

資料10 添付資料

10-1. 環境社会配慮別添資料

(1) EIA 免除レター



الرقم ١٠٢٢ / ٧ / ٤
التاريخ
الموافق ٢٠١٥ / ١٢ / ١٤

معالي وزير المياه والري

تحية طيبة وبعد ،،

إشارة لكتاب معاليكم رقم pmu/14/2375 تاريخ 2014/12/2 ومرفقه دراسة تقييم الأثر البيئي المبدئي لمشروع إنشاء خط ناقل لمياه الشرب من حوفا الى بيت راس وتأهيل شبكات مياه شرب في حوارة والصريح والممول من الوكالة اليابانية للتعاون الدولي (JICA).
أوافق على تقرير الدراسة أعلاه شريطة:
1- ضمان عدم تجاوز مستويات الضجيج للحدود المسموح بها.
2- إعادة تأهيل مواقع العمل.
3- اتخاذ اجراءات السلامة والحماية للسكان والعاملين في مناطق العمل.
4- الإلتزام بالإجراءات الوقائية الواردة في الدراسة.
وذلك استناداً إلى توصية اللجنة الفنية لمراجعة دراسات تقييم الأثر البيئي للمشاريع.

وتفضلوا بقبول فائق الإحترام ،،،

الدكتور طاهر راضي الشخشير
وزير البيئة

المهندس احمد عبد القادر
الأخصائي البيئي

The Hashemite Kingdom of Jordan
Ministry of Environment
P.O.B 1408 Amman 11941
Tel: +96265560112
Fax: +96265516277
Jordan

H.E. Minister of Water & Irrigation

Greetings:

With reference to Your Excellency's, letter No. pmu/14/2375 dated 2/12/2014 together with its attachment of the Evaluation Study of initial environmental impact for the construction of drinking water carrying line project from Hoofa to Bait Ras and prequalify the drinking water networks in Huwwarah and Sareeh which is financed by the Japanese International Cooperation Agency (JICA).

I approve the above study report provided:

1. Ensuring that noise levels do not exceed the permitted levels.
2. Prequalify the work sites again.
3. Take the safety and protection measures for the population work areas.
4. Adhere with the preventive measures stated in the study.

Pursuant to the recommendations of the Technical Committee for reviewing the studies of evaluation of environmental impact of projects.

With kind regards

Dr.Taher Radhi Shakhshir
(Signed)
Minister of Environment

(2) モニタリングフォーム案

Monitoring Form

Construction Phase

1. Response /Actions to Comments and Guidance from Government Authorities and the Public

Monitoring Item	Monitoring Results during Report Period
Number and contents of formal comments made by the public	
Number and contents of responses from Government agencies	

2. Pollution

-Air Quality (Ambient Air Quality)

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Standards for Contract	Referred International Standards	Measurement Point	Frequency
TSP	mg/cm ³			0.26 (24h)				Quarterly
CO	ppm			26 (1h)				
NO ₂	ppm			0.21 (1h)				
SO ₂	ppm			0.135 (1h)				

- Noise

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Standards for Contract	Referred International Standards	Measurement Point	Frequency
Noise Level	dB			Urban; 65 (Day), 55 (Night)				Daily

Remarks: Urban commercial area

- Vibration

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Standards for Contract	Referred International Standards	Measurement Point	Frequency
Traffic Vibration Level	dB					Urban ; 70 (Day), 65 (Night)		Daily

Remarks: Urban commercial area

- Soil Contamination

Monitoring Item	Monitoring Results during Report Period	Measures to be Taken
Treatment of oil leakage	Details of survey results, such as findings.	

3. Natural Environment

- No Monitoring Items

4. Social Environment

- Livelihood

Monitoring Item	Monitoring Results during Report Period	Measures to be Taken
Interference of approach to commercial places	Details of survey results, such as findings.	

- Cultural Heritage

Monitoring Item	Monitoring Results during Report Period	Measures to be Taken
Unearthing of monument and relic	Details of survey results, such as findings.	

- Work Environment

Monitoring Item	Monitoring Results during Report Period	Measures to be Taken
<ul style="list-style-type: none">• Safety measures for labor• Safety measures for inhabitant	Details of survey results, such as findings.	

- Accident

Monitoring Item	Monitoring Results during Report Period	Measures to be Taken
<ul style="list-style-type: none">• Measures for traffic safety• Crossing guard situation	Details of survey results, such as findings.	

(3) 環境チェックリスト

分類	環境項目	主なチェック事項	Yes: Y No: N	具体的な環境社会配慮 (Yes/Noの理由・根拠、緩和策等)
EIA および 環境 許認可	(1)EIAおよび環境許認可	(a) 環境アセスメント報告書（EIAレポート）等は作成済みか。	Y	環境省は本プロジェクトはEIAが不要であることを言明した。
		(b) EIAレポート等は当該国政府により承認されているか。	N	該当しない
		(c) EIAレポート等の承認は付帯条件を伴うか。付帯条件がある場合は、その条件は満たされるか。	N	該当しない
		(d) 上記以外に、必要な場合には現地の所管官庁からの環境に関する許認可は取得済みか。	N	該当しない。
	(2)現地ステークホルダーへの説明	(a) プロジェクトの内容および影響について、情報公開を含めて現地ステークホルダーに適切な説明を行い、理解を得ているか。に反映させたか。	Y	関係省庁にプロジェクトが説明された。
		(b) 住民等からのコメントを、プロジェクト内容に反映させたか。	Y	
	(3)代替案の検討	プロジェクト計画の複数の代替案は（検討の際、環境・社会に係る項目も含めて）検討されているか。	N	配水管はほとんどすべての道路に布設されるので代替案はない。
2 汚染 対策	(1)大気質	(a) 消毒用塩素の貯蔵設備、注入設備からの塩素による大気汚染はあるか。	N	
		(b) 作業環境における塩素は当該国の労働安全基準等と整合するか。	Y	
	(2)水質	施設稼働に伴って発生する排水のSS、BOD、COD、pH等の項目は当該国の排水基準等と整合するか。	N	該当しない。
	(3)廃棄物	施設稼働に伴って発生する汚泥等の廃棄物は当該国の規程に従って適切に処理・処分されるか。	N	該当しない。
	(4)騒音・振動	ポンプ施設等からの騒音・振動は当該国の基準等と整合するか。	N	該当しない。
(5)地盤沈下	大量の地下水汲み上げを行う場合、地盤沈下が生じる恐れがあるか。	N	プロジェクトは配水管の布設が工事内容なので関係しない。	
3 自然 環境	(1)保護区	サイトは当該国の法律・国際条約等に定められた保護区内に立地するか。プロジェクトが保護区に影響を与えるか。	N	プロジェクト対象地区は保護区から10km以上離れており保護区への影響はない。
	(2)生態系	(a) サイトは原生林、熱帯の自然林、生態学的に重要な生息地（珊瑚礁、マングローブ湿地、干潟等）を含むか。	N	
		(b) サイトは当該国の法律・国際条約等で保護が必要とされる貴重種の生息地を含むか。	N	
		(c) 生態系への重大な影響が懸念される場合、生態系への影響を減らす対策はなされるか。	N	
		(d) プロジェクトによる取水（地表水、地下水）が、河川等の水域環境に影響を及ぼすか。水生生物等への影響を減らす対策はなされるか。	N	本プロジェクトには取水施設はない。
(3)水象	プロジェクトによる取水（地表水、地下水）が、地表水、地下水の流れに悪影響を及ぼすか。			

分類	環境項目	主なチェック事項	Yes: Y No: N	具体的な環境社会配慮 (Yes/Noの理由・根拠、緩和策等)
4 社会環境	(1)住民移転	(a) プロジェクトの実施に伴い非自発的住民移転は生じるか。生じる場合は、移転による影響を最小限とする努力がなされるか。	N	プロジェクトは配水管の布設が工事内容であり、配水管は公道路下に埋設されるので住民移転の問題はない。
		(b) 移転する住民に対し、移転前に補償・生活再建対策に関する適切な説明が行われるか。	N	
		(c) 住民移転のための調査がなされ、再取得価格による補償、移転後の生活基盤の回復を含む移転計画が立てられるか。	N	
		(d) 補償金の支払いは移転前に行われるか。	N	
		(e) 補償方針は文書で策定されているか。	N	
		(f) 移転住民のうち特に女性、子供、老人、貧困層、少数民族・先住民族等の社会的弱者に適切な配慮がなされた計画か。	N	
		(g) 移転住民について移転前の合意は得られるか。	N	
		(h) 住民移転を適切に実施するための体制は整えられるか。十分な実施能力と予算措置が講じられるか。	N	
		(i) 移転による影響のモニタリングが計画されるか。	N	
		(j) 苦情処理の仕組みが構築されているか。	N	
(2)生活・生計	(a) プロジェクトにより住民の生活に対し悪影響が生じるか。必要な場合は影響を緩和する配慮が行われるか。	N	プロジェクトは住民の生活環境の改善を目的としている。	
	(b) プロジェクトによる取水（地表水・地下水）が、既存の水利用、水域利用に影響を及ぼすか。	N	プロジェクトに取水施設は含まない。	
4 社会環境	(3)文化遺産	プロジェクトにより、考古学的、歴史的、文化的、宗教的に貴重な遺産、史跡等を損なう恐れはあるか。また、当該国の国内法上定められた措置が考慮されるか。	Y	プロジェクトの対象地区には過去に遺跡・遺物が出土している。観光遺跡省は配管の埋設工事をフォローすることになっており、遺跡・遺物が出土した場合は観光遺跡省からの指示に従うことになる。
	(4)景観	特に配慮すべき景観が存在する場合、それに対し悪影響を及ぼすか。影響がある場合には必要な対策は取られるか。	N	
	(5)少数民族、先住民族	(a) 当該国の少数民族、先住民族の文化、生活様式への影響を軽減する配慮がなされているか。	N	少数民族はいない。プロジェクトはヨルダン人、パレスチナ難民、イラク難民、シリア難民の生活改善に寄与する。
		(b) 少数民族、先住民族の土地及び資源に関する諸権利は尊重されるか。	N	
	(6)労働環境	(a) プロジェクトにおいて遵守すべき当該国の労働環境に関する法律が守られるか。	Y	雇用契約書には法令を順守することを記載してそれをモニターする。
		(b) 労働災害防止に係る安全設備の設置、有害物質の管理等、プロジェクト関係者へのハード面での安全配慮が措置されるか。	Y	安全配慮の措置が実施される。
		(c) 安全衛生計画の策定や作業員等に対する安全教育（交通安全や公衆衛生を含む）の実施等、プロジェクト関係者へのソフト面での対応が計画・実施されるか。	Y	実施される。
		(d) プロジェクトに関する警備要員が、プロジェクト関係者・地域住民の安全を侵害することのないよう、適切な措置が講じられるか。	Y	実施される。

分類	環境項目	主なチェック事項	Yes: Y No: N	具体的な環境社会配慮 (Yes/Noの理由・根拠、緩和策等)
5 その他	(1)工事中的の影響	(a) 工事中の汚染（騒音、振動、濁水、粉じん、排ガス、廃棄物等）に対して緩和策が用意されるか。	Y	配管工事は出来るだけ夜間に実施する。粉塵発生の防止策と散水を行う。
		(b) 工事により自然環境（生態系）に悪影響を及ぼすか。また、影響に対する緩和策が用意されるか。	N	プロジェクト対象地区は居住地区なので配管工事が生態家に影響を及ぼすことはない。
		(c) 工事により社会環境に悪影響を及ぼすか。また、影響に対する緩和策が用意されるか。	Y	商店、住居へのアクセスを確保するために、臨時のアクセス歩廊を用意する。
		(d) 工事による道路渋滞は発生するか、また影響に対する緩和策が用意されるか。	Y	警察と相談して迂回ルートを計画する。
	(2)モニタリング	(a) 上記の環境項目のうち、影響が考えられる項目に対して、事業者のモニタリングが計画・実施されるか。	Y	
		(b) 当該計画の項目、方法、頻度等ほどのように定められているか。	Y	定期的（週、月）に巡回する。
		(c) 事業者のモニタリング体制（組織、人員、機材、予算等とそれらの継続性）は確立されるか。	Y	
		(d) 事業者から所管官庁等への報告の方法、頻度等は規定されているか。	Y	月に1度の報告を行う。
6 留意点	他の環境チェックリストの参照	必要な場合、道路、鉄道、橋梁に係るチェックリストの該当チェック事項も追加して評価すること	N	
	環境チェックリスト使用上の注意	必要な場合には、越境または地球規模の環境問題への影響も確認する（廃棄物の越境処理、酸性雨、オゾン層破壊、地球温暖化の問題に係る要素が考えられる場合等）。	N	

注1) 表中『当該国の基準』については、国際的に認められた基準と比較して著しい乖離がある場合には、必要に応じ対応策を検討する。

当該国において現在規制が確立されていない項目については、当該国以外（日本における経験も含めて）の適切な基準との比較により検討を行う。

注2) 環境チェックリストはあくまでも標準的な環境チェック項目を示したものであり、事業および地域の特性によっては、項目の削除または追加を行う必要がある。



DAI NIPPON CONSTRUCTION

The Programme For Urgent Improvement of Water Sector For The Host Communities of Syrian Refugees In Northern Governorates

Date: 29 June, 2015

Letter No. DNC / IRB / D006

To: Eng. Tawfiq Habashneh
Secretary General of Water Authority

57 2015
2015-1768
51419

**Subject: The Programme For Urgent Improvement of Water Sector For The Host
Communities of Syrian Refugees In Northern Governorates
(under the E/N signed on 13th March 2014)**

Sub: Cabinet Letter Amendment

Dear Sir,

With reference to the captioned subject, please be informed that the awarded contractor DAI NIPPON CONSTRUCTION received the attached Cabinet letter No. 56/10/6/8442 dated 10/March/2014, and the attached Minutes of the contract negotiation for the above-mentioned project dated 26/May/2015.

In accordance with Article 7. Client's responsibilities, Sub-Clause 7.3 and 7.4 in the contract and Article 1.27 Taxes and other charges in the contract documents and with reference to the attached signed exchange of notes No 5/2/15/2127 dated 13/03/2014, and following the attached minutes of the contract negotiation in the contract for the above mentioned project, you are kindly requested to issue the necessary supporting letter to the cabinet to amend and clarify clearly the following subjects which are mentioned in details in the contract documents and generally in the cabinet letter 56/10/6/8442 dated 10/March/2014 :

1. The contractor shall be exempted from submitting Bank Guarantee for the project cargo to custom department or any other authorities in the client's country.
[With reference to contract article 1.27, Taxes and other charges]
2. The contractor shall be exempted from submitting Bank Guarantee for the road use (Excavation work permission) concerning the project to the Ministry of Public works and Housing, Irbid Municipality and any other authorities in the client's country.
[With reference to contract article 1.27, Taxes and other charges]
3. The contractor shall be exempted from all Taxes and fiscal levies including the general and the private sales taxes for material, equipment, services, and preparations up to zero percent.
[With reference to contract article 1.27, and the minutes of the contract negotiation]

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Therefore, you are kindly requested to take the appropriate measure to expedite getting the above exemptions to help the contractor to import the needed material and start the work as soon as possible.

Your prompt action will be highly appreciated.

Yours faithfully,



Company Representative
Makoto Ikawa
DAI NIPPON CONSTRUCTION



Attached:

- Contract, Article 7
- Contract Document, Article 1.27
- Minutes of the contract negotiation
- Exchange Note. Ref No. 5/2/15/2127, Dated 13/03/2014
- Cabinet Letter Ref No. 56/15/6/7442, Dated 15/03/2014

The Prime Ministry

Number: 56 / 10 / 6 / 52202

Date: 29 / 11 / 2015

HE The Minister of Public Works and Housing

Referring to your letter number 5/roads' /48855 dated 31/10/2015

The Ministries' council has reviewed your above letter, and the recommendation of services and infrastructures and social affairs' committee which was issued in their session on 16/11/2015 about exempt the contractor who is executing (the conveyor water line from Hofa reservoir to Bait Ras town and rehabilitation of the water network in Hawwara area in Irbid / phase one) project from submitting guarantees to get the Public Works' required permissions, the council decided in his session on 25/11/2015 the approval to commission the ministry of water and irrigations not to release the performance bond for the above project unless they receive a written approval from the ministry of public works' and housing about returning the roads affected by this project as it was before starting the project.

Yours Sincerely,
The Prime Minister

Copy: HE The minister of water and irrigation

Copy: HE The minister of finance

Copy: Services and infrastructures and social affairs' Committee

الجمهورية العربية السورية
وزارة الشؤون الاجتماعية والعمل
الدمشق
الوقت: 10:45
العدد: 29223
التاريخ: 2015/12/01
بموجب: مرسوم
مجلس الوزراء

عطفه الأمين العام

الرقم: ٥٢ / ١١٠٧ / ٢٠١٥
التاريخ: ١٤٣٧ / ١٢ / ٢٤
العدد: ٢٤١٥ / ١٢ / ٢٤

معالي وزير الأشغال العامة والإسكان

أشير إلى كتابكم رقم ٥ / تصاريح طرق / ٤٨٨٥٥ تاريخ ٢٠١٥/١٠/٣١.

استعرض مجلس الوزراء كتاب معاليكم المشار إليه أعلاه، وتوصية
المجلس من تاريخ ٢٠١٥/١١/١٦ بخصوص إعفاء المقاول المنفذ لأعمال
مشروع خط نقل المياه من خزان حوفا إلى بلدة بيت راس وإعادة تأهيل شبكة
مياه بلدة حوارة في منطقة أريد/ المرحلة الأولى من تقديم كفالات تصاريح
العمل الخاصة بوزارة الأشغال العامة والإسكان، وقرر المجلس في جلسته
المنعقدة بتاريخ ٢٠١٥/١١/٢٥ الموافقة على تكليف وزارة المياه والري بعدم
الإفراج عن كفالة حسن التنفيذ المتعلقة بالمشروع أعلاه إلا بعد موافقة خطية
من وزارة الأشغال العامة والإسكان فيما يخص إعادة الطرق المتأثرة بمشروع
المياه / الخط الناقل إلى وضعها الذي كانت عليه.

واقبلوا فائق الاحترام.

لا تفسد السموات

10-4. 試掘調査結果

(1) 地形

プロジェクト対象事業地域のイルビッド市、ハワラ地区及びペイトラス地区は、標高 400～700m の起伏のある高原に位置している。イルビッドの市街地中央やや東寄りに分水界があり西側がヨルダン川の支流である Wadi Arab 流域、東側が Yarmouk 川の支流である Wadi Shallalah 流域になる。

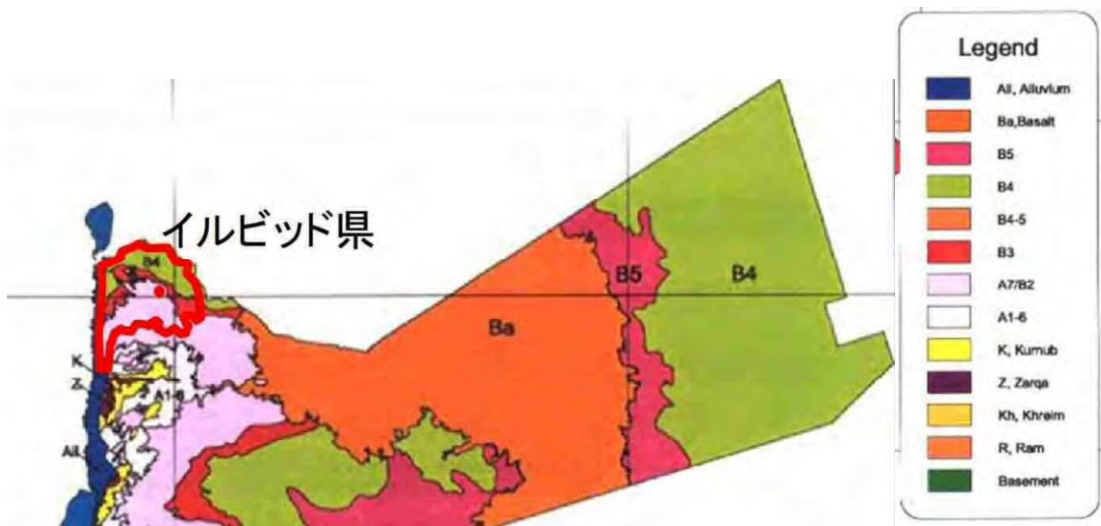
配水拠点である Hofa 配水池は標高 780m、Zebdat 配水池は標高 625m に位置している。Zebdat 配水池は市内に位置し市内への配水に便利である。Hofa 配水池は、プロジェクト対象地域で最も標高の高い場所に位置し、イルビッド市やハワラ地区への自然流下に適した標高に位置している。対象地域は高低差があるため、配水施設の計画においては、十分標高を配慮した計画策定が必要である。

(2) 地質

対象事業地域の表層の地質は、主に白亜紀上部層から古第三紀層が分布し、石灰岩、ドロマイト質石灰岩、チョークで構成されている。本調査の試掘調査結果によると、配管布設路線は礫交じりの石灰岩（土砂）及び石灰岩地盤（軟岩）である。地質状況から地盤は、構造物に対して十分な地耐力を有しており、一般に基礎工は必要ない。

(3) 水理地質

ヨルダン国の水理地質ユニット分布概略図、水理地質ユニット層序表を示す。北部 4 州の生産井戸が取水の対象としている主要帯水層を表示す。北部 4 県の井戸は、主に B2/A7 帯水層（Barqa 層群 Wadi Amman 累層/Ajilun 層群 Wadi Sir 累層：古第三紀暁新世／白亜紀上部）から取水している。



出典:Northern Governorates Water Transmission System Feasibility Study Final Report CDM International Inc. 2005, Modified from JICA 2001 and BGR 2001

図 ヨルダン水理地質ユニット分布概略図

表 水理地質ユニット層序表

ERA	PERIOD	EPOCH	Group	Formation	Symbol	Lithology	Aquifer Characteristics	Aquifer Cond. (m/s)	
CENOZOIC	Quarter-nary	Holocene	Alluvium	Fuviatile	Re	Soil, sand, and gravel	Poor to Good (Aquifer)	Not Available	
		Pleistocene	Diluvium	Laest and Eolian					
	Tertiary	Neogene	Pliocene	J. Valley	Jafer – Azraq	Ja-Az	Marl, clay, and evaporites conglomerate with siliceous sand, gravel, and basalt	Poor Fair	Not Available
			Miocene	Volcanics	Basalts	Ba	Basalt	Good (Aquifer)	4.0 E -04 *
		Paleogene	Oligocene	Volcanics	Basalts	Ba	Basalt		
			Eocene	Balqa	Wadi Shallah	B5	Limestone, chalk, and marl	Good (Aquifer)	5.0 E -05 *
			Paleocene	Rijam	B4	Chert, limestone, chalk, and marl	Good (Aquifer)	5.0 E -05 *	
				Muwaqqar	B3	Marly limestone, and shale	Poor (Aquifer)	1.0 E -09 **	
			Amman	B2	Chert, limestone, and phosphate	Good (Aquifer)	2.0 E -05 *		
			Wadi Ghudran	B1	Chalk, marl, and marly limestone	Poor (Aquifer)	Not Available		
MESOZOIC	Cretaceous	Upper	Meastrichtian						
			Campanian						
			Santonian						
		Turonian	Ajlun	Wadi Sir	A7	Limestone, dolomite, and chert	Very Good (Aquifer)	2.0 E -05 *	
		?????		Shueib	A5, A6	Limestone, and marly limestone	Poor (Aquitard)	1.0 E -09 **	
	Cenomanian		Hummar	A4	Dolomite, and dolomitic limestone	Fair to Good (Aquifer)	2.0 E -05 *		
			Fuheis	A3	Marl, and marly limestone	Good (Aquifer)	1.0 E -09 **		
	Lower		Naur	A1, A2	Limestone, and dolomitic limestone	Poor (Aquitard)	1.0 E -05 **		
			Albian	Kurnub	Subaibi	K2	Sand and shale	Fair to Good (Aquifer)	3.0 E -05 *
			Aptian				Clay and sandy limestone		
		Neocomian							
		Berriasian							
Jurassic	Malm			Aarda	K1	Sandstone, marl and shale			

(Source: Northern Governorates Water Transmission System Feasibility Study Final Report CDM International Inc. 2005, Modified from JICA 2001 and BGR 2001)

表 主要帯水層

記号	層名	岩種	層厚 (m)	透水量係数 (m/s)	比揚水量 (m ³ /h/m)
BS	Basalt	玄武岩	10->500	4. 0E-04	0. 01
B5/B4	Shallala/Rijam	石灰岩、層灰岩	0-850	5. 0E-05	0. 05
B2/A7	Amman/Wadi as Sir	石灰岩	80-650	2. 0E-05	0. 05
A4	Hummar	石灰岩	30-100	2. 0E-05	0. 01
A1. 2	Naur	層灰岩、石灰岩	90-220	1. 0E-05	0. 01
K	Kurnub	砂岩	120-350	3. 0E-05	0. 025

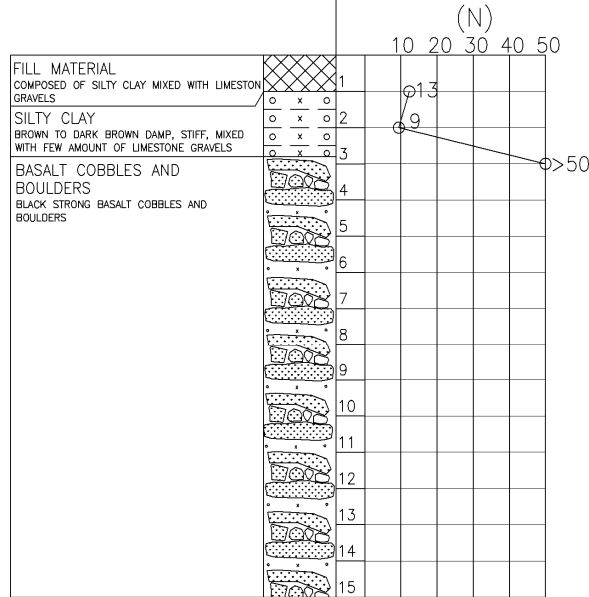
試掘調査位置図



BOREHOLE POINT AT BAGHDAD, PETRA AND SARIEH ROAD

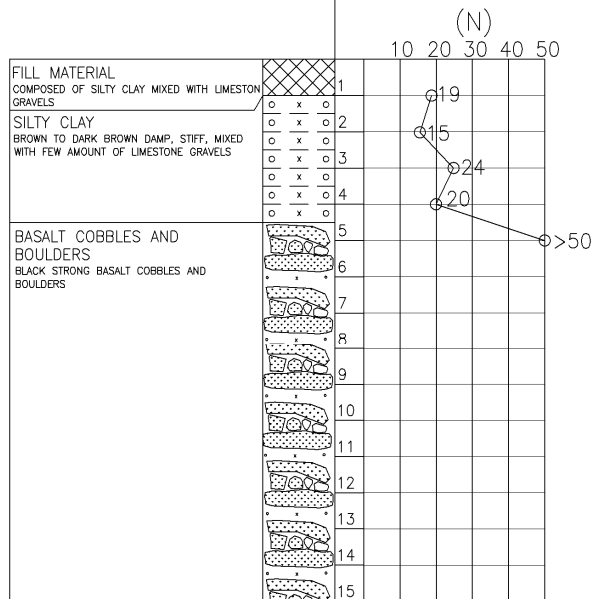
BBH-1.1(G.L.)

