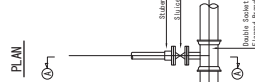
# Typical Drawing for Air Valve



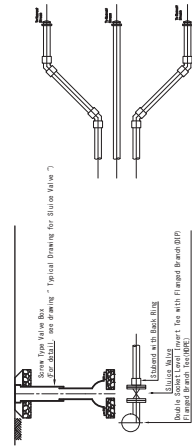
CAST IRON MANHOLE COVER  
ø 500 (No.3 Type)



Blow off  
SECTION B-B



SECTION A-A



MAIN PIPE MATERIAL	MAIN PIPE DIAMETER DN (mm) / OD (mm)	BRANCH PIPE for AIR VALVE	AIR VALVE	BRANCH PIPE for Wash Out
D1P	DN60	DN60	13	OD63
D1P	DN80	DN80	13	OD90
D1P	DN100	DN80	13	OD90
D1P	DN150	DN80	20	OD90
D1P	DN200	DN80	20	OD90
D1P	DN250	DN80	25	DN100
D1P	DN300	DN80	25	DN100
D1P	DN350	DN80	25	DN100

MAIN PIPE MATERIAL	MAIN PIPE DIAMETER DN (mm) / OD (mm)	BRANCH PIPE for AIR VALVE	AIR VALVE	BRANCH PIPE for Wash Out
HDPE	63	DN50	13	OD63
HDPE	90	DN80	13	OD90
HDPE	110	DN80	13	OD90
HDPE	160	DN80	20	OD90
HDPE	225	DN80	20	OD90
HDPE	280	DN80	25	DN100
HDPE	355	DN80	25	DN100
HDPE	400	DN80	25	DN100

**NOTE**

1. THE THICKNESS OF THE BINDING LAYER SPECIFIED IN THE DRAWING IS FOR NORMAL SOIL TYPES. HOWEVER, IF THE STRUCTURE IS FOUND ON VERY WEAK SOIL SUCH AS PEAT, A GROUND STABILIZATION METHOD, AS DIRECTED BY THE ENGINEER, SHALL BE FOLLOWED.
2. THE TOP OF THE AIR VALVE CHAMBER SHOULD BE AT THE SAME LEVEL AS THE ROAD TOP LEVEL.
3. ALL DIMENSIONS ARE IN mm.

PROJECT

PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG

DESCRIPTION

Typical Drawing for Pipe Laying (3)  
Air Valve

APPROVED BY

MINISTRY OF PUBLIC WORKS AND TRANSPORT

DATE

DRAWING No

LBP-P-TYP-003

PREPARED BY

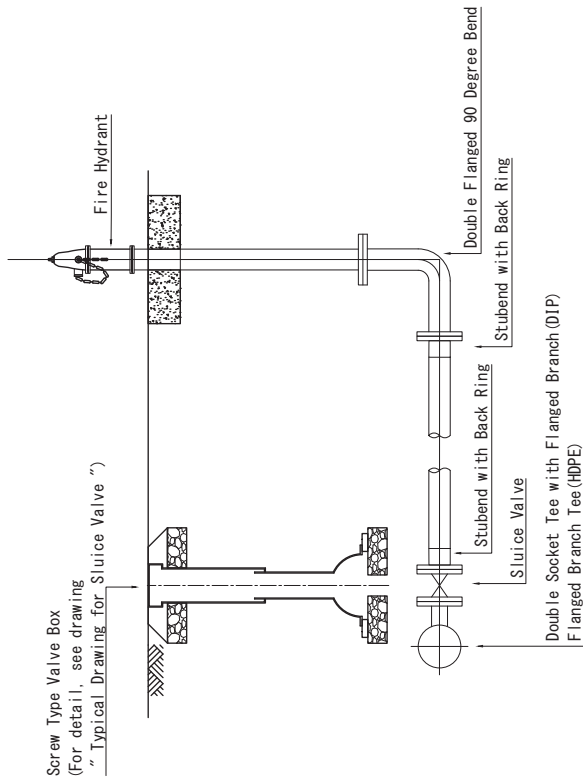
NIHON SUIDO CONSULTANTS CO., LTD.

DATE

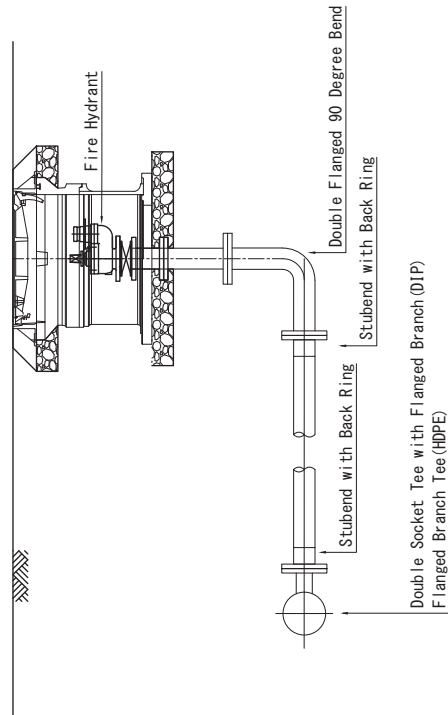
SCALE

1:200

# Typical Drawing for Fire Hydrant



## Above ground type



## Underground type

PIPE	Material	Diameter DN (mm) / OD (mm)	Main Pipe OD160-225 Number	Main Pipe DN150-200 Number
	Fire Hydrant	100	1	1
	Double Flanged	100 x 1000	1	1
	Double Flanged 90 Degree Bend	100	1	1
	Valve	100	1	1
	Flange Joint	100	5	5
HDPE	HDPE Straight	110	1	1
HDPE	Stub End	110	2	2
HDPE	EF Socket	110	1	1
DIP (T)	Double Socket Tee with Flanged Branch	150-200 x 100	-	1
DIP (T)	Restrained Cupling	150-200	-	2
HDPE	Tee with Reduced Branch	160-225 x 110	1	-
HDPE	EF Socket	160-225	2	-

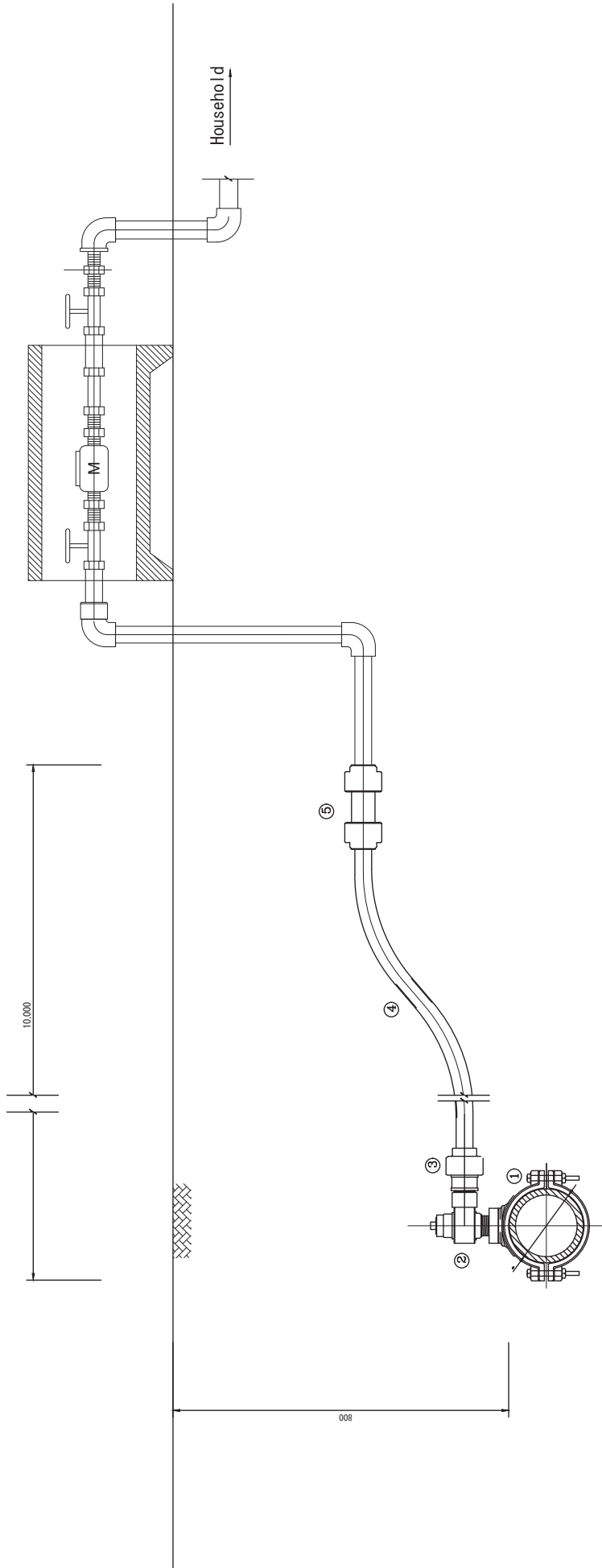
PIPE	Material	Diameter DN (mm) / OD (mm)	Main Pipe OD160-225 Number	Main Pipe DN150-200 Number
	Fire Hydrant	100	1	1
	Double Flanged	100 x 1000	1	1
	Double Flanged 90 Degree Bend	100	1	1
	Valve	100	1	1
	Flange Joint	100	5	5
HDPE	HDPE Straight	110	1	1
HDPE	EF Socket	110	1	1
DIP (T)	Double Socket Tee with Flanged Branch	150-200 x 100	-	1
DIP (T)	Restrained Cupling	150-200	-	2
HDPE	Tee with Reduced Branch	160-225 x 110	1	-
HDPE	EF Socket	160-225	2	-

**NOTE**

1. THE THICKNESS OF THE BUNDLING LAYER SPECIFIED IN THE DRAWING IS FOR NORMAL SOIL TYPES. HOWEVER, IF THE STRUCTURE IS FOUND ON VERY WEAK SOIL SUCH AS PEAT, A GROUND STABILIZATION METHOD, AS DIRECTED BY THE ENGINEER, SHALL BE FOLLOWED.
2. THE TOP OF THE AIR VALVE CHAMBER SHOULD BE AT THE SAME LEVEL AS THE ROAD TOP LEVEL.
3. ALL DIMENSIONS ARE IN mm.

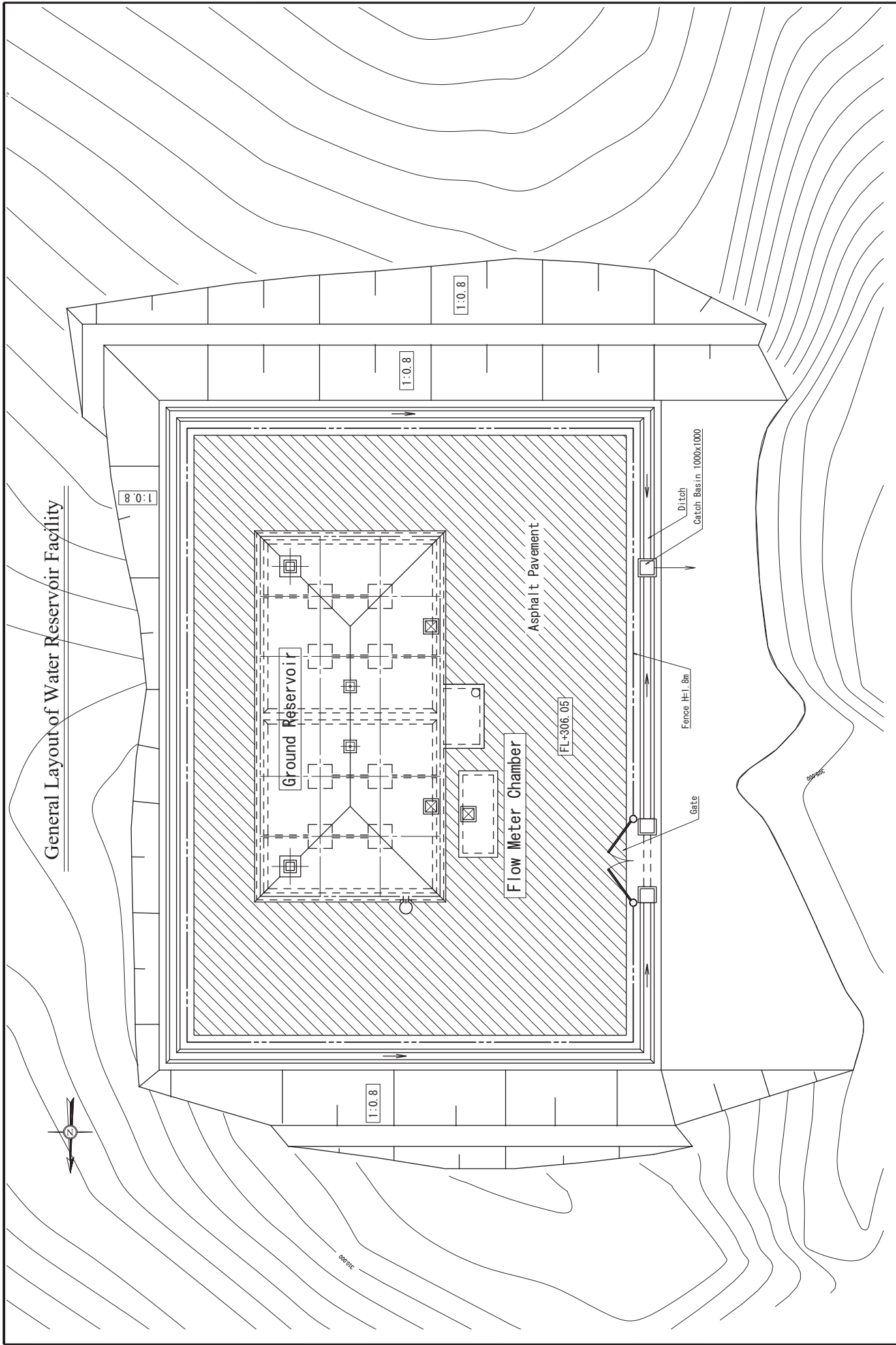
PROJECT <b>PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG</b>	DESCRIPTION <i>Typical Drawing for Pipe Laying (4) Fire Hydrant</i>	APPROVED BY	DATE	DRAWING No <i>LBP-P-TYP-004</i>
		PREPARED BY	DATE	SCALE <i>1:200</i>

# Typical Drawing for Service Connection



No	Description	Size	Unit	Quantity
1	Clamp Saddle	∅ Main Pipe X 1"	PC	1
2	Brass Ferrule	1"	PC	1
3	Compression Male Adaptor	25mm X 1"	PC	1
4	HDPE Pipe	25mm	m	10
5	Compression Coupling	25mm	PC	1

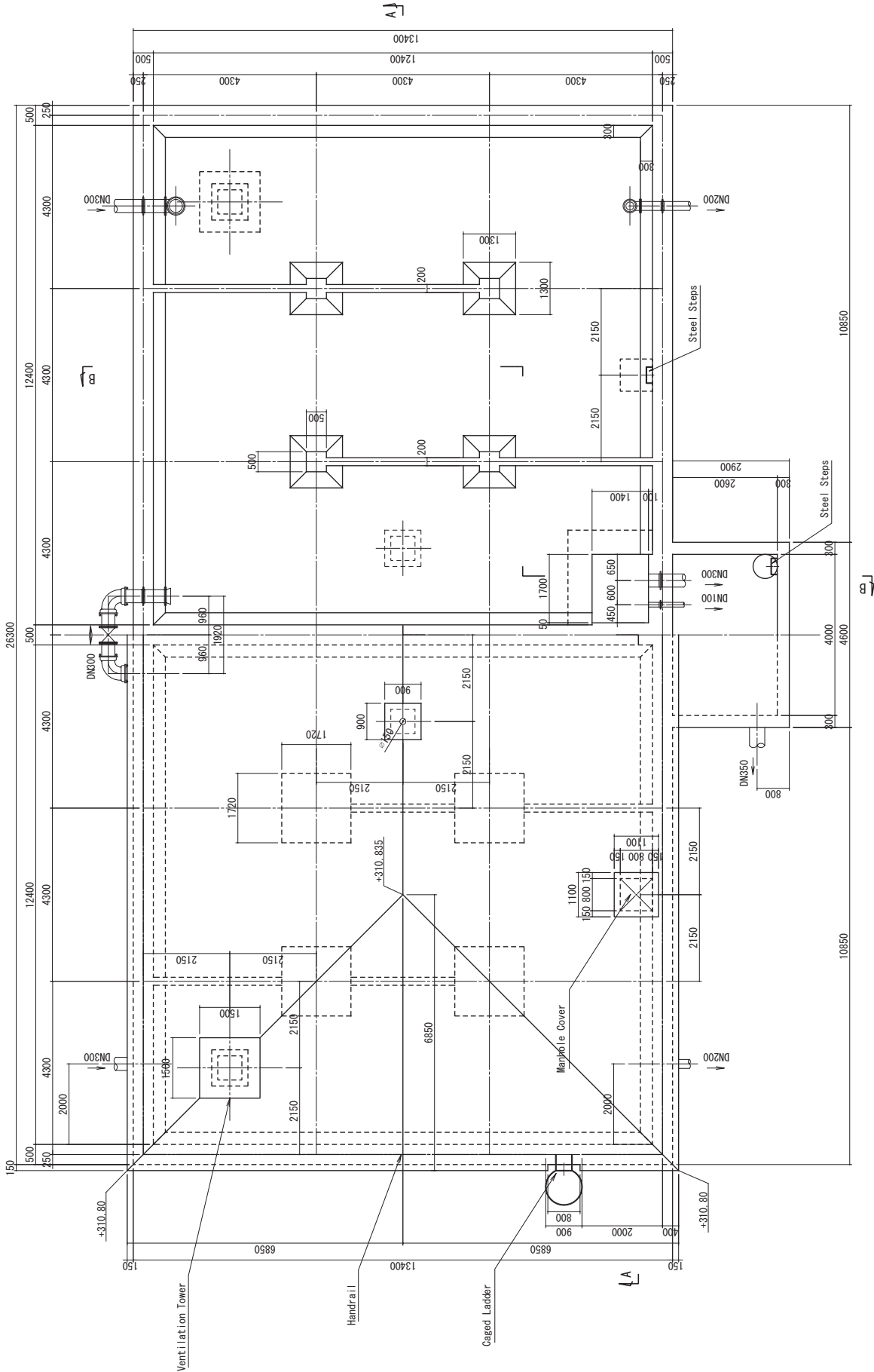
<b>PROJECT</b> PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	<b>DESCRIPTION</b> Typical Drawing for Pipe Laying (5) Service Connection	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No LBP-P-TYP-005
		NIHON SUIDO CONSULTANTS CO., LTD. EXEIDEA LTD.	PREPARED BY	DATE	SCALE None



