HYGRADEWATER INFRASTRUCTURE

KURIMOTO

Disaster Resilient Ductile Iron Pipes

SRDIP is engineered with advanced seismic resilience at its core. Designed to prevent pipe joint separation, it is capable of withstanding high levels of compression, extension, and angular deflection.

TECHNICAL GUIDE: **APF1.8A**

Applications

- Active fault line crossings
- Liquefaction prone ground and subsidence.
- Soft weak ground
- Pipelines crossing bridge abutments
- Water and waste water pipelines
- Pipelines connected to critical service supply hubs: Hospitals, Civil Defence headquarters,government buildings etc.
- Installation using Slip Lining and Pipe Jacking Methods

Standards

- JIS G 5526: Ductile iron pipes
- JIS G 5527: Ductile iron fittings
- JIS G 5528: Epoxy-powder coating for interior of ductile iron pipes and fittings
- JWWA G 112: Epoxy-powder coating for interior of ductile iron pipes and fittings for water supply
- JWWA G 113: Ductile iron pipes for water supply
- JWWA G 114: Ductile Iron fittings for water supply
- ISO 16134 Earthquake and subsidence resistant design of ductile iron pipelines - Table 2 Classification of pipeline components
- Flange drillings to AS4087 for water works purposes (PCD only) available upon special order request

SRDIP rubber ring jointed pipeline systems can perform in a wide range of New Zealand ground conditions. The joint design has been proven worldwide when installed in high risk seismically active locations including in Japan.

Seismic Resilience

- Proven to be damage free after natural disasters.
- SRDIP has many seismic resilient features - extension, contraction and joint separation prevention.
- 6-8 degrees angular deflection during an event.

Corrosion Resilience

- Lower life cycle cost.
- The special external coating can provide a minimum of 100-year life expectancy without PE sleeving installed (Design Conditions Apply – Refer to the guidelines provided within AWWA C105 – 10 Polyethylene encasement for Ductile Iron Pipe systems).

Improved Productivity

- Increased productivity and reduced construction failures.
- SRDIP eliminates any need for installation of concrete anchor thrust blocks.

Pipe types

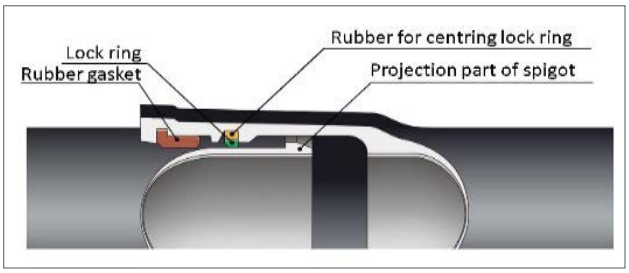


FIG. 1 Type NS Pipe (DN75-450)

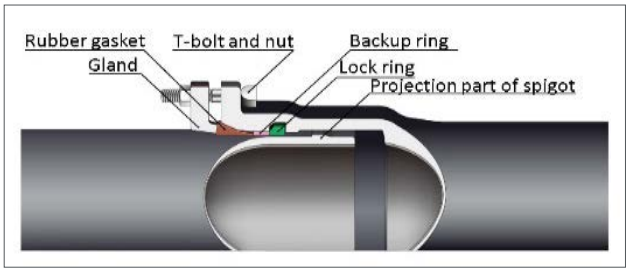


FIG. 2 Type NS Pipe (DN500-1000)

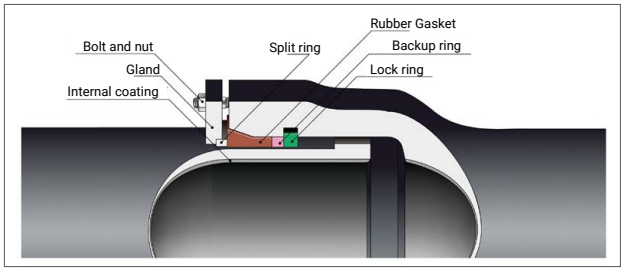


FIG. 6 Type NS Pipe (DN1100-2600)

