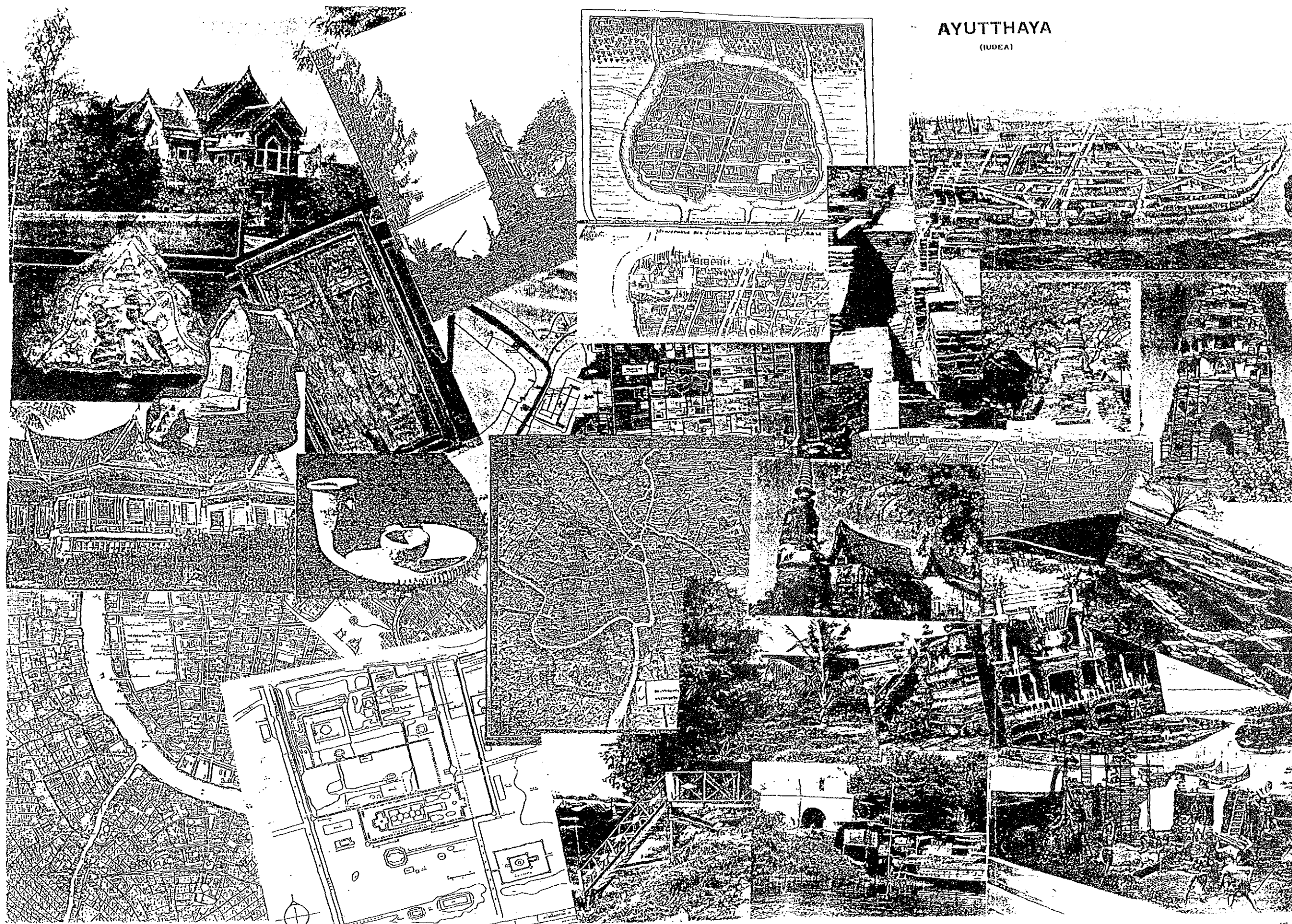
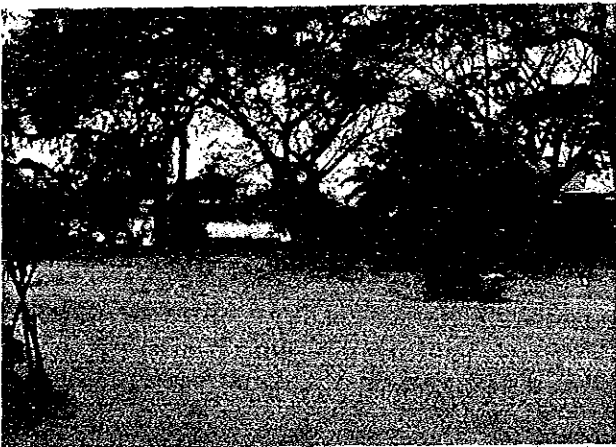
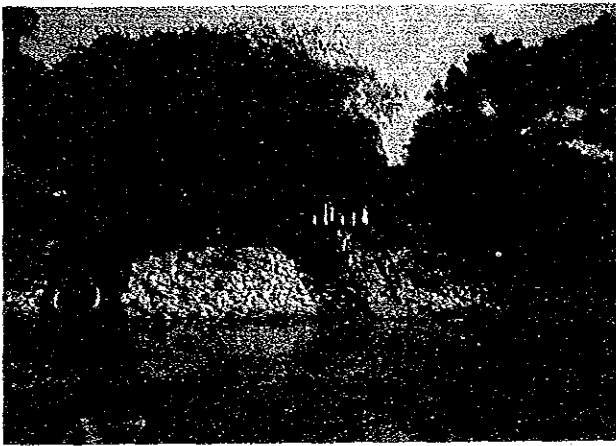


AYUTTHAYA  
(IUDEA)