General Layout of Water Reservoir Facility

PROJECT PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION General Layout of Water Reservoir Facility	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No LPB-R-W-001
		NIHON SUDO CONSULTANTS CO., LTD. EXEIDEA LTD.	PREPARED BY	DATE	SCALE 1:250

# Ground Reservoir (I)

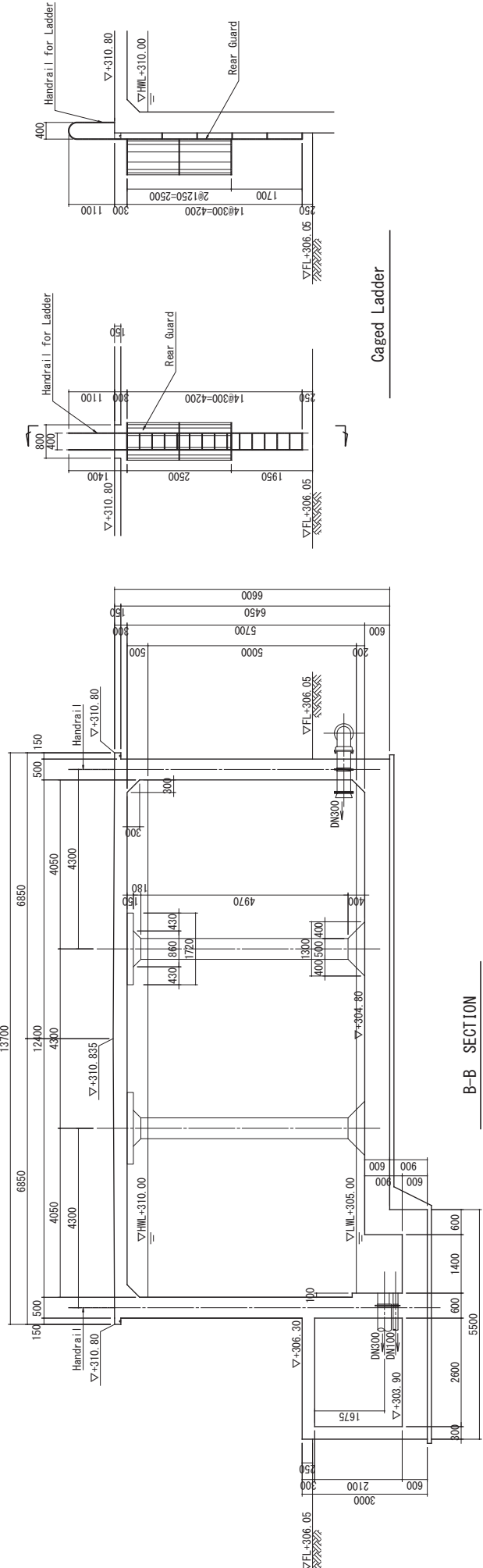
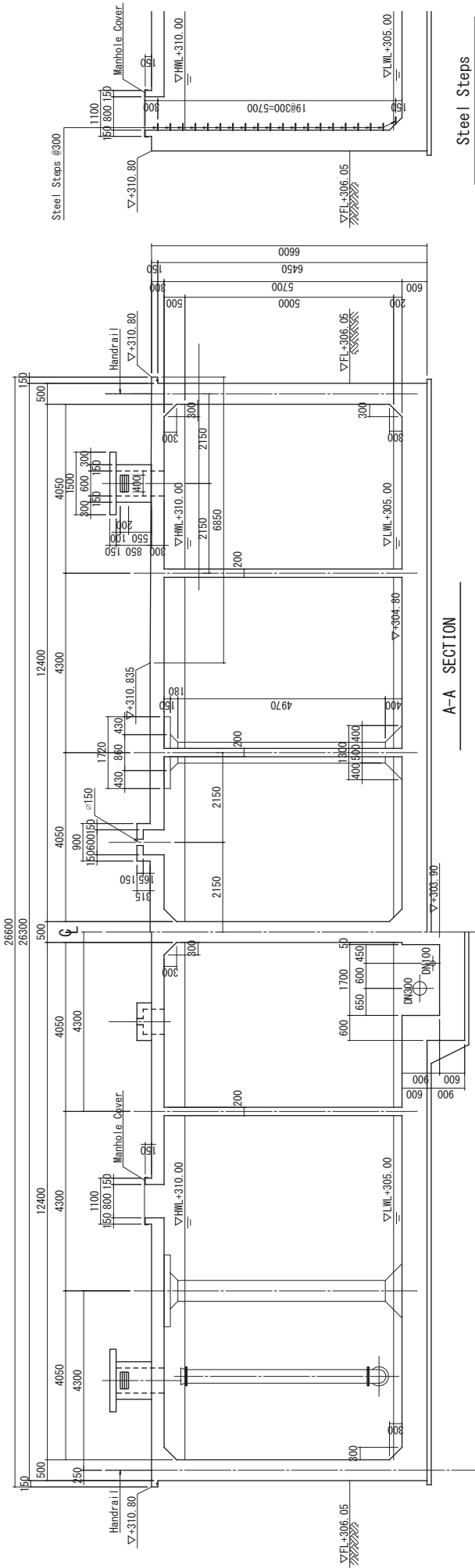


PLAN

SECTIONAL PLAN

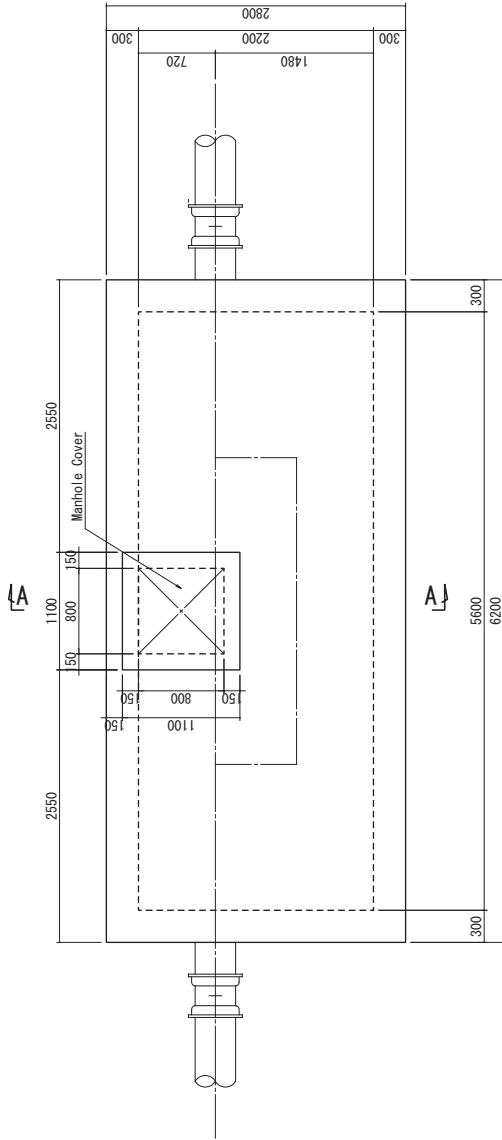
PROJECT	PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION	Ground Reservoir Structure (1)	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No	LPB-R-W-002
				NIHON SUIDO CONSULTANTS CO., LTD.	PREPARED BY	DATE	SCALE	1:100

# Ground Reservoir (2)

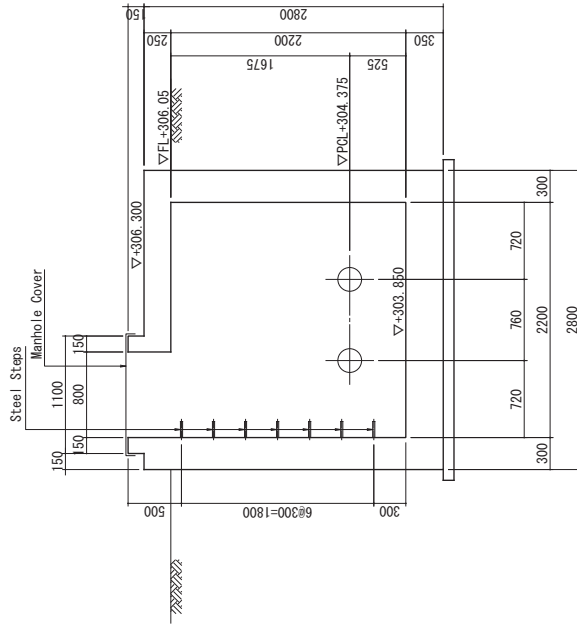


PROJECT	PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION	Ground Reservoir Structure (2)	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No	LPBR-W-003
				NIHON SUIDO CONSULTANTS CO., LTD.	PREPARED BY	DATE	SCALE	1:100

# Flow Meter Chamber



PLAN

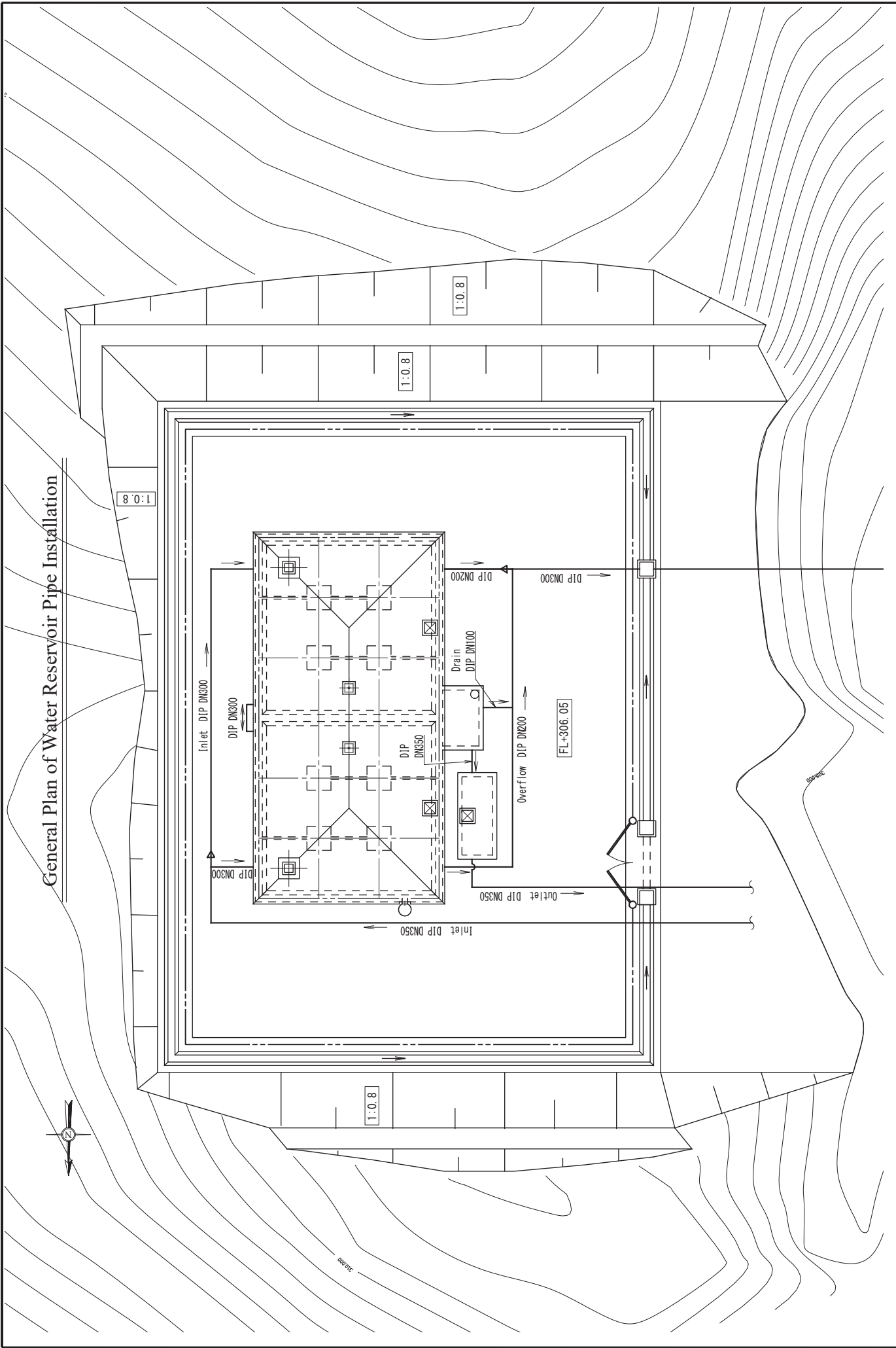


A - A SECTION

SECTIONAL PLAN  
(Pipe Installation)

PROJECT PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION Flow Meter Chamber Structure	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No LPB-R-W-004
		NIHON SUDO CONSULTANTS CO., LTD. EXEIDEA LTD.	PREPARED BY	DATE	SCALE 1:50

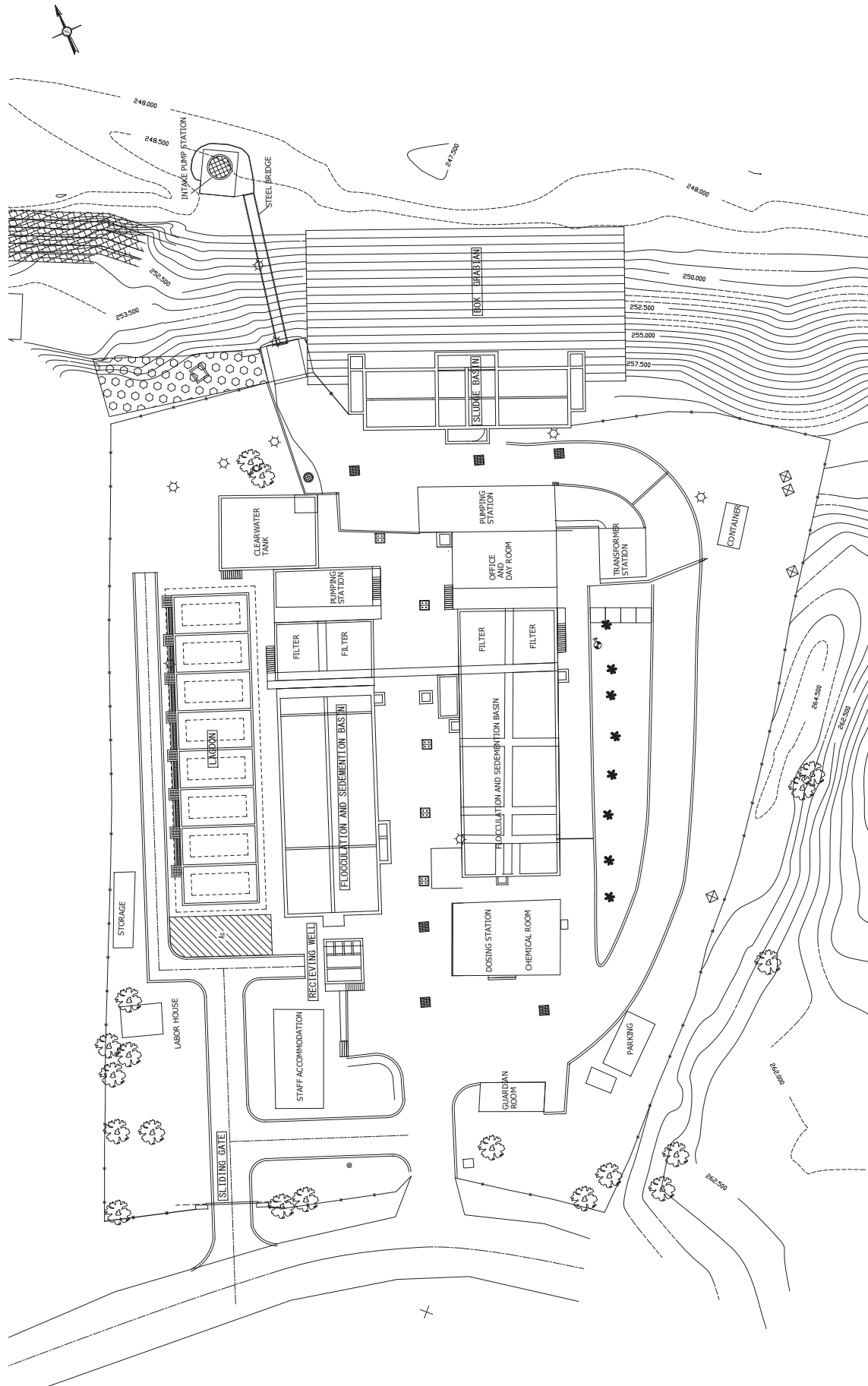
# General Plan of Water Reservoir Pipe Installation