Fitting types

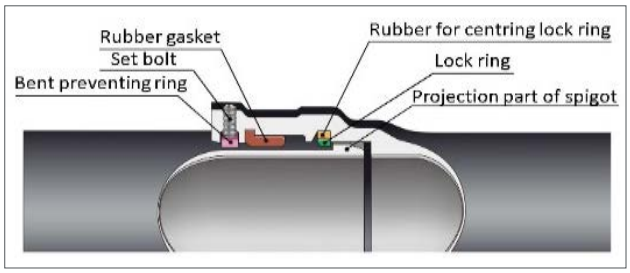


FIG. 3 Type NS Fitting (DN75-250)

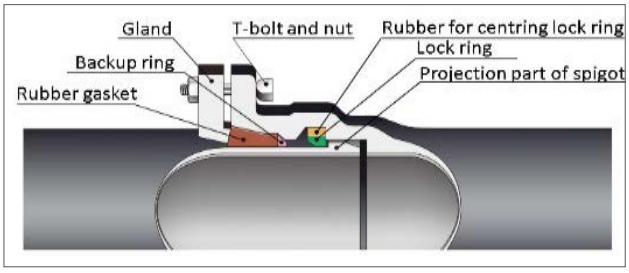


FIG. 4 Type NS Fitting (DN300-450)

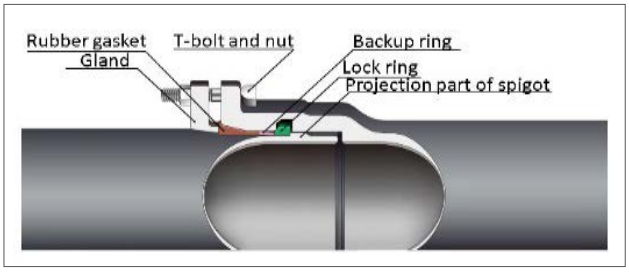


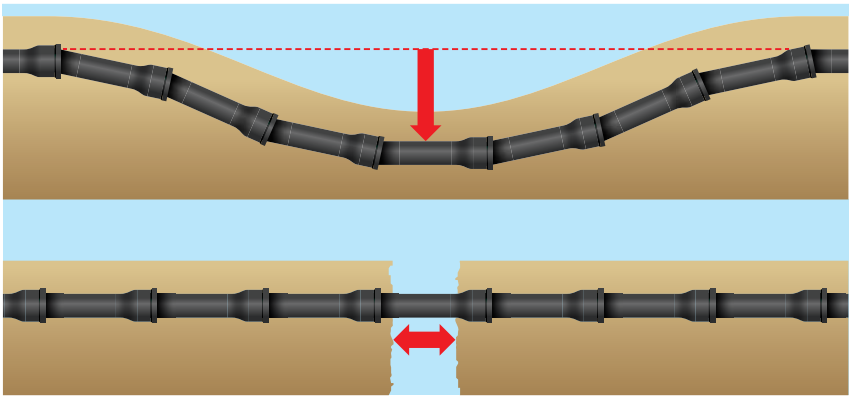
FIG. 5 Type NS Fitting (DN500-1000)

Seismic Resilience

Joint Features

- **Separation prevention**: 3 x DN (kN)*
  DN is Nominal size (in mm)
- **Flexibility:** 6-8 degrees (maximum angular deflection)
- **Extension and compression:** ffl 1% of pipe length

Joint flexibility enables pipelines to follow subsidence during earthquakes. Extension and contraction of the pipes enables the pipeline to follow crack movement during earthquakes.



Damage caused during natural disasters

SRDIP has never failed in service during any disasters

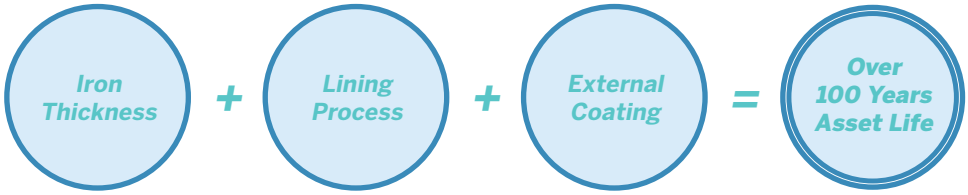
FIG. 7 Example of joint separation.

FIG. 8 SRDIP will remain in operation during seismic events.