資料-7 敷地の現状写真

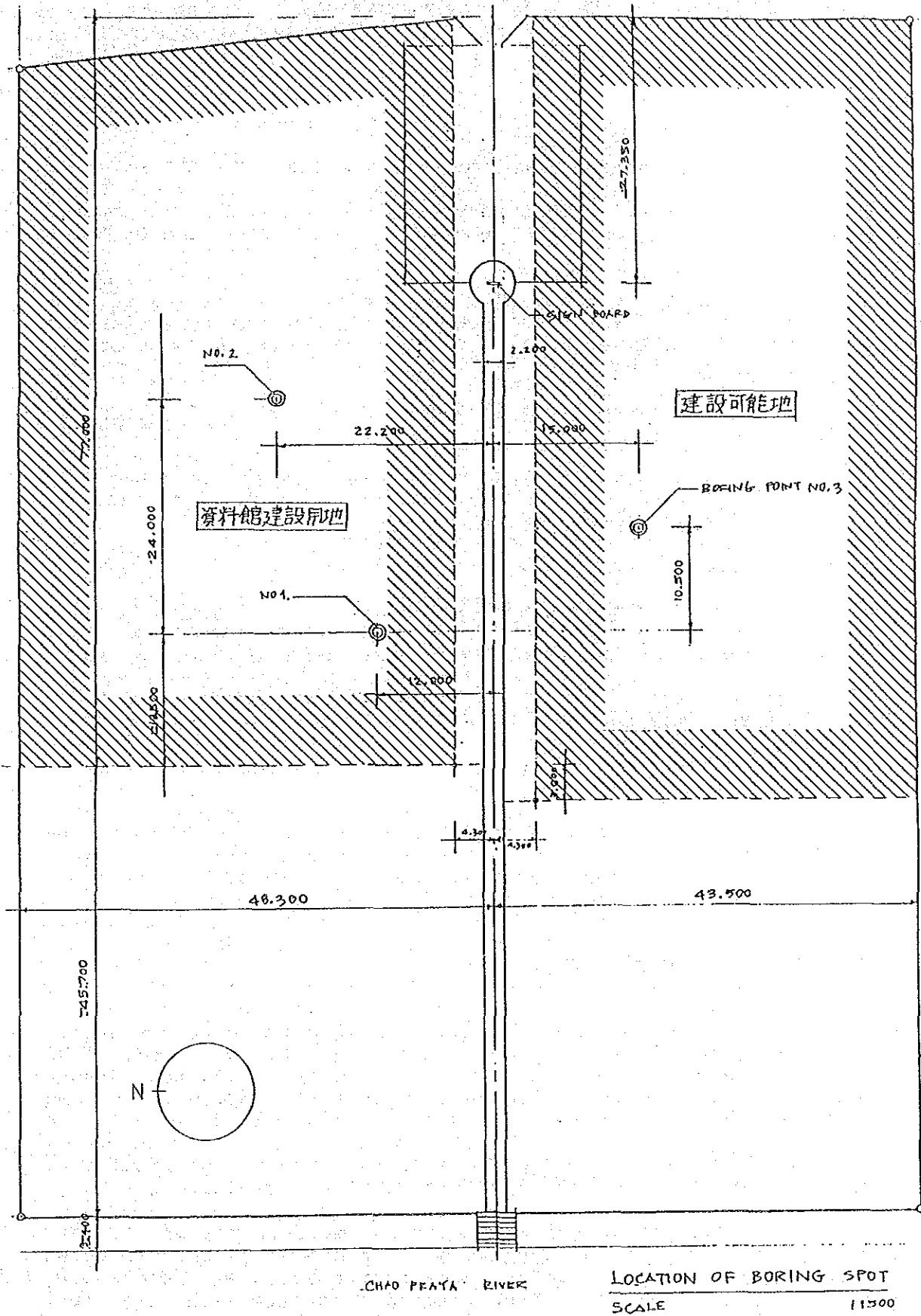








資料-9 建設エリアの限定及びボーリング位置の指定図



## INTRODUCTION

-----

The subsurface investigation for "YAMADA HOUSING PROJECT" at Yamada village, Ayuthaya, has been completed. Total of three borings were performed at this site, two of 25.0 meters and one of 30.0 meters. Locations of bore holes, BH-1, BH-2 and BH-3 are shown on figure 1.

It is expected that some buildings and related facilities will be constructed at this site. The soil conditions at this site are general Chao Phraya River bank deposits. They can be described in successive layers as follows:

From the existing ground level to 2.0 m. depth is stiff weathered silty clay.

From 2.0 - 6.0 m. depth is soft silty clay, except for BH-3.

From 6.0 - 8.0 m. depth is stiff silty clay.

From 8.0 - 12.0 m. depth is medium clayey fine sand.

From 12.0 - 18.0 m. depth is very stiff silty clay, and

From 18.0 - end of boring is dense to very dense fine to coarse sand.

Pile foundation for general concrete buildings shall be designed appropriately. The pile tip shall be placed at the depth of 20.0 m. from the existing ground surface, it will be embedded 2.0 m. in dense to very dense sand.

The purpose of this report is to describe the soil conditions encountered at the site, to analyze and to evaluate tests data obtained, and to submit our recommendation regarding feasible foundation design and construction.

## SUBSURFACE INVESTIGATION PROCEDURE

-----

The three borings were carried out with skid mounted rotary drilling rig comprising rotary feed head and adjustable speed. The bore holes were advanced by power auger with a 3-inch inside diameter pipe casing protection in upper soft and medium clay and then followed by wash boring method in stiff and sandy materials.

Undisturbed samples were collected in soft, medium and stiff clay by thin wall tube pushed statically at 1.50 intervals.

Disturbed samples were obtained during the performance of standard penetration test in hard cohesive soil or cohesionless stratum at 1.50 intervals. In the standard penetration test, a 2 inches O.D. split spoon sampler was driven into soil stratum with 140 lbs.

hammer falling through a distance of 30 inches. The number of blows per foot of penetration was taken as the Standard Penetration Resistance N value.

#### LABORATORY TESTING PROGRAMME

-----

The laboratory testing programme included:

1. Wet density and water content determination on every samples.
2. Atterberg's limit tests on selected cohesive samples.
3. Sieve analysis tests on selected samples.
4. Unconfined compression tests on selected cohesive samples.

Testing procedure are in accordance with ASTM Standard specification. All tested results are presented in tabular summary, plot and log of borings at the appendix of this report.

#### SOIL CONDITIONS

-----

General soil profile and engineering properties are shown in figure 2 and the soil profile from available data are shown in figure 3. The soil formations encountered can be described as follows:

The site is covered with 2.0 meters of weathered silty clay with about 25.0% natural moisture content, 1.90 tons/cu.m. wet unit weight and having 10.0-15.0 tons/sq.m. undrained shear strength.

Underlying the surface weathered clay is light grey soft silty clay. High natural water content of about 70.0%, plasticity index ranging from 27.0% to 40.0% and low undrained shear strength were obtained. It is the soft marine clay of Chaophraya Delta, the engineering properties lie close to the soft Bangkok clay. For BH-3, yellowish grey stiff to very stiff clay was encountered instead.

For BH-1 and BH-2 area, the stiff to very stiff yellowish grey clay was encountered at 6.0 to 8.0 m. But for BH-3 area, since soft grey clay does not exist, the stiff clay was encountered at 2.0 till 9.0 m.

After the stiff yellowish grey clay is a three meters layer of clayey fine sand in medium dense state. Low natural moisture content ranging from 17.0 to 23.0% with 2.0 tons/cu.m. and 10.0-16.0% of plasticity index were obtained. This layer ends at the depth of 12.0 meters.

Below the thin sandy material, the very stiff brown clay was encountered from the depth of 12.0 to 18.0 meters. The SPT, N value slightly increased with increasing depth from 17 to 35 blows per foot. The undrained shear strength measured by means of field

pocket penetrometer lie in the same range through out the layer, 20 tons/sq.m. Su measured by means of unconfined compression test from available split spoon samples yield higher values. This very stiff clay has a wet unit weight of 1.9-2.0 tons/cu.m., 17.0-28.0% natural moisture content, 54.0-76.0% liquid limit and 30.0-46.0% plasticity index.

