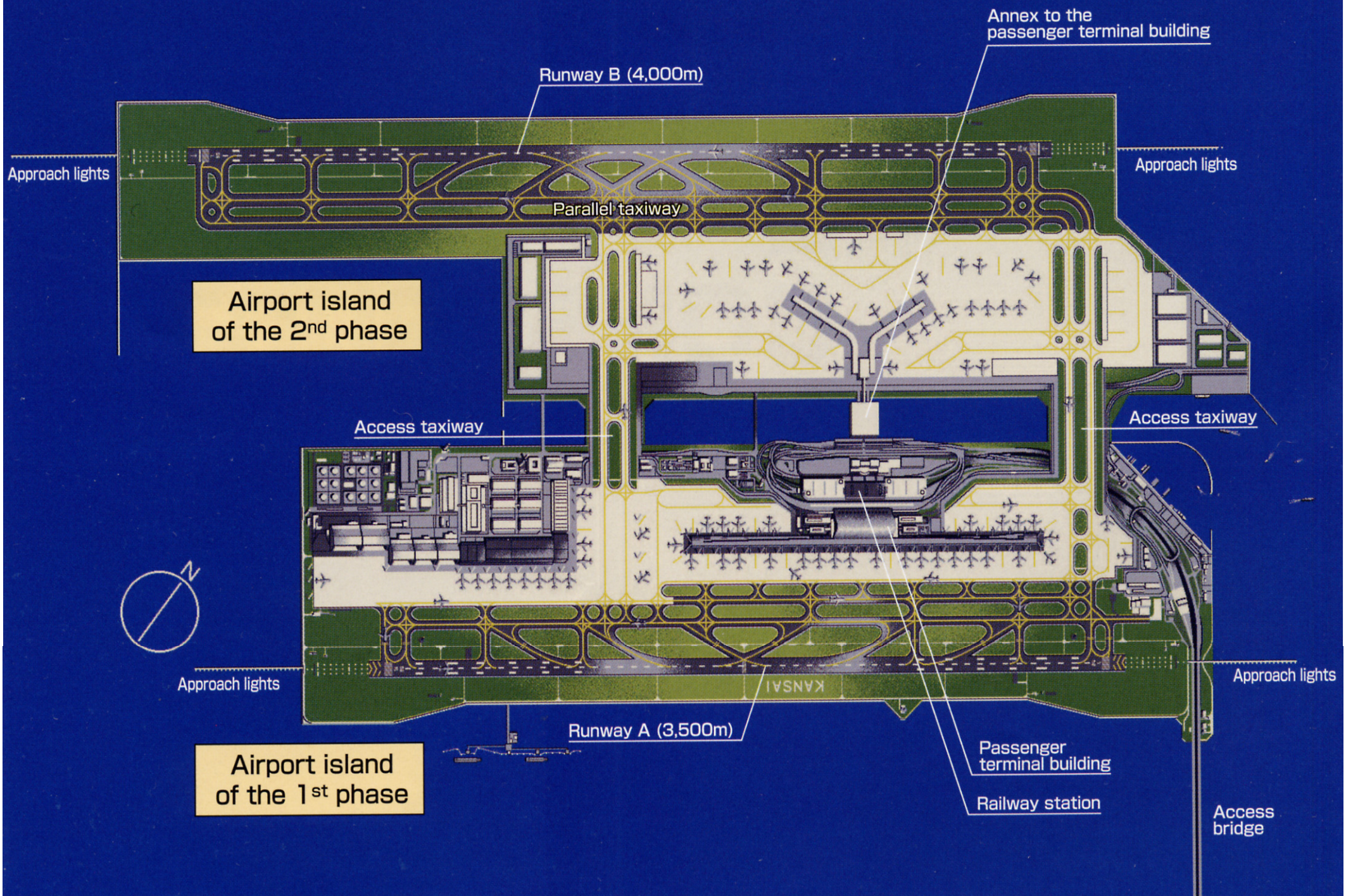
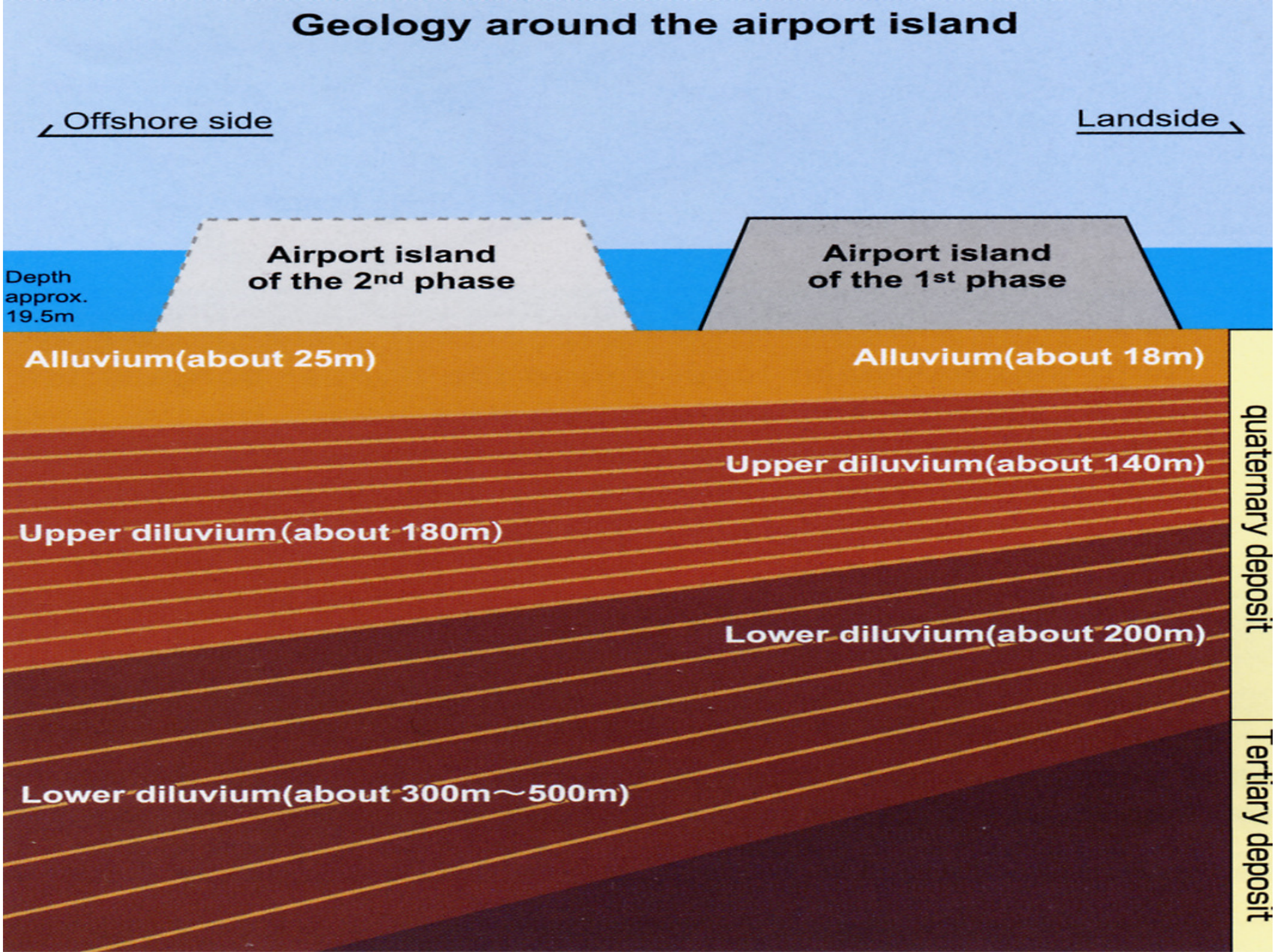
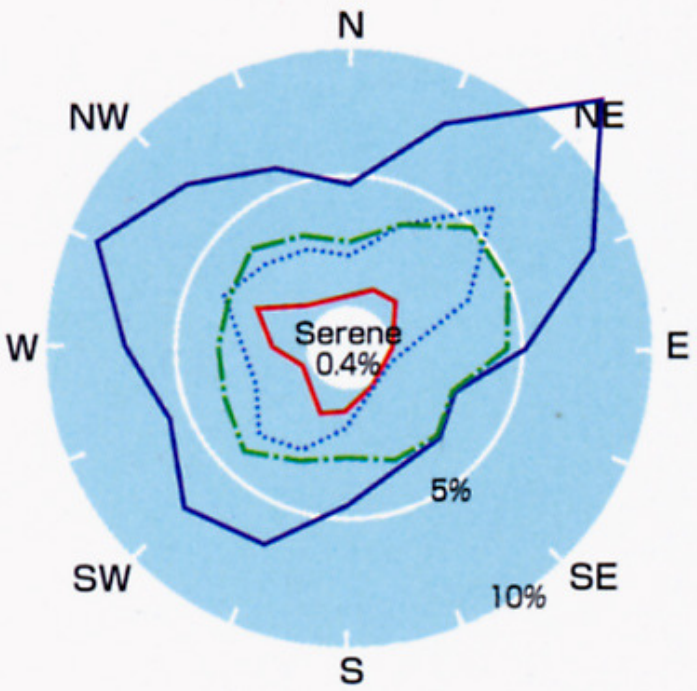
Conceptual Plan of Kansai International Airport (after completion of the 2nd phase)