DEPTH=15m
 S.W.L. = NOWATER
 Static Water Level
 January 2016



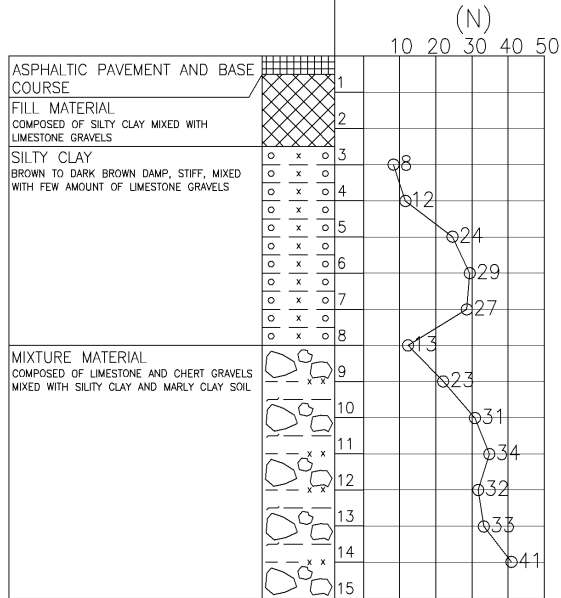
BBH-1.2(G.L.)

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 S.W.L. = NOWATER
 Static Water Level
 January 2016



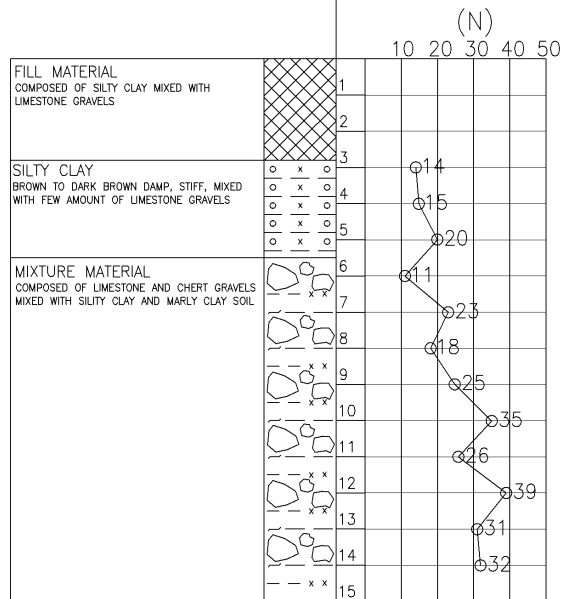
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 S.W.L. = NOWATER
 Static Water Level
 January 2016



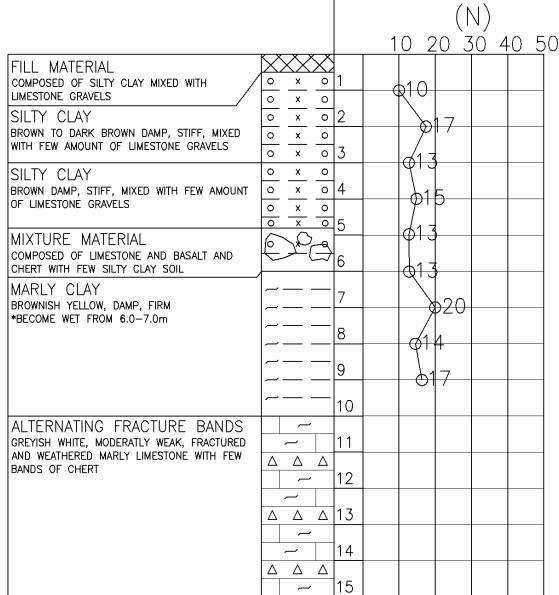
BBH-2.2(G.L.)

DEPTH=15m
 S.W.L. = NOWATER
 Static Water Level
 January 2016



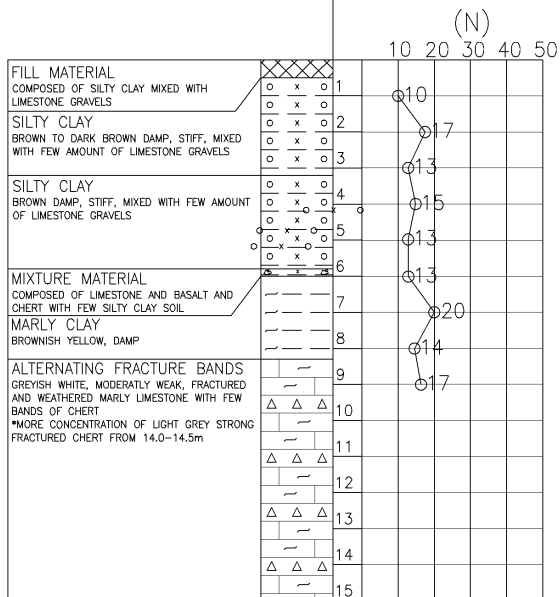
BBH-3.1(G.L.)

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 Static Water Level
 January 2016



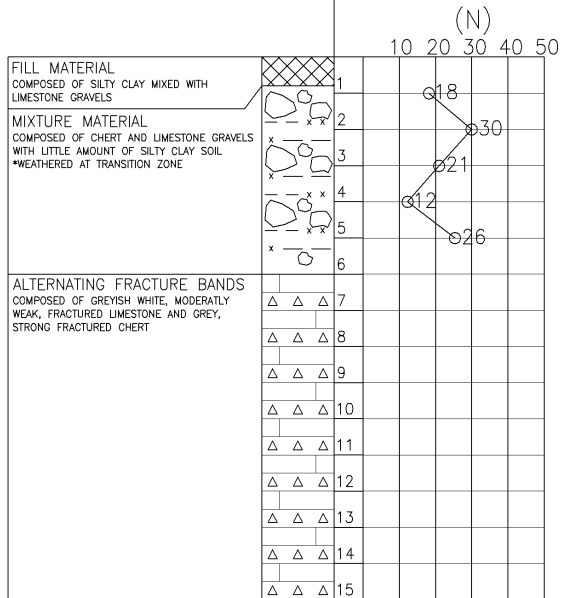
BBH-3.2(G.L.)

DEPTH=15m
 S.W.L. = NOWATER
 Static Water Level
 January 2016



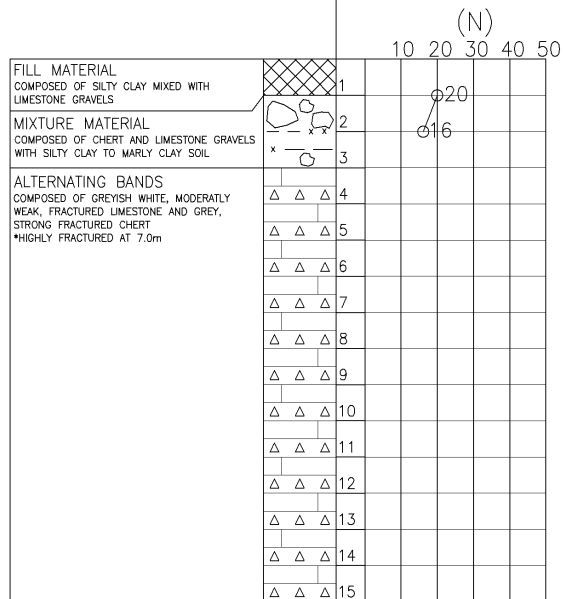
BBH-4.1(G.L.)

DEPTH=15m
 S.W.L. = NOWATER
 Static Water Level
 January 2016



BBH-4.2(G.L.)

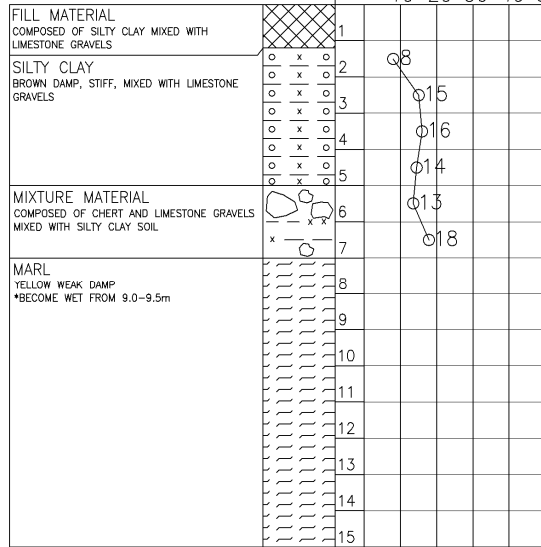
DEPTH=15m
 S.W.L. = NOWATER
 Static Water Level
 January 2016



PBH-1.1(G.L.)

DEPTH=15m
 S.W.L. = NOWATER
 Static Water Level
 January 2016

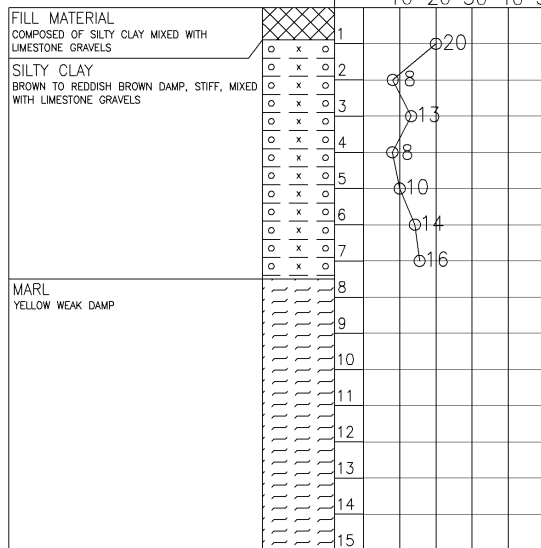
(N)
 10 20 30 40 50



PBH-1.2(G.L.)

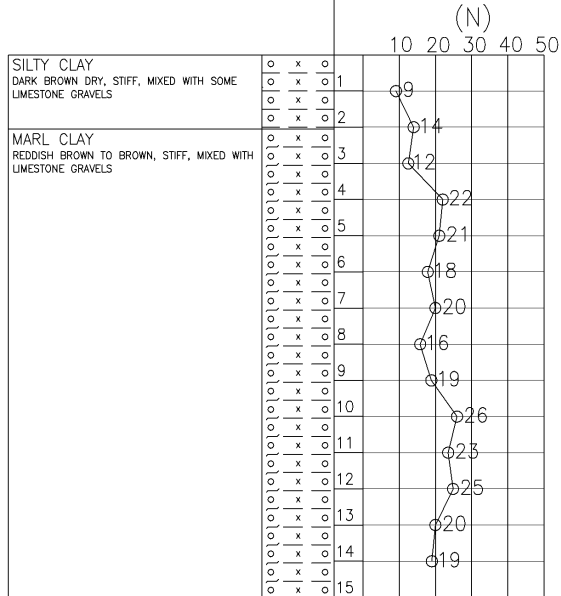
DEPTH=15m
 S.W.L. = NOWATER
 Static Water Level
 January 2016

(N)
 10 20 30 40 50



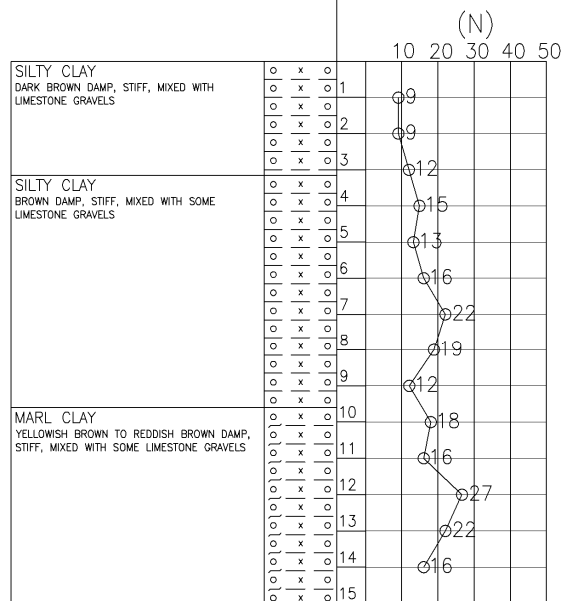
BH-11(G.L.)

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 S.W.L. = NOWATER
 Static Water Level
 February 2014



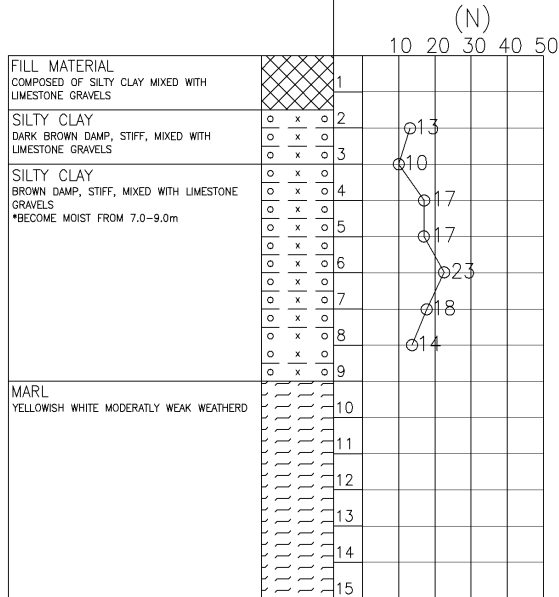
BH-12(G.L.)

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 S.W.L. = NOWATER
 Static Water Level
 February 2014



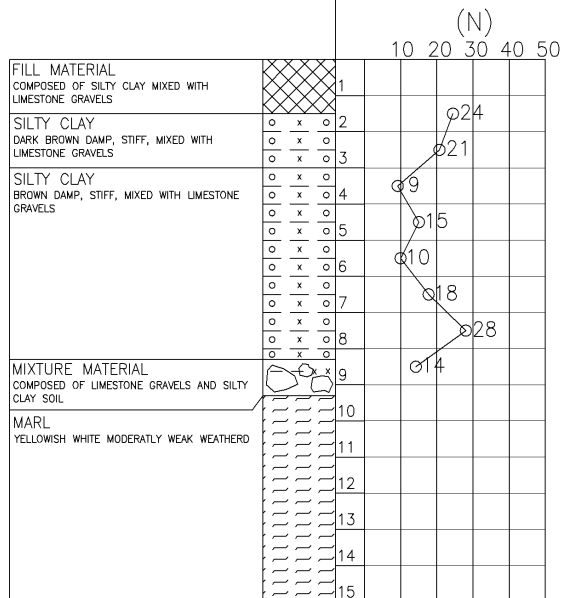
SBH-1.1(G.L.)

DEPTH=15m
 S.W.L. = NOWATER
 Static Water Level
 January 2016



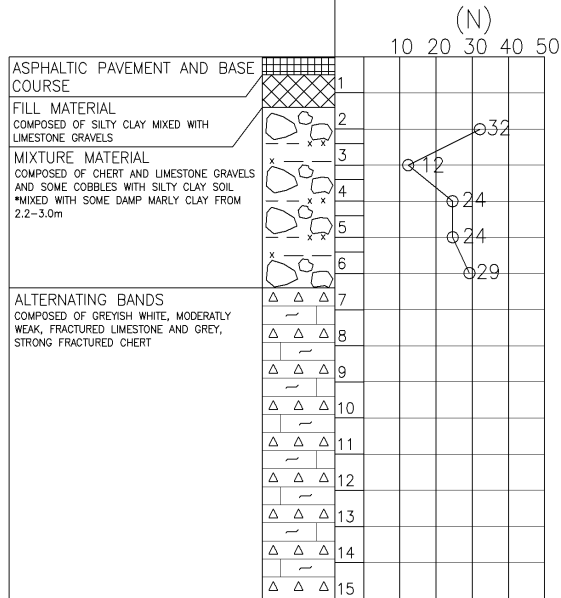
SBH-1.2(G.L.)

DEPTH=15m
 S.W.L. = NOWATER
 Static Water Level
 January 2016



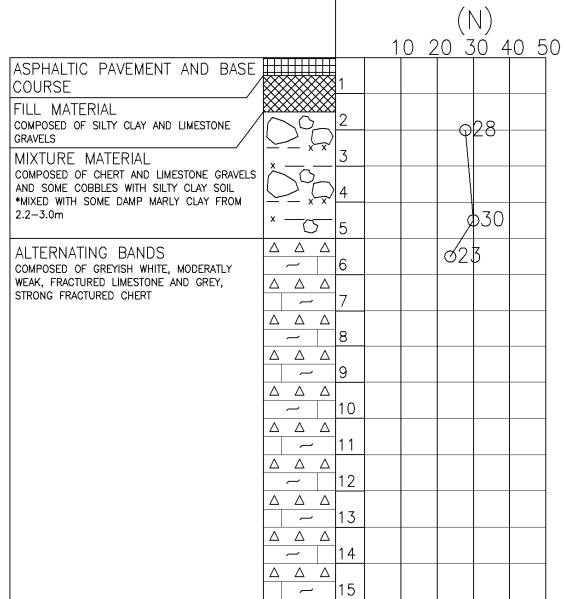
SBH-2.1(G.L.)

DEPTH=15m
 S.W.L. = NOWATER
 Static Water Level
 January 2016



SBH-2.2(G.L.)