After the very stiff clay formation is fine to coarse sand in dense to very dense state. The standard penetration test, N values are mostly greater than 30 blows per foot and scattered. Percentage of non plastic fines is ranging from 7.6 to 24.0%.

#### WATER CONDITION

Ground water levels in the bored hole measuring after boring operation are indicated in the boring logs. They were about 1.30 m. from the existing ground surface.

The variation of the water level must be anticipated through out the year dependent upon the amount of evaporation, rainfall and run-off.

#### RECOMMENDATION

If the low rise buildings of medium load are designed to constructed over the proposed site, pile foundation shall be desired. From the available information, the pile tip shall be placed at the depth of 20.0 meters from the existing ground surface. Shorter piles shall be applied for light load structures.

The bearing capacity of soil to pile foundation can be determined from the estimated ultimate skin friction and ultimate end bearing capacity given below by means of proposed design procedure presented in the appendix.

The estimated ultimate bearing capacity of soil for prefabricated concrete pile follows:

LOCATION	DEPTH RANGE M.	MATERIAL	ULTIMATE SKIN FRICTION T/SQ.M.	ULTIMATE END BEARING T/SQ.M.
BH-1 & BH-2	0.0 - 2.0	stiff clay	5.0	-
	2.0 - 6.0	soft clay	1.5	-
	6.0 - 8.0	stiff clay	4.0	-
	8.0 -12.0	medium fine sand	6.5	-
	12.0 -18.0	very stiff clay	10.0	200
	18.0 -20.0	dense to very dense fine to coarse sand	10.0	400
BH-3	0.0 - 8.0	stiff clay	8.0	-
	the rest	as above	as above	as above

For BH-3 area, short pile of 8.0 m. can be used. During pile driving operation, an experienced engineer shall interpret the uniform existence of stiff clay. If soft clay layer was observed, the accuracy of pile bearing capacity determination will depend upon the thickness of soft clay encountered.

For BH-1 and BH-2 area, pile tip shall penetrate through soft clay. At least 8.0 m. pile shall be designed. This prevention will overcome large settlement of the structures.

If high load from buildings was designed, minimum pile tip of 20.0 meters shall be considered. Pile sizes and magnitude of loading will lead to a further subsurface investigation at the known location and deeper boring shall be needed.

Most of the estimated value given above shall be used with care. Moreover, pile load tests are always necessary.