PROJECT PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION General Plan of Water Reservoir Pipe Installation	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No LPB-R-W-005
		NIHON SUDO CONSULTANTS CO., LTD. EXEIDEA LTD.	PREPARED BY	DATE	SCALE 1:250

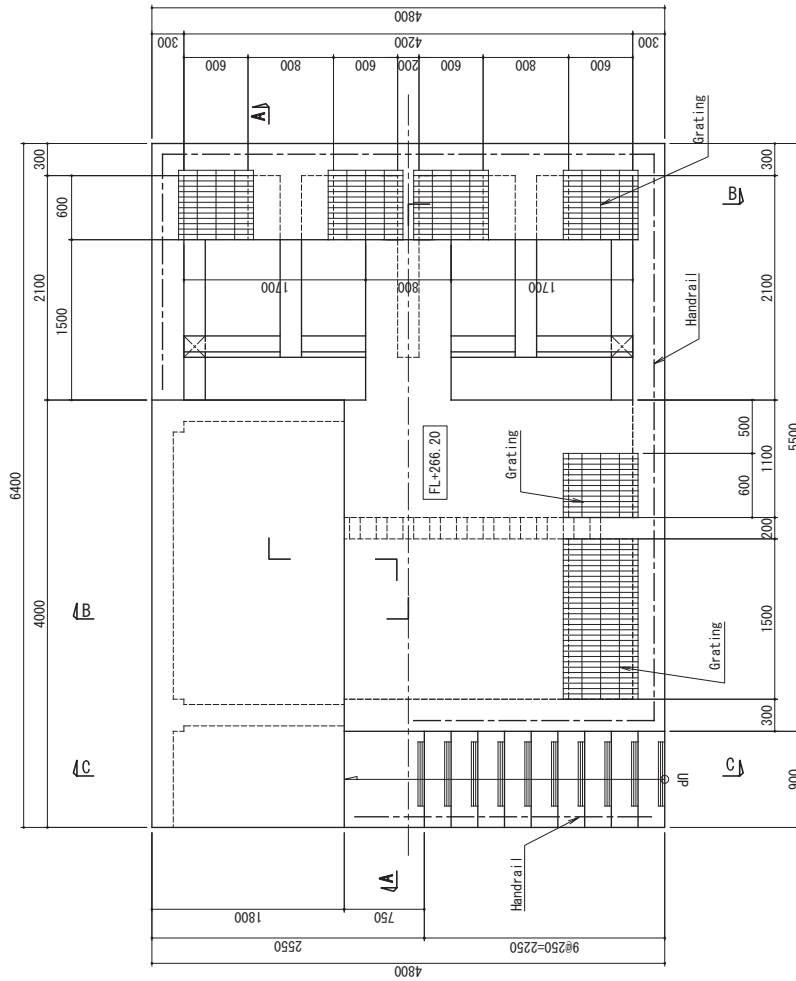


# General Layout of Nam Khan Water Treatment Plant

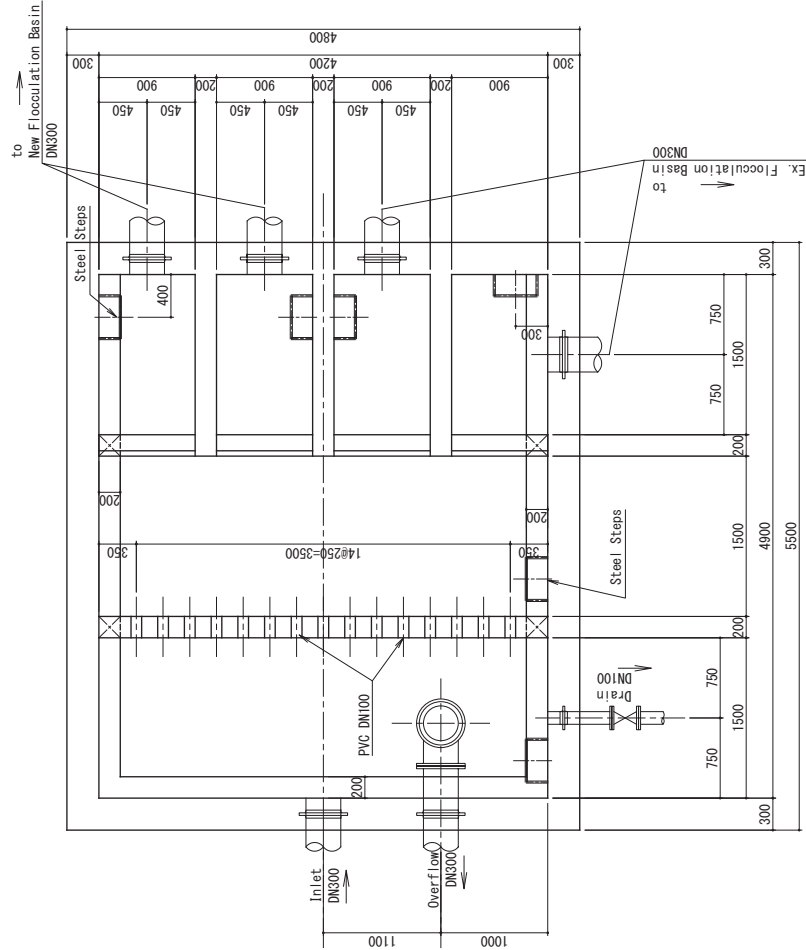


PROJECT PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION General Layout of Nam Khan Water Treatment Plant	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No LPB-C-W-001
		NIHON SUDO CONSULTANTS CO., LTD. EXEIDEA LTD.	PREPARED BY	DATE	SCALE 1:500

# Receiving and Mixing Well (1)



PLAN



SECTIONAL PLAN

PROJECT

PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF  
WATER SUPPLY SYSTEMS IN LUANG PRABANG

DESCRIPTION

Receiving and Mixing Well Structure (1)

MINISTRY OF PUBLIC WORKS AND TRANSPORT

NIHON SUIDO CONSULTANTS CO., LTD.  
EXEIDEA LTD.

DATE

APPROVED BY

DRAWING No  
LPB-C-W-002

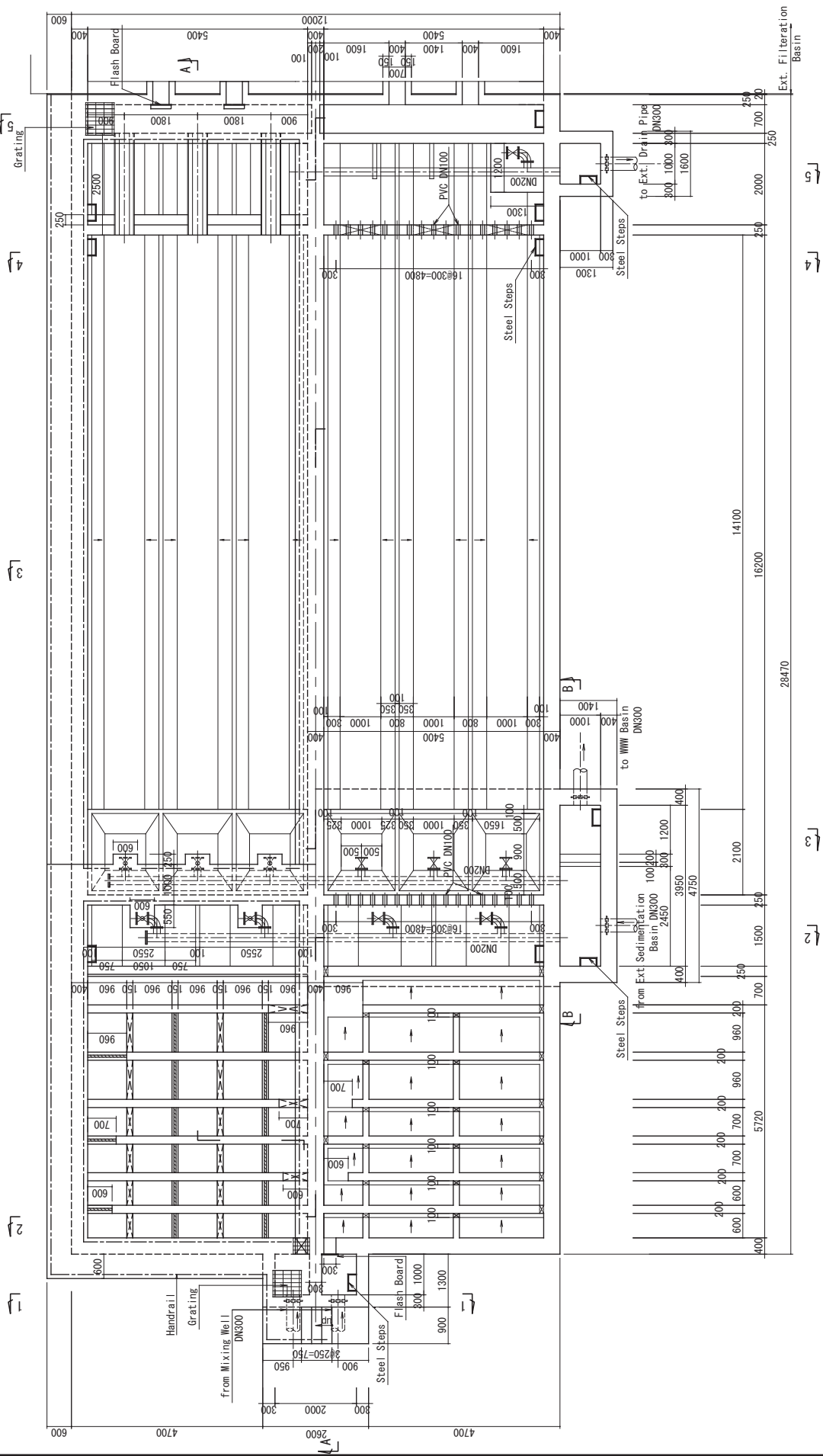
DATE

PREPARED BY

SCALE  
1:50



# Flocculation Basin, Sedimentation Basin (I)

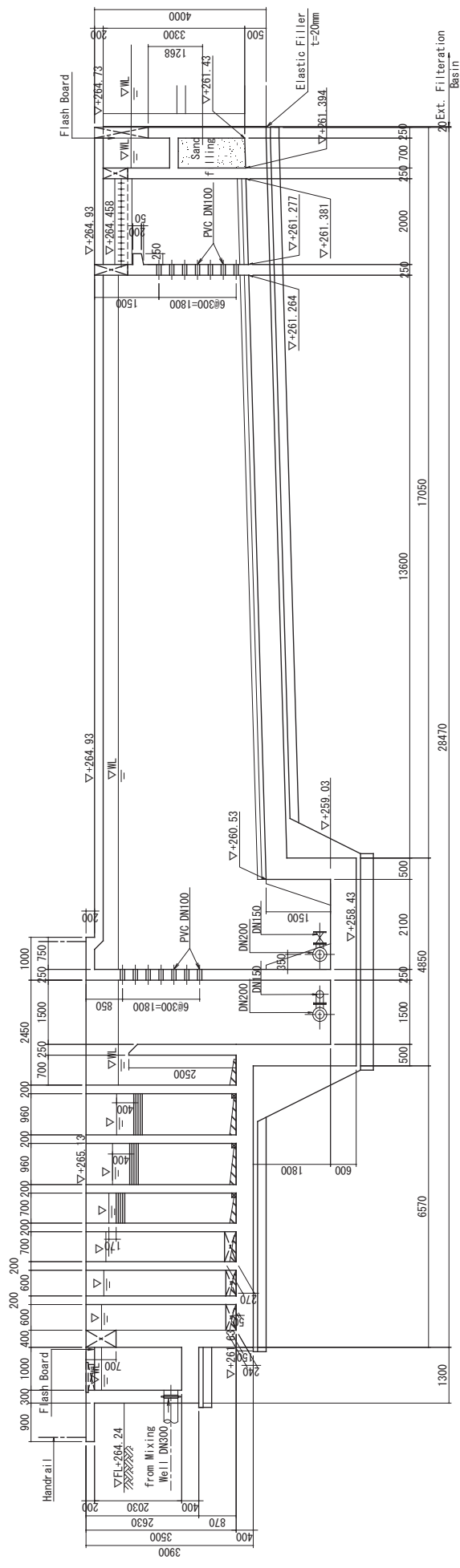


Flocculation Basin

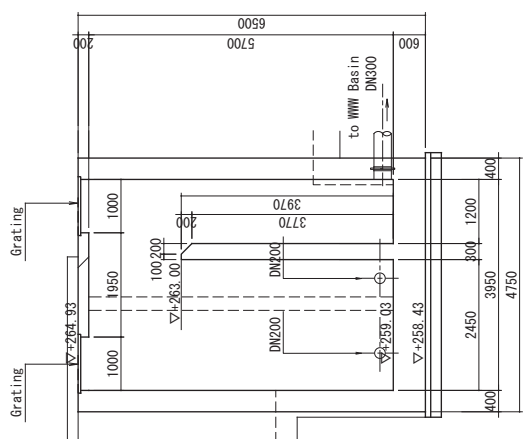
Sedimentation Basin

PROJECT PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION Flocculation Basin, Sedimentation Basin Structure (I)	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No LPB-C-W-004
		NIHON SUIDO CONSULTANTS CO., LTD. EXEIDEA LTD.	PREPARED BY	DATE	SCALE 1:100

# Flocculation Basin, Sedimentation Basin (2)



A-A SECTION

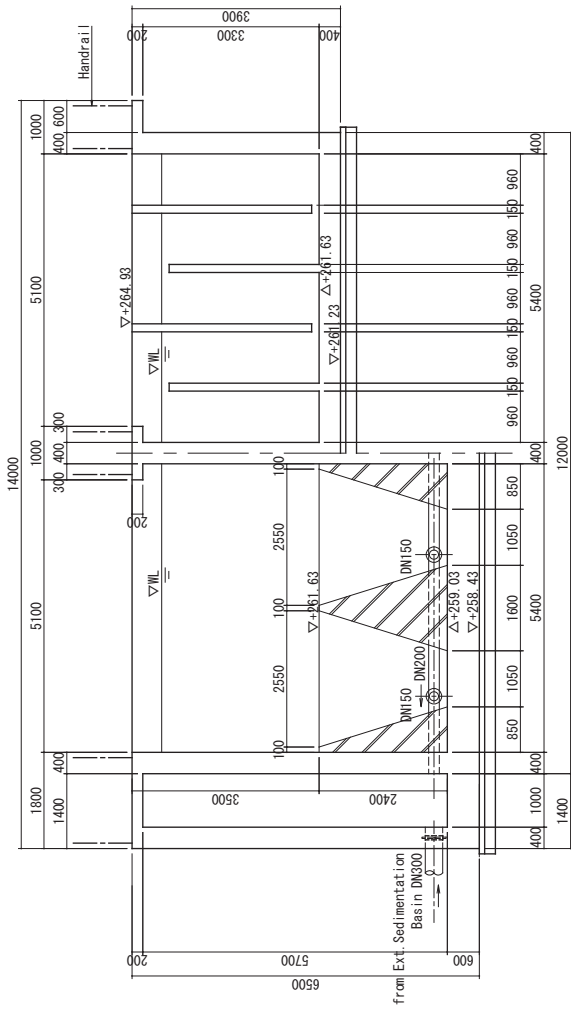


B-B SECTION

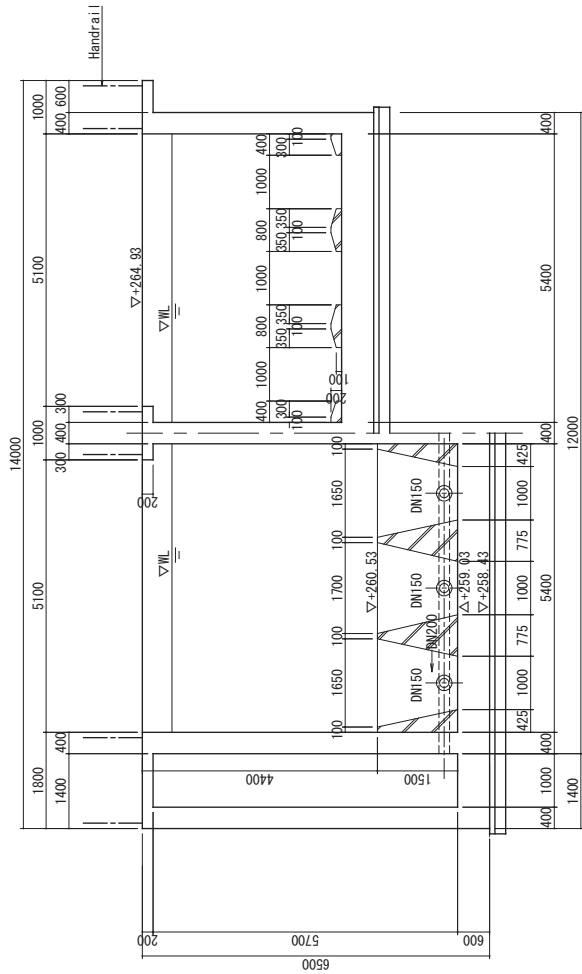
1-1 SECTION

PROJECT PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION Flocculation Basin, Sedimentation Basin Structure (2)	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No LPB-C-W-005
		NIHON SUIDO CONSULTANTS CO., LTD.	PREPARED BY	DATE	SCALE 1:100