DEPTH=15m
 S.W.L. = NOWATER
 Static Water Level
 January 2016

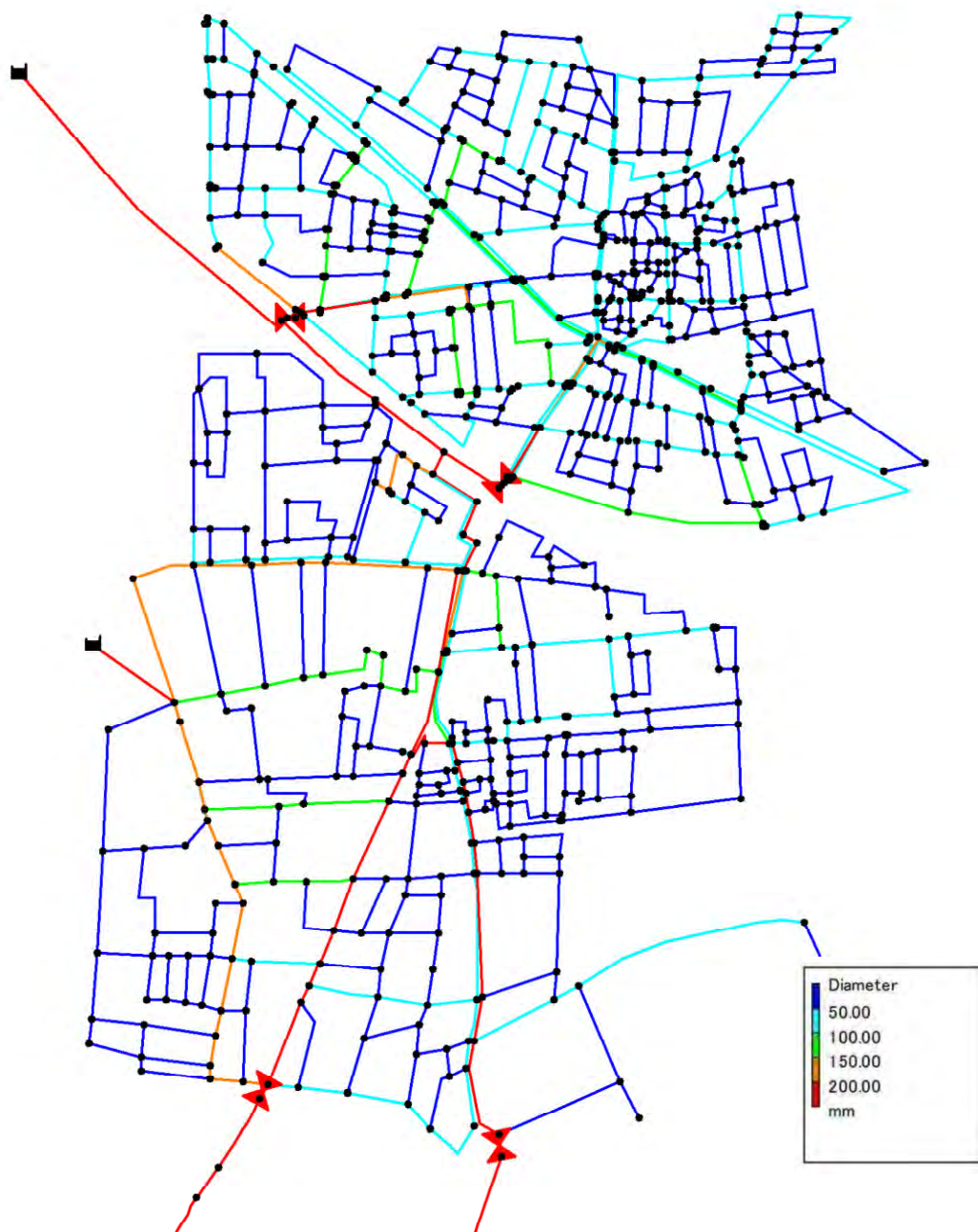


10-5. 水理計算結果

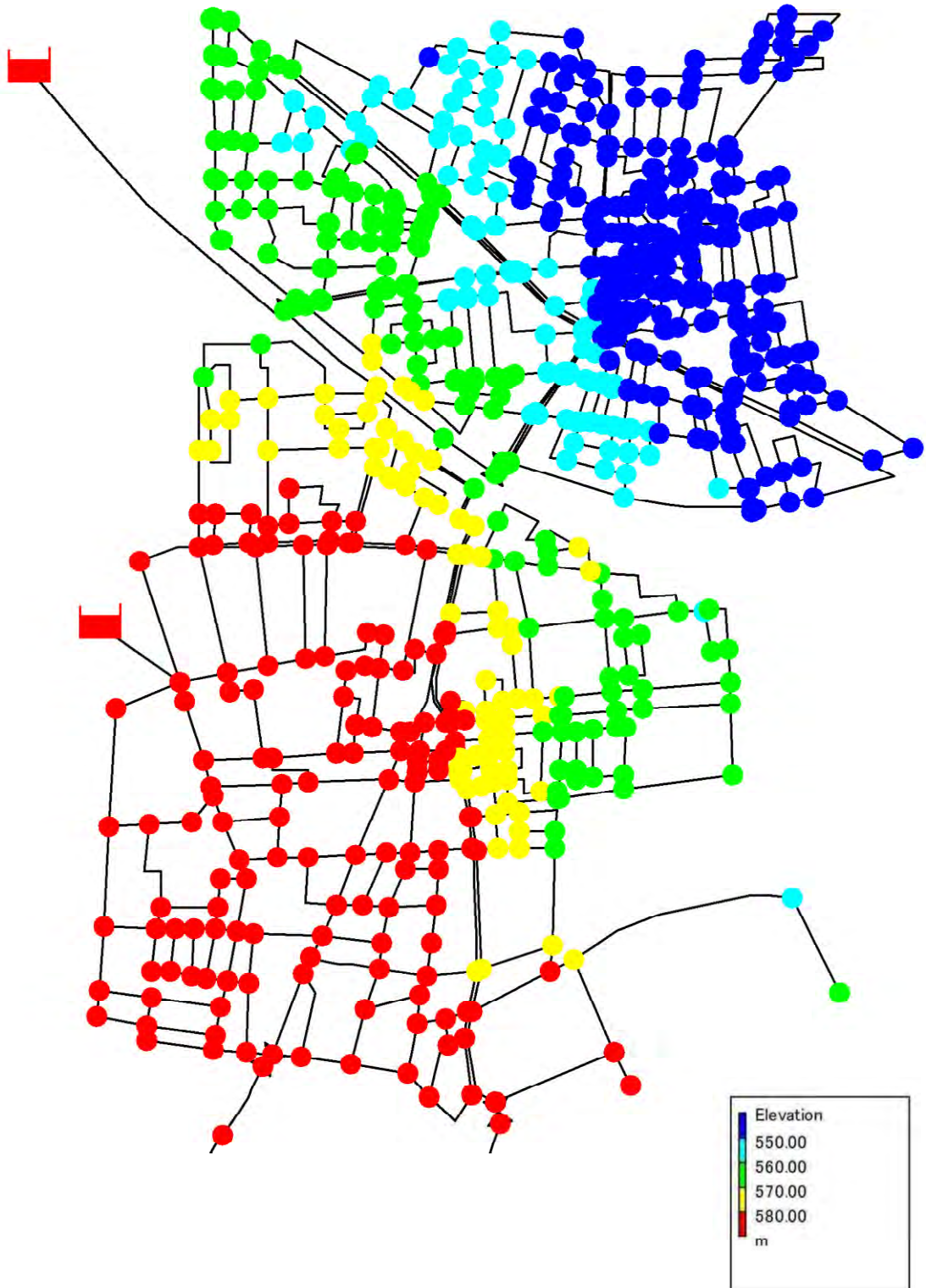
(1) 計算条件

- 適用プログラム： EPANET (アメリカ環境庁の公開プログラム)
- 計算アルゴリズム： 節点水位法、多点注入対応
- 管摩擦損失計算式： ヘーゼン・ウィリアムの公式
- 計算流量： 時間最大時流量
- 管径の判定基準： 水圧範囲 (25m~75m) を基本とする。流速は 3m以下。

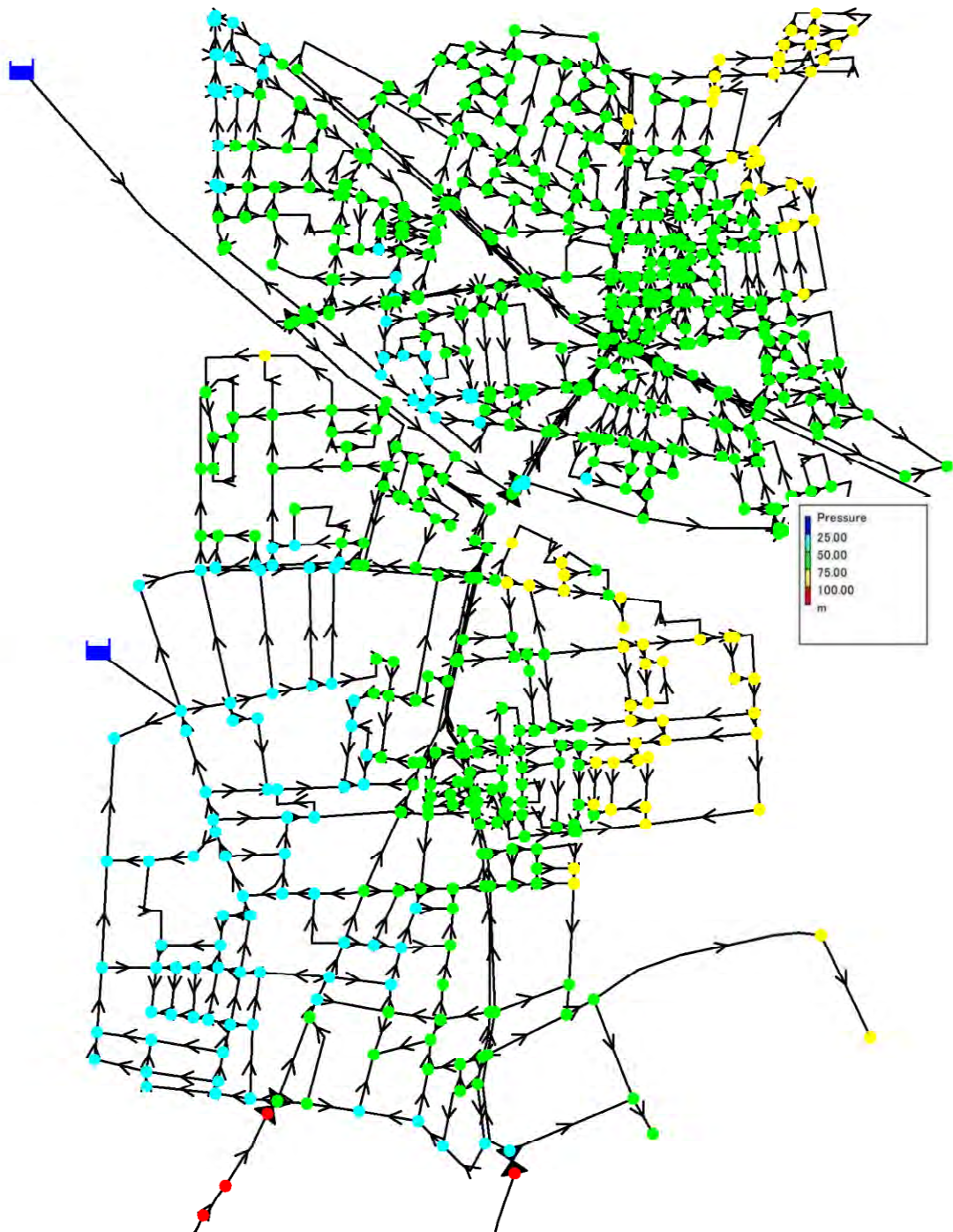
(2) 水理モデル



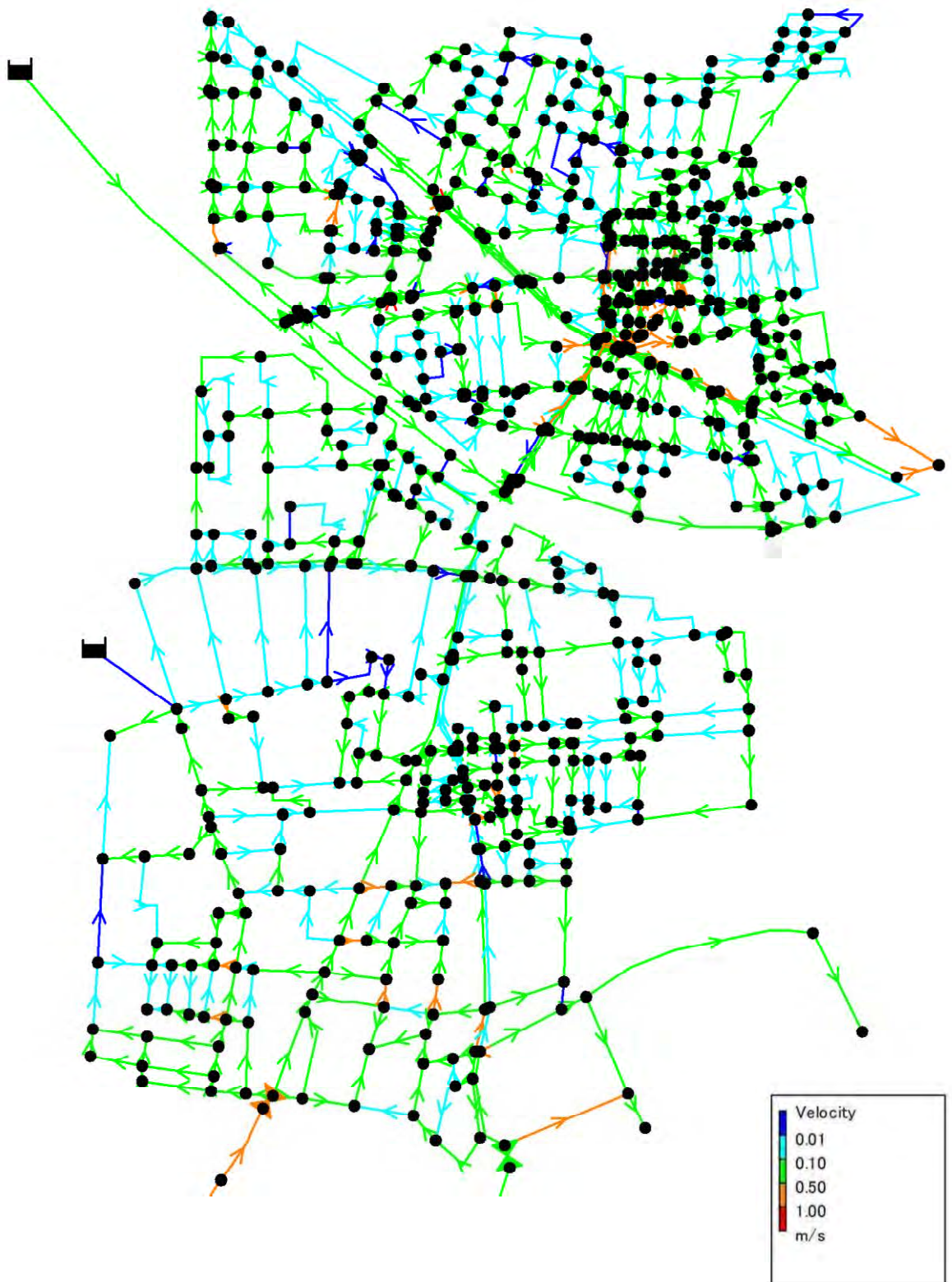
(3) 地形標高



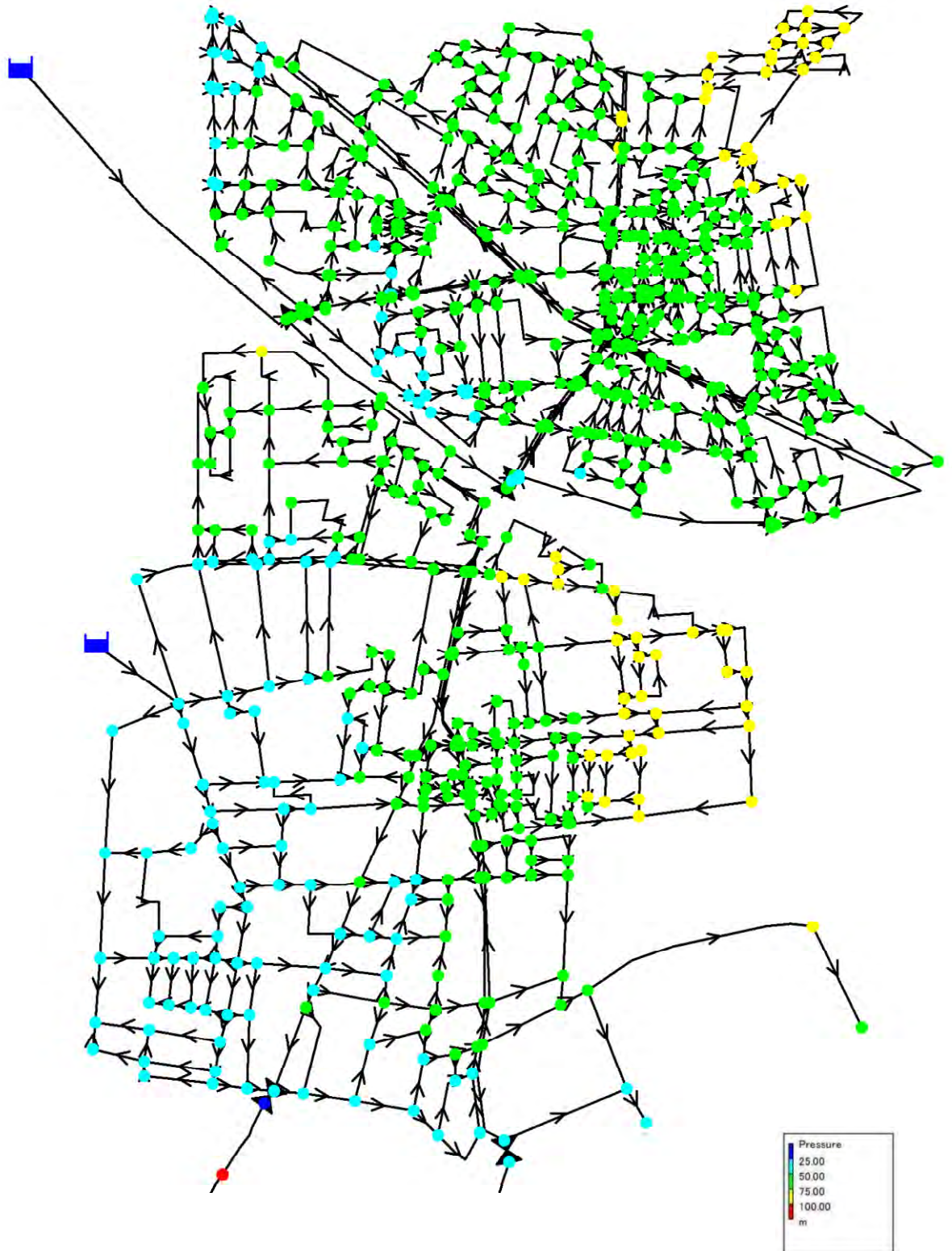
(4) 計算結果



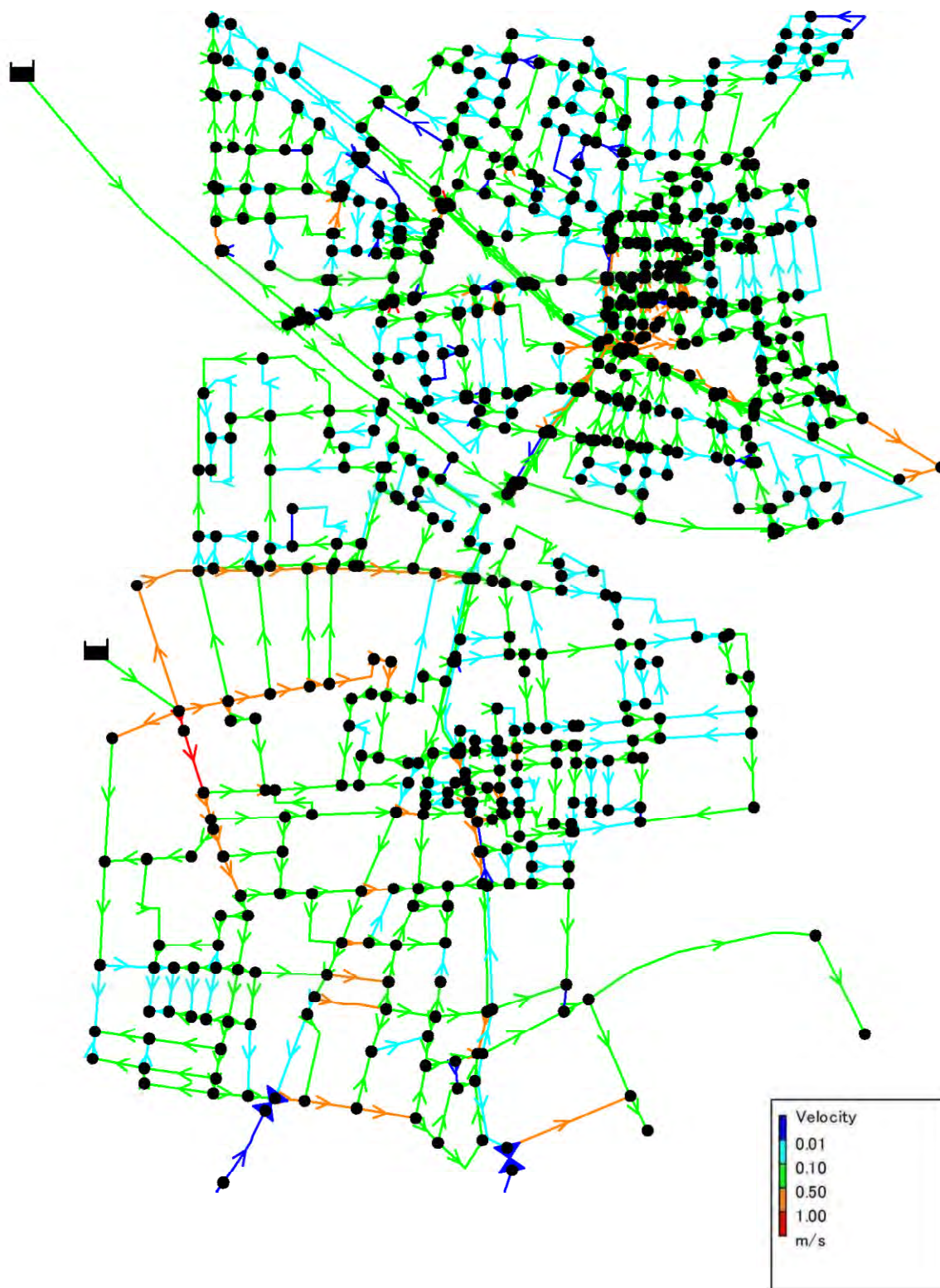
水圧分布図 (ケース A)



流速分布図 (ケース A)



水圧分布図（ケース B）



流速分布図 (ケース B)

10-6. 管種選定の説明レター

The Preparatory Survey on the Project for Urgent Improvement of Water Sector for the Host Communities of Syrian Refugees in Northern Governorates in the Hashemite Kingdom of Jordan Phase 2

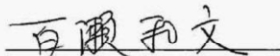
December 28, 2016

Engineer Tawfiq Z. Habashneh,
Secretary General
Water Authority of Jordan

Supplementary Explanation on the Selection of Pipe Materials

We are pleased to inform you that we are now at the final stage of the captioned survey with your kind cooperation. The remaining issue is the selection of pipe materials, for which the technical notes dated November 17, 2016 were concluded by JICA Study Team and WAJ. In order to support the technical notes, further discussions were made between the JICA mission and WAJ in a series of meetings held on December 4 and 5. Both parties confirmed WAJ's intention to use High Density Poly-Ethylene (HDPE) for OD63mm pipe of pressure class PN25 in Hawwara and Sarieh as the same conclusion of the technical notes of November 17, 2016. However, a risk was pointed out that some areas might be subjected to high pressure exceeding the allowable internal pressure of HDPE pipe of grade PN25 unless the pressure reducing valves are properly functioning. For minimizing the risk, WAJ assured intensive maintenance of the pressure reducing valves governing the pressure of said areas. Since a technical justification of using HDPE pipe was not described in the technical notes, we have prepared a study summarizing the technical justification of using HDPE pipe as attached notes. We would appreciate your confirmation in writing of the attachment and your subsequent decision of using HDPE pipe in said areas. Upon your confirmation reaching us, we will prepare the draft final report within December 2016 as agreed in the meeting.

Thanking you for your continuous cooperation,
Sincerely,



Eng. Kazufumi Momose
Team Leader
JICA Study Team
TEC International Co., Ltd.

cc:

Eng. Iyad Dahiyat, Secretary General of Ministry of Water and Irrigation
Eng. Salame Mahasneh, Project Manager, Project Management Unit
Eng. Bashar Bataineh, Project Manager, Project Management Unit

Mr. Tsutomu Kobayashi, Senior Representative, JICA Jordan Office

Ms. Eriko Tamura, Head of Water Resources Group, Global Environmental Department, JICA

Attachment:

Maximum Water Pressure and Material Selection for diameter 63 mm pipe in Hawwara and Sarieh

Summary

WAJ and JICA Study Team have mutually understood on the captioned issues as follows:

- Maximum water pressure in the target area in case of supplying water from Hofa reservoir (**Case A**, refer to the Detailed Evaluation) might exceed 250 m or the allowable water pressure of High Density Poly-Ethylene (HDPE) pipe with class PN25, in case 3 Pressure Reducing Valves (PRVs) are out of order simultaneously.
- Ductile cast Iron (DCI) pipe with class K9, which possess much higher allowable water pressure than HDPE pipe, should be used in the target area in case 3 PRVs are out of order simultaneously. However, the period of water supply system for Case A will be short; about 1 year at most because supplying water from Zebdat reservoir (**Case B**, refer to the Detailed Evaluation) is expected to start in 2020 assuming that this Project requires at least 3 years from 2017 for completion and will start its operation in 2020.
- In Case B, maximum water pressure is less than 250 m, which is less than the allowable water pressure of HDPE (PN25) pipe, and the HDPE (PN25) pipe can be used for the target area.
- Scope of the Project will be reduced if DCI pipe is used instead of HDPE pipe because price of DCI pipe is much higher than HDPE pipe.
- The suitable diameter of DCI pipe is 75mm in this case. This diameter is not used in Jordan and special pipe maintenance is required only for this area.
- Alternately, HDPE (PN25) pipe can be used for the target area even for Case A if WAJ maintains PRVs periodically and properly, and thus simultaneous out of order of 3 PRVs can be avoided.