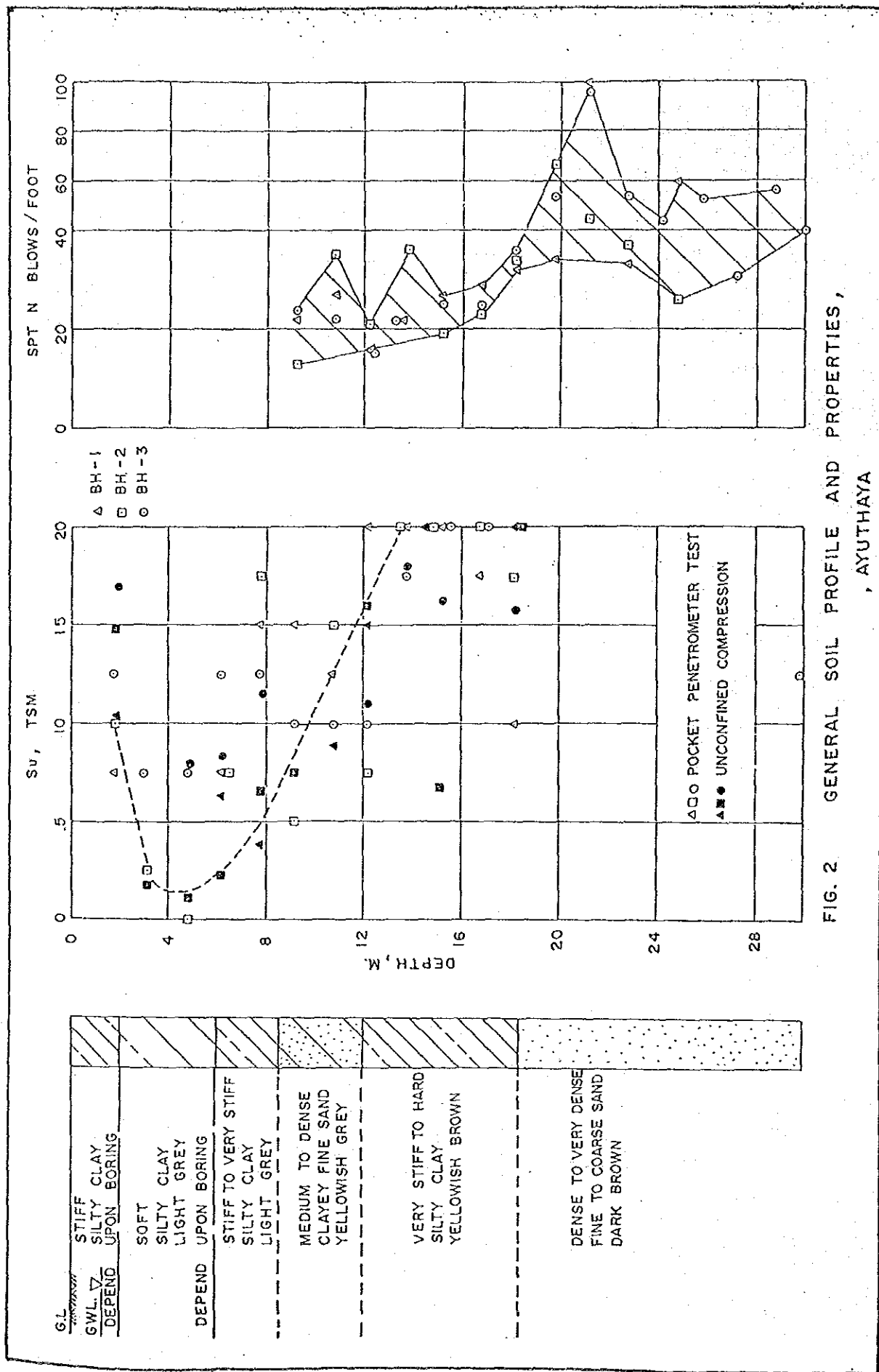


FIG. 2 GENERAL SOIL PROFILE AND PROPERTIES, AYUTHAYA

SUMMARY OF TEST RESULTS

PROJECT		LOCATION		TESTED BY		APPROVED BY		RS				
DATE		AYURBAYA		VP, CC		G		POCKES				
DATE		AYURBAYA		VP, CC		G		POCKES				
BORING NO.	%	DEPTH M.	ATTERBERG LIMIT			FLUIDITY INDEX	SIEVE ANALYSIS PERCENT FINE					CLASSIFICATION
			LL	PL	PI		3/0"	4	10	40	100	
		FROM	TO	WATER %	FLUIDITY INDEX	3/0"	4	10	40	100	200	
BH-1	ST-1	1.50	2.00	25.5	1.894	100.0	100.0	100.0	98.6	96.4	94.7	ML
	ST-2	6.00	6.50	28.1	1.891	100.0	100.0	100.0	99.6	99.1	97.3	CH
	ST-3	7.50	8.00	22.8	1.966	100.0	100.0	99.7	99.2	95.7	40.2	SC
	SS-4	9.00	9.45	21.7	2.004	-	-	-	-	-	-	SC
	SS-5	10.50	10.95	17.2	2.094	100.0	99.2	97.0	87.1	48.3	36.4	SC
	SS-6	12.00	12.45	27.2	1.972	-	-	-	-	-	-	CH
	SS-7	13.50	13.95	26.9	1.949	-	-	-	-	-	-	CH
	SS-8	15.00	15.45	24.6	1.991	91.2	88.3	85.2	83.8	82.2	81.3	CH
	SS-9	16.50	16.95	28.2	1.905	-	-	-	-	-	-	CH
	SS-10	18.00	18.45	17.8	2.078	-	-	-	-	-	-	CL
	SS-11	19.50	19.95	19.2	1.987	100.0	97.1	89.2	56.4	13.4	10.2	SM-SC
	SS-12	21.00	21.45	15.2	1.876	100.0	99.1	89.1	55.0	12.6	7.6	SM-SC
	SS-13	22.50	22.95	26.5	2.040	100.0	97.1	94.7	89.5	80.6	73.6	CL
	SS-14	24.55	25.00	23.3	1.874	100.0	100.0	95.9	82.5	8.3	6.0	SM-SC