# Flocculation Basin, Sedimentation Basin (3)



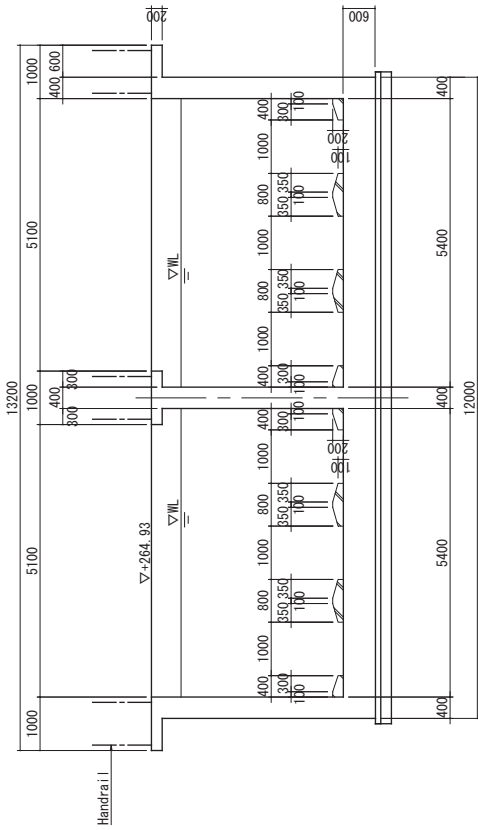
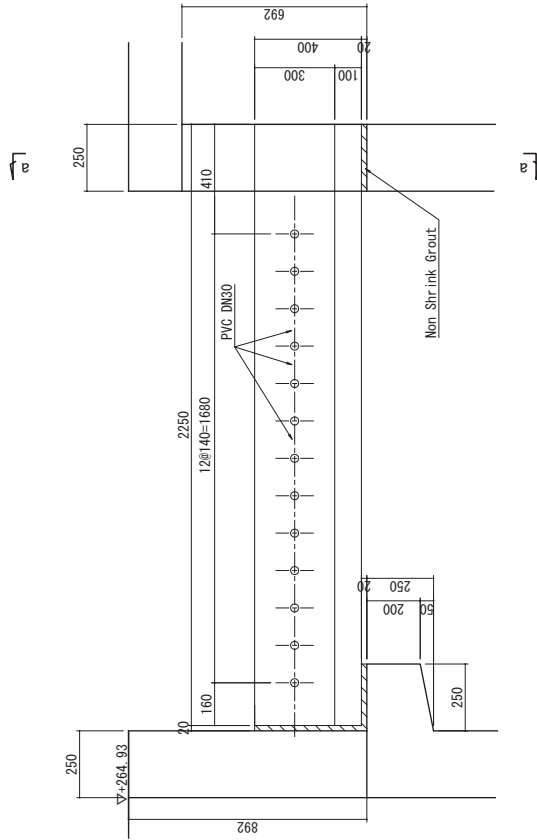
2-2 SECTION



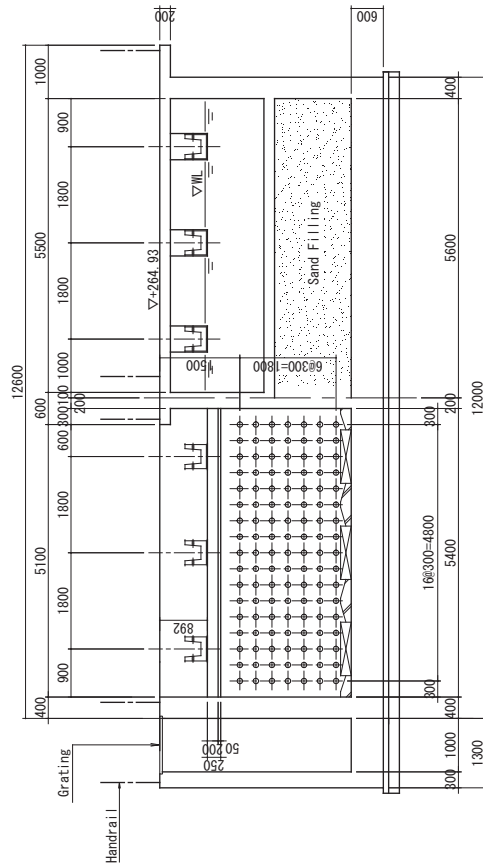
3-3 SECTION

PROJECT	DESCRIPTION	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No
PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	Flocculation Basin, Sedimentation Basin Structure (3)	MINISTRY OF PUBLIC WORKS AND TRANSPORT			LPB-C-W-006
		NIHON SUIDO CONSULTANTS CO., LTD.	PREPARED BY	DATE	SCALE
		EXEIDEA LTD.			1:100

# Flocculation Basin, Sedimentation Basin (4)



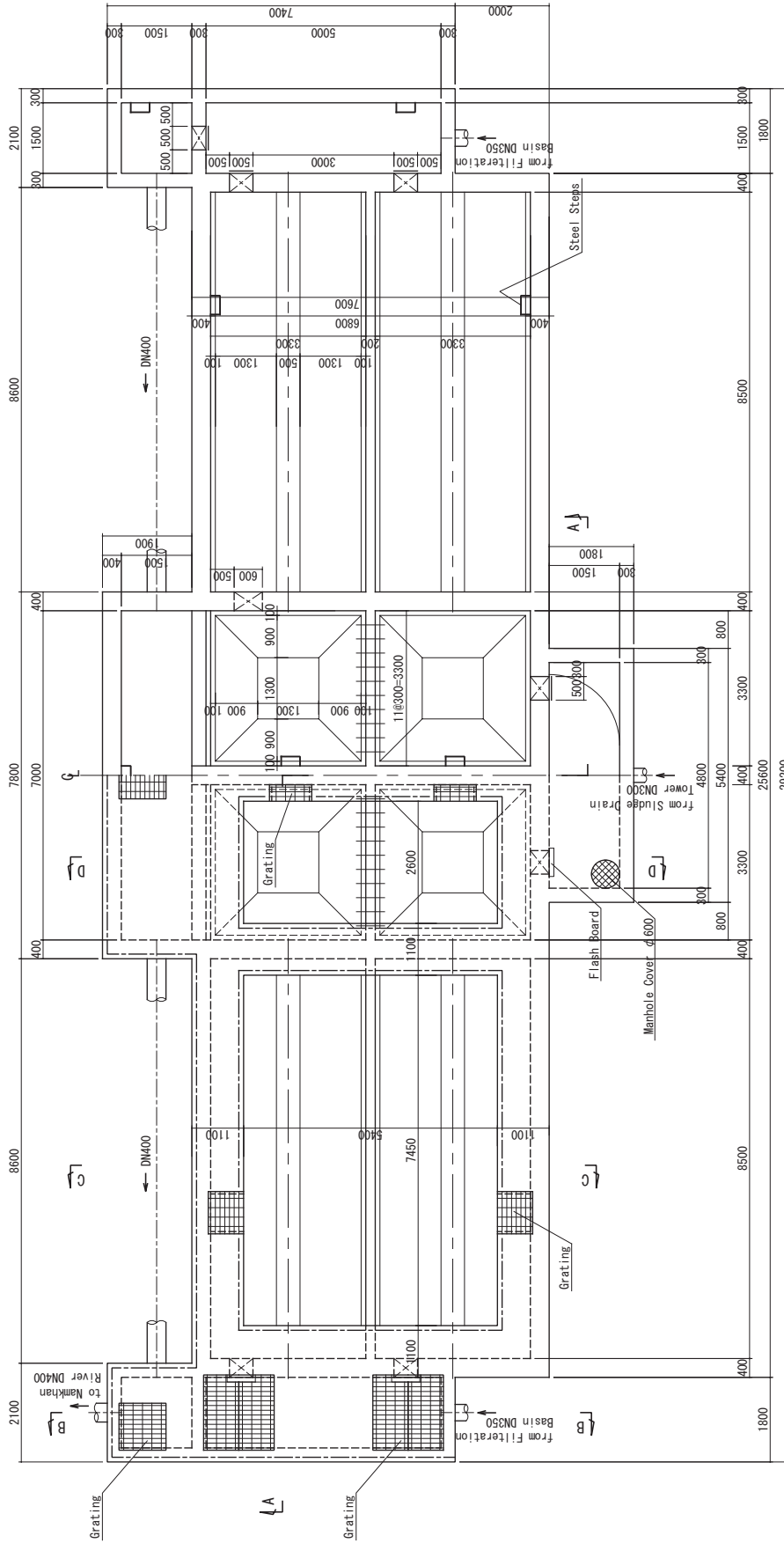
4-4 SECTION



5-5 SECTION

PROJECT	PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION	Flocculation Basin, Sedimentation Basin Structure (4)	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No	LPB-C-W-007
				NIHON SUIDO CONSULTANTS CO., LTD.	PREPARED BY	DATE	SCALE	1:100 1:20

# WWW Basin and Sludge Basin (1)



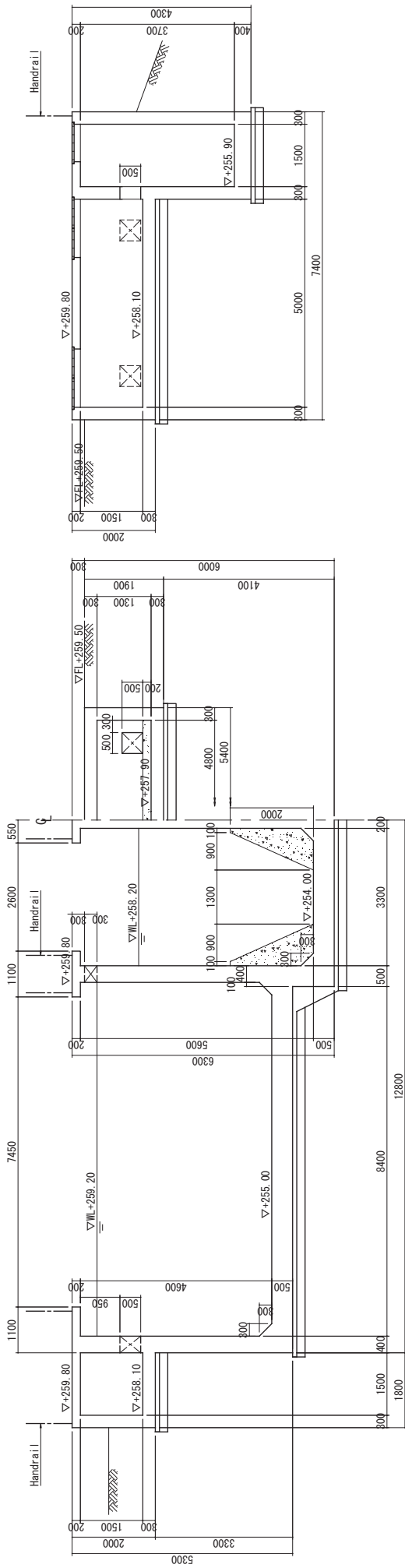
SECTIONAL PLAN

PLAN

PROJECT	PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION	WWW Basin and Sludge Basin Structure (1)		MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No	L/PB-C-W-008
					NIHON SUIDO CONSULTANTS CO., LTD.	PREPARED BY	DATE	SCALE	1:100

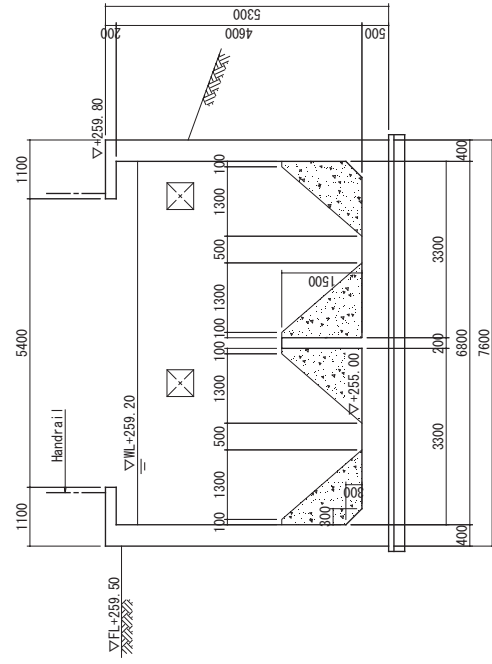


WWW Basin and Sludge Basin (2)

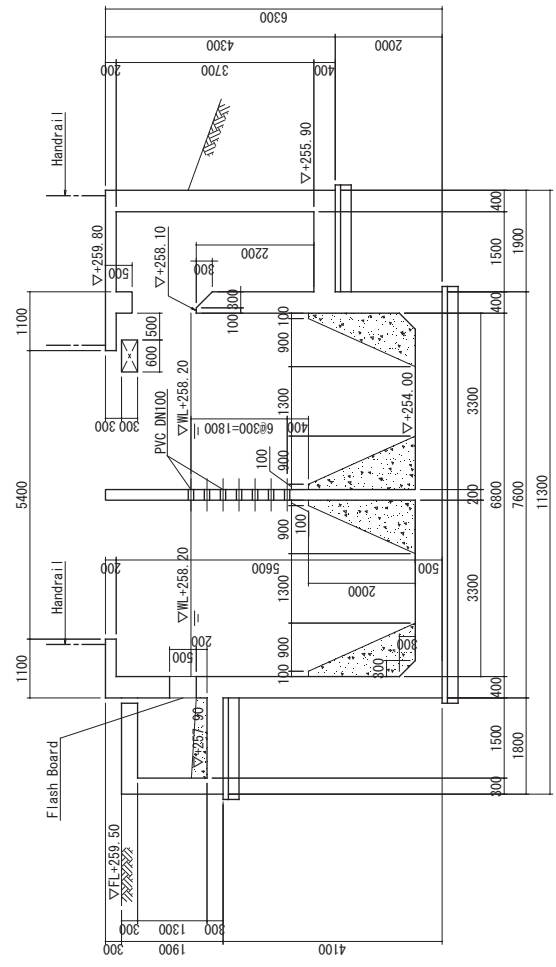


A-A SECTION

B-B SECTION



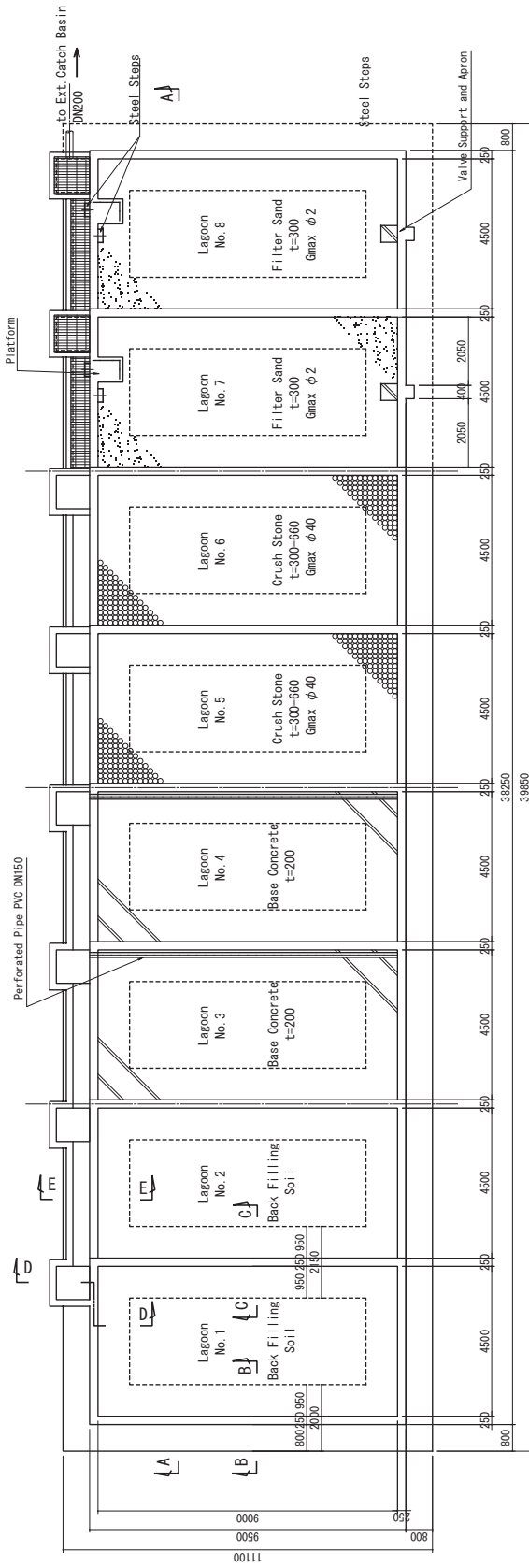
C-C SECTION



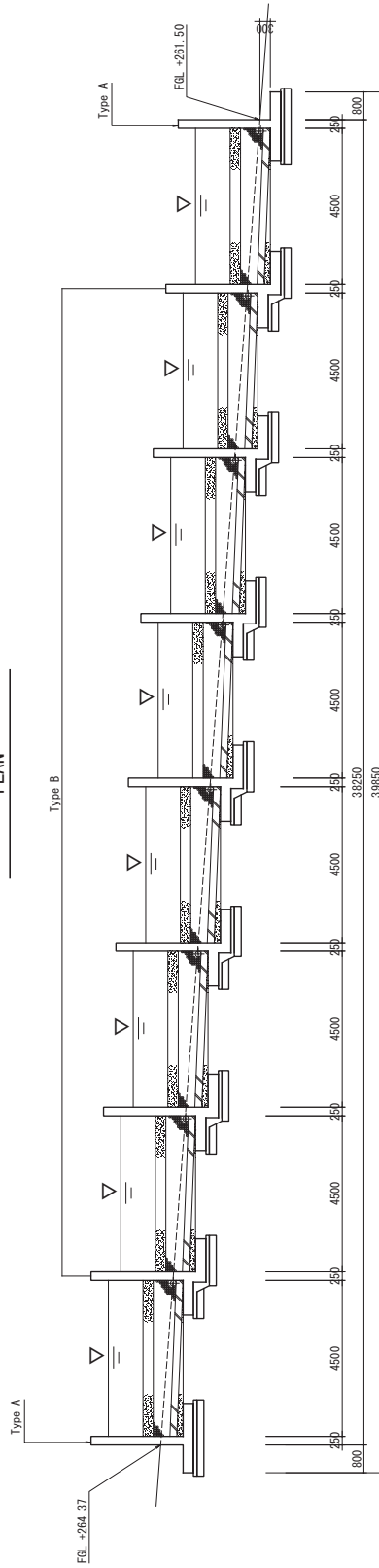
D-D SECTION

PROJECT	PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION	WWW Basin and Sludge Basin Structure (2)	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No
						LPB-C-W-009	
					PREPARED BY	DATE	SCALE
							1:100