Geology around the airport island

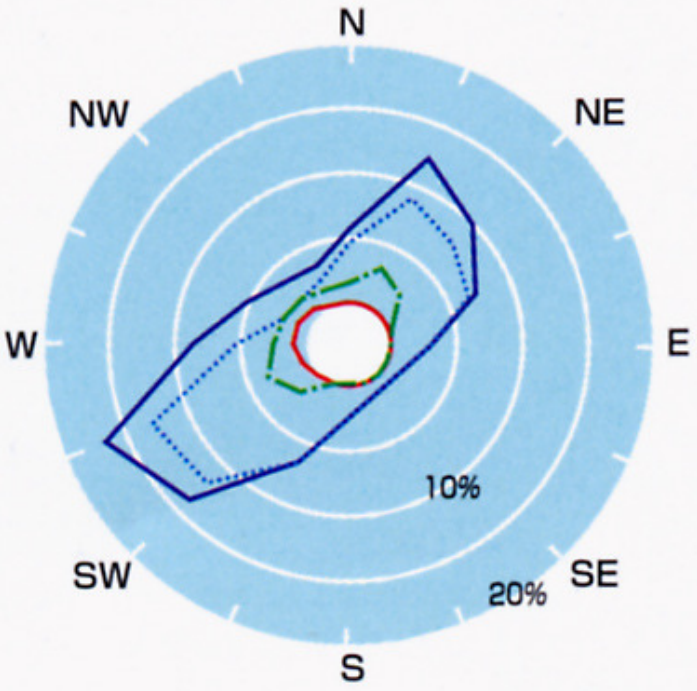


Wind rose (throughout the year)



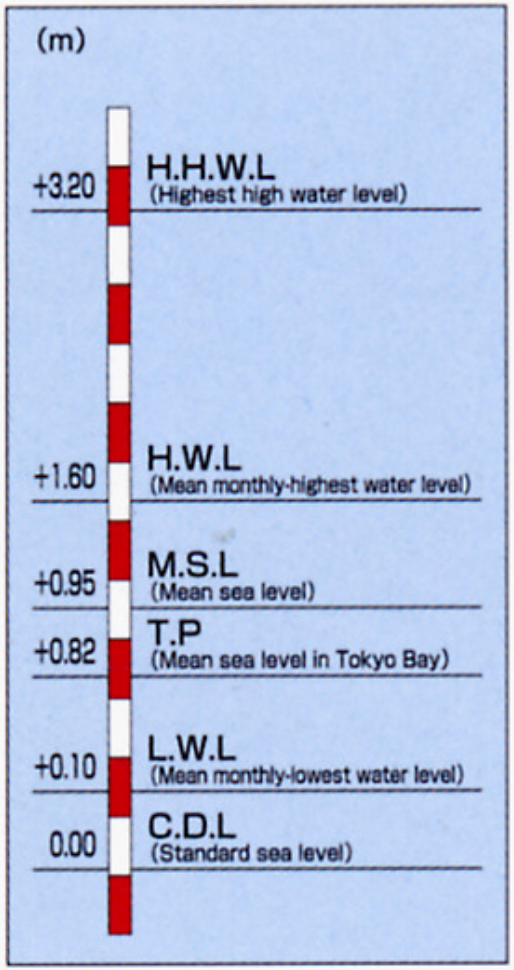
Calm 0.0~0.2 (m/s)
0.3~4.9
5.0~9.9
10.0~
Total