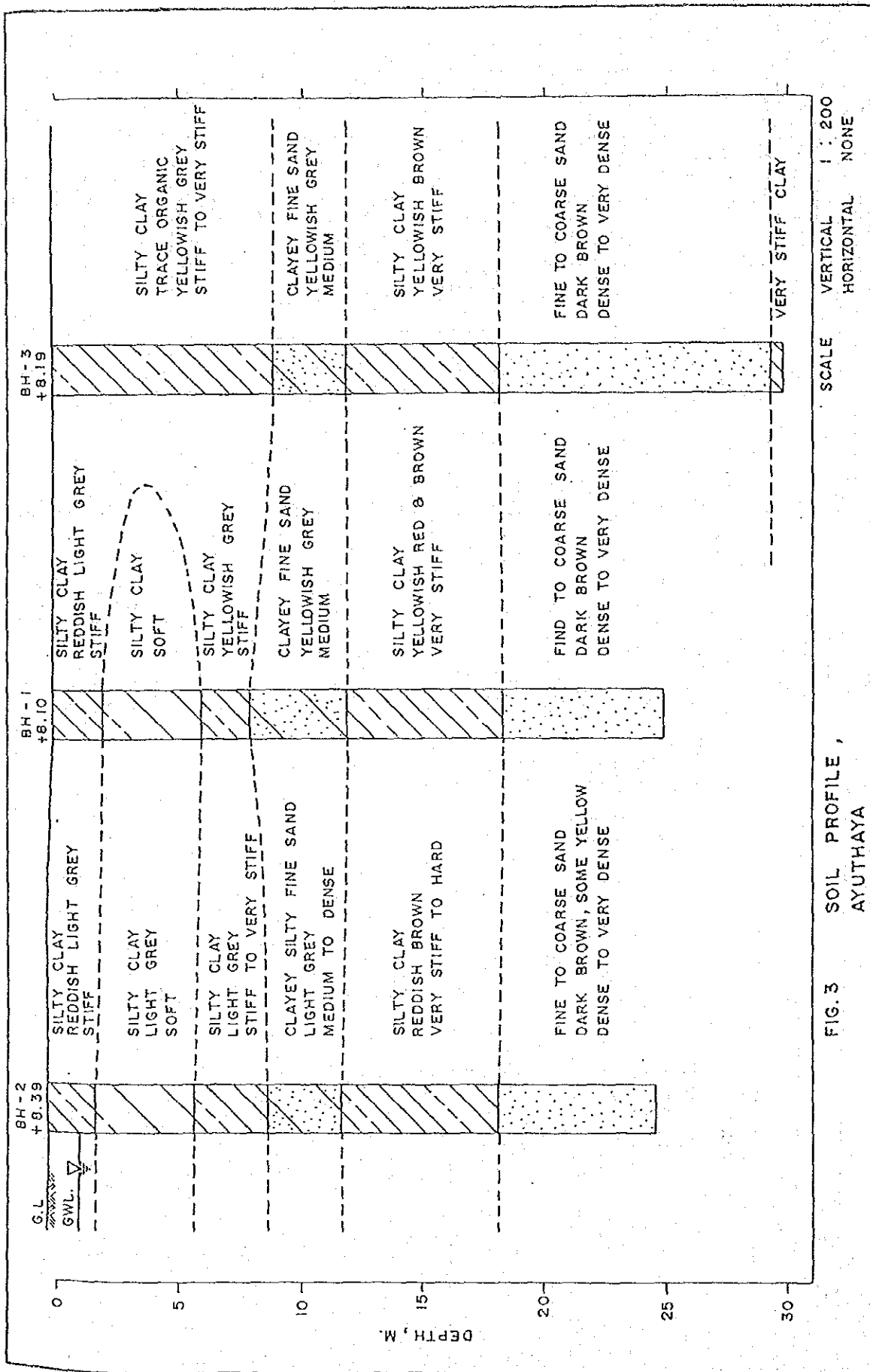


FIG. 3 SOIL PROFILE, AYUTHAYA



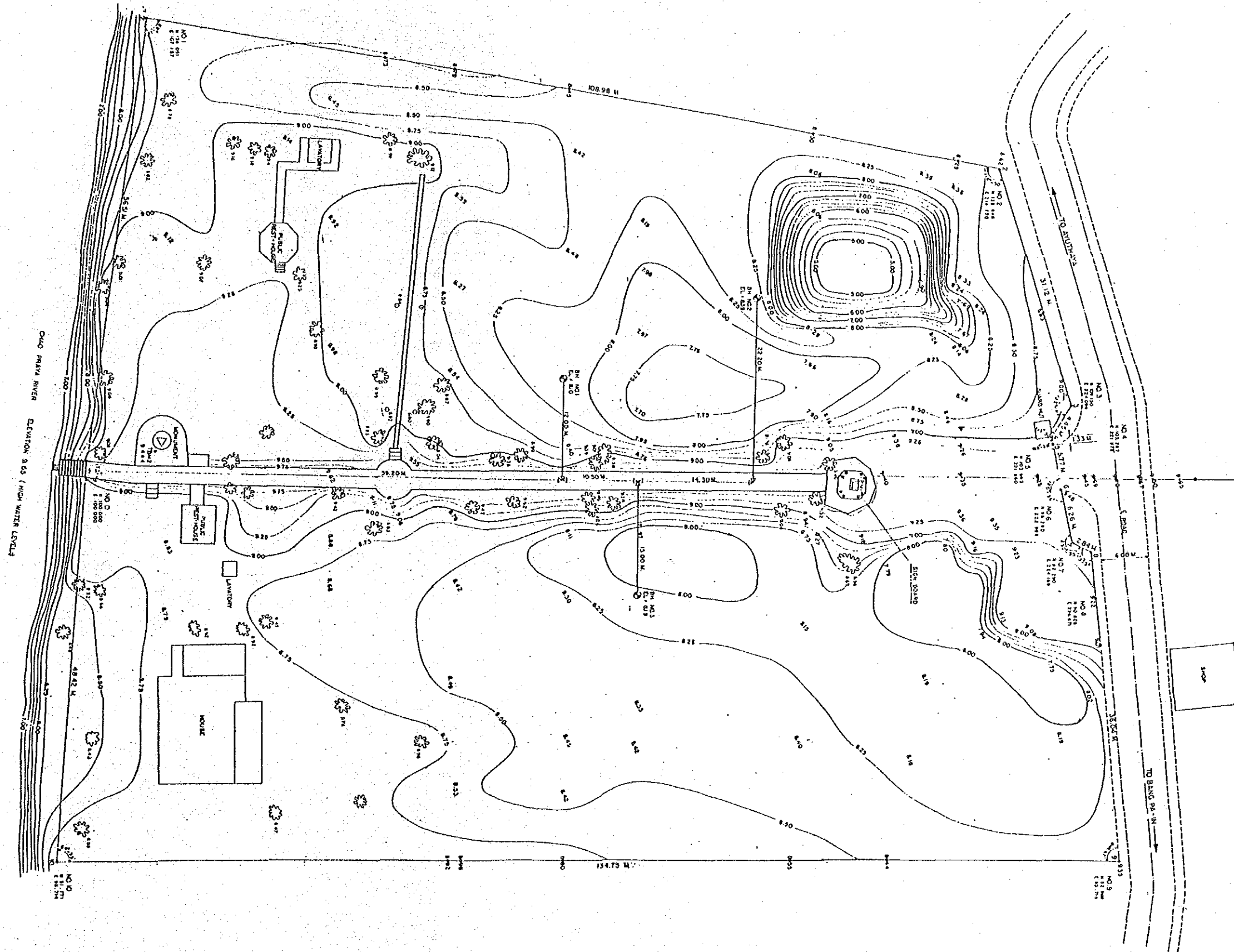
**SUMMARY OF TEST RESULTS**

PROJECT	DATE		LOCATION		TESTED BY		APPROVED BY		RS	DEGREE			
	9.2.1987		AYUTHIAYA		VP, CC		G	UNGRAINED SHEAR STRENGTH TEST			POCKET PENETROMETER		
BORING NO	SON LOG NO	DEPTH M.		NATURAL MOISTURE CONTENT %	ATTENBERG LIMIT %			LIQUID LIMIT PL	PLASTIC LIMIT PI	UNIFORMITY COEFFICIENT	SIEVE ANALYSIS PERCENT FINER	SHELL SANDS CLASSIFICATION	
		FROM	TO		LL	PL	4						10
BH-2	ST-1	1.50	2.00	20.5	64.0	33.9	30.1	1.947	-	-	-	-	MH
	ST-2	3.00	3.50	71.8	67.0	39.8	27.2	1.556	100.0	100.0	99.3	98.3	MH
	ST-3	4.50	5.00	67.8	66.0	33.6	32.4	1.576	-	-	-	-	MH
	ST-4	6.00	6.50	73.9	68.8	28.7	40.1	1.541	100.0	100.0	97.6	95.2	CH
	ST-5	7.50	8.00	21.8	32.3	17.7	14.6	2.023	100.0	100.0	94.7	50.9	CL
	SS-6	9.00	9.45	22.8	34.7	18.3	16.4	2.010	100.0	100.0	77.2	38.5	SC
	SS-7	10.50	10.95	20.9	-	-	-	1.956	100.0	98.0	45.1	32.8	SC
	SS-8	12.00	12.45	27.7	-	-	-	1.989	-	-	-	-	CH
	SS-9	13.50	13.95	24.9	65.6	28.0	37.6	2.005	100.0	100.0	98.5	97.4	CH
	SS-10	15.00	15.45	28.0	-	-	-	1.967	-	-	-	-	CH
	SS-11	16.50	16.95	27.9	76.0	29.8	46.2	1.950	100.0	100.0	99.6	99.0	CH
	SS-12	18.00	18.45	22.5	-	-	-	2.044	-	-	-	-	CH
	SS-13	19.50	19.95	16.8	-	-	-	1.929	100.0	99.2	62.6	16.1	SM
	SS-14	21.00	21.45	20.0	-	-	-	1.986	100.0	100.0	83.8	16.5	SM-SC
	SS-15	22.50	22.95	15.8	-	-	-	1.902	100.0	99.3	51.8	11.7	SM-SC
	SS-16	24.50	25.00	16.3	-	-	-	2.123	100.0	95.7	78.8	30.9	SM