# Lagoon (1)



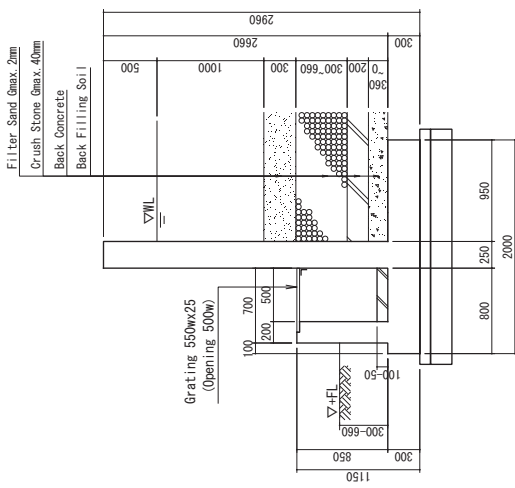
PLAN



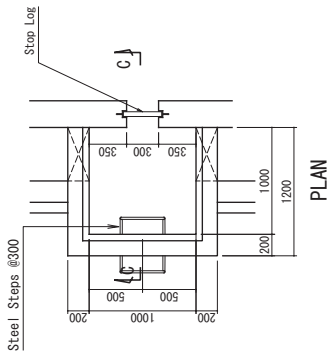
A-A SECTION

PROJECT	DESCRIPTION	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No
			PREPARED BY	DATE	LPB-C-W-010
PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG		NIHON SUDO CONSULTANTS CO., LTD.	SCALE		
			1:150		

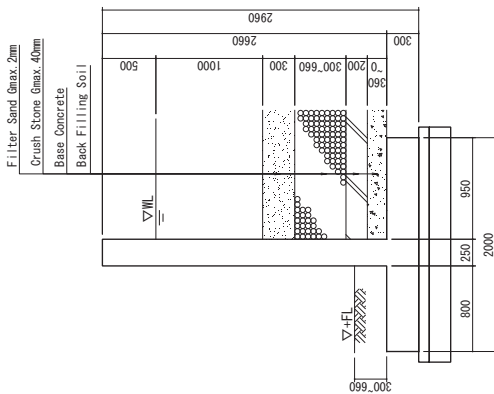
# Lagoon (2)



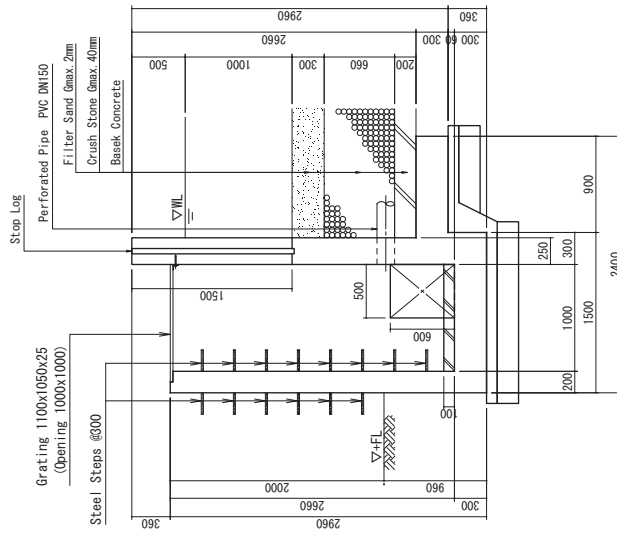
E-E SECTION  
Type D



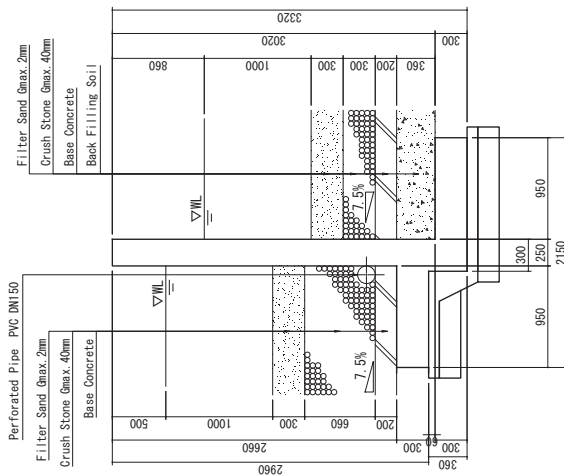
PLAN



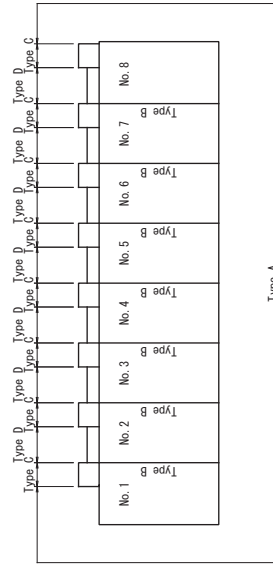
B-B SECTION  
Type A



D-D SECTION  
Type C



C-C SECTION  
Type B

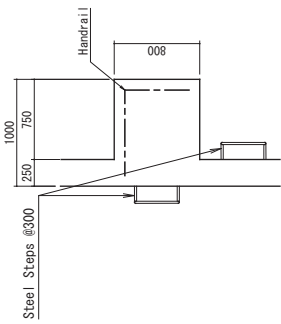


KEY PLAN

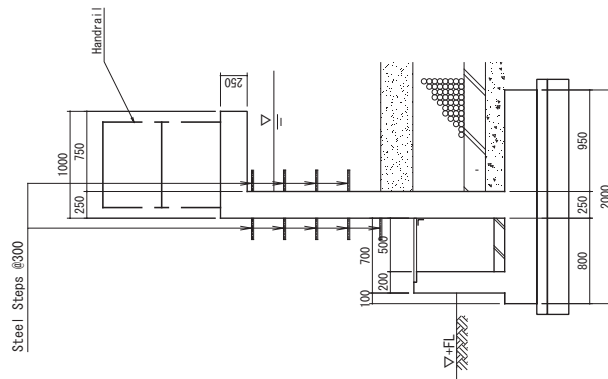
## Supernatant Water Catchment

PROJECT PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION Lagoon Structure (2)	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No LPB-C-W-011
		NIHON SUIDO CONSULTANTS CO., LTD. EXEIDEA LTD.	PREPARED BY	DATE	SCALE 1:50

# Lagoon (3)

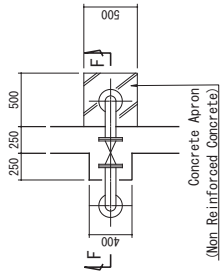


PLAN

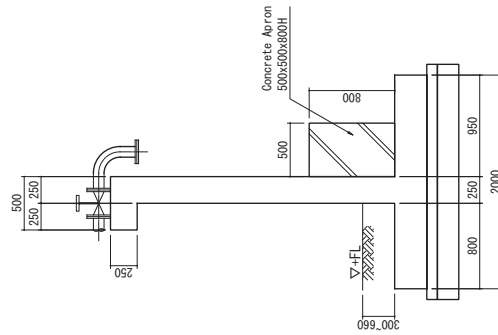


SECTION

Platform



PLAN



SECTION

Valve Support and Apron

PROJECT

PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG

DESCRIPTION

Lagoon Structure (3)

MINISTRY OF PUBLIC WORKS AND TRANSPORT

NIHON SUIDO CONSULTANTS CO., LTD.  
EXEIDEA LTD.

DATE

APPROVED BY

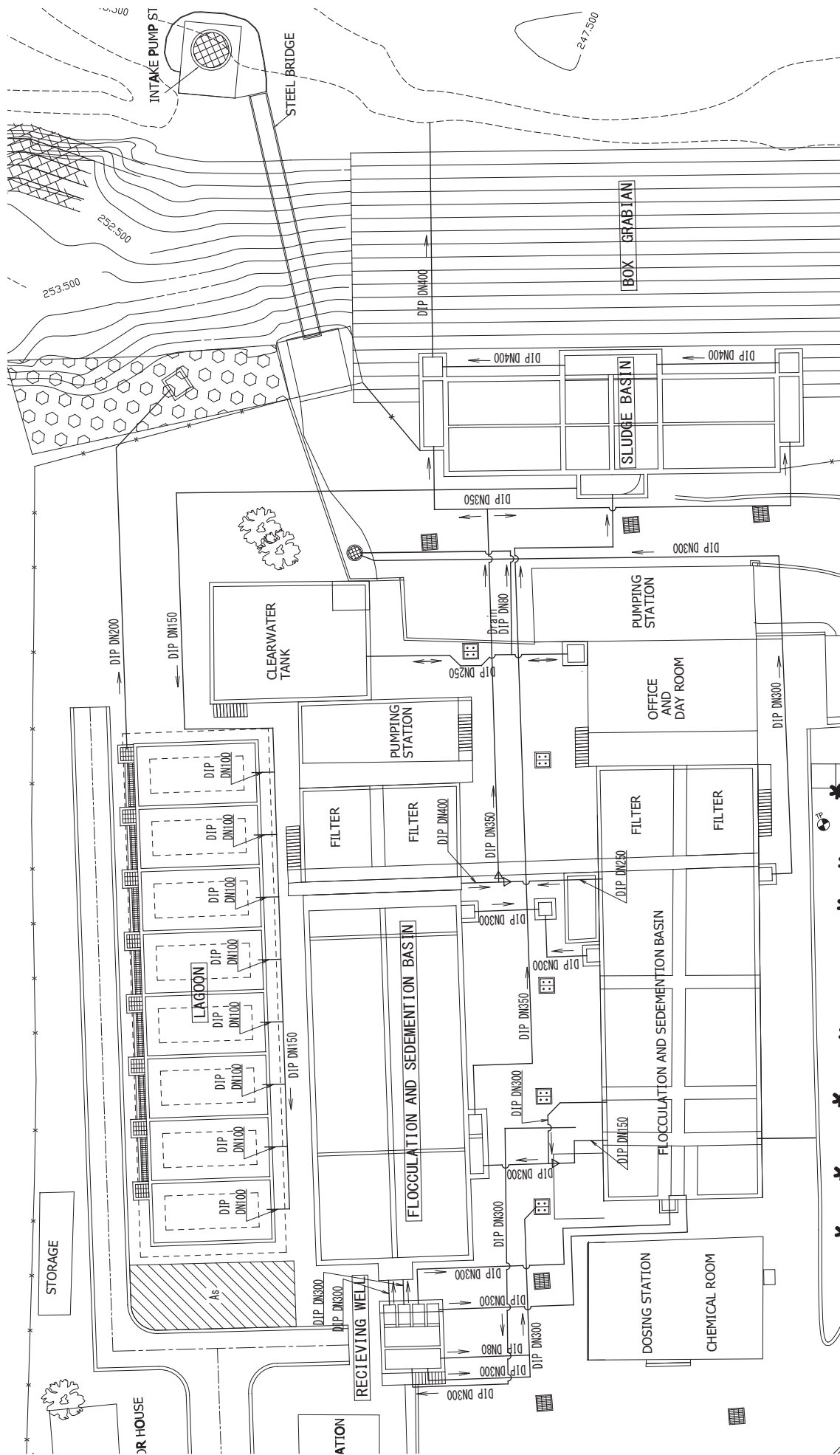
DRAWING No  
LPB-C-W-012

DATE

PREPARED BY

SCALE  
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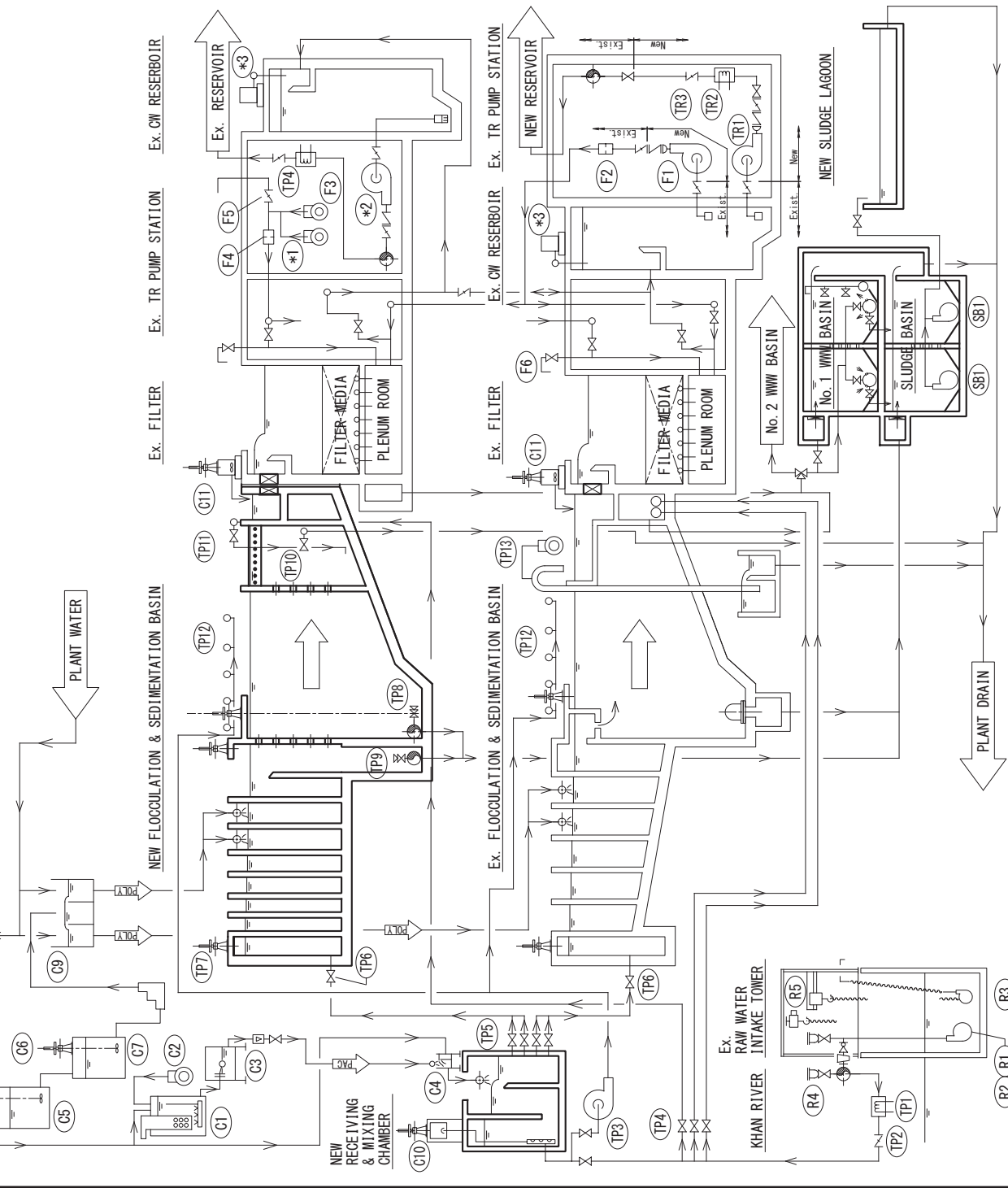
# General Plan of Nam Khan Water Treatment Plant Pipe Installation