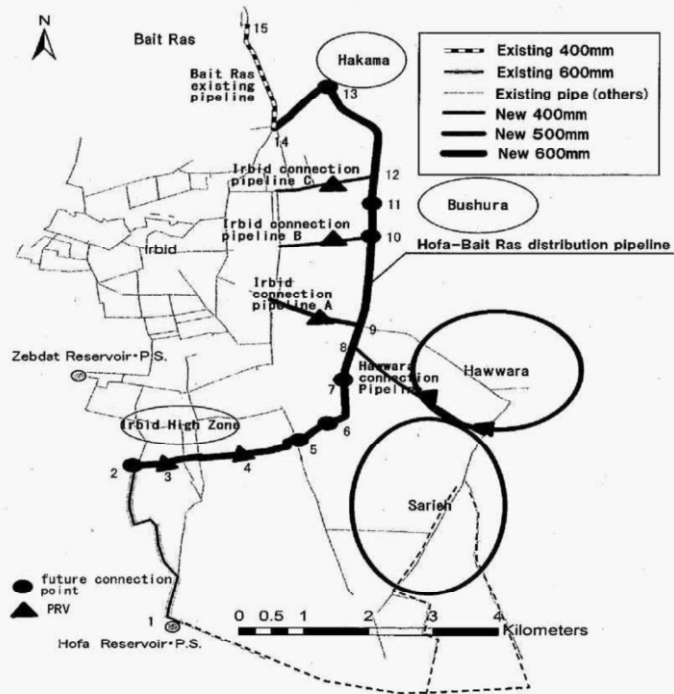
Based on the understanding above, WAJ has decided to use HDPE with class PN25 committing that WAJ will make periodical and proper maintenance of PRVs.

Detailed Evaluation

1. Maximum Water Pressure

Maximum water pressure (static water pressure and water hammer pressure) in the target area depends on the water distribution systems (Cases A and B) in this Project.

- Case A: Water is supplied from **Hofa reservoir** (water level is 790 m) **up to 2019**- See Figure 1 (3 PRVs are installed under the 1st stage grant aid project.)
- Case B: Water is supplied from **Zebdat reservoir** (water level is 630 m) **from 2020** –see figure 2



Existing Distribution Main
 Figure 1: Water Supply to Hawwara and Sarien (Case A: from Hofa reservoir)

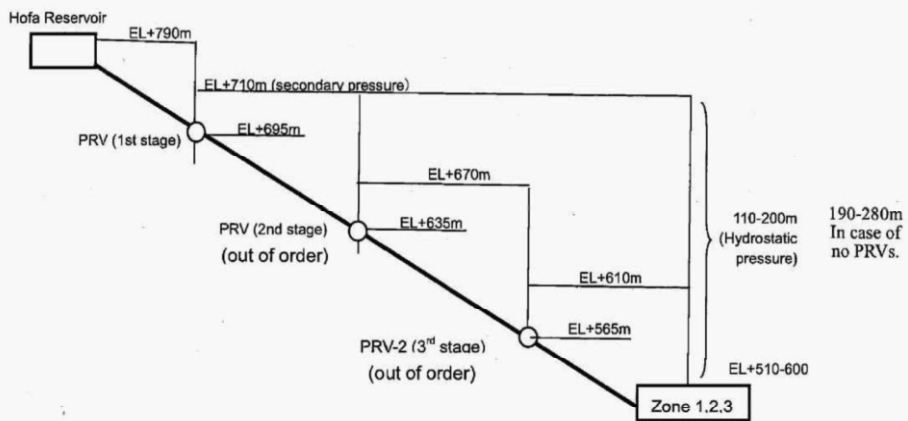


Figure 2: Maximum Working Pressure during Out of Order of Two PRVs

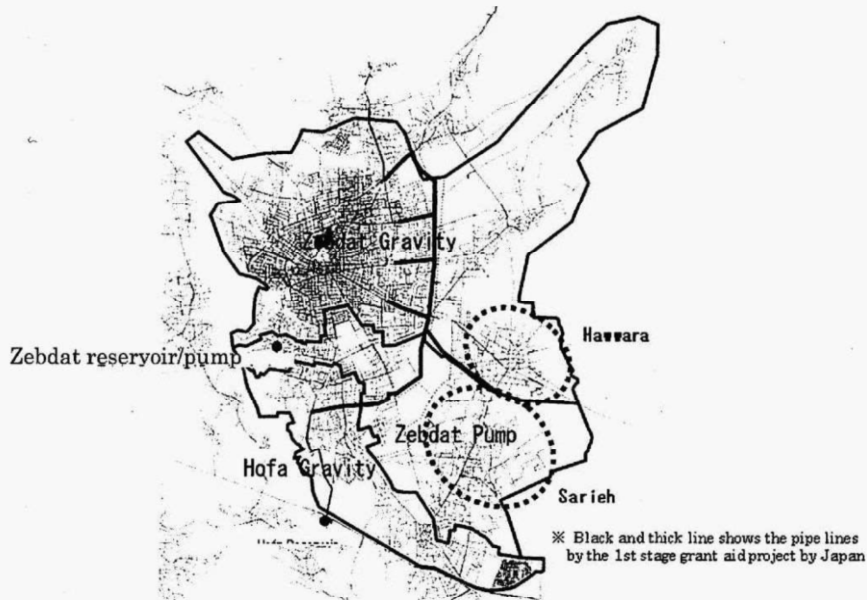


Figure 3: Water Supply to Hawwara and Sarieh (Case B: from Zebdat reservoir or pump)

The possible maximum water pressures by distribution system, by zone and by number of PRVs simultaneous out of order are shown below. The maximum water pressure is estimated as sum of maximum static pressure (difference between Hofa reservoir and the elevation of target area) plus water hammer pressure (55 m for DCI and 25 m for plastic pipe) calculated based on “The Design Guideline for Water Supply Facilities 2012” in Japan.

Table 1: Maximum Water Pressure for HDPE pipe

Distribution system case	Zone 1 and 2	Zones 3	No. of PRVs simultaneous out of order among 3 PRVs
A	305m	255m	3
	225m	175m	2
	185m	135m	1
B	146m	146m	n.a.
	138m	138m	n.a.

Note: Zones are shown in Figure 3. Zone 4 is located in higher altitude area so that PN 25 pipe can satisfy the maximum water pressure in this Zone. Therefore, Zone 4 is not mentioned in the table.

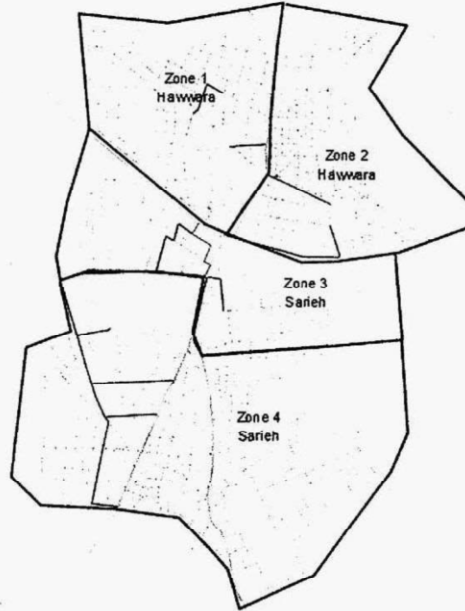


Figure 3: Zones 1 to 4 in Hawwara and Sarieh

2. Pipe Material according to Maximum Water Pressure

WAJ always uses HDPE pipe for diameter 63 mm pipe. The HDPE pipe has 3 classes against pressure; PN10 (100 m, maximum tolerate pressure, used widely in Japan), PN16 (160 m, normally used in Jordan) and PN25 (250 m). HDPE (PN25) pipe is applicable to the most cases in the target area except the case that 3 PRVs are out of order simultaneously in case A, in which Ductile Cast Iron (DCI) pipe (K9) should be used for 3 zones to tolerate the maximum water pressure as shown in table below.

Table 2: Pipe Material Selection against Maximum Water Pressure by distribution system and by zone and by PRVs simultaneous out of order

Distribution system case	Zone 1 and 2	Zones 3	No. of PRVs simultaneous out of order among 3 PRVs
A	DCI (K9)	DCI (K9)	3
	HDPE (PN25)	HDPE (PN25)	2
	HDPE (PN25)	HDPE (PN16)	1
B	HDPE (PN16)	HDPE (PN16)	n.a.
	HDPE (PN16)	HDPE (PN16)	n.a.

Note: Ductile Cast Iron pipe, DCI pipe
High Density Polyethylene Pipe, HDPE pipe

3. Conditions of Occurrence of Maximum Water Pressure

The maximum water pressure may occur only when the following incidents (3 PRVs out of order simultaneously and maximum water pressure plus water hammer pressure) occurs at the same time in Case A distribution system. These incidents may rarely occur at the same time.

- Case A distribution system from Hofa reservoir
The period of this distribution system will be 1 year at most because;
 - This Project will be in operation in 2020 at the earliest (1 year for detailed design and tendering and 2 years for pipe laying from 2017).
 - Wadi Arab 2nd stage (Case B distribution system) is expected to be operational in 2020.
- Three (3) PRVs are out of order simultaneously; 2 PRVs along the Hofa – Bait Ras main pipeline and 1 PRV at the inlets of zones are already installed.
- Maximum static pressure (it happens when water flow is zero) plus water hammer pressure (25 m for HDPE pipe estimated based on the “The Design Guideline for Water Supply Facilities 2012” in Japan. Water hammer may occur when flow velocity in pipe is quickly changed e.g. all valves in the network are closed quickly.

4. Possibility of HDPE Pipe Burst

If the conditions above are all met, maximum water pressure may exceed 250 m water pressure (2.5 Mpa) in some areas. With these conditions, if HDPE (PN25) pipe is used, burst may occur in the area where the maximum water pressure exceeds 2.5 Mpa. The following table shows possibility of pipe burst by pipe material and pressure type.

Table 3: Possibility of Pipe Burst

Distribution system case	No. of PRV, out of order	DCI (K9)	HDPE (PN25)
A	3	No	Yes
A	2	No	No.
A	1	No	No
B	n.a.	No	No

5. Comparison of HDPE pipe and DCI pipe

As per above discussion, DCI (K9) and HDPE (PN25) pipes may be selected for the pipe materials for the target area. The following table shows comparison of HDPE (PN25) and DCI (K9) pipes.

Table 4: Comparison of HDPE (PN25) pipe and DCI (K9) pipe

Item	HDPE pipe 63mm (PN25)	DCI pipe 75mm (K9)
Materials availability	○ Commonly available material in Jordan	× Not used in Jordan
Maintenance of pipe	○ Repair works can be quickly conducted using the common stock	× Not kept in stock. A separate stock is required only for this area and special Saddle for service connection is required for only this project
PRV maintenance	△ Periodical inspection of PRVs is strongly recommended to prevent 3 PRVs out of order simultaneously that may lead to pipe burst in Case A distribution system.	△ Periodical inspection of PRVs is recommended.
Suitability with Case A distribution system	× Maximum water pressure exceeds pipe tolerance level in Case A distribution system.	○ Maximum water pressure is within the pipe tolerance level.
Suitability with Case B distribution system	○ If Case B distribution system is in operation in 2020, maximum water pressure is less than 2.5 Mpa and HDPE (PN25) pipe is suitable.	△ If Case B distribution system comes in operation in 2020, DCI (K9) is over specification.
Pipe Laying Cost	○ Pipe laying cost (1.1 billion Japanese Yen) is lower than DCI pipe.	× Pipe laying cost (1.4 billion Japanese Yen) is higher than HDPE pipe.
Overall evaluation	○	△

Note: ○: good, △: fair, ×: bad

As a result of comparison in table above, HDPE (PN25m) has been selected for the following main reasons.

- Suitability with Case B distribution system which will be completed and come in operation in 2020
- Easiness in pipe maintenance
- Pipe burst will be prevented by periodical and proper maintenance of PRVs even in Case A distribution system

6. Requirement of PRV maintenance

When HDPE pipe is selected, PRVs should be maintained periodically and properly in order to avoid PRVs going out of order.

The following are the main causes of PRV going out of order.

- Small objects like small stones, woodchips and debris enter into the PRV
- Copper tubes for drawing water from upstream and downstream main pipes to the PRV actuator are clogged with small objects.

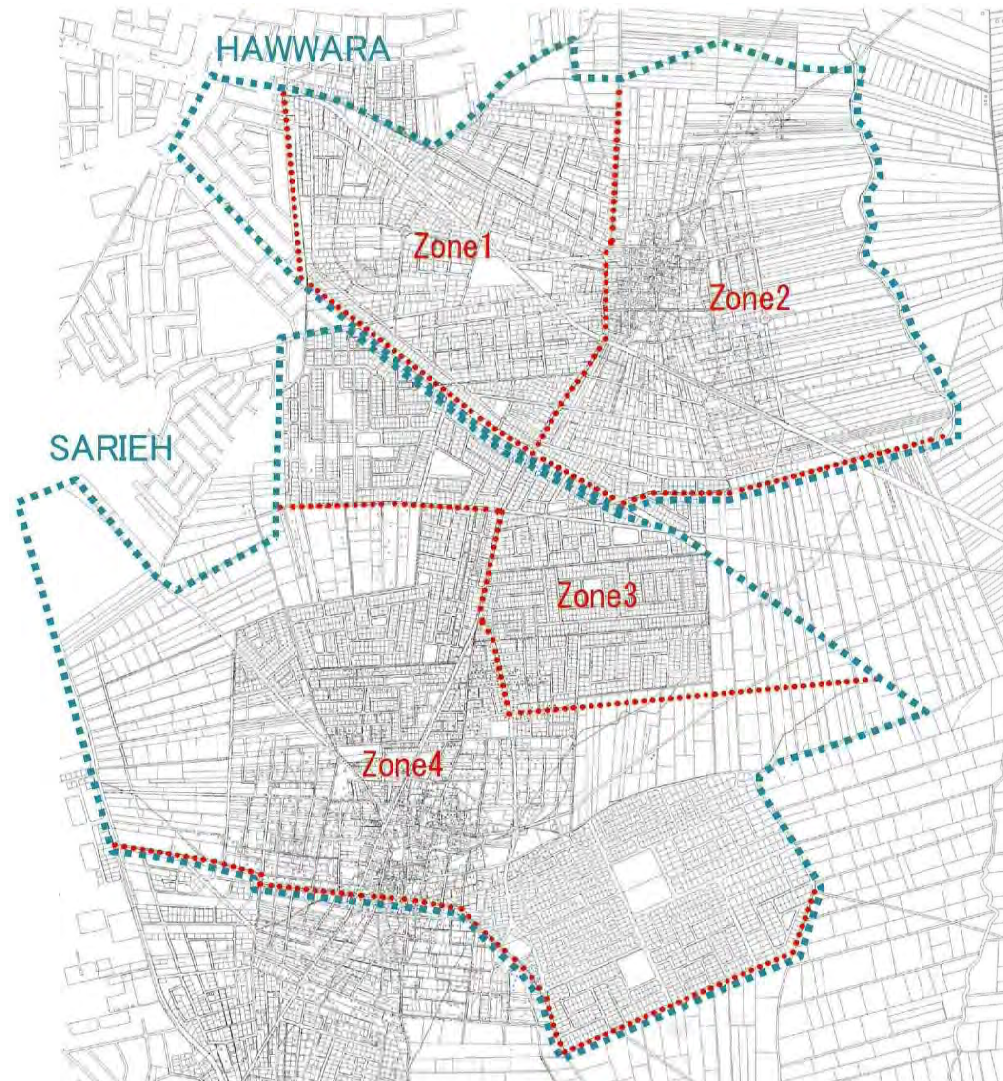
To avoid PRV going out of order, following maintenance is required and WAJ has to ensure this maintenance.

- Strainer and filters at the copper tubes both equipped with the PRV should be cleaned periodically (every 3 months or less).
- Regular measurement of the downstream pressure at the PRV. In case the downstream pressure of PRV is out of the value set initially, it should be adjusted to the initial value.
- Spare parts of PRV should be kept always.
- After-service system for PRV should be established in case of the damage of PRV.