FIG. 9 SRDIP pipe remaining intact during the 2011 Japan Earthquake

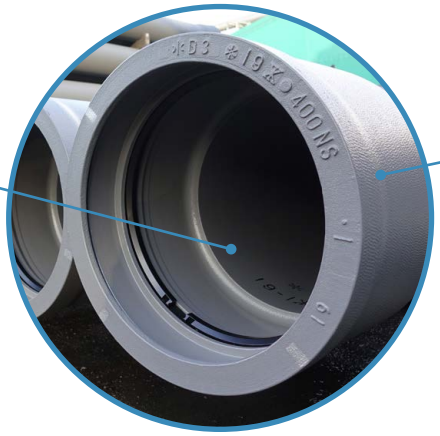
FIG. 10 SRDIP pipe remaining intact during the 2011 Japan Earthquake

Corrosion Resilience



Internal Coating

Fusion Bonded Epoxy Powder Coating



External Coating

Triple layer Kzinc epoxy coating (Al-Si-Mn)

Internal Coating Process

Coating Process	Material & Coating thickness
Pipe: Oven baked tspray applciation Fitting: Electrostatic spray	Fusion bonded epoxy powder Minimum 0.3mm

External Coating Process

Layer	Coating Process	Material & Coating thickness
1	Thermal Spraying alloy	Zn Alloy (Al-Si-Mn) Not less than 200mg/m²
2	Sealing treatment	Silica compound sealing agent Not less than 50g/m²
3	Synthetic Resin coating	Synthetic Resin Not less than 80μm

Coating Advantages

SRDIP can supply safe and secure potable water due to the oven baked internal FBE powder lining.

Advantage	Mortar Lining	Fusion Bonded Epoxy Powder Coating
Water Resilience and Chemical Resistance	○	✓
Water Quality and Sanitation	○	✓
Smoother Internal Surface - Increased Flow	100%	110~120%

Note: *For pipe and fittings ≥DN500, the coating applied is a Zinc rich paint Containing Aluminum which provides an equivalent performance to the KZinc™ triple layer external coating system*

Coating Advantages

Zn alloy (Al - Si - Mn) coating of SRDIP has a higher corrosion resilience than bitumen coating.

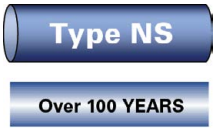
Traditional Bitumen Coating
- Rust (7 days)

VERSUS

Zn Alloy Coating
- No Rust (59 days later)

Enhanced Asset Life

Using oven baked fusion bonded epoxy powder (FBE) lining combined with triple layer Kzinc coating (Al-Si-Mn) corrosion resistance improves durability resulting in longer asset life.



Improved Productivity

- No concrete anchor blocks at bends required.
- No PE sleeves required
  (under most conditions - 95% of Japan)

TABLE 1 Joining Time: Pipe-joint

Nominal Size	Pipe-joint (mins)	Fitting-joint (mins)
75	4.2	-
100	4.9	6.4
150	4.9	-
200	5.4	7.0
250	5.9	-
300	7.0	13.4
400	7.5	13.8
450	8.6	14.1
500	15.5	15.5
600	16.0*	16.0*
700	18.5*	18.5*
800	23.0*	23.0*
900	23.5*	23.5*
1000	24.0	24.0
1100	50	50
1200	50	50
1350	50	50
1500	55	55
1600	55	55
1650	55	55
1800	55	55
2000	55	55
2100	60	60
2200	60	60
2600	60	60

Source: *Japan Ductile Iron Pipe Association (JDPA) *except for DN600~900 estimated by Kurimoto.*

FIG. 11 An example of DN375 x 11 degree bend showing:
1. Type NS Mechanical Bend, Tee Bolts and Gland plate.
2. Type NS mechanical bend socket installed into Type NS Pipe Socket

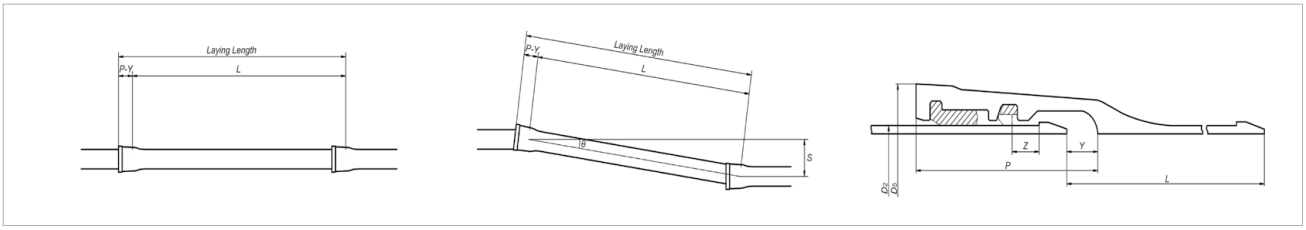
FIG. 12 Type NS pipe joint being made using special tools.