<b>PROJECT</b> PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	<b>DESCRIPTION</b> General Plan of Nam Khan Water Treatment Plant Pipe Installation	<b>MINISTRY OF PUBLIC WORKS AND TRANSPORT</b>  NIHON SUIDO CONSULTANTS CO., LTD. EXEIDEA LTD.	<b>APPROVED BY</b>  <b>DATE</b>	<b>DRAWING No</b> LPB-C-W-013
		<b>PREPARED BY</b>  <b>DATE</b>	<b>SCALE</b> 1:300	

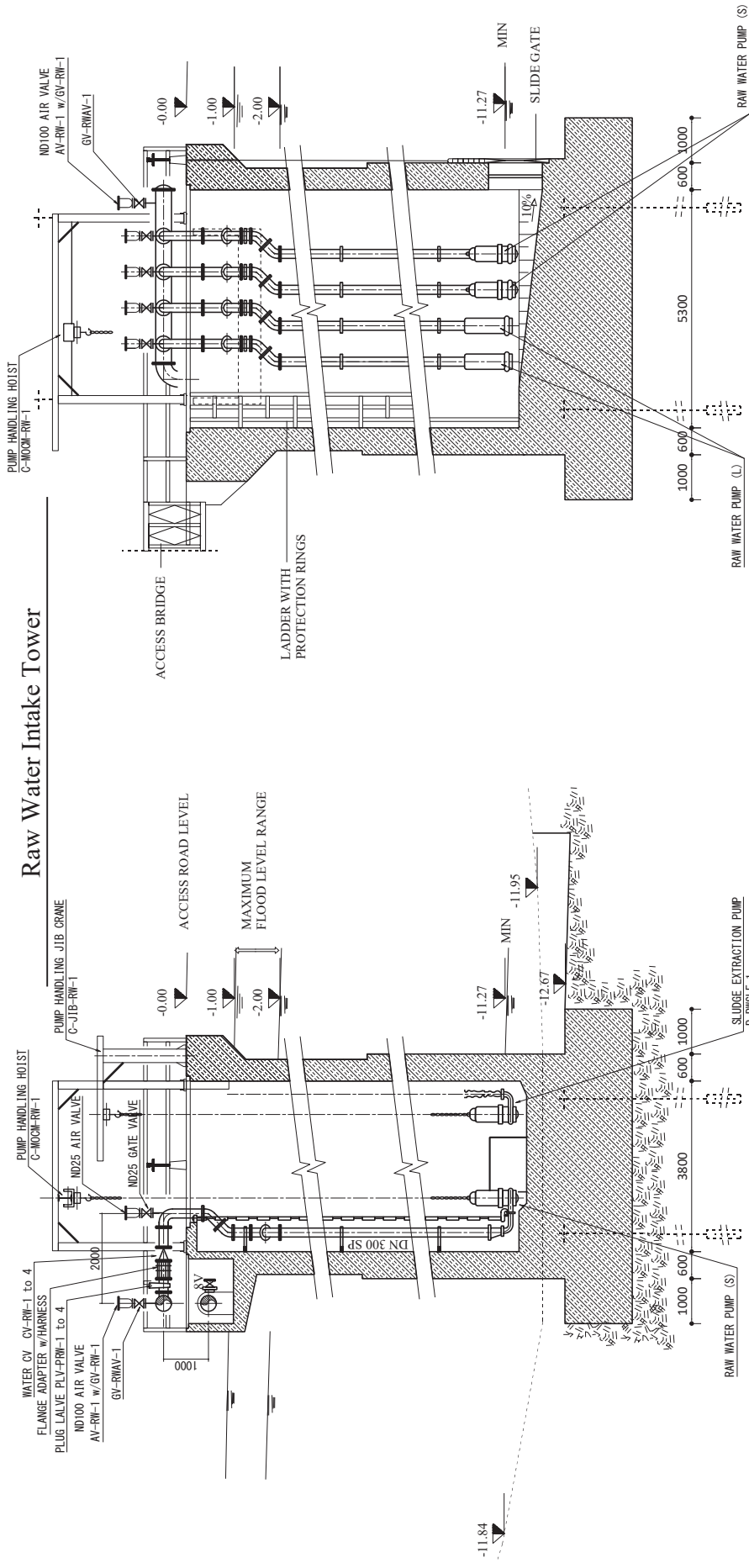
# Nam Khan Water Treatment Plant Process Flow Diagram

*3	Best chlorination facilities	To utilize post chlorination facilities as these are
*2	Transmission Pumps	To utilize 3 transmission pumps as these are to be moved from original location at old transmission pump station to this location, new transmission pump station due to availability of installation space for 2 blowers, existing and new.
*1	Existing Air Scouring Blower	
SBI	P-SD-1 to 6	Sludge Pump
C11	T-HYP0-B1 & B2	Hypo Preparation Tank B
C10	T-HYP0-A1&A2	Hypo Preparation Tank A
C9	T-POLH-1 & 2	Polymer Dosing Head Tank
C8	P-POL-1 to 4	Polymer Feed Pump
C7	T-Poly-1 & 2	Polymer Preparation Tank
C6	MK-POL-1 & 2	Polymer Mixer
C5	AUT-POL-1 & 2	Auto Polymer Preparation Unit
C4	T-PACFP&D-1	PAC Flow Proportion & Dilution Tank
C3	T-PACOM-1 & 2	Constant Water Level Tank
C2	AB-PAC-1 & 2	PAC Mixing Blower
C1	T-PAC-1 to 4	PAC Preparation Tank
TR4	FM-TR-2	Flow Meter for Transmission Flow
TR3	BV-TRFC-1	Transmission Flow Control Valve
TR2	FM-TR-1	Flow Meter for Transmission Flow
TR1	P-TR-1 & 2	Transmission Pump
F6	GV-FVV-1 to 8	Filter Vent Valve
F5	BV-FAS-1	Blower By-pass Valve
F4	FM-AS-1	Flow Meter for Air Scouring
F3	AB-FAS-1	Air Scouring Blower
F2	FM-BW-1	Flow Meter for Backwash Flow
F1	P-BW-1 & 2	Backwash Pump
TP13	SIFPS-SE-1 & 2	Sedimentation Basin Drain Siphoning System
TP12	GV-FLS-1 to 13	Sedimentation Basin Wash Water Valve
TP11	GV-FLS-1 to 4	Sedimentation Flushing Valve
TP10	GV-SEDR-1 & 2	Sedimentation Basin Drain Valve
TP9	GV-SLE-7 to 10	Sludge Extraction Valve B
TP8	GV-SLE-1 to 6	Sludge Extraction Valve A
TP7	SG-FLC-1	Flocculation Basin Inlet Gate
TP6	GV-FLC-1 & 2	Flocculation Basin Inlet Valve
TP5	GV-RECOMO-1 to 4	Receiving & Mixing Chamber Outlet Valve
TP4	P-SEBW-1	Sedimentation Basin Wash Pump
TP3	GV-RECOMW1-1	Receiving & Mixing Chamber Inlet Valve
TP2	BV-RWFC-1	Raw Water Flow Control Valve
TP1	FM-RW-1	Flow Meter for Raw Water
R5	C-JB-RW-1	Pump Handling Jib Crane
R4	C-MOCH-RW-1	Pump Handling Hoist
R3	P-RINSE-1 & 2	Sludge Extraction Pump
R2	P-RW-3 to 4	Raw Water Pump (S)
R1	P-RW-1 to 2	Raw Water Pump (L)
No.	ID Number	Name of Equipment (newly installed)

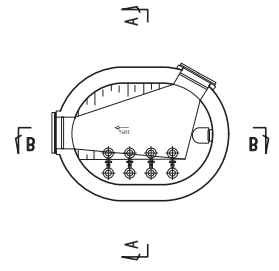


PROJECT	PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION	Num Kham Water Treatment Plant Process Flow Diagram	APPROVED BY	DATE	DRAWING No	LPB-M-W-001
				MINISTRY OF PUBLIC WORKS AND TRANSPORT			
				NIHON SUIDO CONSULTANTS CO., LTD.		SCALE	None
				EXEIDEA LTD.		DATE	

# Raw Water Intake Tower



Raw Water Intake Tower Section A

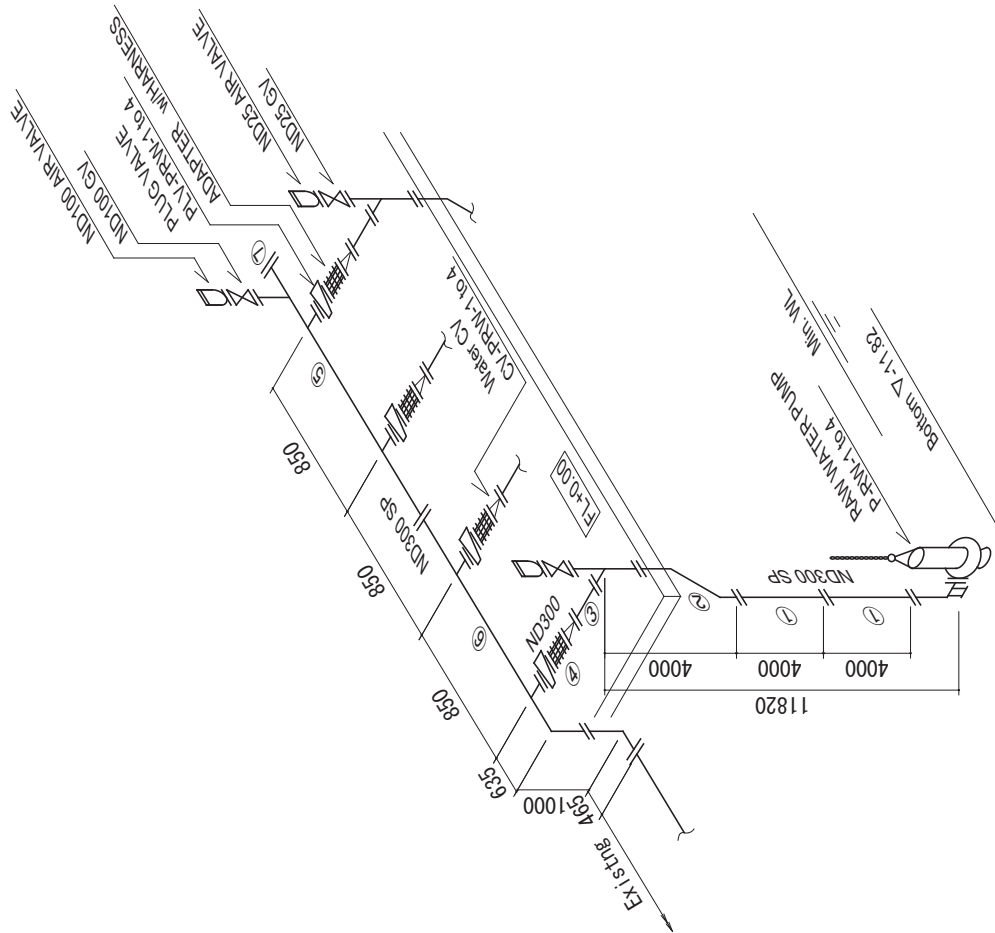


Key Plan

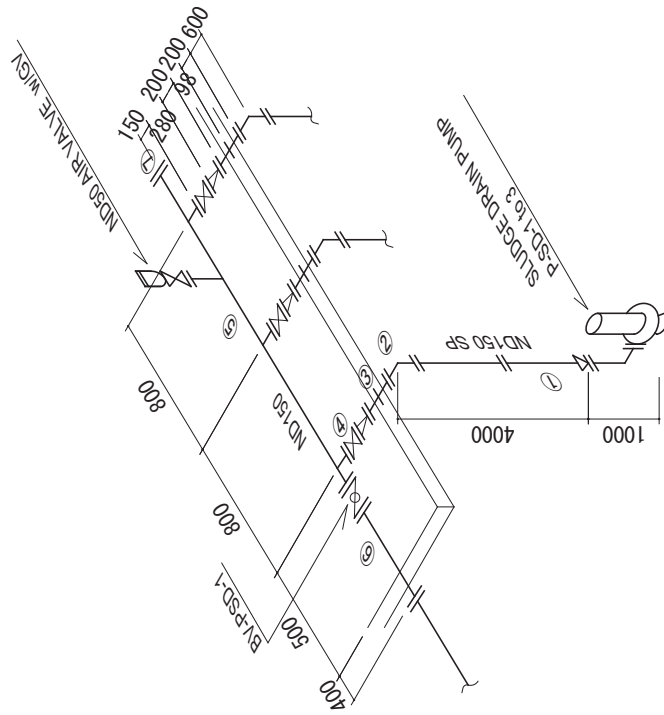
Raw Water Intake Tower Section B

PROJECT PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION Layout of Raw Water Intake Tower Pump & Sludge Extraction Pump	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No LPB-MV-002
		NIHON SUIDO CONSULTANTS CO., LTD.	PREPARED BY	DATE	SCALE 1:100

Raw Water Pump



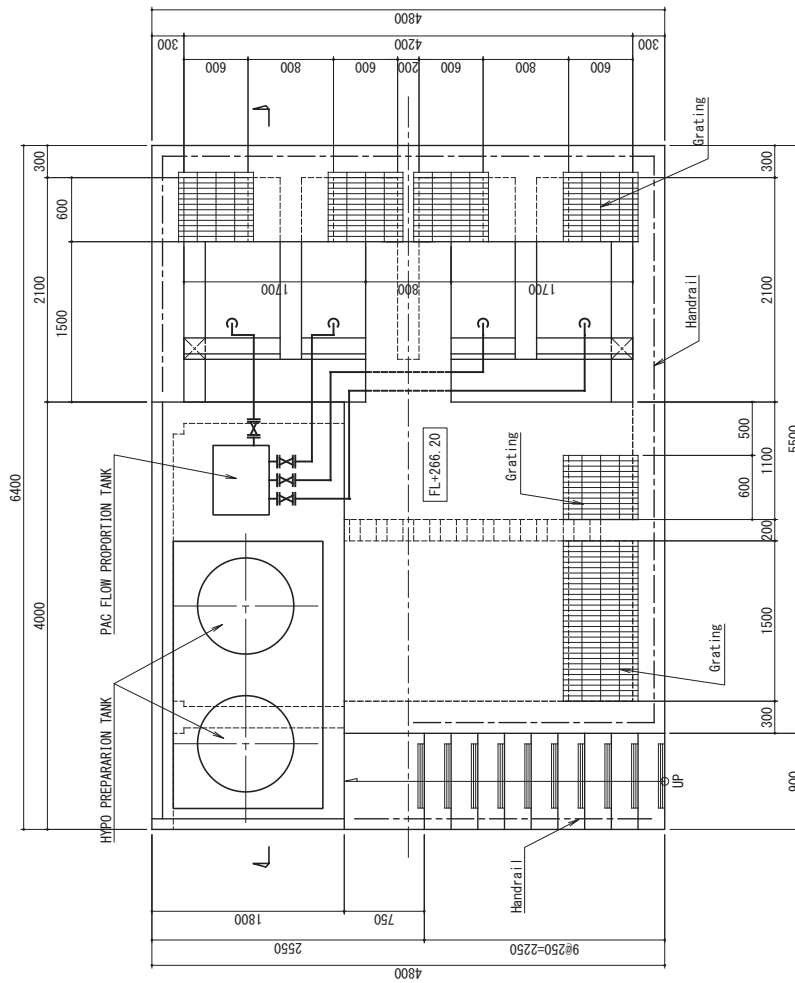
Sludge Drain Pump



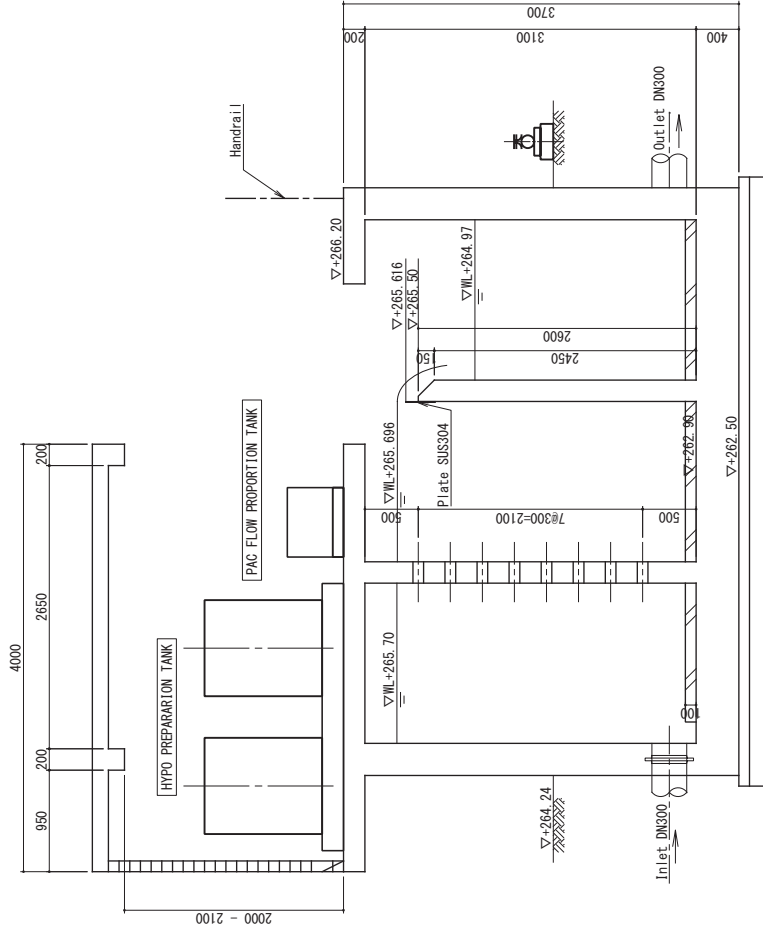
PROJECT	PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION Raw Water Pump & Sludge Drain Pump Piping Schematic	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No LPB-M-W-003
			NIHON SUIDO CONSULTANTS CO., LTD. EXEIDEA LTD.	PREPARED BY	DATE	SCALE None



# Receiving and Mixing Well



PLAN



SECTION

PROJECT

PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG

DESCRIPTION

Receiving and Mixing Well Hypo Tank & PAC Feed Piping Detail

MINISTRY OF PUBLIC WORKS AND TRANSPORT

NIHON SUDO CONSULTANTS CO., LTD.  
EXEIDEA LTD.