# SUMMARY OF TEST RESULTS

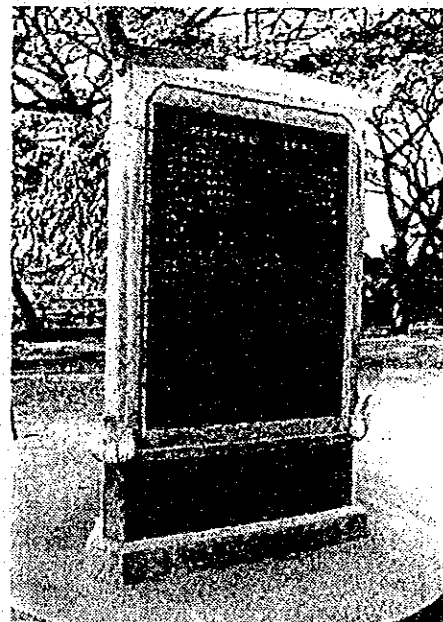
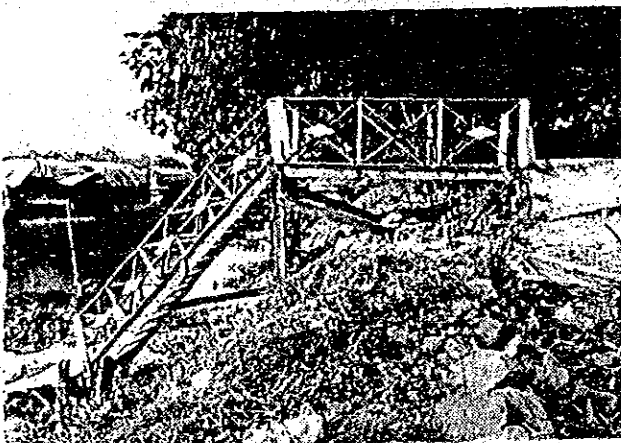
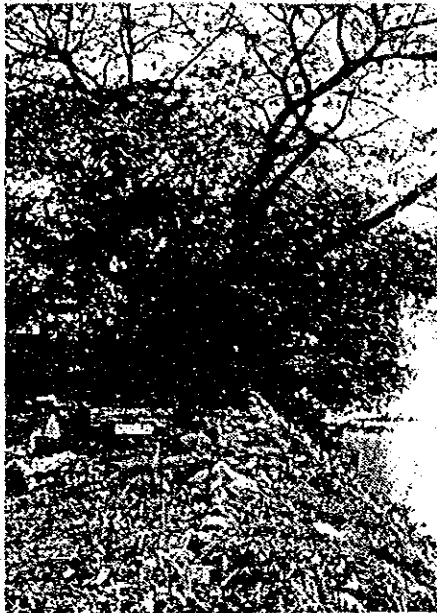
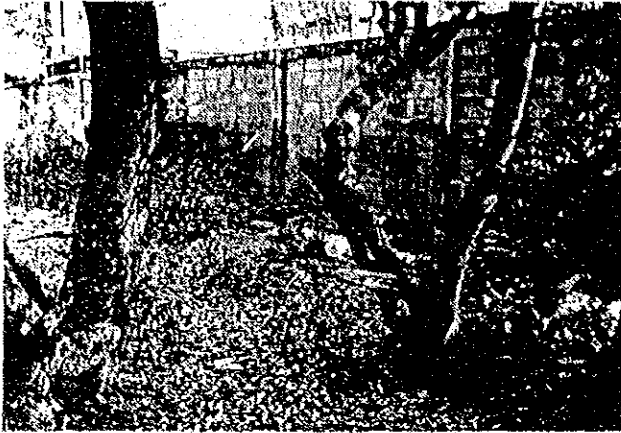
PROJECT		LOCATION AYUTHAYA										APPROVED BY				RS				
DATE		TESTED BY										VP, CC				G	UNOBTAINED SHEAR STRENGTH SO. TSM.	POCKET PENETROMETER	C TSM	Ø DEGREE
BORING NO.	SAMPLE NO.	DEPTH M.		NATURAL WATER CONTENT %	ATTERBERG LIMIT %			UNIT WEIGHT KGF/CC	3/8"	SIEVE ANALYSIS PERCENT FINER				UNIFIED SOIL CLASSIFICATION	G	UNOBTAINED SHEAR STRENGTH SO. TSM.	POCKET PENETROMETER	C TSM	Ø DEGREE	
		FROM	TO		LL	PL	PI			4	10	40	100							200
BH-3	ST-1	1.50	2.00	27.1	52.0	28.1	23.9	1.847	100.0	100.0	99.6	98.4	97.0	CH	17.0					
	ST-2	3.00	3.50	-	48.9	28.1	20.8	-	100.0	100.0	99.4	97.4	95.5	CL	-					
	ST-3	4.50	5.00	24.4	44.7	18.7	26.0	2.006	100.0	100.0	96.1	92.8	86.0	CL	7.90					
	ST-4	6.00	6.50	22.9	44.7	17.9	26.8	2.025	100.0	100.0	96.1	93.1	86.6	CL	8.30					
	ST-5	7.50	8.00	25.5	52.7	20.7	32.0	1.986	100.0	100.0	98.4	97.3	94.7	CH	11.50					
	SS-6	9.00	9.45	21.7	-	-	-	1.966	-	-	-	-	-	-	-					
	SS-7	10.50	10.95	18.0	-	-	-	1.971	-	-	-	-	-	-	-					
	SS-8	12.00	12.45	27.7	55.5	21.1	34.4	1.990	100.0	100.0	100.0	99.6	98.4	CH	11.00					
	SS-9	13.50	13.95	25.0	60.6	23.7	36.9	2.014	-	-	-	-	-	CH	18.00					
	SS-10	15.00	15.45	24.3	57.2	20.0	37.2	2.011	100.0	100.0	99.7	98.2	94.0	CH	16.25					
	SS-11	16.50	16.95	26.3	-	-	-	1.921	-	-	-	-	-	-	-					
	SS-12	18.00	18.45	20.9	29.5	14.8	14.7	2.056	100.0	100.0	98.2	86.2	82.4	CL	15.75					
	SS-13	19.50	19.95	16.7	-	-	-	1.995	100.0	100.0	67.6	18.0	12.9	SM	-					
	SS-14	21.00	21.45	17.8	-	-	-	1.894	100.0	100.0	79.2	14.7	10.2	SM-SC	-					
	SS-15	22.50	22.95	15.8	-	-	-	2.026	100.0	96.0	78.4	49.6	14.5	SM-SC	-					
	SS-16	27.00	27.45	15.0	-	-	-	2.180	98.6	91.9	75.3	35.6	21.8	SM	-					
	SS-17	28.50	28.95	16.5	-	-	-	2.171	98.7	92.8	70.6	41.4	29.1	SM	-					