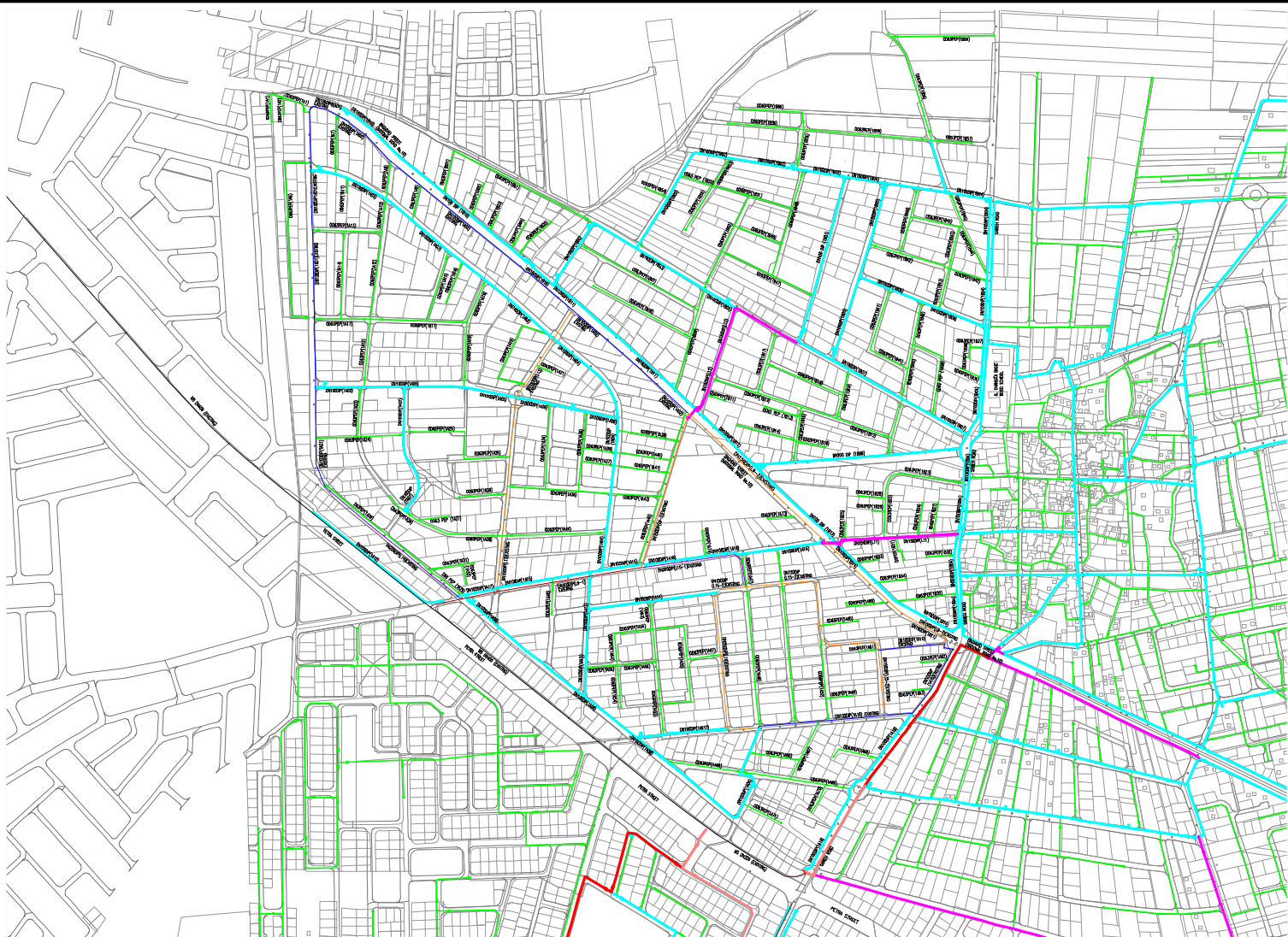
10-7. 概略設計図面



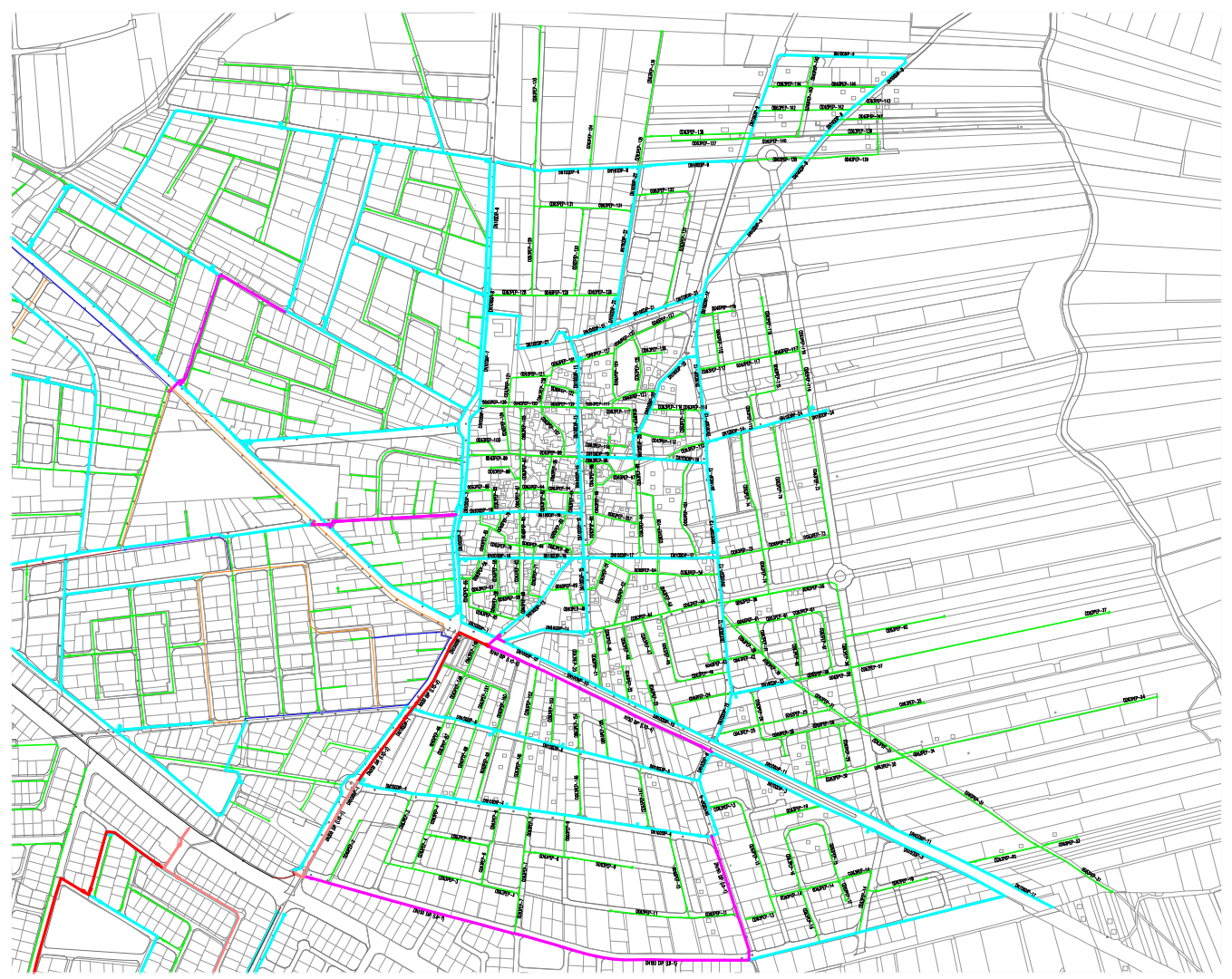
NO SCALE



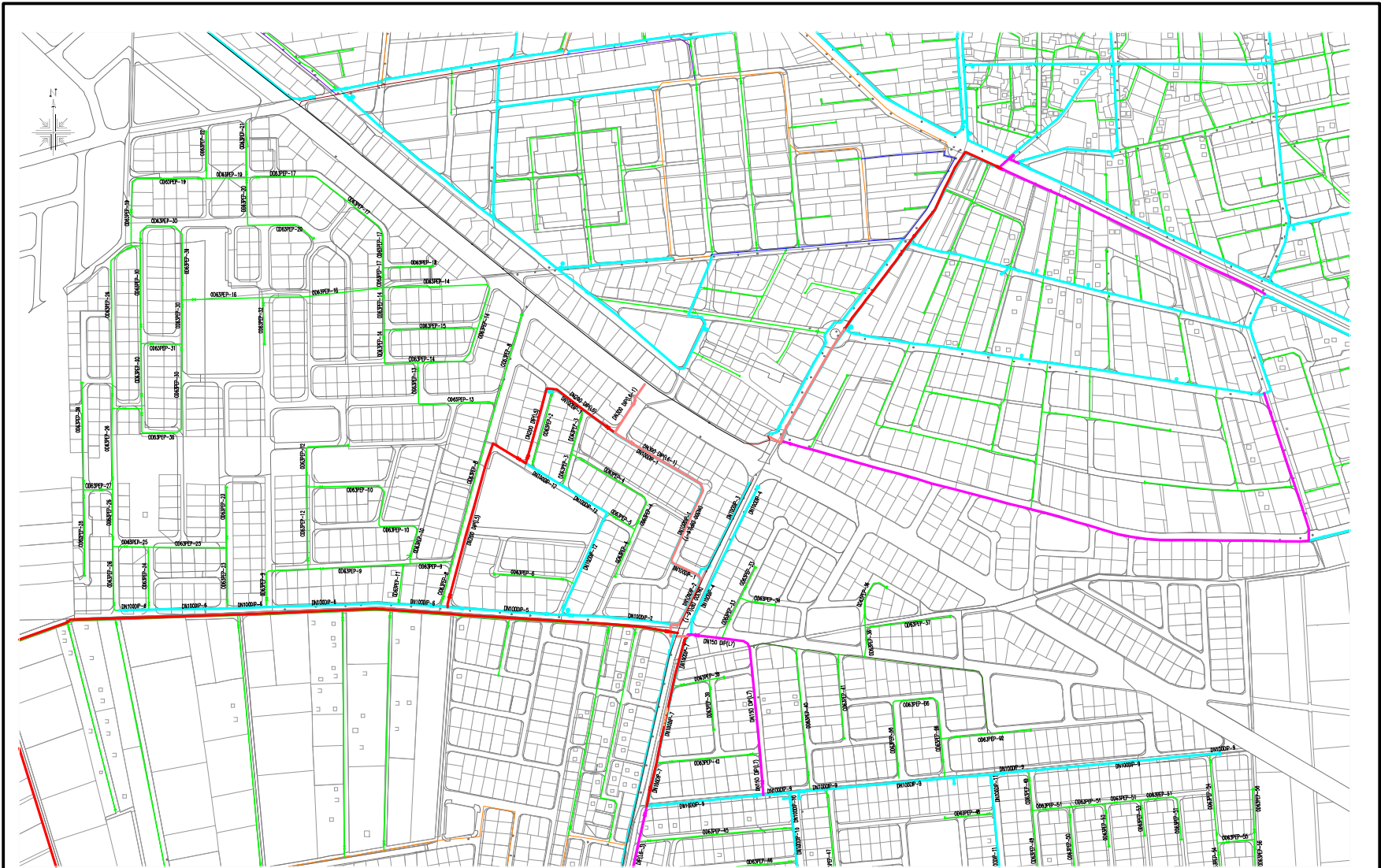
No. 1	ZONE DIVIDED PLAN
ゾーン区分図	



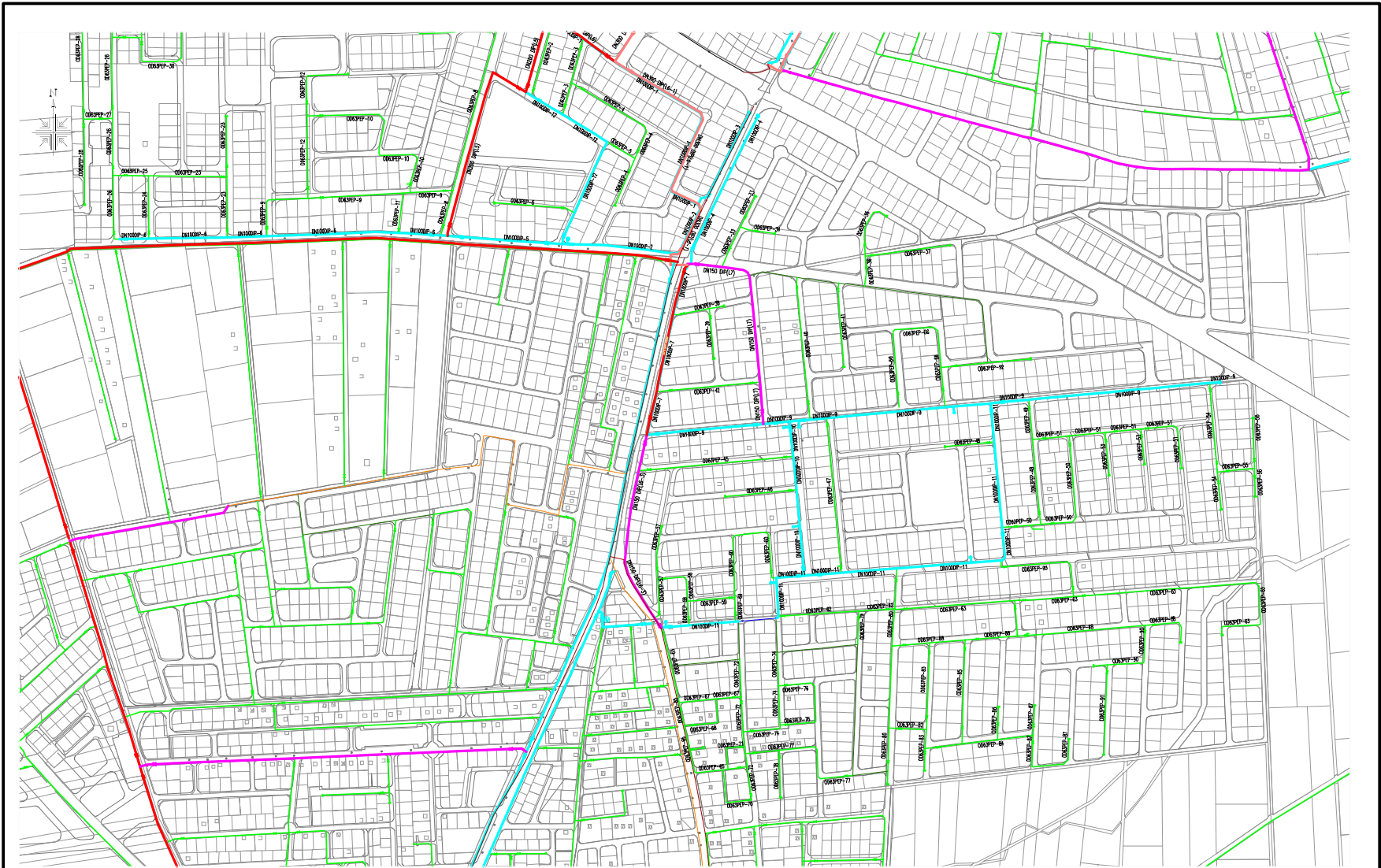
No. 2	ZONE1 GENERAL SITE PLAN
ゾーン1 全体計画図	



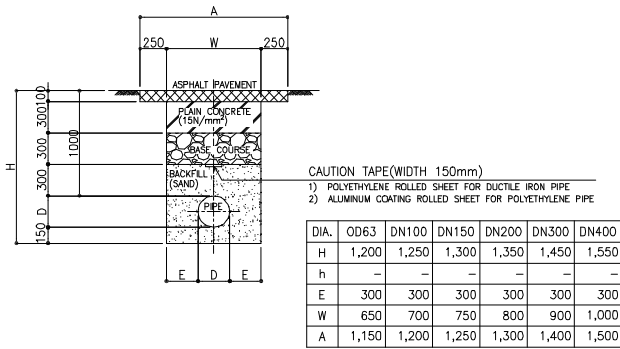
No. 3	ZONE2 GENERAL SITE PLAN
ゾーン2 全体計画図	



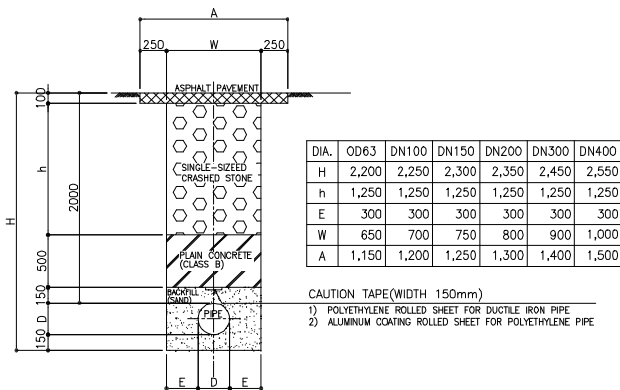
No. 4	ZONE3 GENERAL SITE PLAN (1)
ゾーン3 全体計画図(1)	



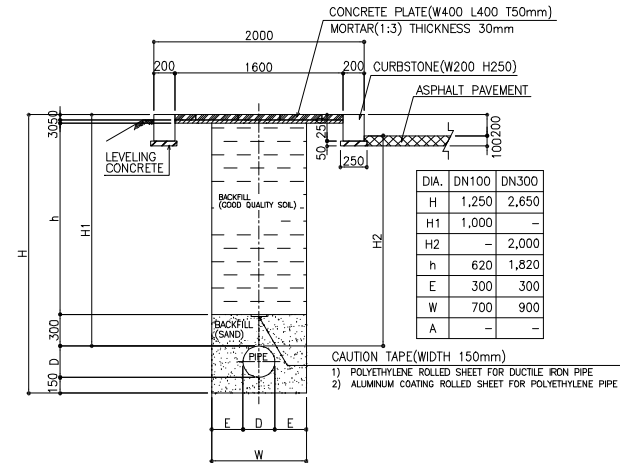
No. 5	ZONE3 GENERAL SITE PLAN (2)
ゾーン3 全体計画図 (2)	



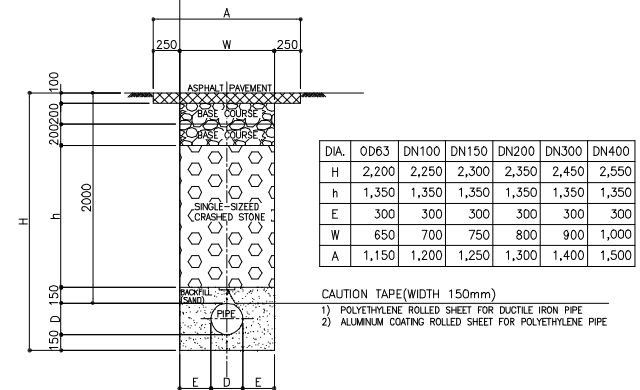
MUNICIPALITY ROAD PAVEMENT



ROAD ALONG PAVEMENT FOR NATIONAL ROAD AND MAIN ROAD



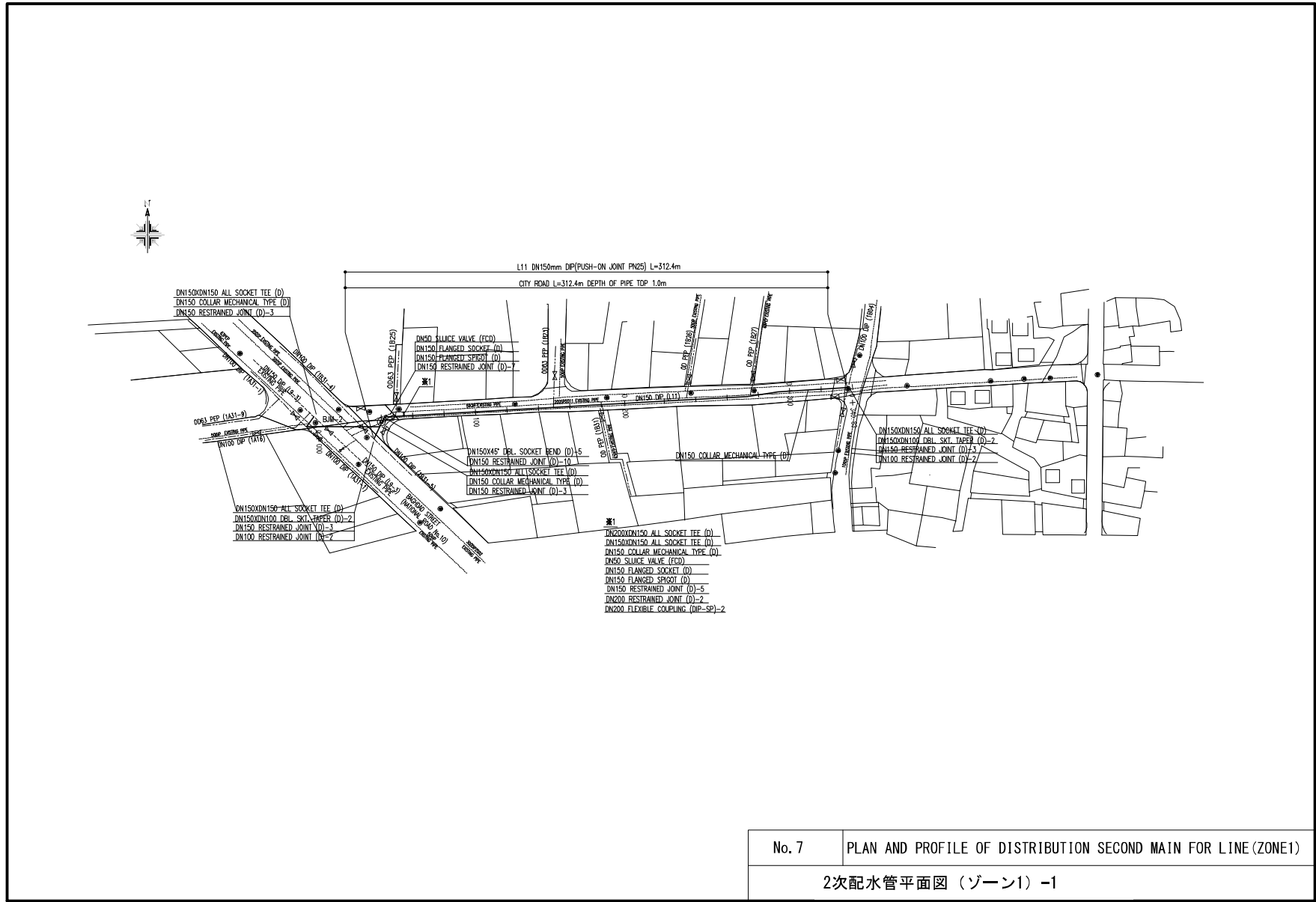
SIDEWALK PAVEMENT FOR PETRA STREET



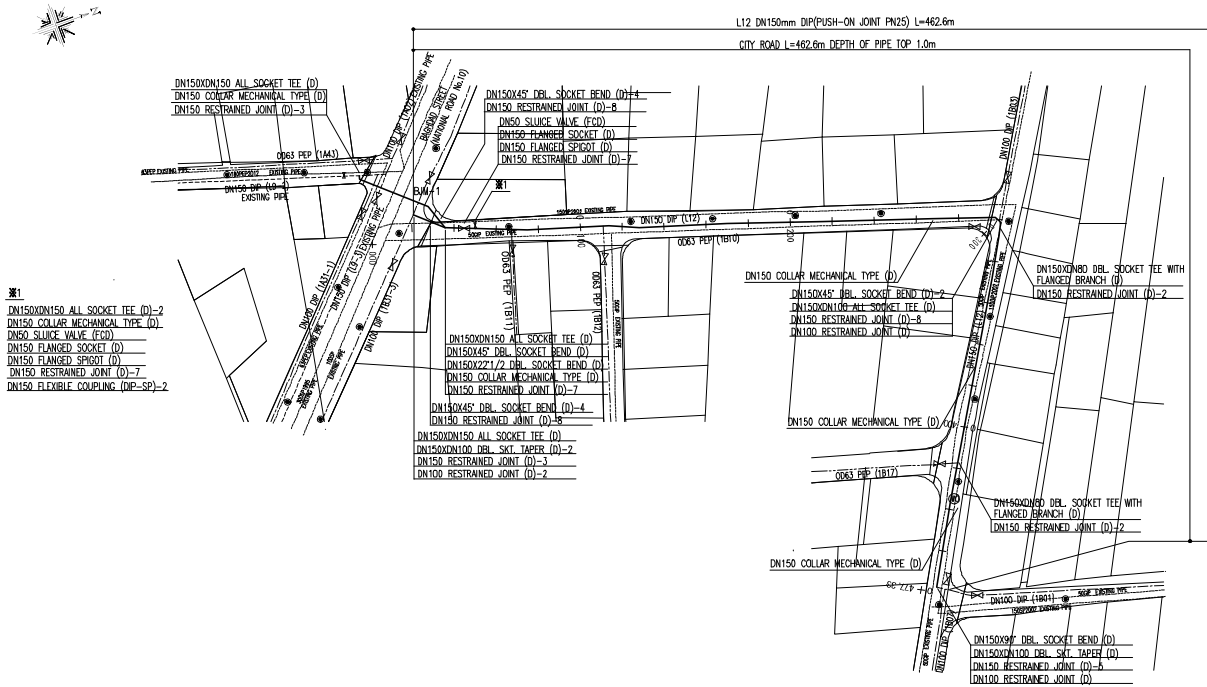
ROAD CROSSING PAVEMENT FOR NATIONAL ROAD AND MAIN ROAD

No. 6 TYPICAL TRENCH CROSS SECTION FOR PIPELINE IN THE ROAD UNDER MP WH

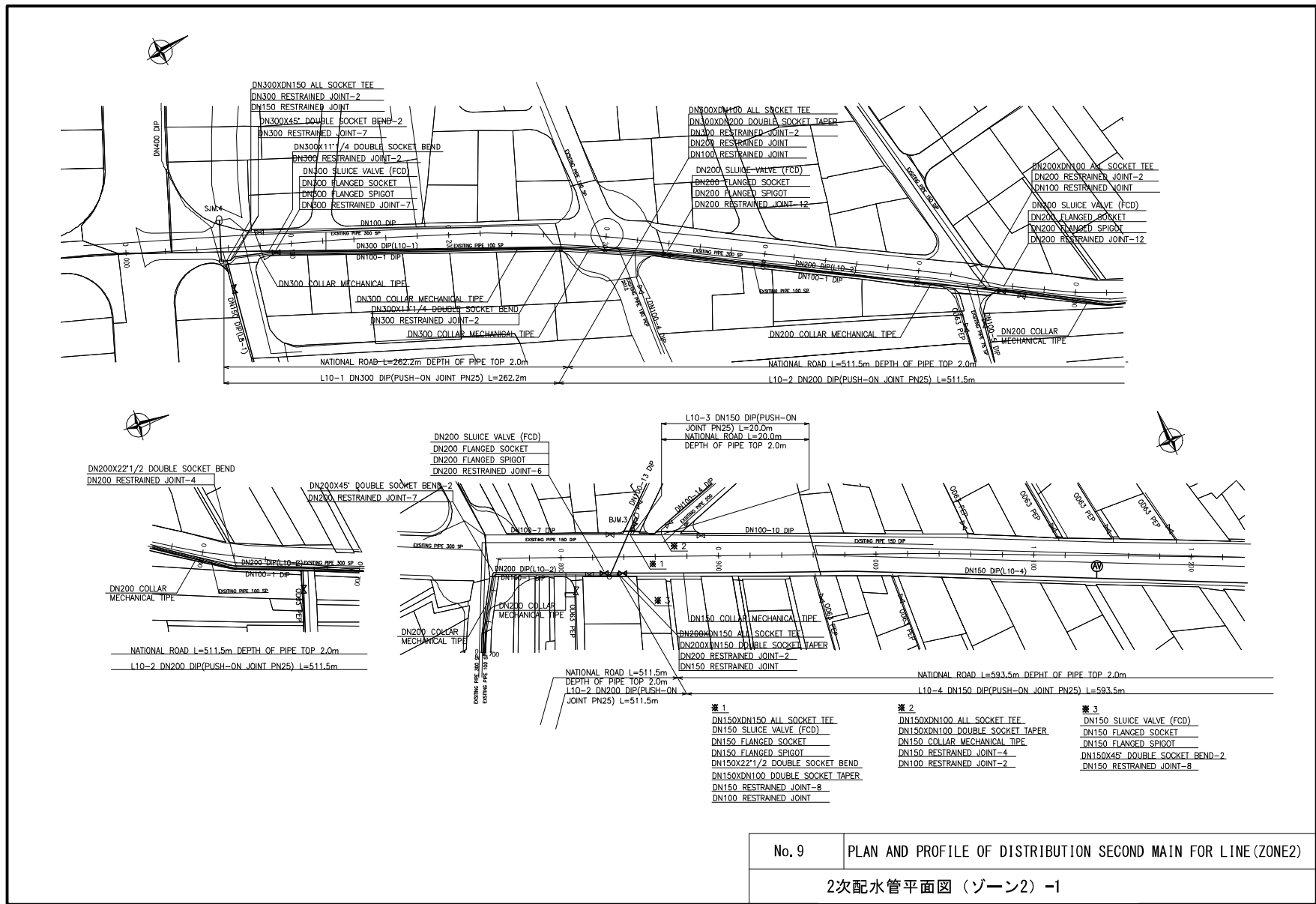
配水管路掘削標準断面図



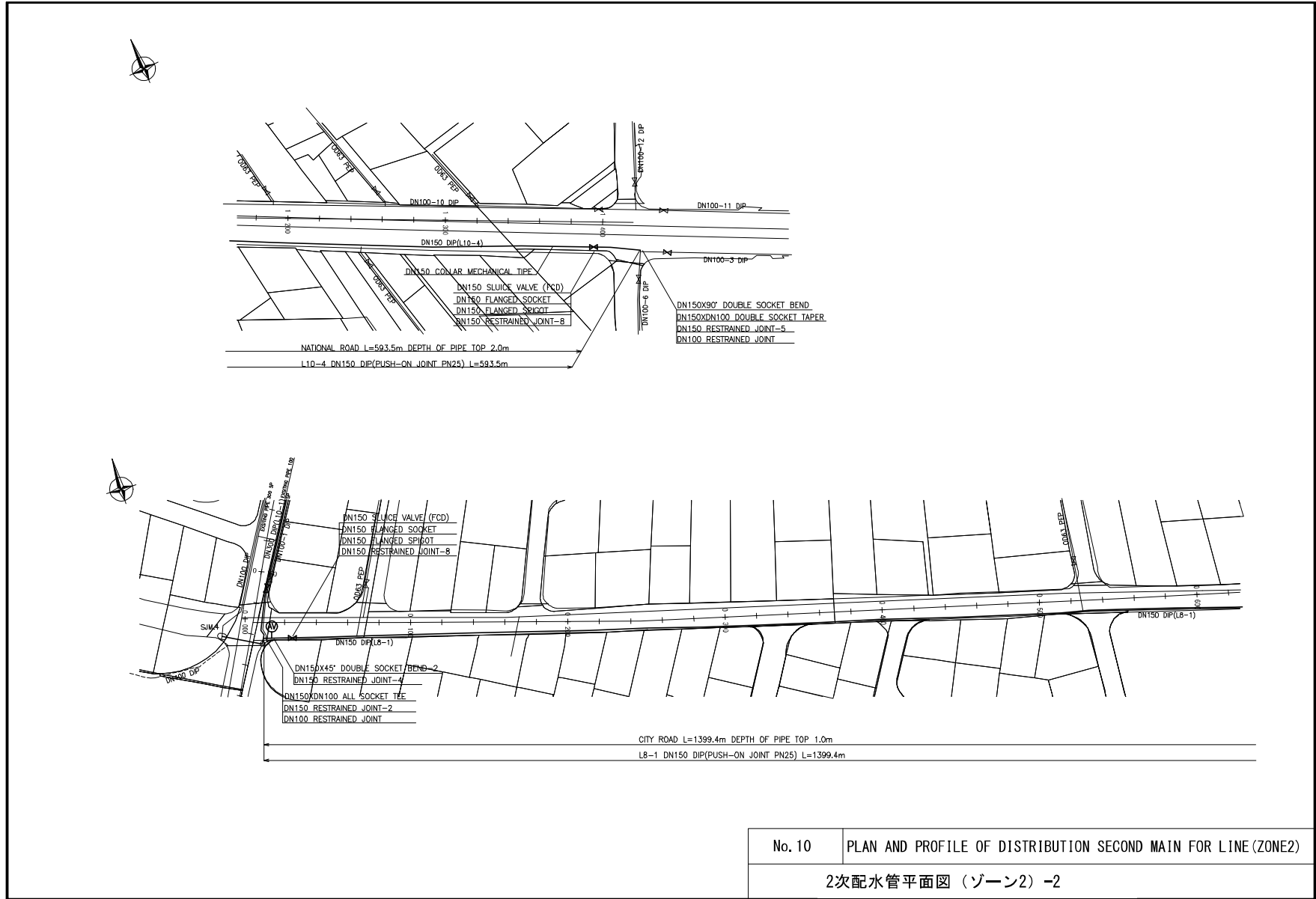
No. 7	PLAN AND PROFILE OF DISTRIBUTION SECOND MAIN FOR LINE (ZONE1)
2次配水管平面図 (ゾーン1) -1	