DATE

APPROVED BY

DATE

APPROVED BY

DATE

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DATE

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DATE

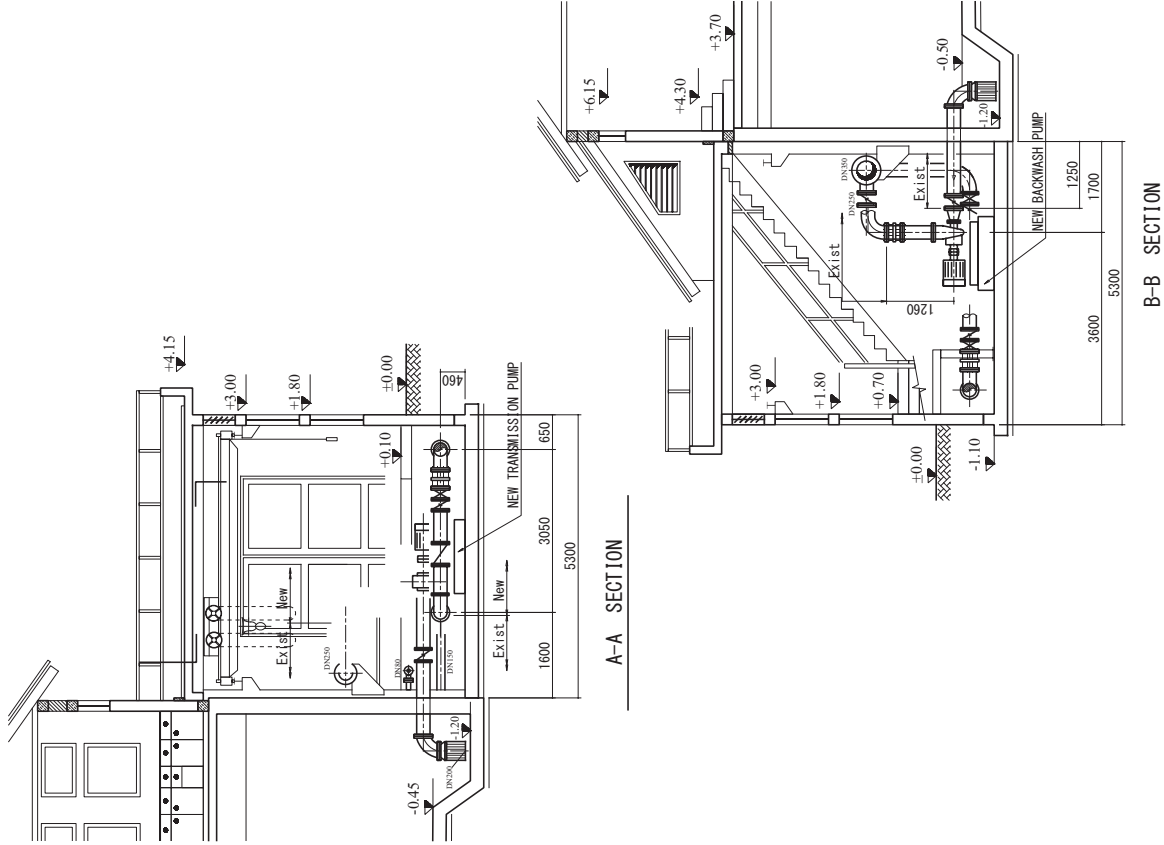
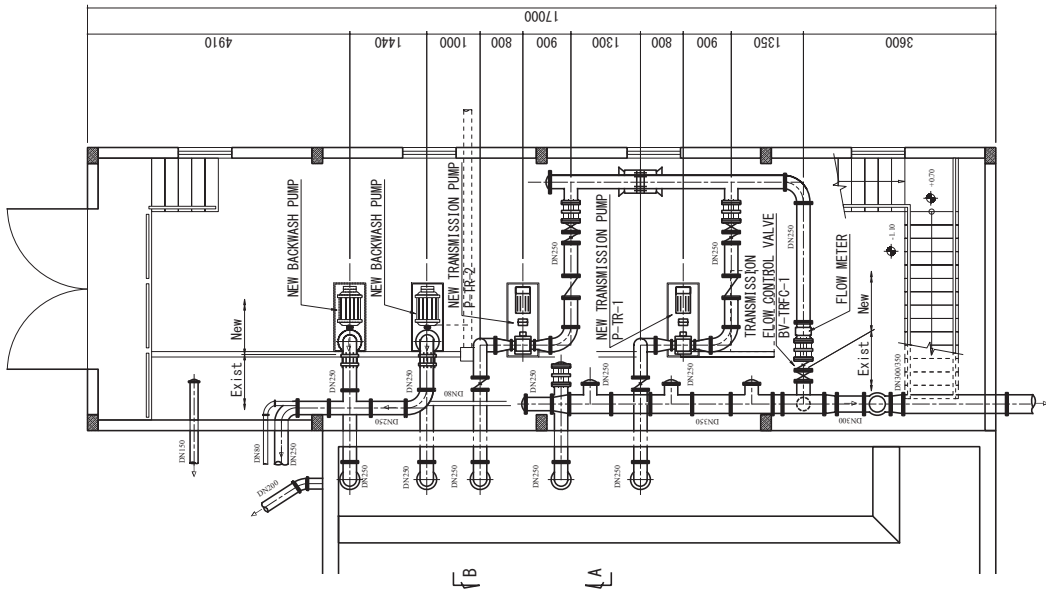
DRAWING No

LPB-M-W-004

SCALE

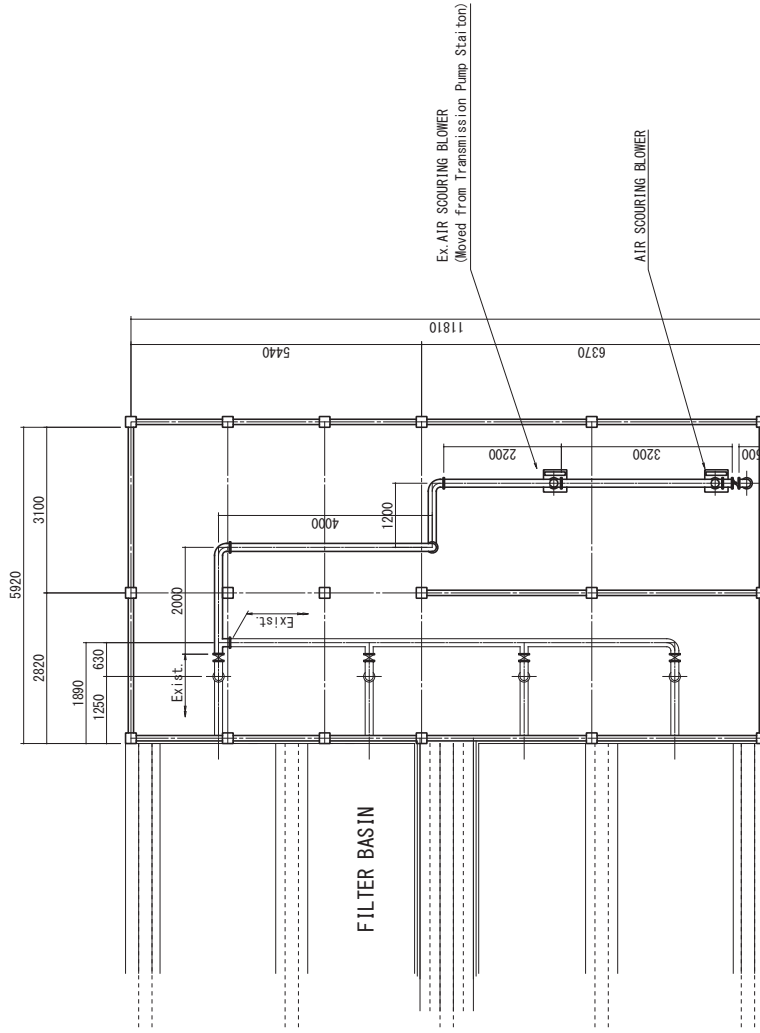
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# Transmission Pump Station



PROJECT	PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION Layout of Transmission Pump Station	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No LPB-M-V-005
			NIHON SUIDO CONSULTANTS CO., LTD.	PREPARED BY	DATE	SCALE 1:100

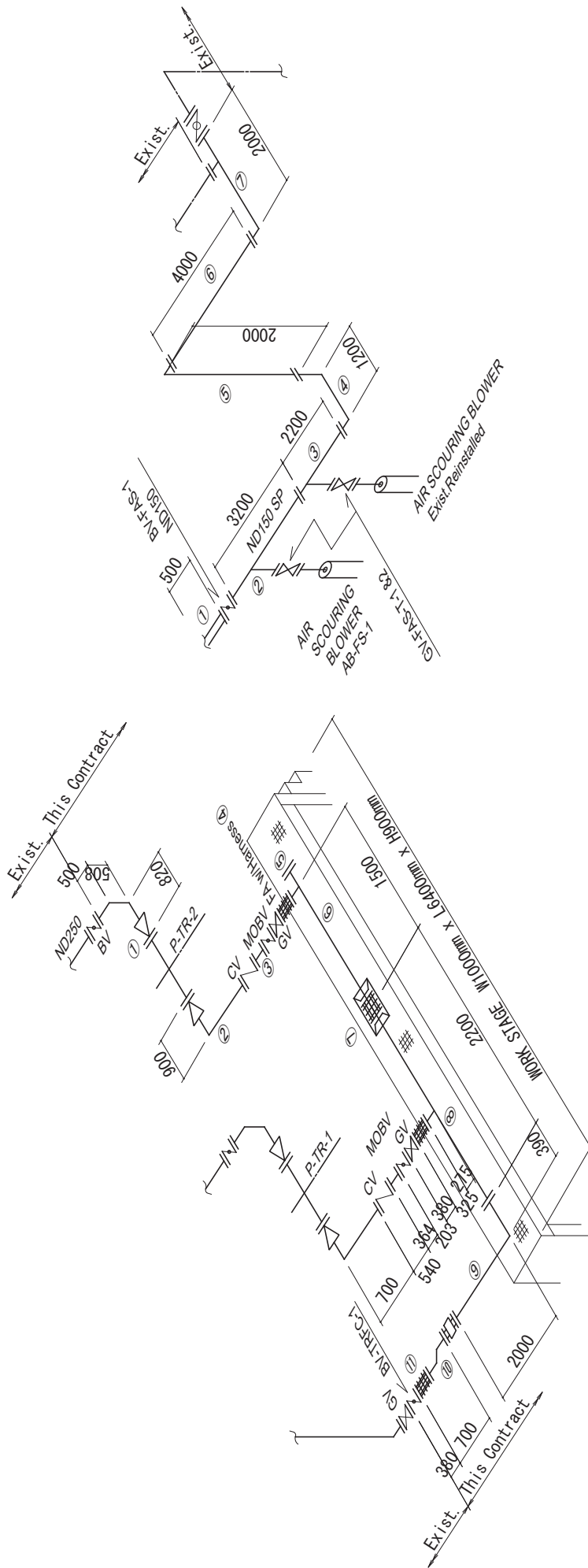
# Filter Air Scouring Blower



PROJECT	DESCRIPTION	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No
		NIHON SUDO CONSULTANTS CO., LTD. EXEIDEA LTD.	PREPARED BY	DATE	L/PB-M-V-006 SCALE 1:100
PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG					

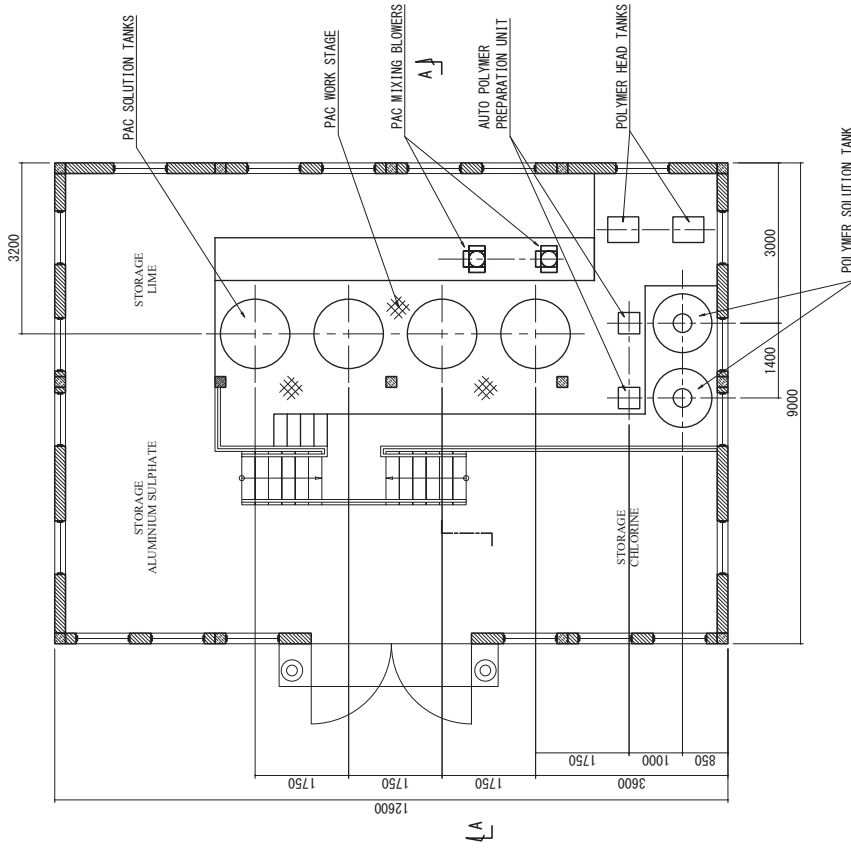
Transmission Pump

Air Scouring Blower

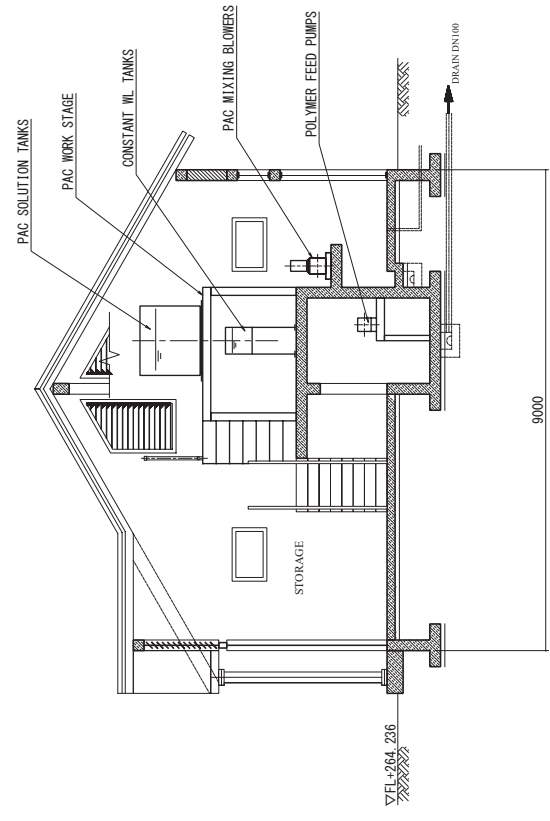


PROJECT	DESCRIPTION Transmission Pump & Air Scouring Blower Piping Schematic	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No
		PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	NIHON SUIDO CONSULTANTS CO., LTD.	PREPARED BY	LPB-M-W-007
		EXEIDEA LTD.			SCALE
					None