FIG. 13 Quality assurance check with an installed pipe-joint measuring the pipes gasket position to the first witness mark.

FIG. 14 Typical handing, jointing and workmanship quality checks of DN400 Kurimoto SRDIP installed at Cleat Street Porirua City, New Zealand.

TABLE 2 Seismic Resilient Ductile Iron Pipe Laying Length (Refer to FIG.15)

Nominal Pipe Size	D2 (mm)	D5 (mm)	Bending angle		Z, Y Extension & Contraction (mm)	Laying Length (mm)	L (mm)	S (mm)	
			Allowable	Maximum				Allowable	Maximum
75	93.0	161	4°00'	8°00'	ffl42	4167	4000	279	557
100	118.0	190	4°00'	8°00'	ffl41	4172	4000	279	557
150	169.0	242	4°00'	8°00'	ffl54	5195	5000	349	696
200	220.0	294	4°00'	8°00'	ffl52	5195	5000	349	696
250	271.6	346	4°00'	8°00'	ffl50	5195	5000	349	696
300	322.8	408	3°00'	6°00'	ffl60	5531	5300	277	554
350	374.0	465	3°00'	6°00'	ffl60	5540	5300	277	554
400	425.6	521	3°00'	6°00'	ffl60	5542	5300	277	554
450	476.8	572	3°00'	6°00'	ffl60	5543	5300	277	554
500	528.0	700	3°20'	7°00'	ffl60	5520	5300	308	646
600	630.8	804	2°50'	7°00'	ffl60	5520	5300	262	646
700	733.0	930	2°30'	7°00'	ffl60	5557	5300	231	646
800	836.0	1039	2°10'	7°00'	ffl60	5565	5300	200	646
900	939.0	1164	2°00'	7°00'	ffl60	5565	5300	185	646
1000	1041.0	1273	1°50'	7°00'	ffl60	5568	5300	170	646
1100	1144.0	1318	1°40'	7°00'	ffl61	5560	5300	154	646
1200	1246.0	1420	1°30'	7°00'	ffl62	5560	5300	139	646
1350	1400.0	1574	1°30'	6°30'	ffl60	5570	5300	139	600
1500	1554.0	1728	1°30'	5°50'	ffl60	5580	5300	139	539
1600	1650.0	1830	1°30'	5°00'	ffl50	5285	5000	131	436
1650	1701.0	1881	1°30'	4°50'	ffl50	5285	5000	131	421
1800	1848.0	2028	1°30'	4°40'	ffl50	5290	5000	131	407
2000	2061.0	2241	1°30'	4°20'	ffl50	5295	5000	131	378
2100	2164.0	2344	1°30'	4°10'	ffl51	5310	5000	131	363
2200	2280.0	2460	1°30'	4°00'	ffl50	5310	5000	131	349
2400	2458.0	2638	1°30'	3°50'	ffl50	4310	4000	105	267
2600	2684.0	2874	1°30'	3°40'	ffl50	4330	4000	105	256



Pipe Jacking for Trenchless applications

TABLE 3 Jacking Pipe Type US

Norminal diameter DN	Standardised length L (mm)	Dimensions			Weight (kg)						
					Pipe				Lining	Exterior	
		P (mm)	Y (mm)	Z (mm)	D1	D2	D3	D4	Mortar lining	Reinforced concrete	Flange & reinforced plate
800	4000 6000	405	105	300	1290 1790	1190 1630	1110 1520	1040 1410	188 285	1710 2659	40.0
900	4000 6000	405	105	300	1580 2210	1420 1960	1340 1840	1260 1720	212 320	1920 2970	43.7
1000	4000 6000	430	105	325	1930 2690	1750 2420	1620 2200	1530 2080	292 444	1710 2659	69.0
1100	4000 6000	430	105	325	2290 3200	2050 2830	1900 2610	1800 2470	322 488	2400 3730	74.6
1200	4000 6000	430	105	325	2670 3740	2410 3340	2190 3020	2030 2780	352 532	2590 4040	79.1
1350	4000 6000	450	105	345	3300 4630	2940 4090	2710 3730	2530 3460	474 717	2910 4550	87.2
1500	4000 6000	475	105	370	4020 5640	3620 5040	3290 4530	3090 4230	527 797	3320 5190	116.0
1600	4000 5000	465	115	350	4510 5440	4090 4890	3660 4360	3450 4090	696 876	3600 4620	125.0
1650	4000 5000	465	115	350	4740 5700	4300 5150	3870 4610	3650 4330	718 903	3710 4750	127.0
1800	4000 6000	465	115	350	5590 6730	4960 5950	4490 5350	4250 5050	781 982	4000 5130	135.0
2000	4000 5000	490	115	375	6830 8220	6130 7340	5600 6680	5160 6120	872 1100	4540 5830	185.0
2100	4000 5000	500	115	385	7520 9050	6780 8120	6140 7310	5670 6730	916 1150	4830 6210	195.0
2200	4000 5000	510	115	395	8280 9980	7410 8880	5310 8030	6250 7410	966 1210	5170 6640	207.0
2400	4000	530	115	415	9760	8710	7880	4310	1040	5750	228.0
2600	4000	560	130	430	11670	10420	9400	8830	1130	6880	366.0