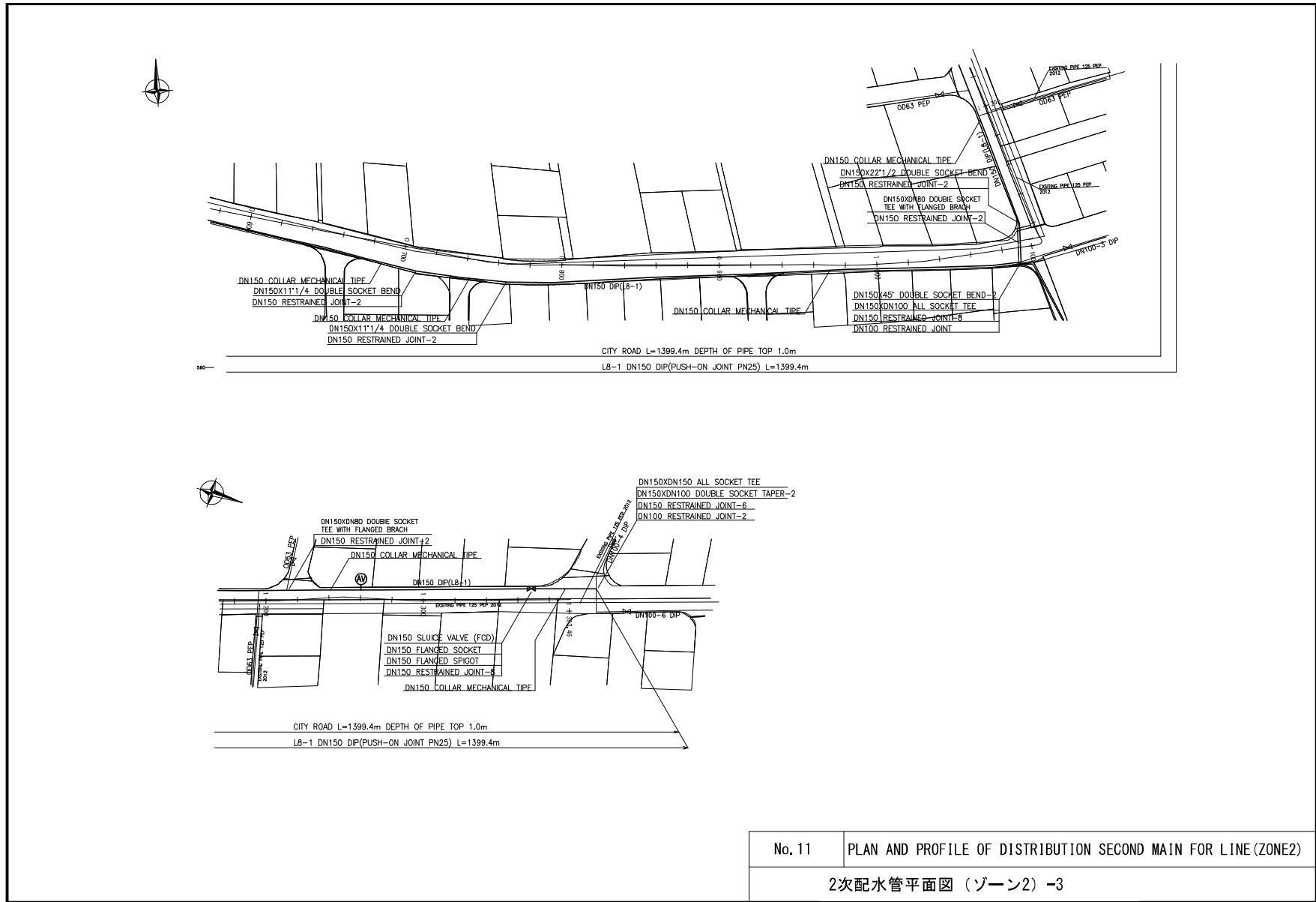


No. 8	PLAN AND PROFILE OF DISTRIBUTION SECOND MAIN FOR LINE (ZONE1)
2次配水管平面図 (ゾーン1) -2	

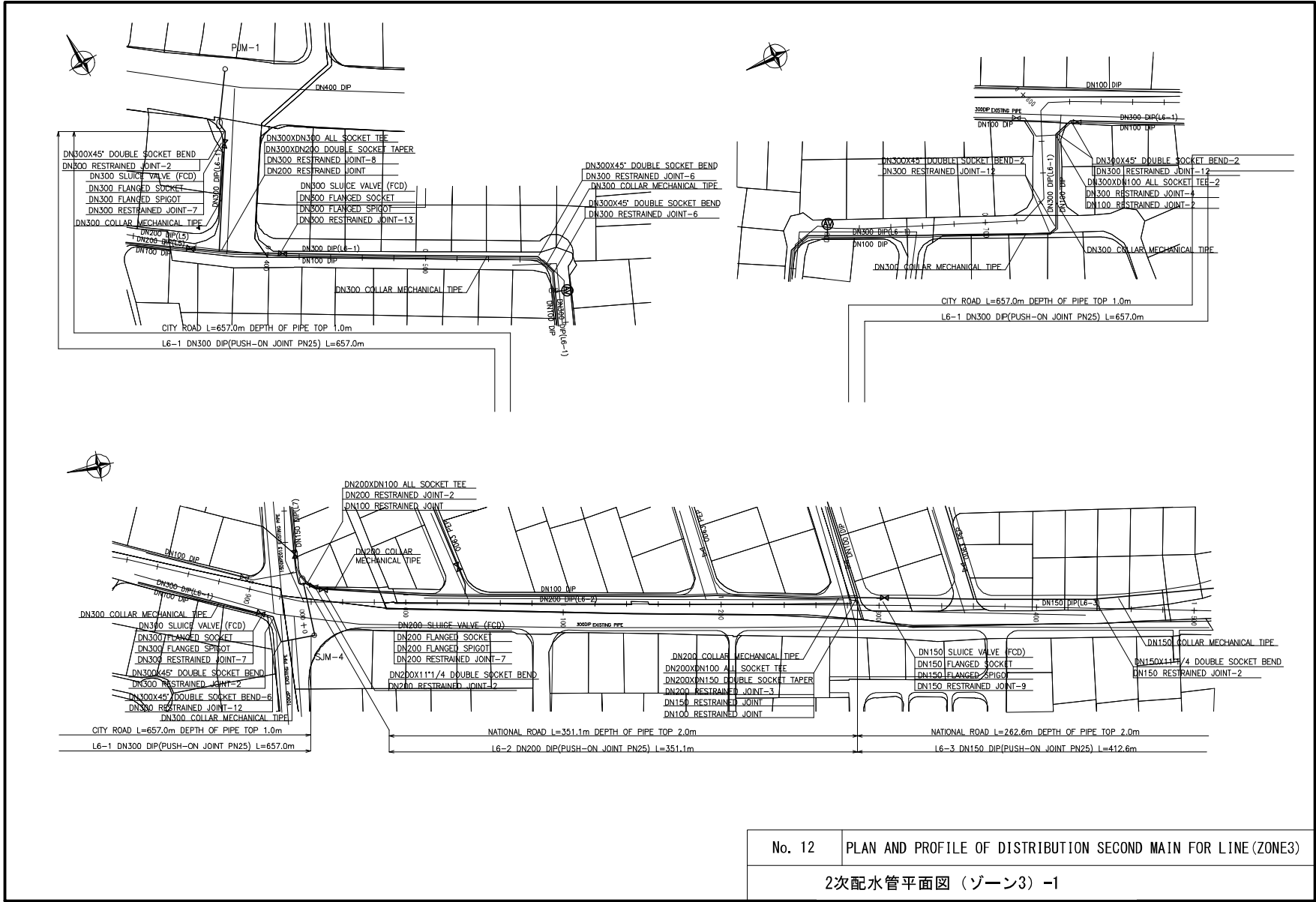


No. 9	PLAN AND PROFILE OF DISTRIBUTION SECOND MAIN FOR LINE (ZONE2)
2次配水管平面図 (ゾーン2) -1	





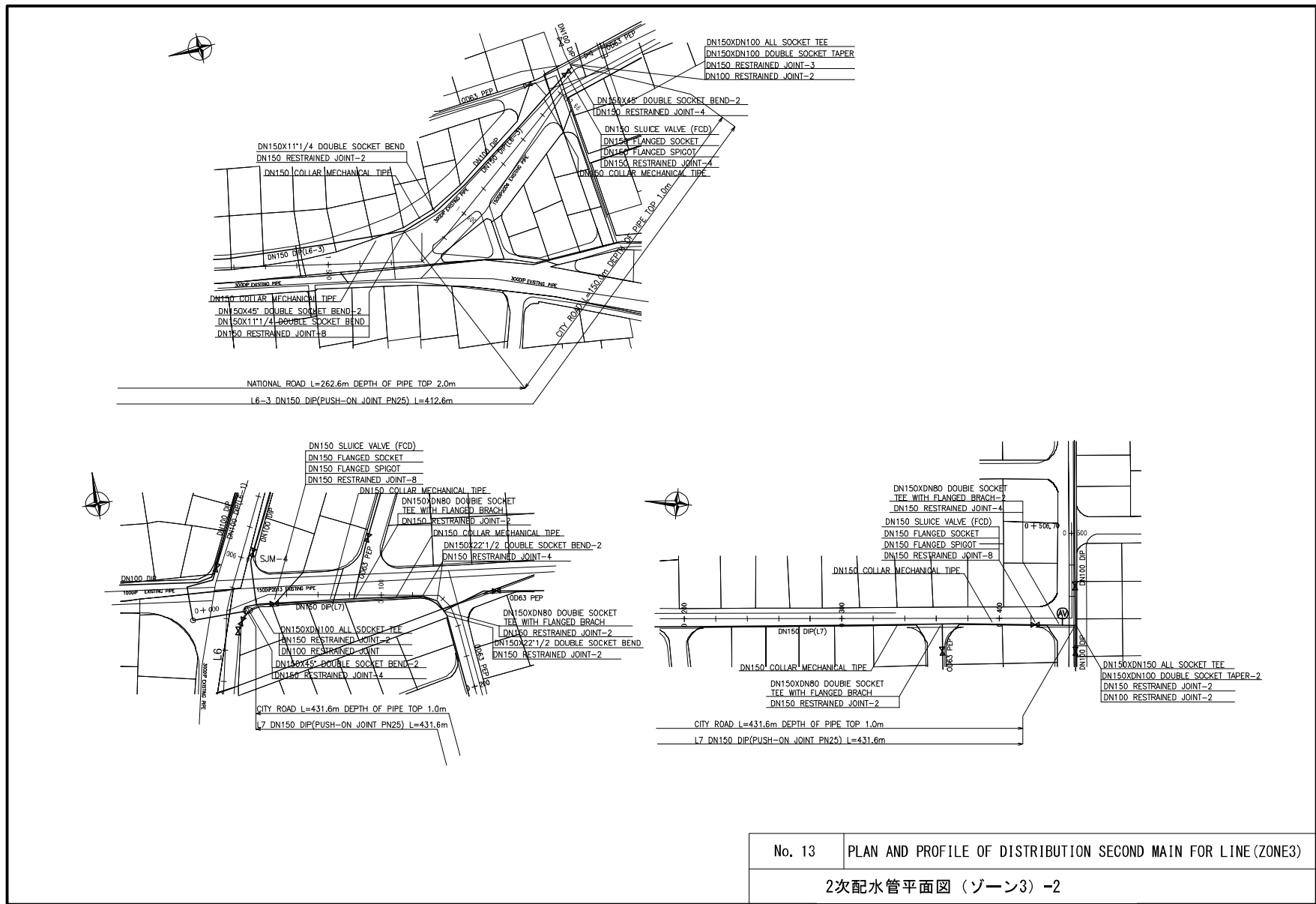
No. 11	PLAN AND PROFILE OF DISTRIBUTION SECOND MAIN FOR LINE (ZONE2)
2次配水管平面図 (ゾーン2) -3	



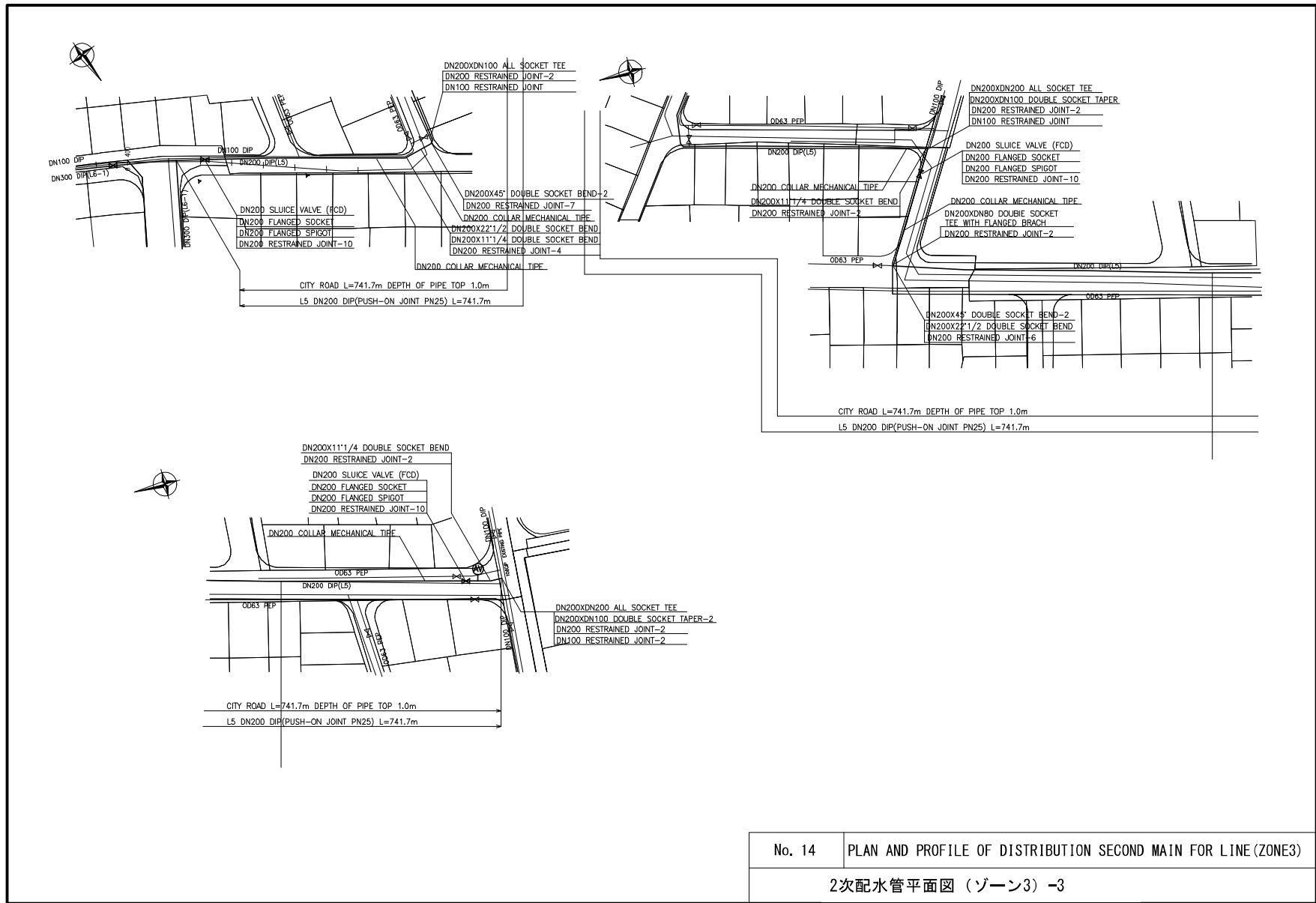
No. 12

PLAN AND PROFILE OF DISTRIBUTION SECOND MAIN FOR LINE (ZONE3)

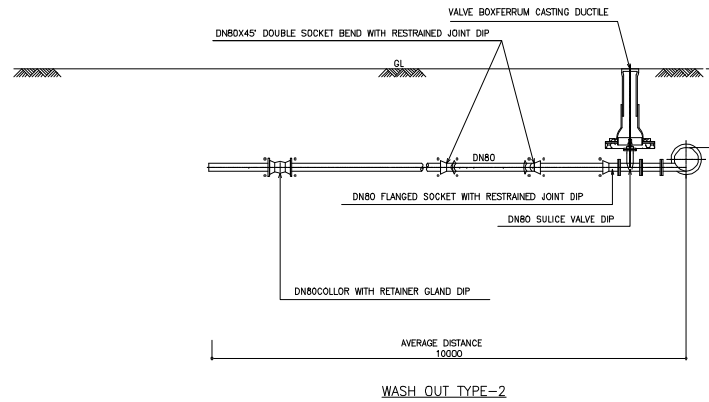
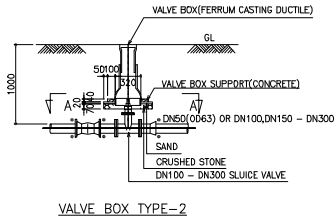
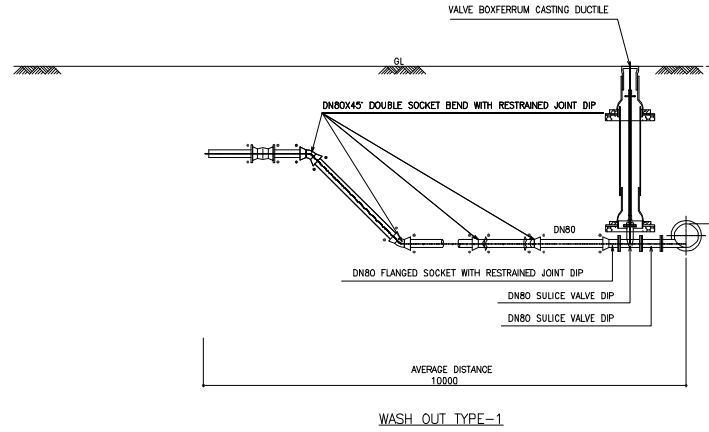
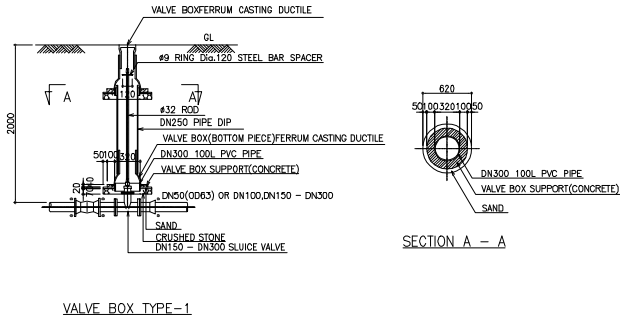
2次配水管平面図 (ゾーン3) -1



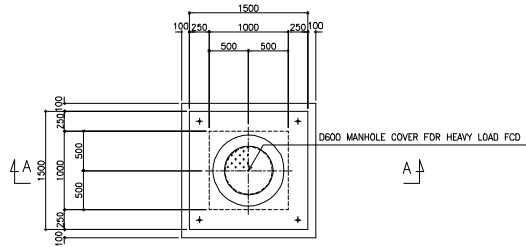
No. 13	PLAN AND PROFILE OF DISTRIBUTION SECOND MAIN FOR LINE (ZONE3)
2次配水管平面図 (ゾーン3) -2	



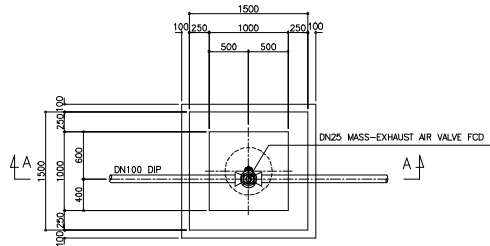
No. 14	PLAN AND PROFILE OF DISTRIBUTION SECOND MAIN FOR LINE (ZONE3)
2次配水管平面図 (ゾーン3) -3	



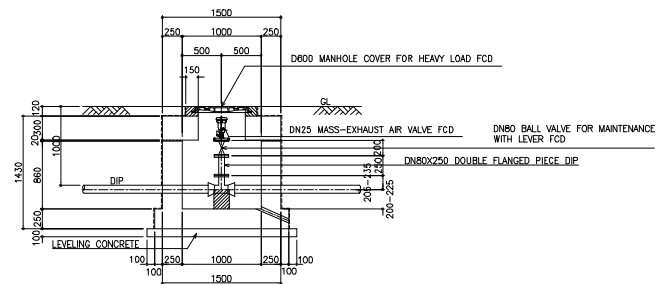
No. 15	STRUCTURAL DRAWING OF CHAMBER 1
弁室構造図 1	



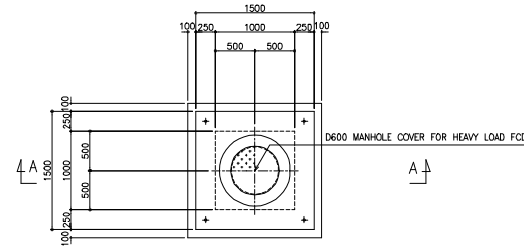
PLAN OF TOP



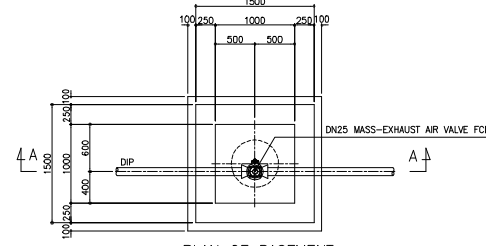
PLAN OF BASEMENT



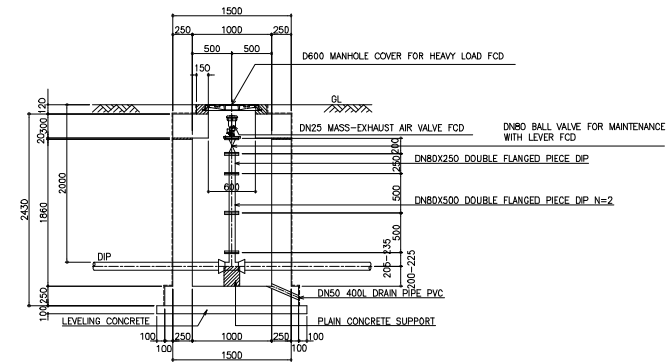
SECTION A - A DEPTH OF PIPE TOP 1.0m



PLAN OF TOP

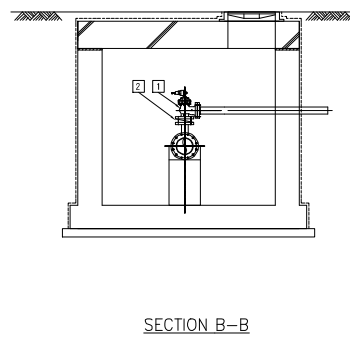
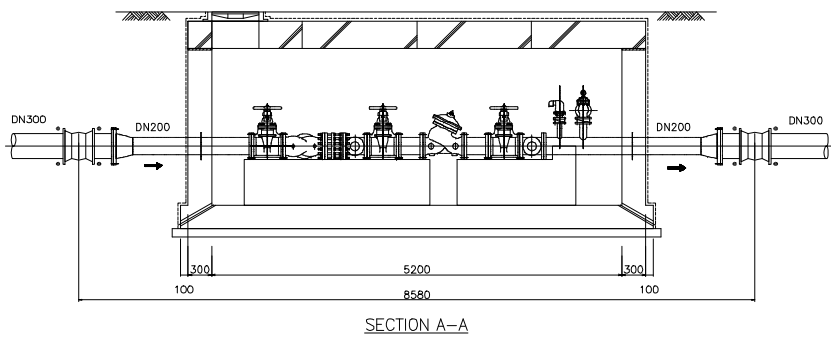
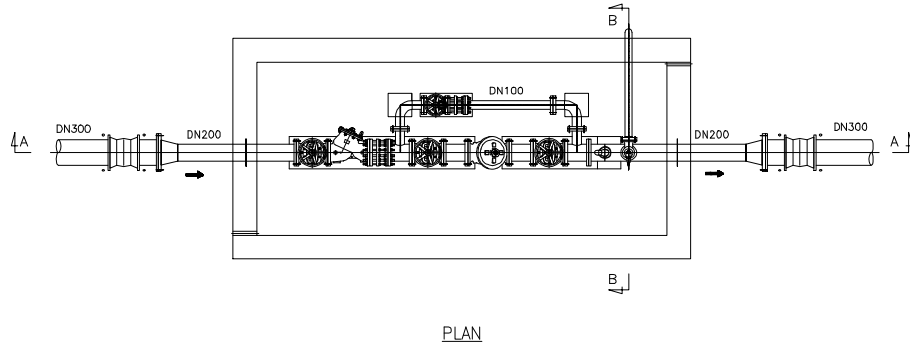