# Chemical Building



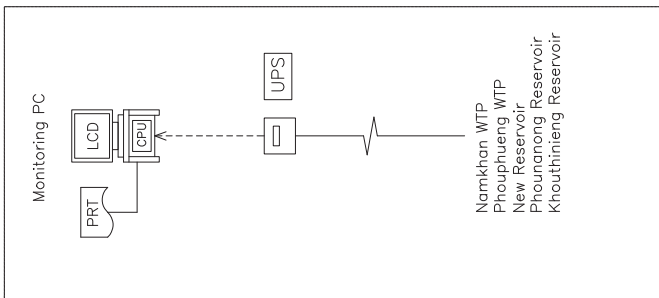
Chemical Building



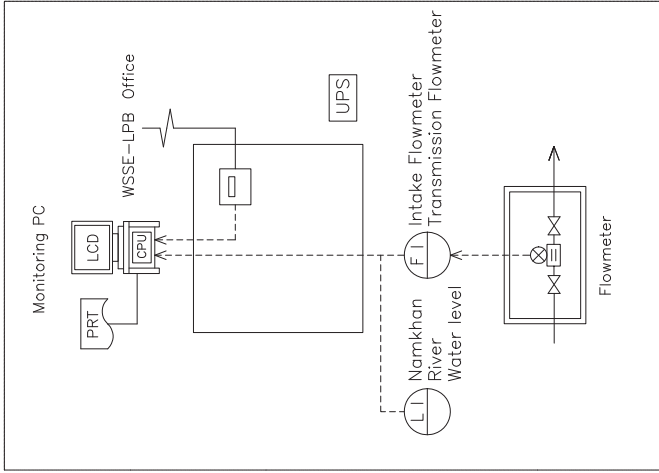
A-A SECTION

PROJECT PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG	DESCRIPTION Chemical Building Tank Layout Plan & Section	MINISTRY OF PUBLIC WORKS AND TRANSPORT  NIHON SUDO CONSULTANTS CO., LTD. EXEIDEA LTD.	APPROVED BY  PREPARED BY	DATE  DATE	DRAWING No LPB-M-V-008  SCALE 1:100
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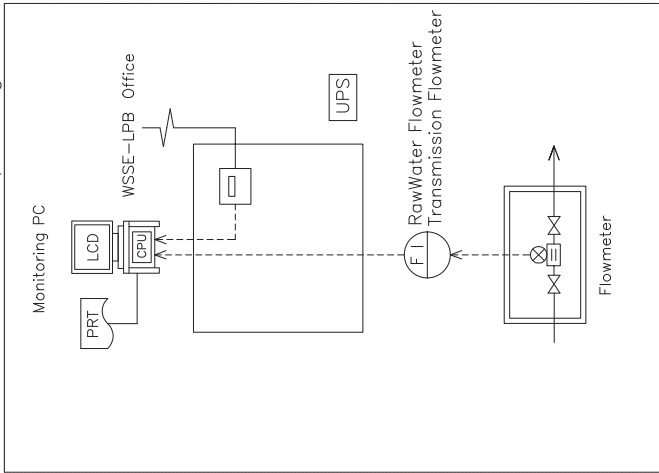
WSSE-LPB Office



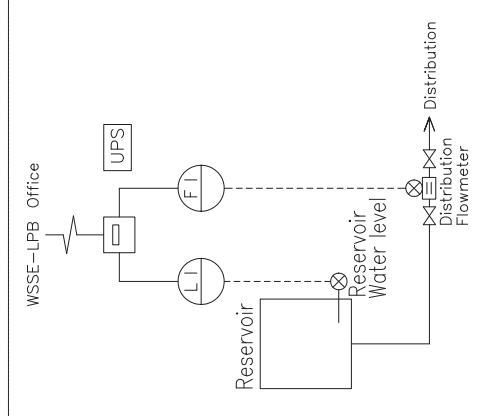
Namkhan WTP



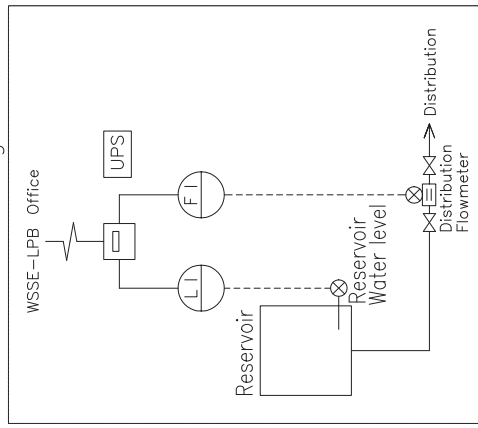
Phouphuang WTP



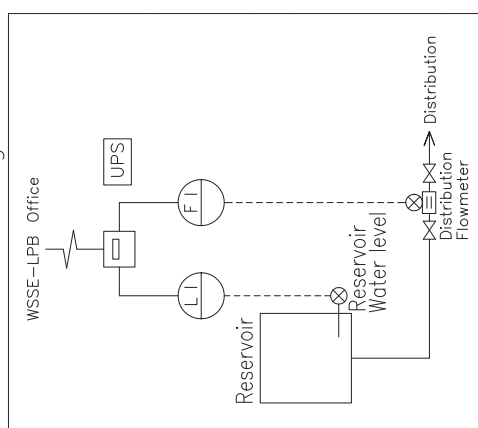
New Reservoir



Phouanong Reservoir

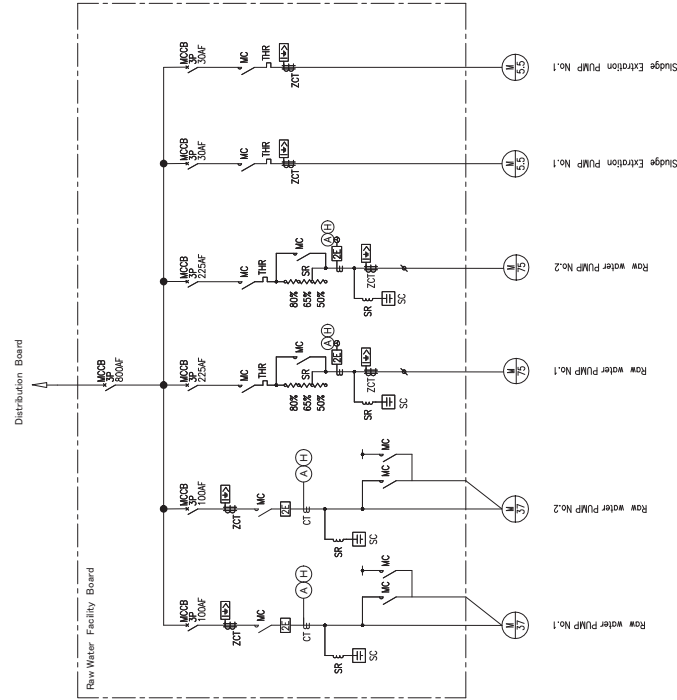
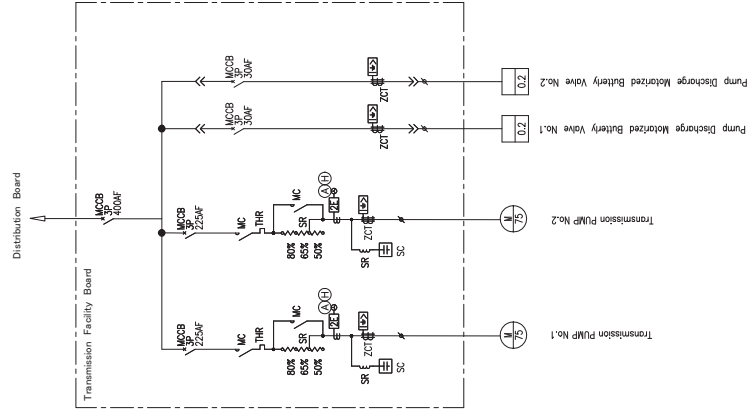


Khouthieng Reservoir



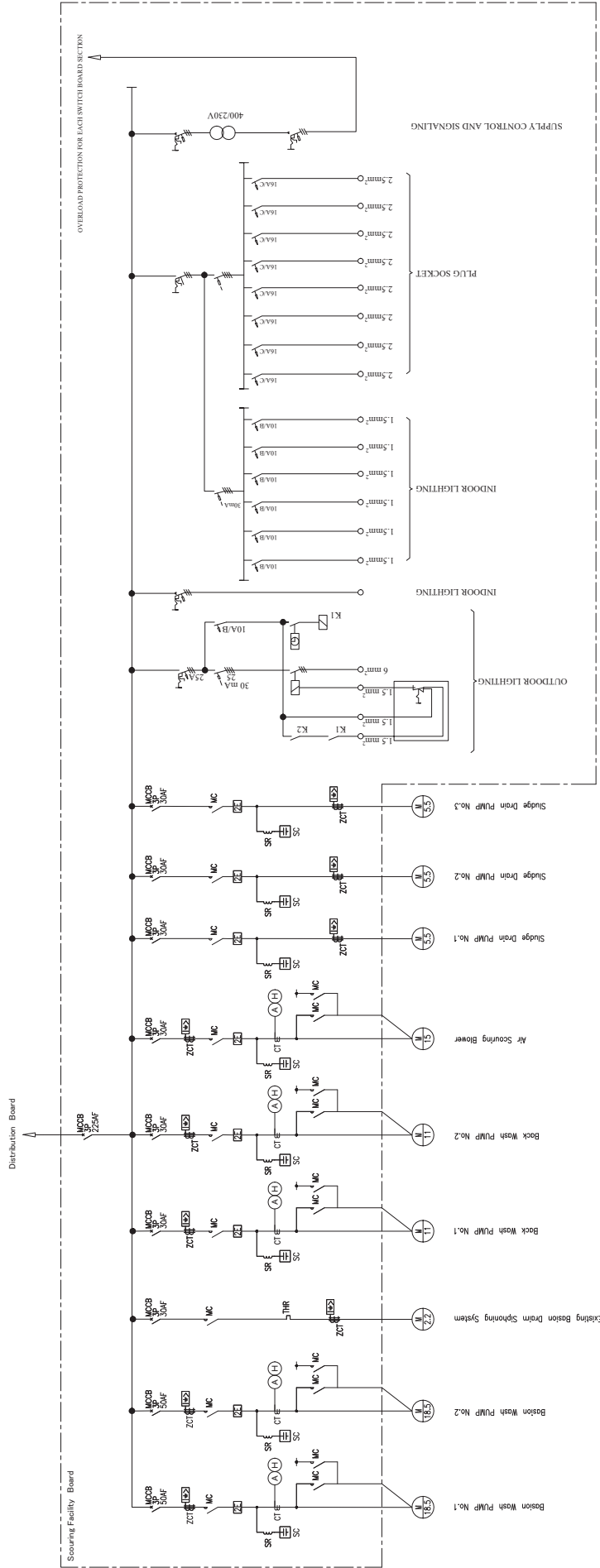
PROJECT <b>PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG</b>	DESCRIPTION System Configuration Diagram	MINISTRY OF PUBLIC WORKS AND TRANSPORT	APPROVED BY	DATE	DRAWING No LPB-E-1
		NIHON SUDO CONSULTANTS CO., LTD. EXEIDEA LTD.	PREPARED BY	DATE	SCALE None



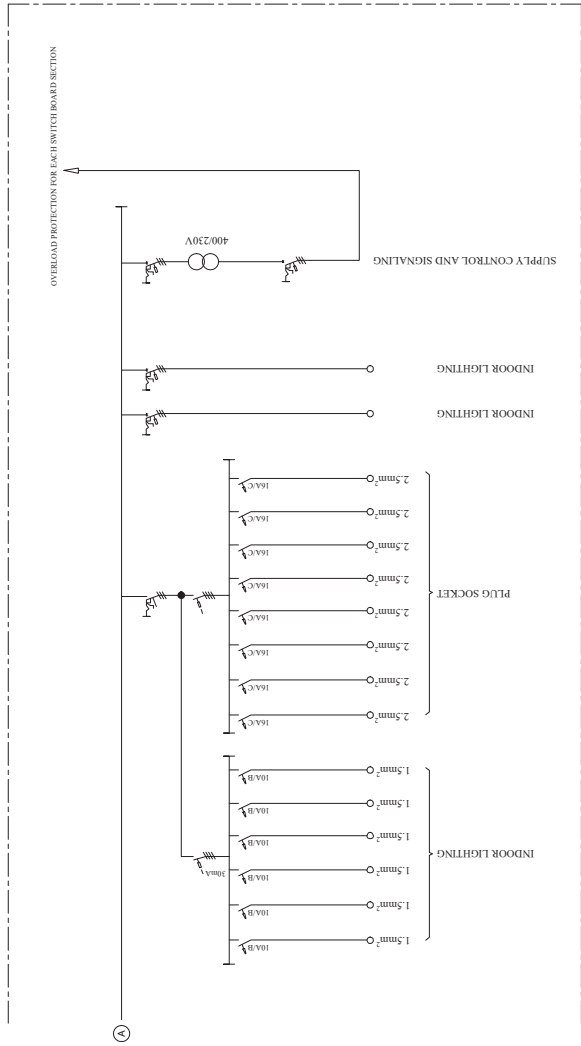
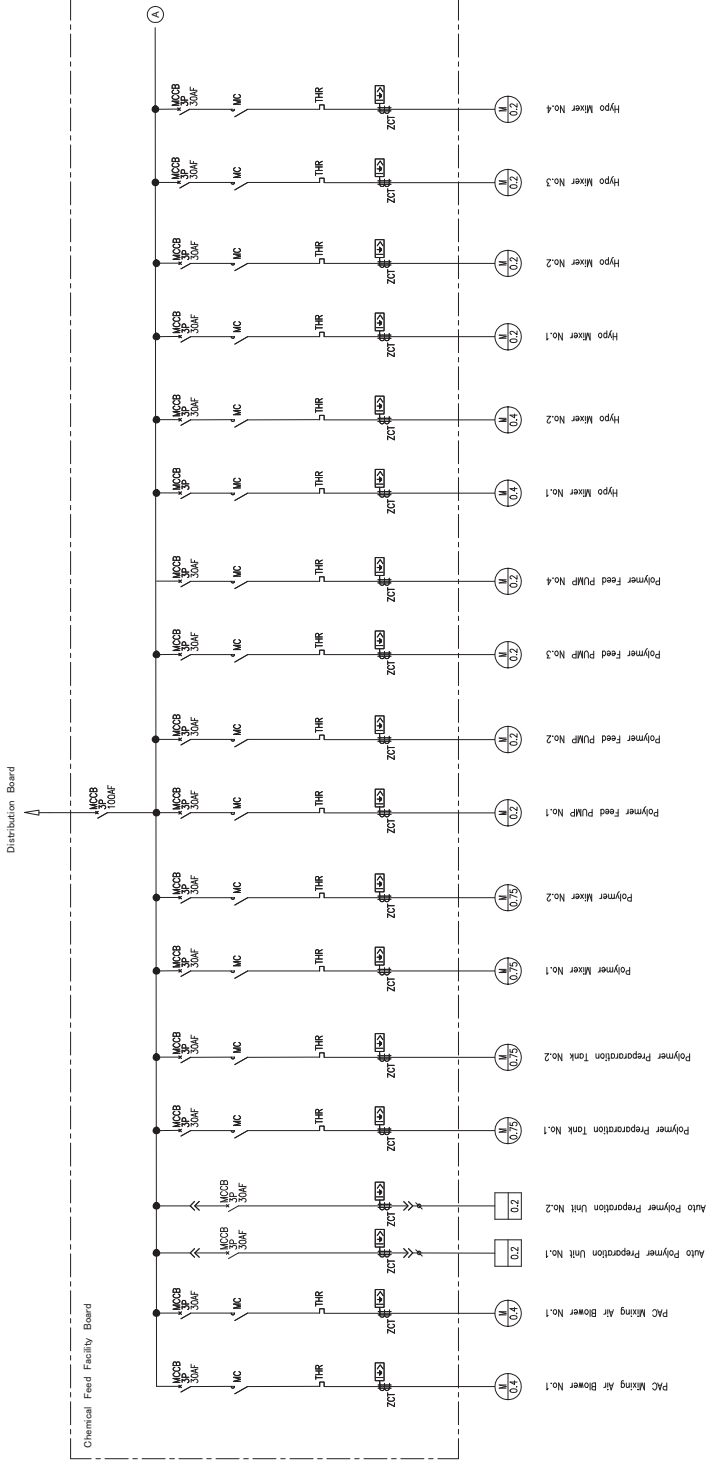


PROJECT	<b>PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG</b>	DESCRIPTION		Single Line Diagram of Raw Water Control Panel and Transmission Pump Control Panel	<b>MINISTRY OF PUBLIC WORKS AND TRANSPORT</b> <b>NIHON SUIDO CONSULTANTS CO., LTD.</b> <b>EXEIDEA LTD.</b>	APPROVED BY	DATE	DRAWING No
		PREPARED BY	DATE			LPB-E-3	SCALE	None





PROJECT	<b>PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG</b>		
DESCRIPTION	Single Line Diagram of Wash Pump Control Panel		
APPROVED BY	<b>MINISTRY OF PUBLIC WORKS AND TRANSPORT</b>		
DATE	<b>NIHON SUIDO CONSULTANTS CO., LTD.</b>		
APPROVED BY	<b>EXHIDEA LTD.</b>		
DATE	DATE		
SCALE	None		
DRAWING No	LPB-E-4		



PROJECT	DESCRIPTION		APPROVED BY	DATE	DRAWING No LPB-E-5
	<b>PREPARATORY SURVEY ON THE PROJECT FOR EXPANSION OF WATER SUPPLY SYSTEMS IN LUANG PRABANG</b>				
PROJECT	DESCRIPTION		APPROVED BY	DATE	SCALE
	Single Diagram of Chemical Feed Control Panel  <b>MINISTRY OF PUBLIC WORKS AND TRANSPORT</b>  <b>NIHON SUIDO CONSULTANTS CO., LTD.</b> <b>EXEIDEA LTD.</b>				
PREPARED BY DATE None					