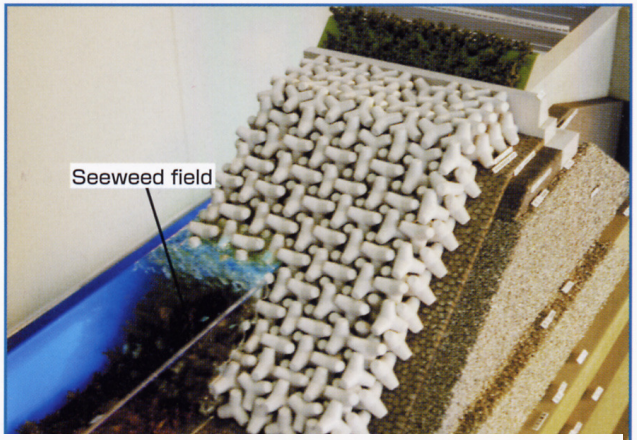
Wave climate (throughout the year)

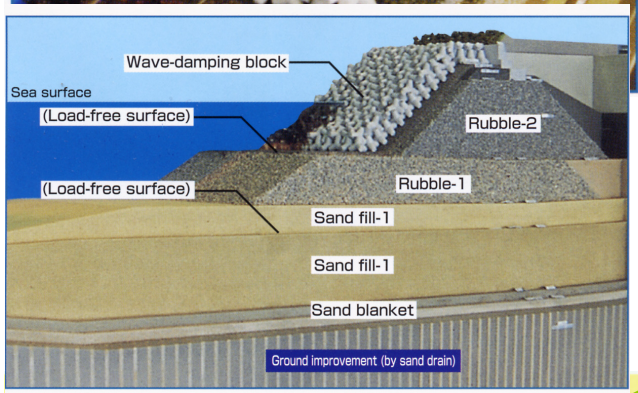


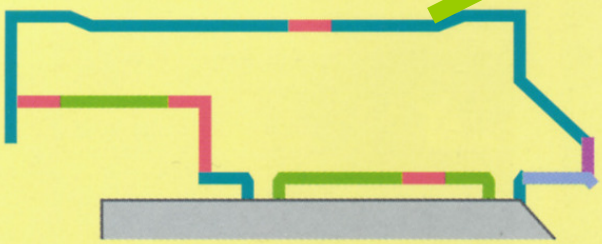
10~49 (cm)
50~99
100~
Total

Water level









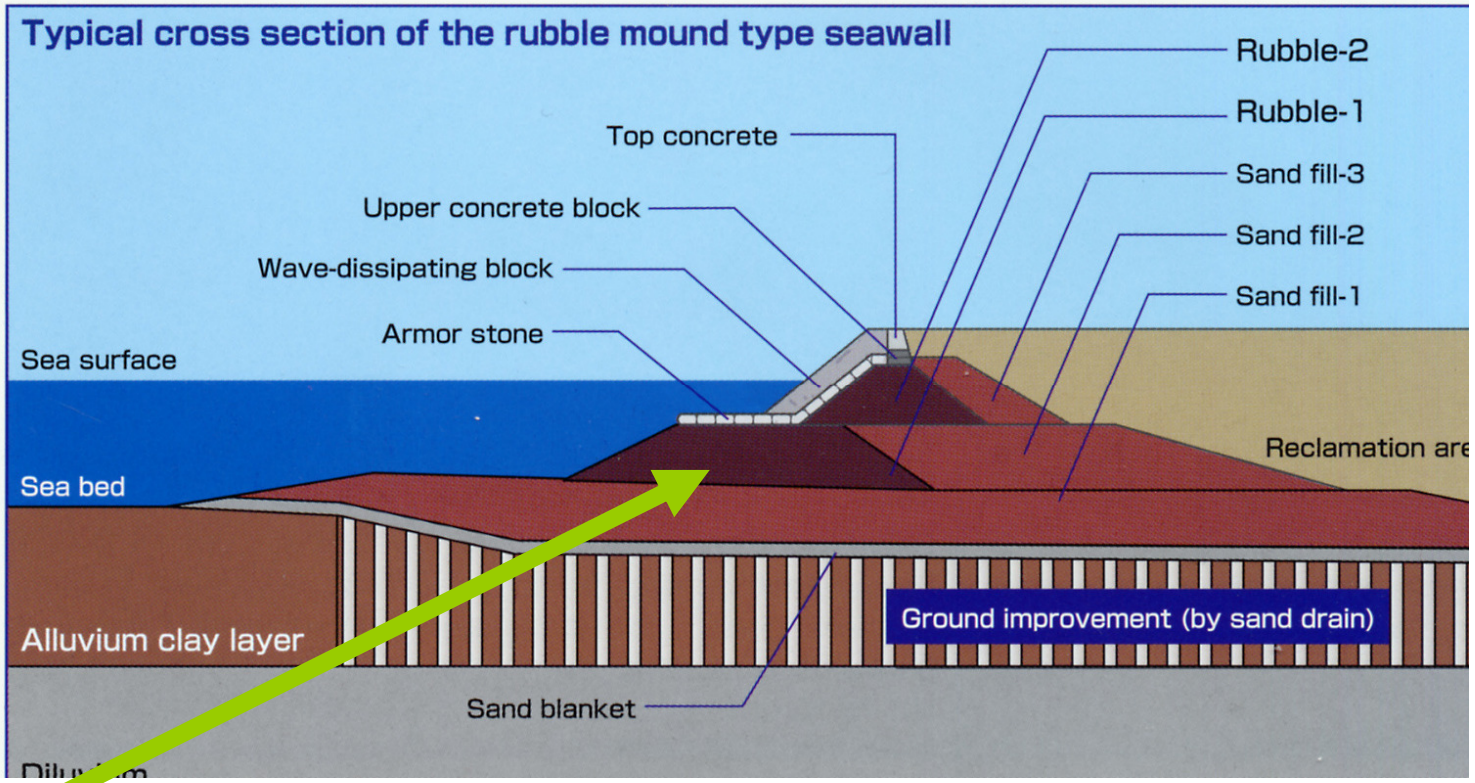
Rubble mound type Seawall (with wave-dissipating block)