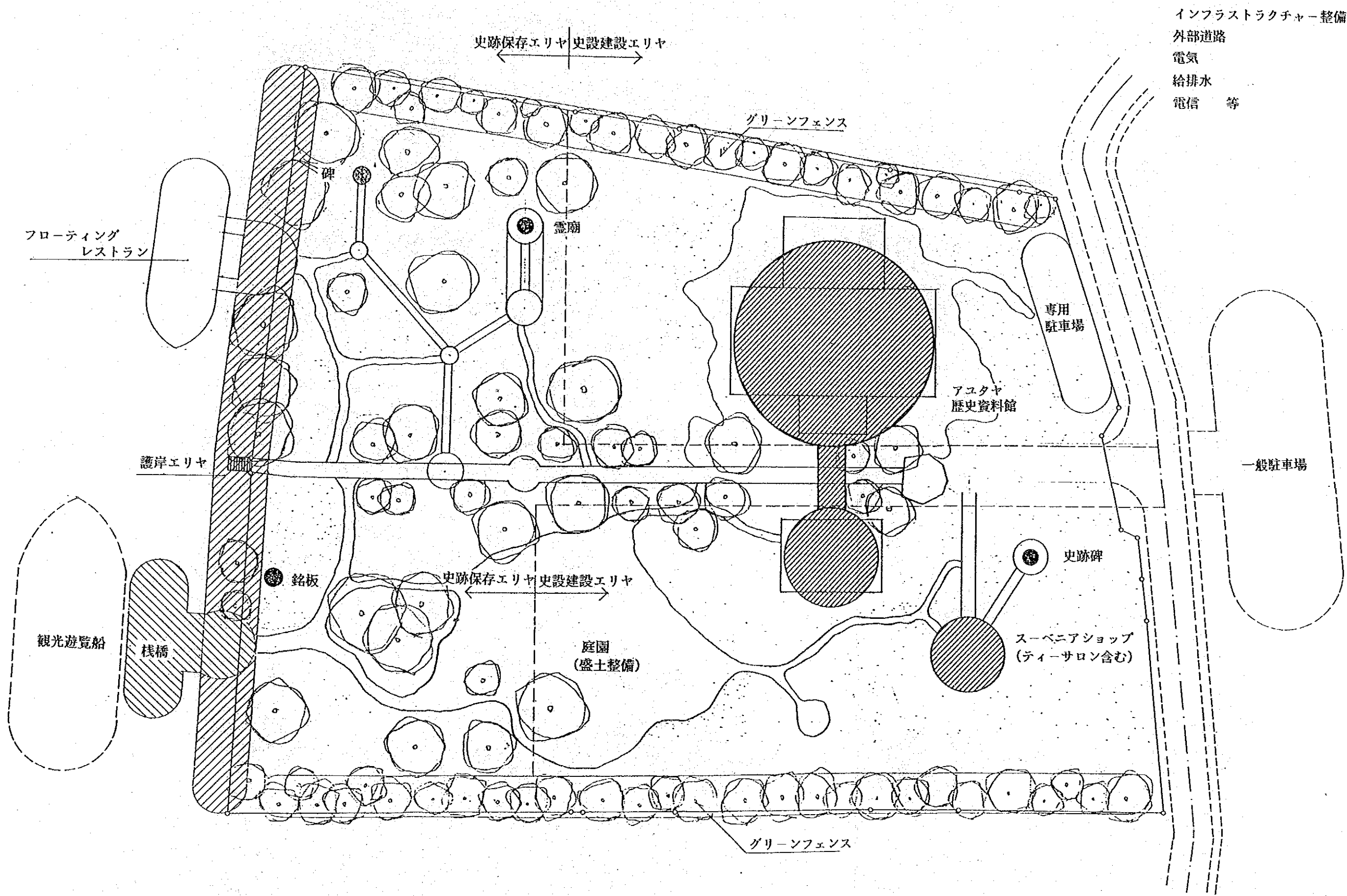




資料-12 整備要素の記録写

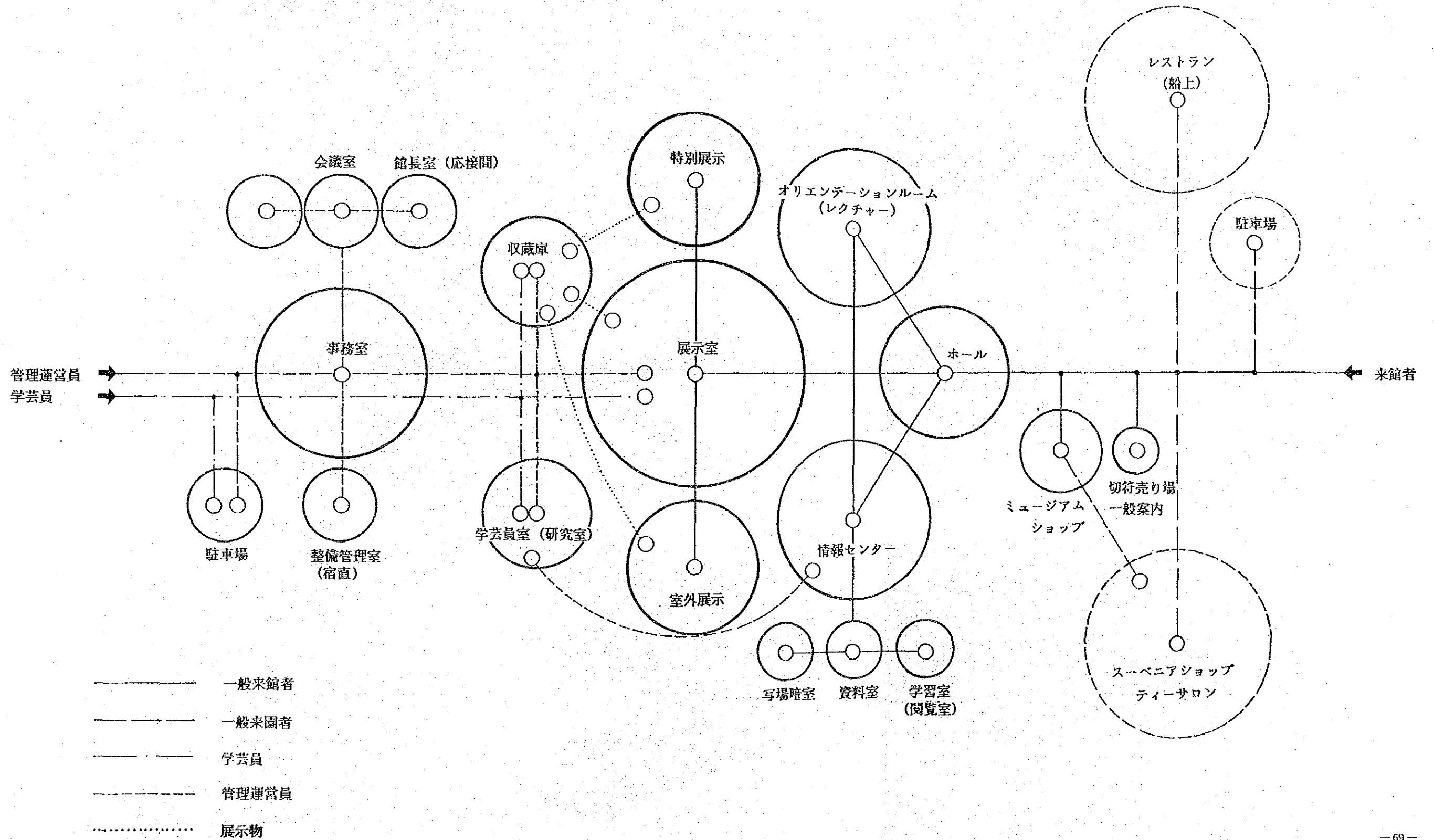


資料-13 マスタープラン概要図 (スケール=500分の1)