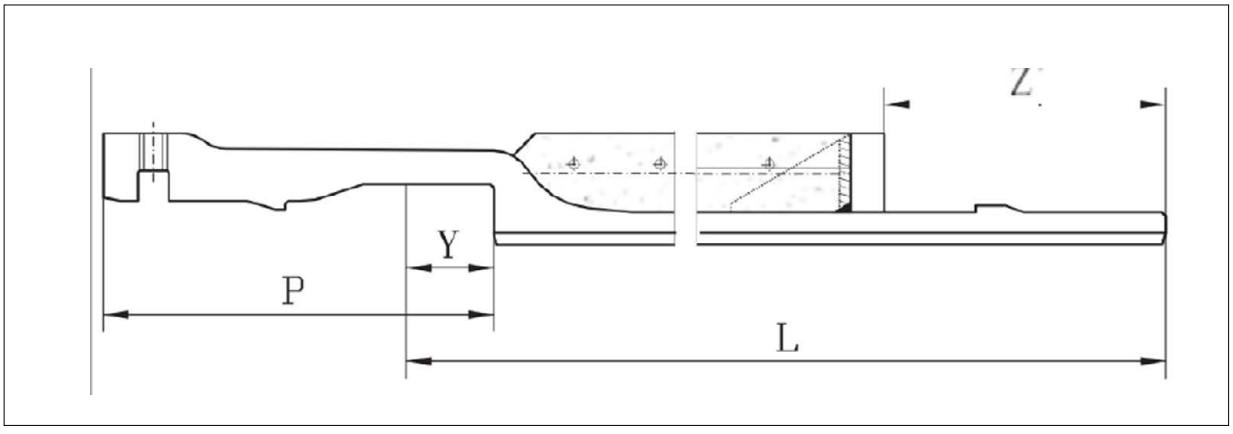
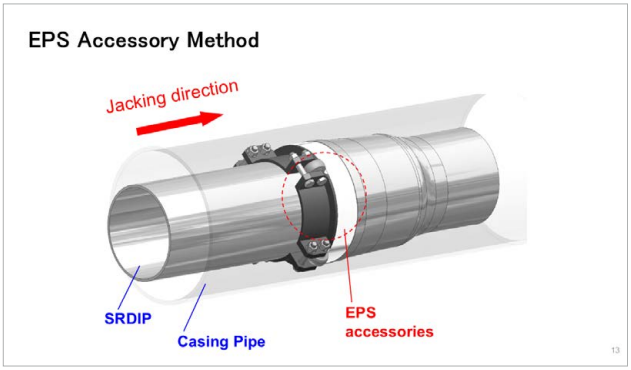


FIG. 15 Laying Length

Jacking Pipe

Kurimoto SRDIP pipes can be inserted into a host pipe or casing. Once the casing has been installed pipes are connected and the pipe casters are assembled onto the pipe barrel preventing pipe-joints from over-contracting. The assembly work can be completed at depth from a launch pit, the receiving pit receives the pipe-string as illustrated in Figure 13.