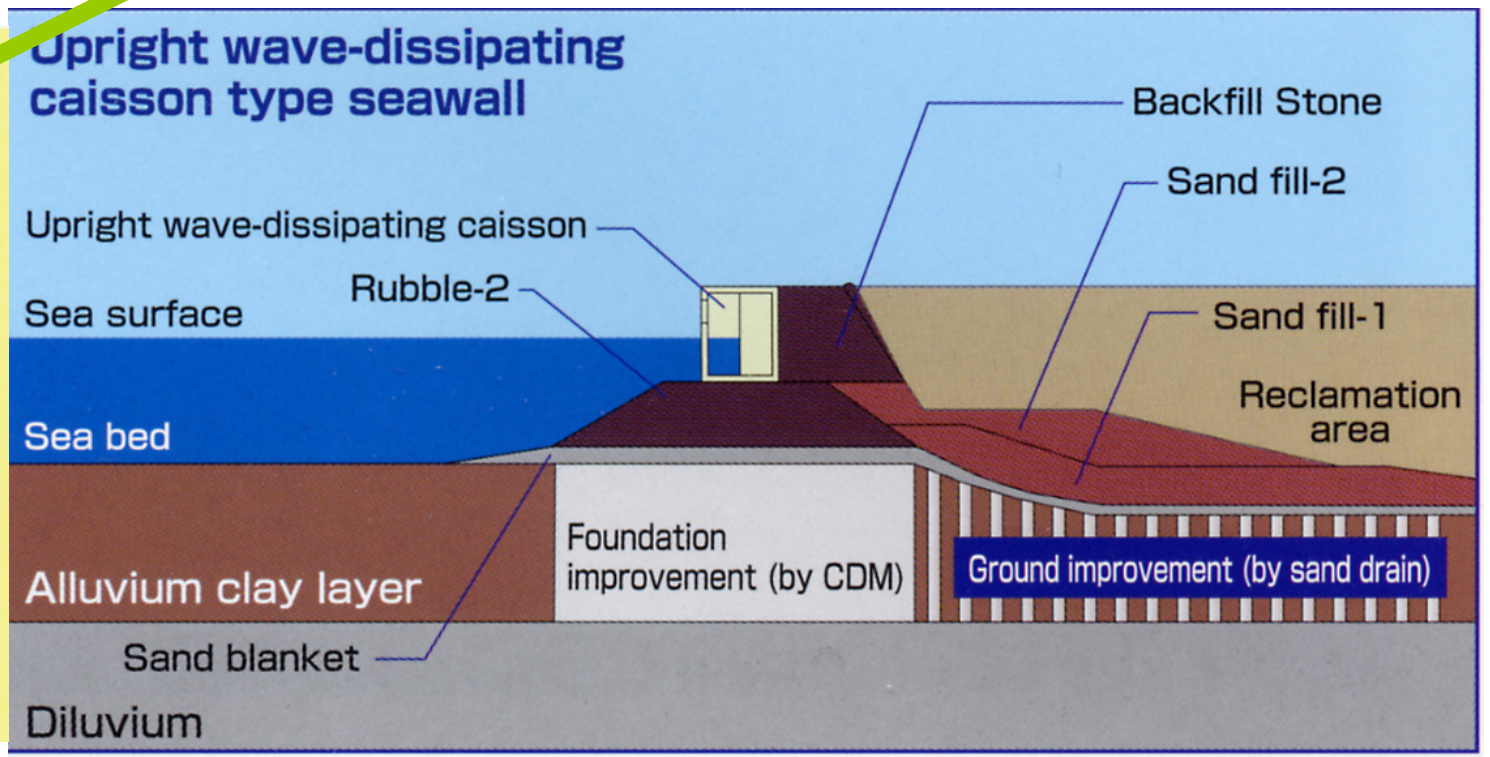
Rubble mound type Seawall

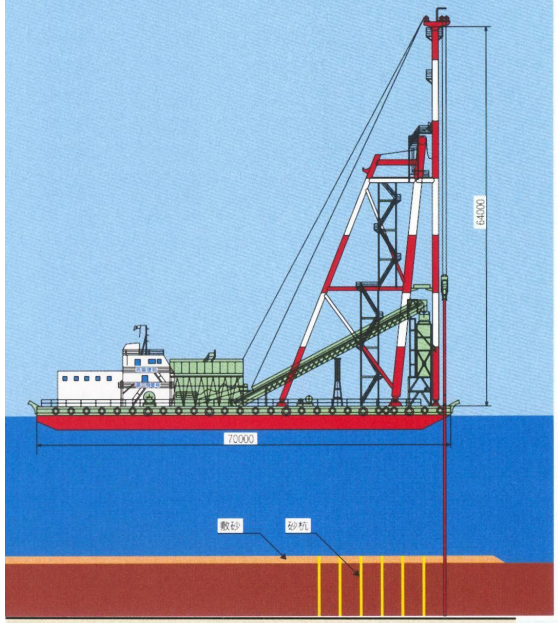
Upright wave-dissipating caisson type seawall

Steel cellular bulkhead type seawall

Temporary mooring pier



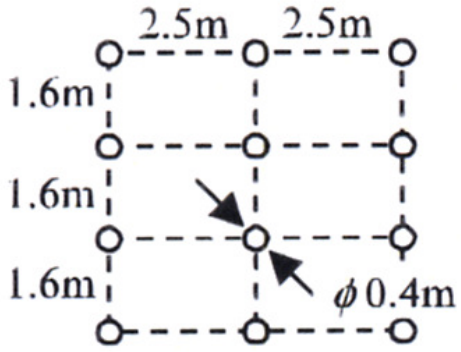




Specifications	
Hull Dimensions:	
Length	57.00m
Breadth	32.00m
Depth	4.00m
Draft	2.30m
Pipe Diameter of Sand Pile	0.40m
Max. Depth of Sand Pile	45m
Driving Pitch of Sand Pile	2.00m, 2.50m
	3.00m, 3.50m

Specifications

Hull Dimensions:	