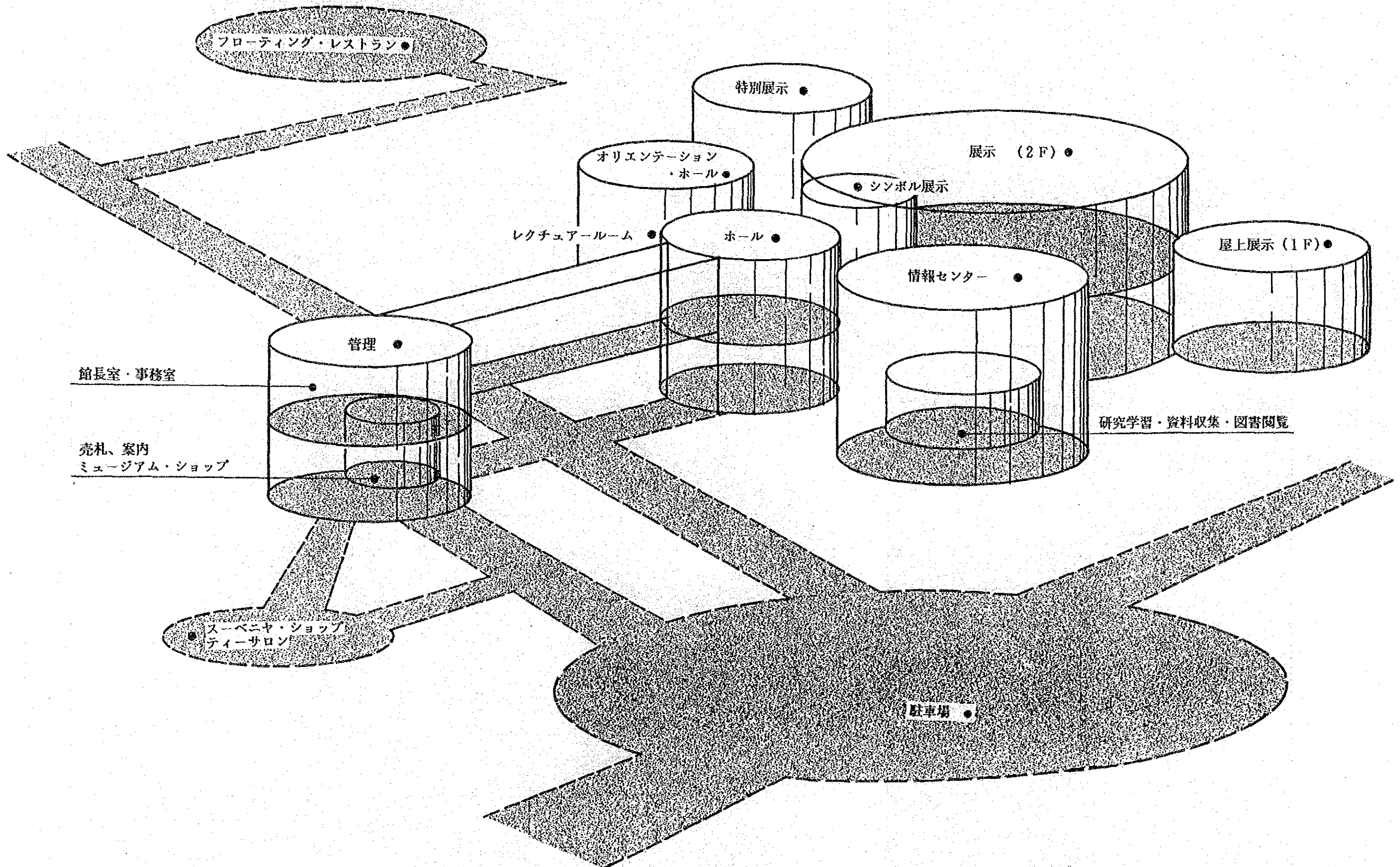
インフラストラクチャー整備  
外部道路  
電気  
給排水  
電信 等

資料-14 施設機能図





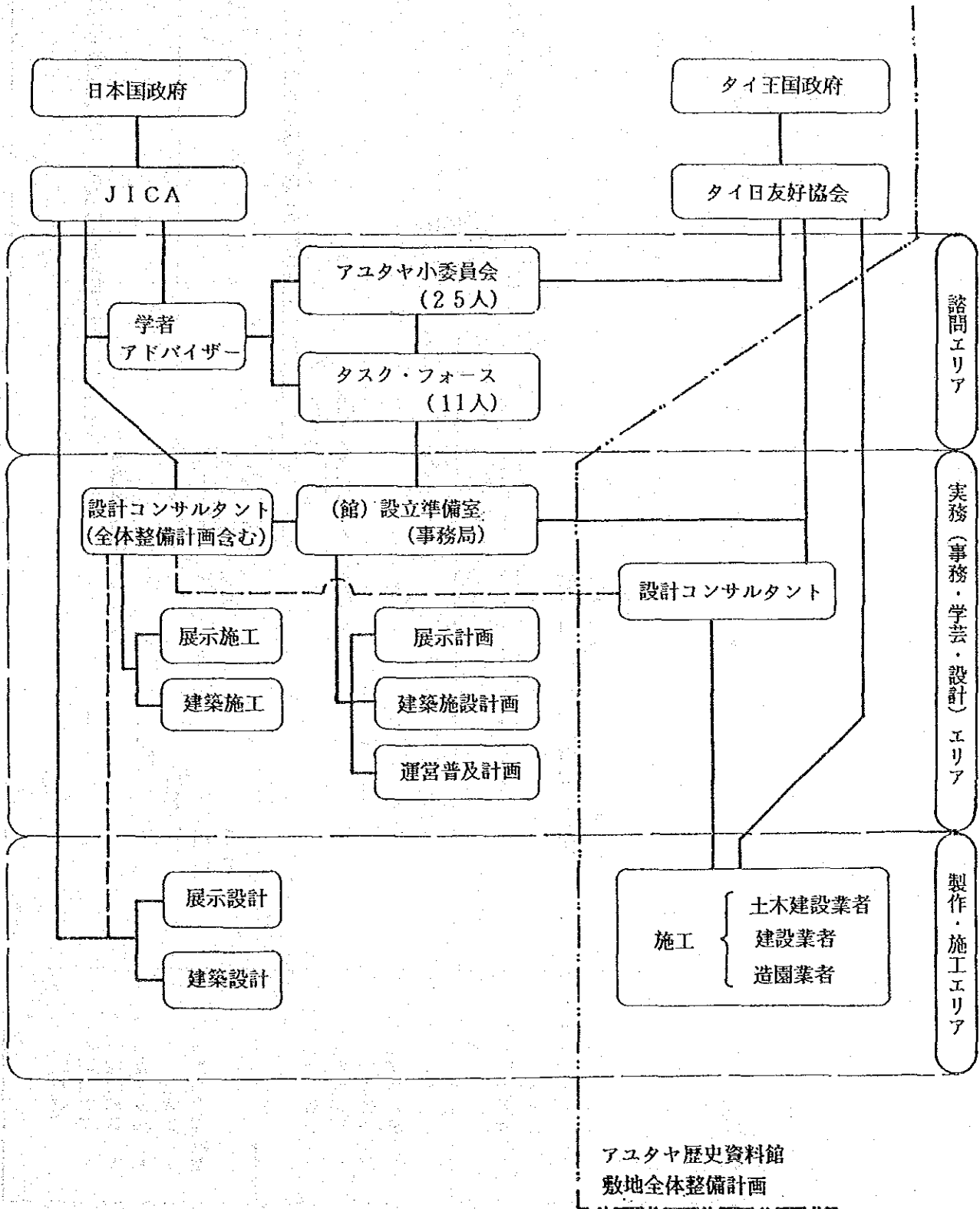
資料-15 空間概念図





資料-16 組織図

アユタヤ歴史資料館  
建設計画



資料-17 タイ王国・アユタヤ歴史資料館工程表