Features

- Easy and secure
- Speedy
- Rollable
- Curveable

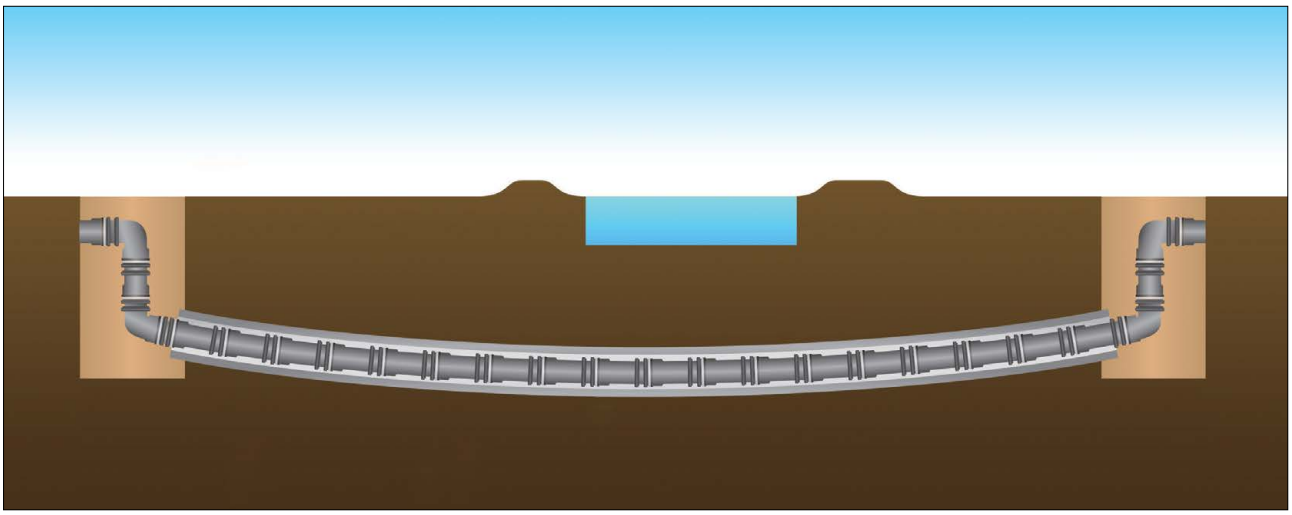


FIG. 16 Case study using curved Jacking Pipe method to cross under a river.

FIG. 17 Work In progress

FIG. 18 Pipe casters set on the pipe barrel

Trunk Water Main Heathcote Valley

Contractor: Utility Infrastructure NZ

- 2.7km DN350 SRDI Pipe
- Three Separable Portions.
- Project:
    I. Start – July 2022.
    II. Finish of SP 1&2 April 2023.
    III. Final completion April 2025.

TRENCHLESS Installation

- DN350 SRDI & SRMS (Mild Steel) Pipe & Fittings
- Using EPS saddle assembly, slip lined through Steel Casings. Beneath Railway crossings.

Fulton Hogan is undertaking the installation of a DN350

- 600m DN350 SRDI Pipe.
- Three Separable Portions.
- Summary of risks at Heathcote Valley include:
    - *Seismic:*
        I. Low strength soils.
        II. Liquefaction.
        III. Lateral Spread.
    - *High ground water level.*
    - *Hydrocarbon contaminated ground*

Kaitoke Flume Bridge Wellington

The bulk water, bridge mounted water transmission pipeline has been commissioned at the isolated Kaitoke Bridge construction site

Porirua Branch Pipeline Extension

New Zealand's first installation.

- DN400 Seismic Resilient Ductile Iron Pipe (SRDIP).
- Summary of risks :
  - *Exposure to Seismic activity*
  - *A crucial transmission main feeding high level reservoir. Failure during an event not wanted*

Greenfield Water Supply Pipeline

New Zealand's first installation.

- 4km DN150 PN30 SRDIP
- Part of a 38 km water pipeline
- Potable drinking water to the town of Lawrence Central Otago.
- An open country pipeline up to 40 joints assembled per day.

Grassmere & Dulles Place Water Main

Christchurch, New Zealand

- DN350 SRDI pipe & fittings
- High pressure water main located at a high RL.
- Summary of risks:
  - *High ground water level.*
  - *Seismic:*
    I. Lateral Spread.
    II. Landslip.

Colombo Main Pumps Raw Water Supply

Christchurch, New Zealand

- 450m DN200 SRDIP
- Bore Raw-Water supply to treatment plant.
- Summary of risks:
  - *High ground water level*
  - *Seismic:*
    I. Low strength soils.
    II. Low strength soils.
    III. Lateral Spread.

Scan for more information

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