PLAN OF BASEMENT



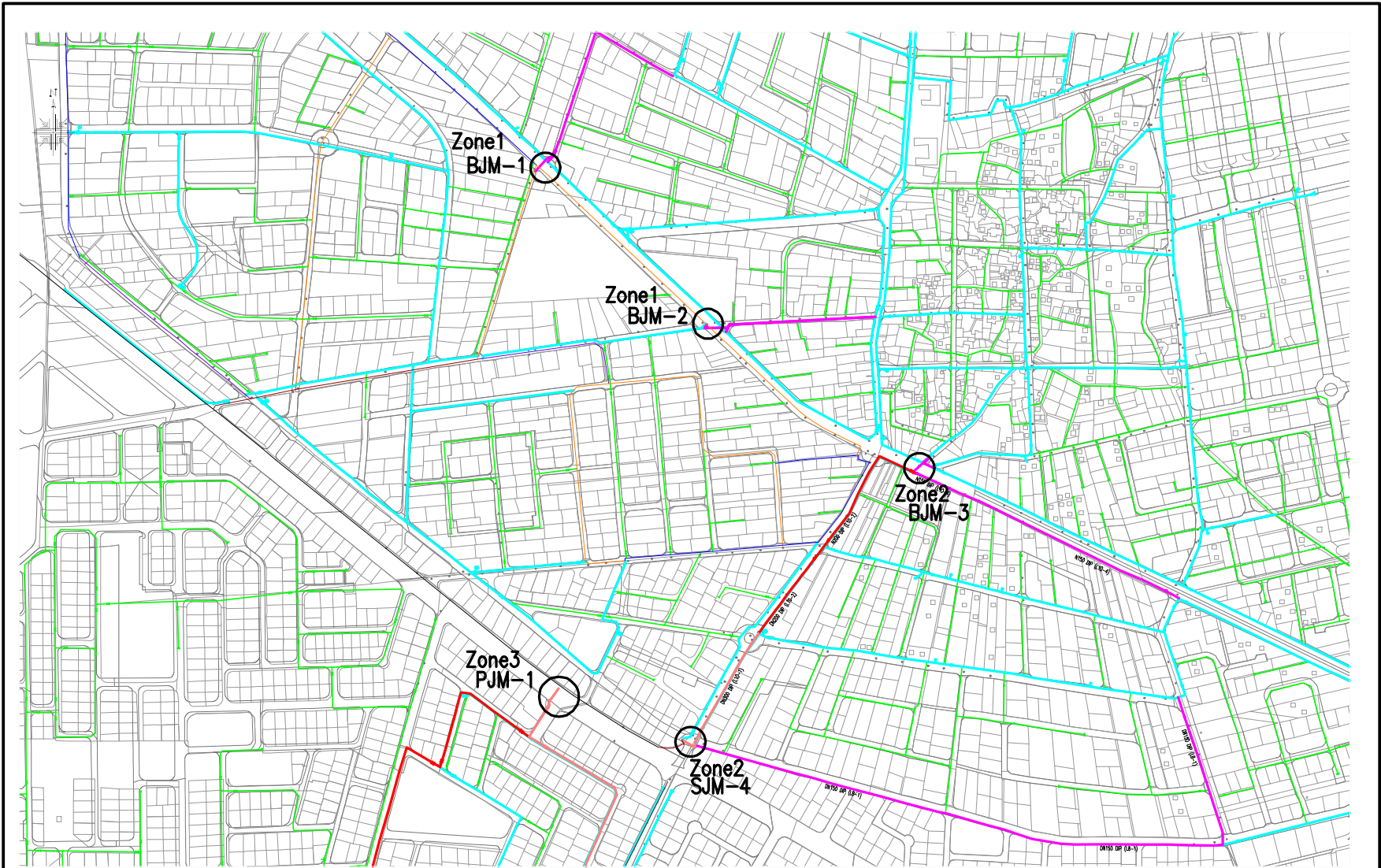
SECTION A - A DEPTH OF PIPE TOP 2.0m : TYPE 1

No. 16	STRUCTURAL DRAWING OF CHAMBER 2
弁室構造図 2	

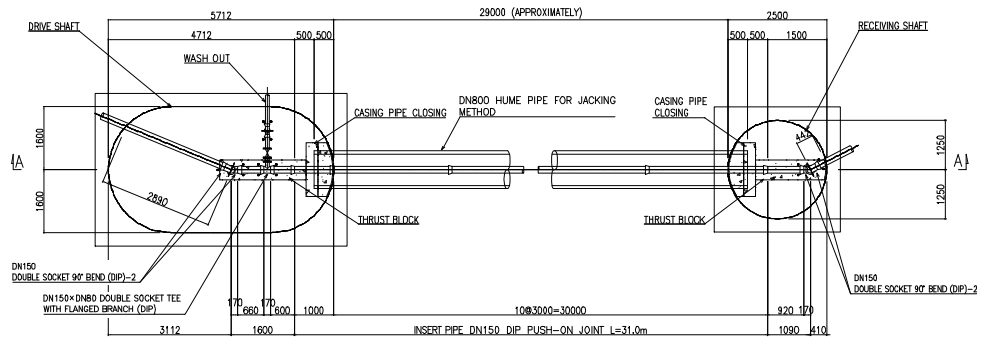


PRESSURE REDUCING VALVE

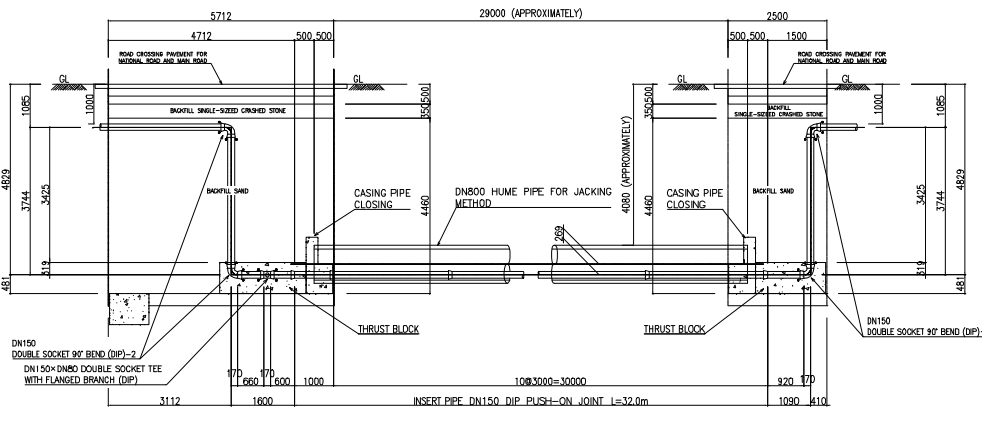
No. 17	STRUCTURAL DRAWING OF CHAMBER 3
弁室構造図 3	



No. 18	PLAN OF JACKING METHOD
推進工法箇所位置図	

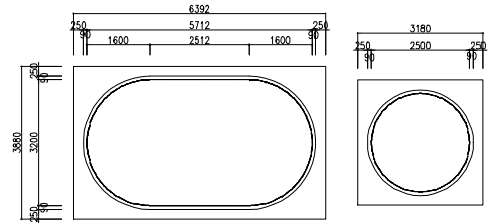


PLAN

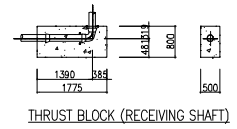
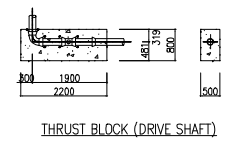
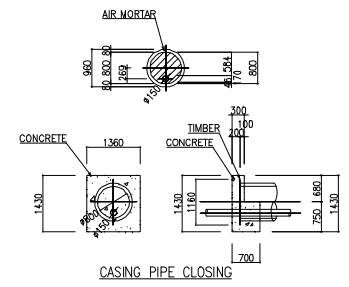


SECTION A - A

BJM-1 PIPE ARRANGEMENT

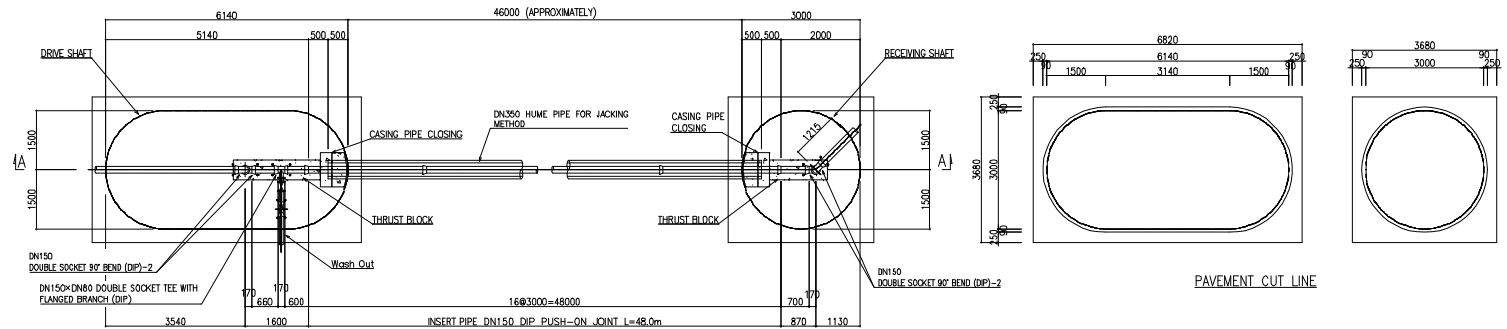


PAVEMENT CUT LINE

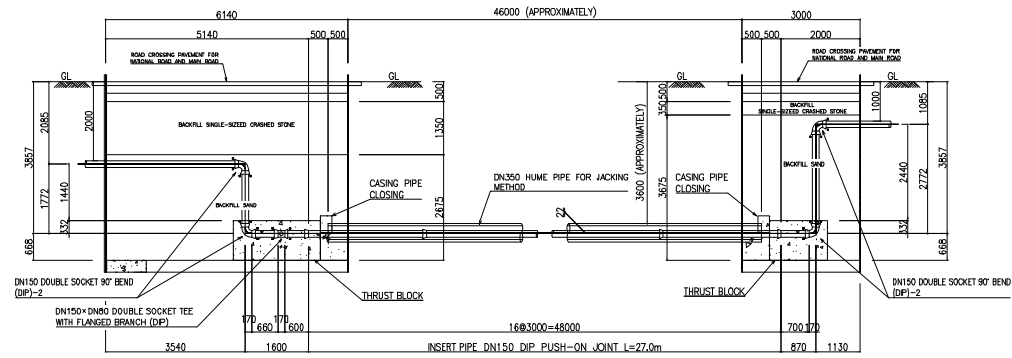


LEGEND	
	: PUSH-ON JOINT
	: DITTO (RESTRAINED)
	: K TYPE (RESTRAINED)
	: FLANGE RF-RF TYPE

No. 19	BJM-1 PIPE ARRANGEMENT
BJM-1 推進工法位置 配管計画	

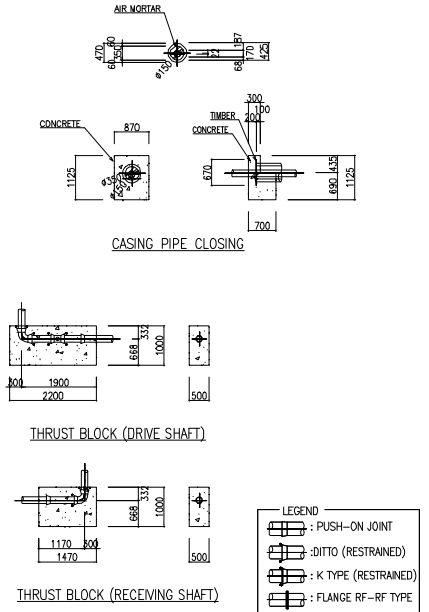


PLAN

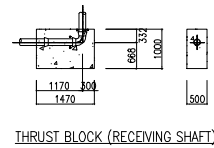
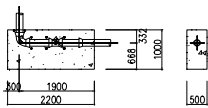
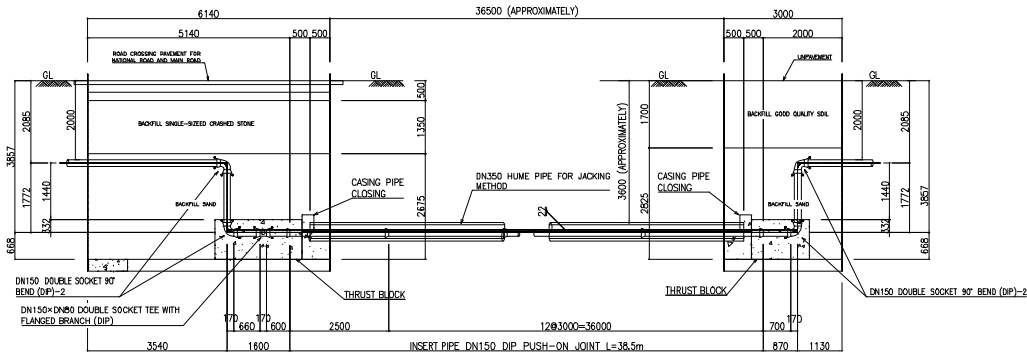
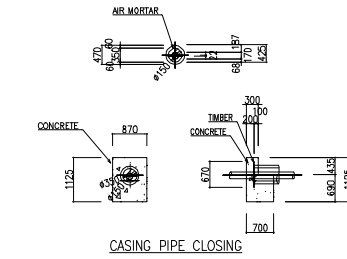
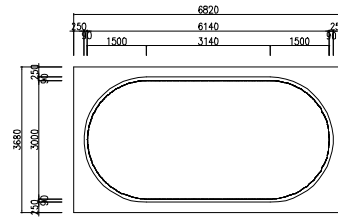
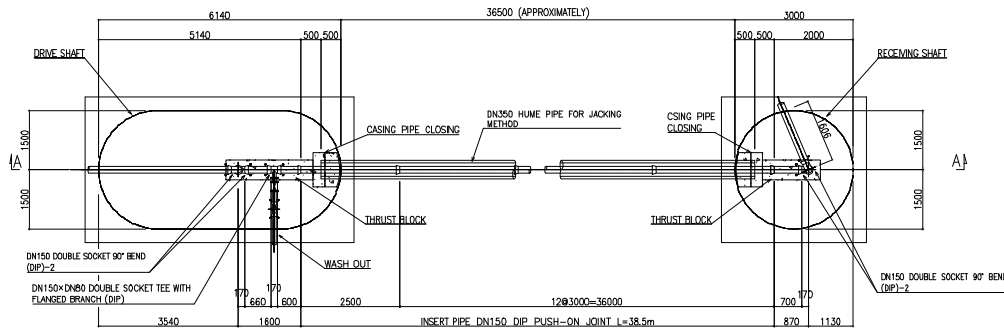


SECTION A - A

BJM-2 PIPE ARRANGEMENT



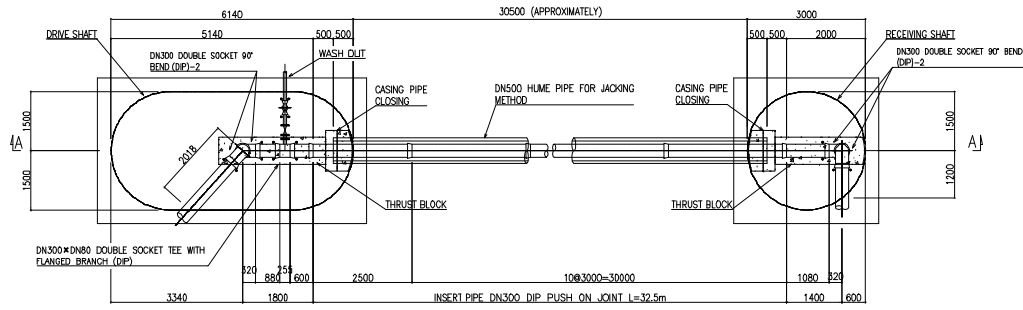
No. 20	BJM-2 PIPE ARRANGEMENT
BJM-2 推進工法位置 配管計画	



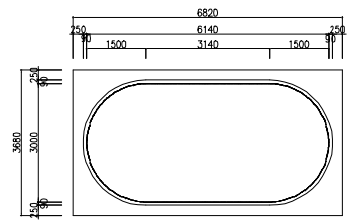
- LEGEND
- : PUSH-ON JOINT
 - : DITTO (RESTRAINED)
 - : K TYPE (RESTRAINED)
 - : FLANGE RF-RF TYPE

PIPE ARRANGEMENT BJM-3

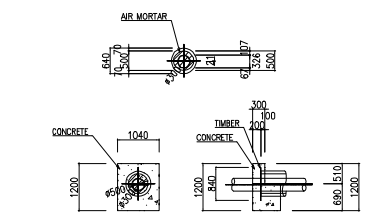
No. 21	BJM-3 PIPE ARRANGEMENT
BJM-3 推進工法位置 配管計画	



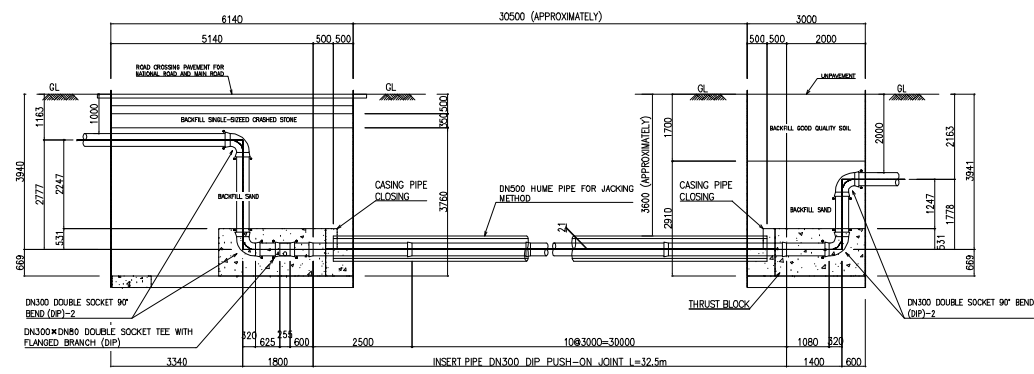
PLAN



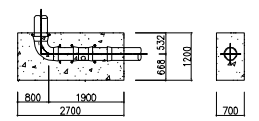
CUTTING WORK



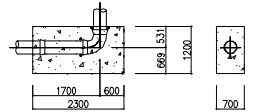
CASING PIPE CLOSING



SECTION A - A



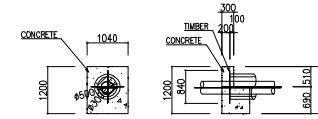
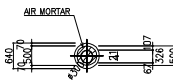
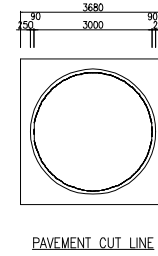
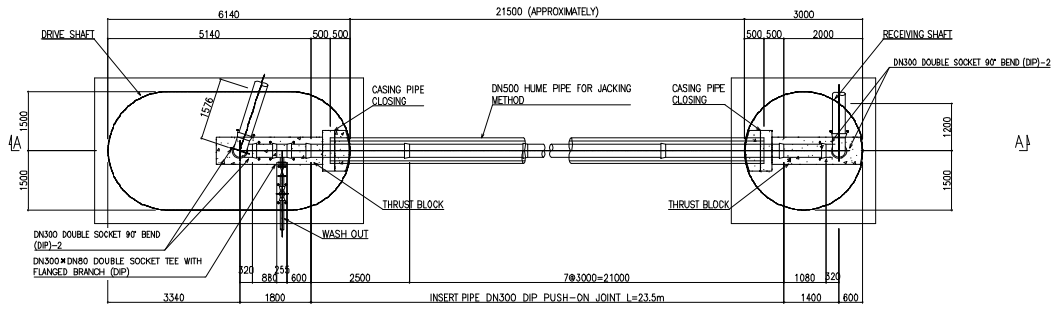
THRUST BLOCK (DRIVE SHAFT)



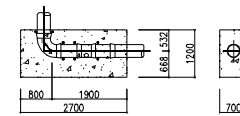
THRUST BLOCK (RECEIVING SHAFT)

- | | |
|--|-----------------------|
| | LEGEND |
| | : PUSH-ON JOINT |
| | : DITO (RESTRAINED) |
| | : K TYPE (RESTRAINED) |
| | : FLANGE RF-RF TYPE |

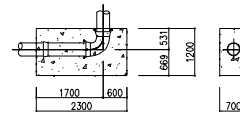
No. 22	PJM-1 PIPE ARRANGEMENT
PJM-1 推進工法位置 配管計画	



CASING PIPE CLOSING



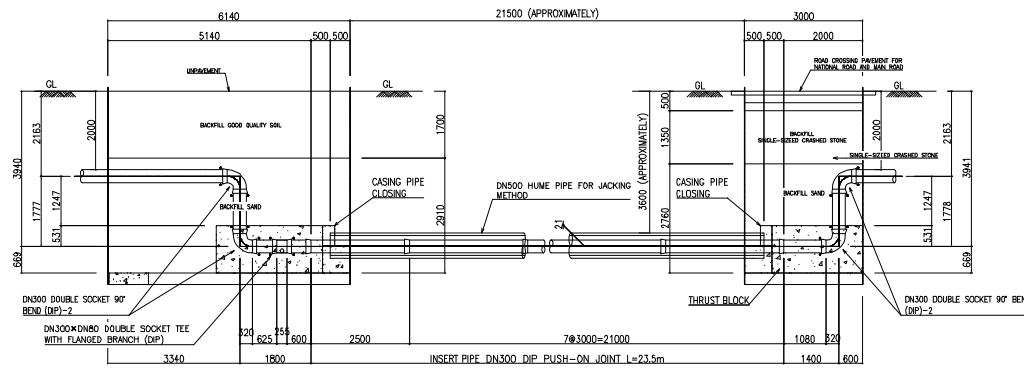
THRUST BLOCK (DRIVE SHAFT)



THRUST BLOCK (RECEIVING SHAFT)

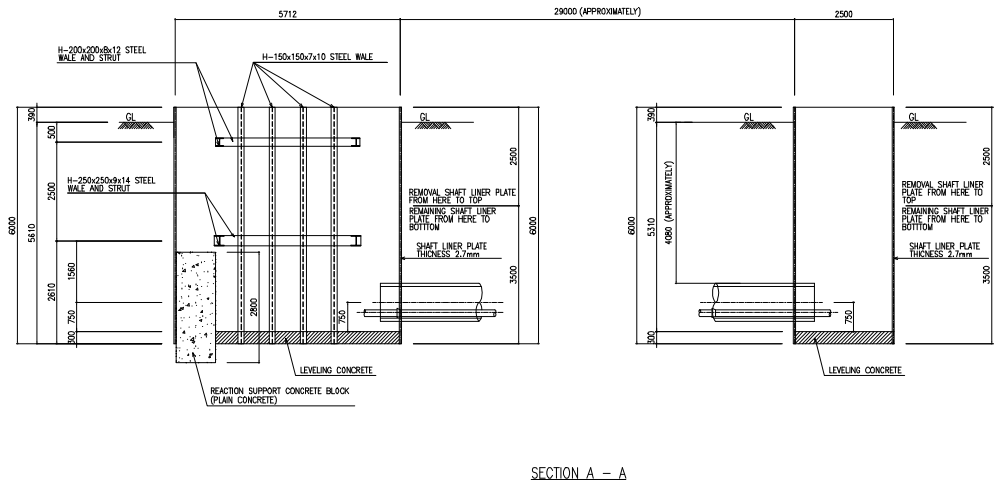
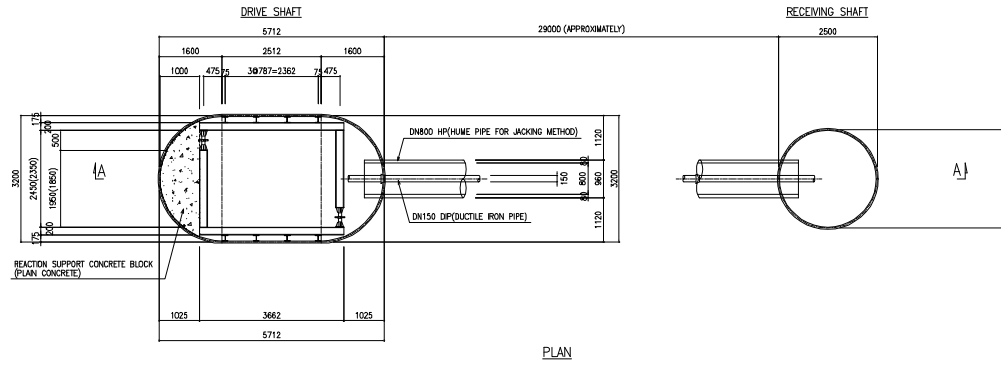
LEGEND

	: PUSH-ON JOINT
	: DITTO (RESTRAINED)
	: K TYPE (RESTRAINED)
	: FLANGE RF-RF TYPE



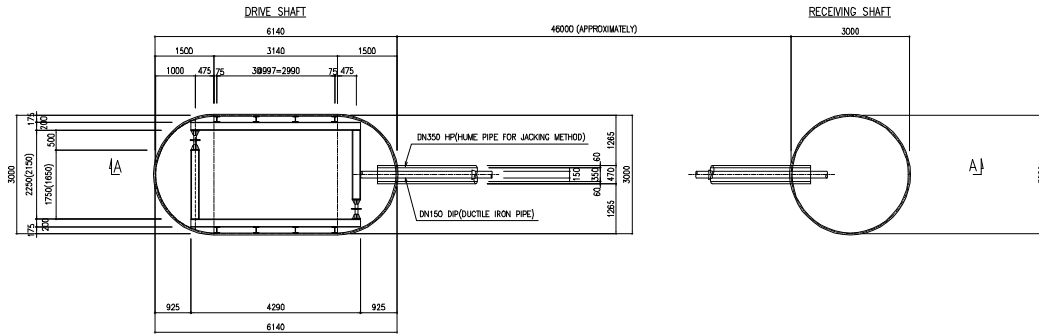
SJM-4 PIPE ARRANGEMENT

No. 23	SJM-4 PIPE ARRANGEMENT
SJM-4 推進工法位置 配管計画	

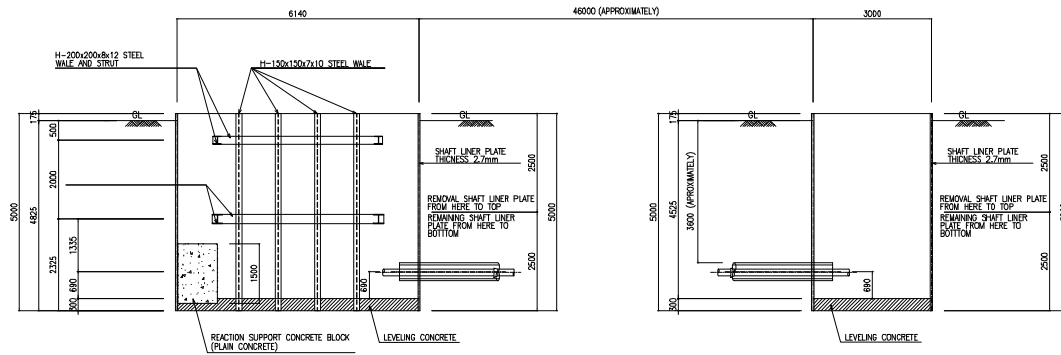


BJM-1 JACKING METHOD

No. 24	BJM-1 JACKING METHOD
BJM-1 推進工法	



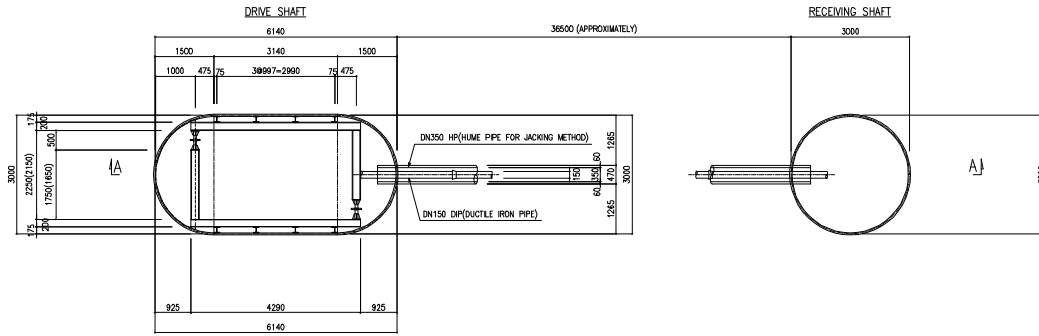
PLAN



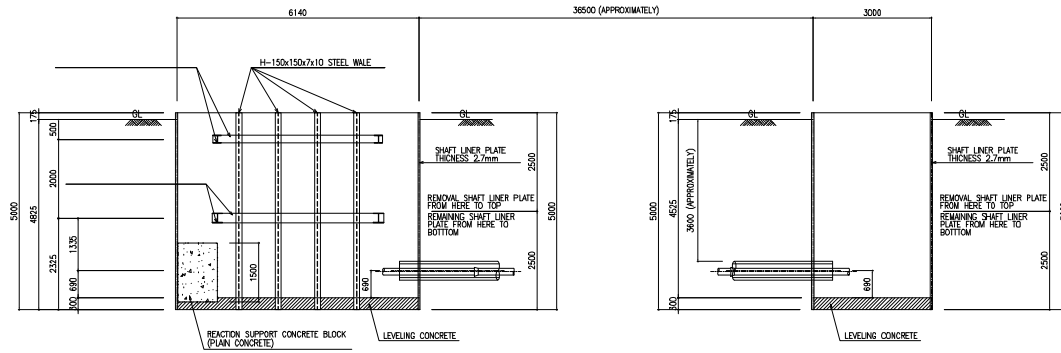
SECTION A - A

BJM-2 JACKING METHOD

No. 25	BJM-2 JACKING METHOD
BJM-2 推進工法	



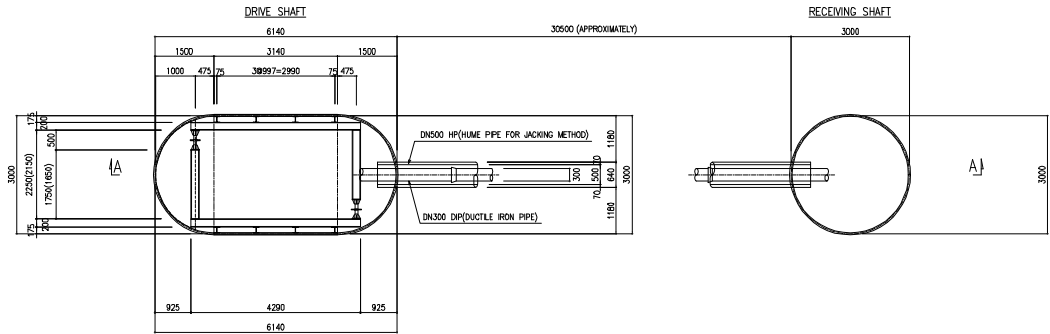
PLAN



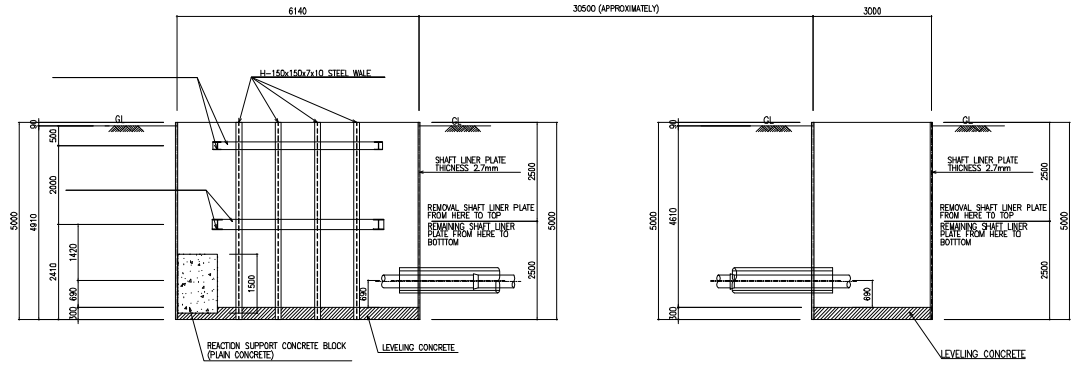
SECTION A - A

BJM-3 JACKING MTHOD

No. 26	BJM-3 JACKING METHOD
BJM-3 推進工法	



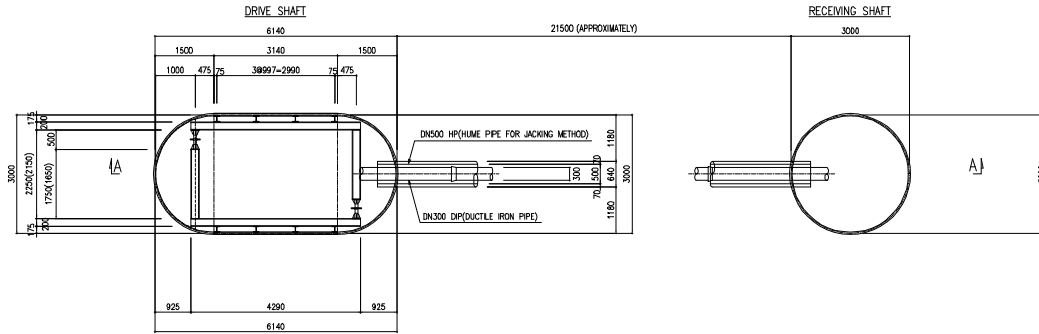
PLAN



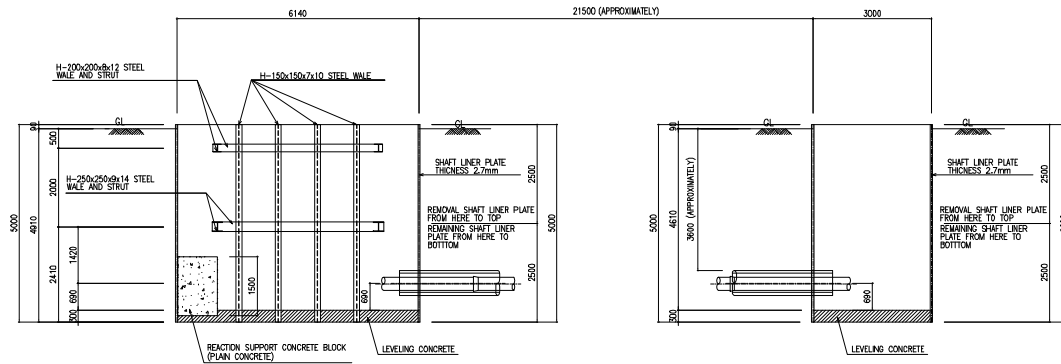
SECTION A - A

PJM-1 JACKING METHOD

No. 27	PJM-1 JACKING METHOD
PJM-1 推進工法	



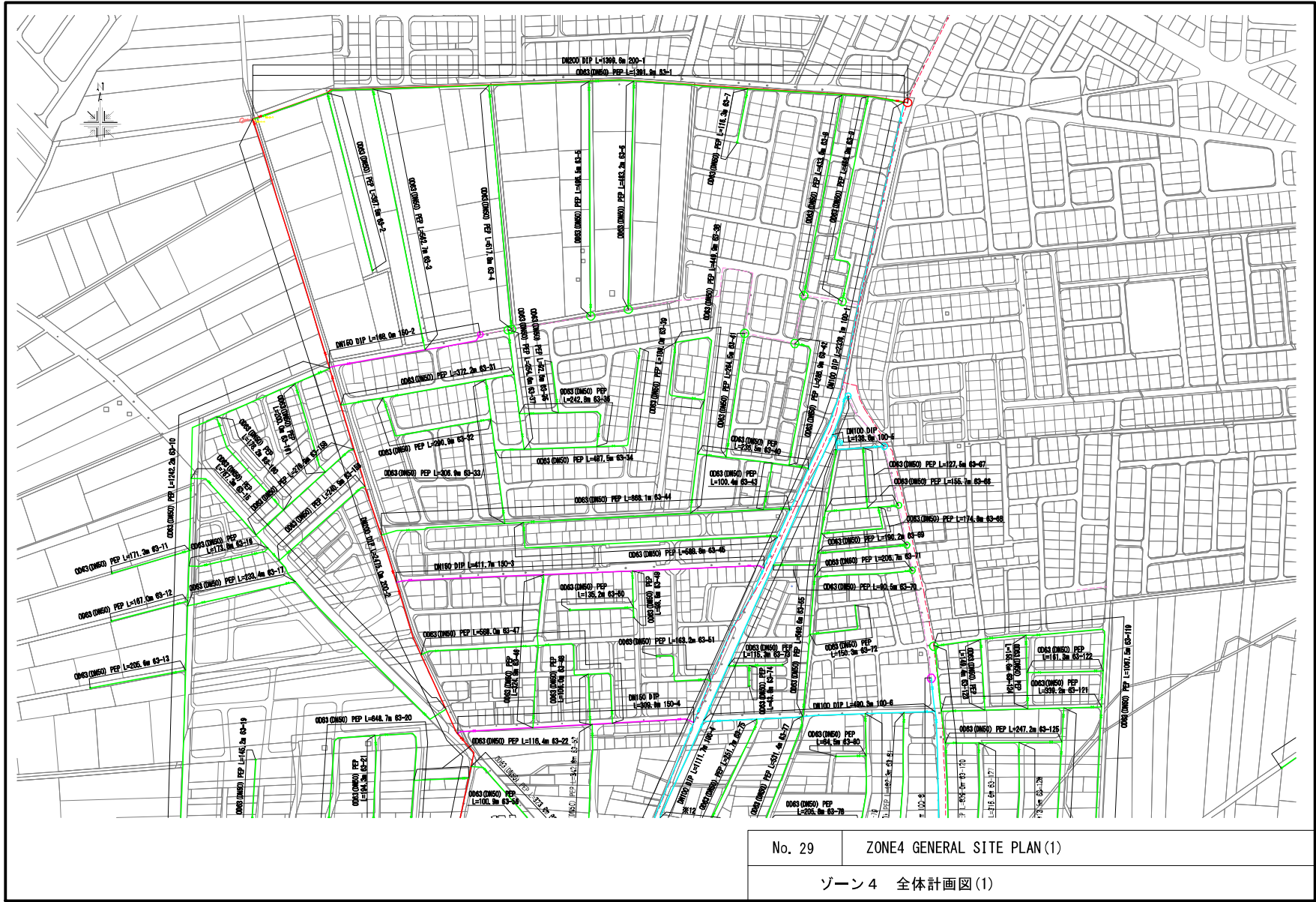
PLAN



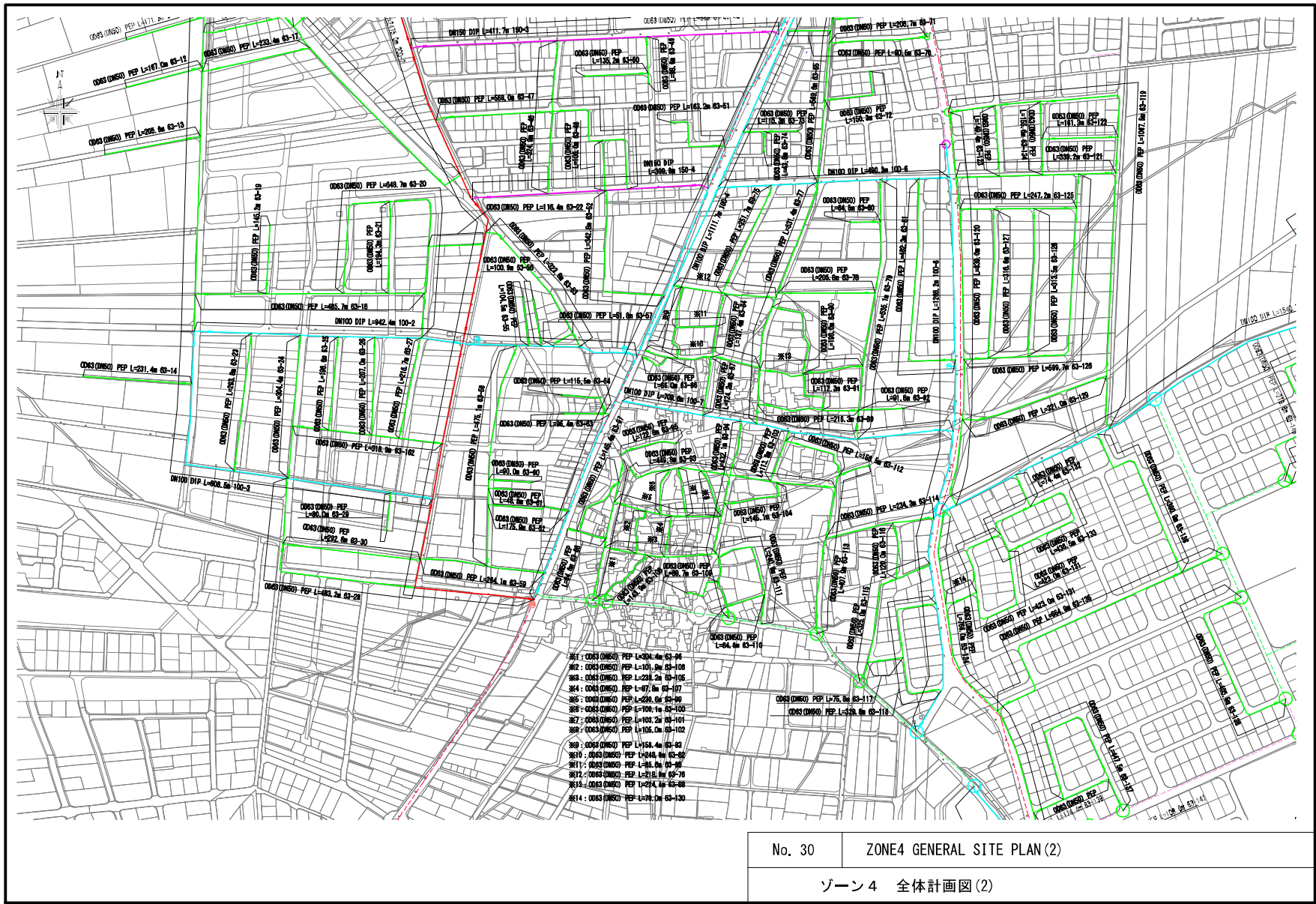
SECTION A - A

SJM-4 JACKING METHOD

No. 28	SJM-4 JACKING METHOD
SJM-4 推進工法	

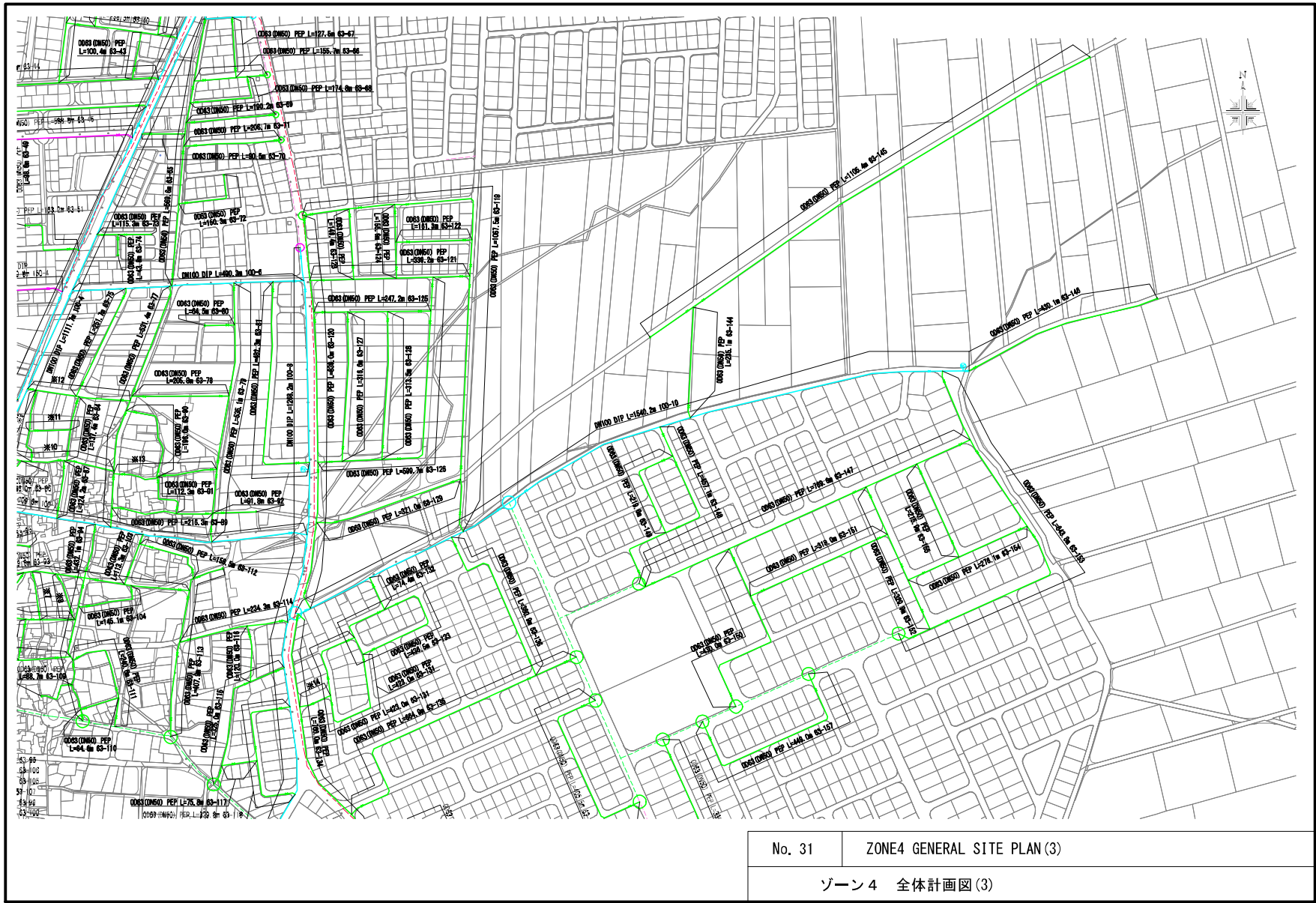


No. 29	ZONE4 GENERAL SITE PLAN (1)
ゾーン4 全体計画図(1)	



No. 30 ZONE4 GENERAL SITE PLAN (2)

ゾーン4 全体計画図(2)



No. 31	ZONE4 GENERAL SITE PLAN (3)
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ゾーン4 全体計画図(3)



No. 32	ZONE4 GENERAL SITE PLAN (4)
ゾーン4 全体計画図(4)	