Length	57.00m
Breadth	32.00m
Depth	4.00m
Draft	2.30m
Number of Casing Pipe	12lines
Displacement Tonnage	3,900tons
Type of Engine	DIESEL
Engine Horsepower:	
for Hydraulic Equipment	1,800p.s.
for Generator	1,800p.s.
Pipe Diameter of Sand Pile	0.40m
Max. Depth of Sand Pile	45m
Driving Pitch of Sand Pile	2.00m, 2.50m
	3.00m, 3.50m
Height of Leader	62.30m
Date of Manufacture	1986
Manufacturer	ISHIBASHI SANGYO CO., LTD.



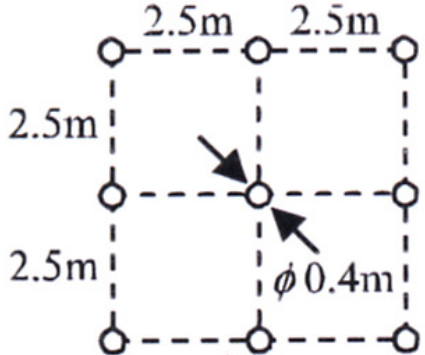
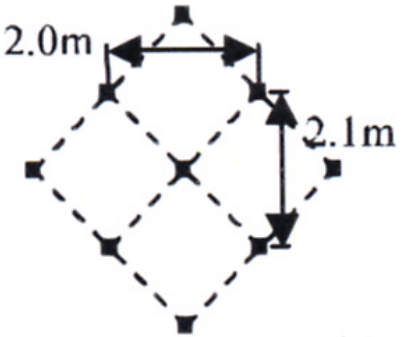
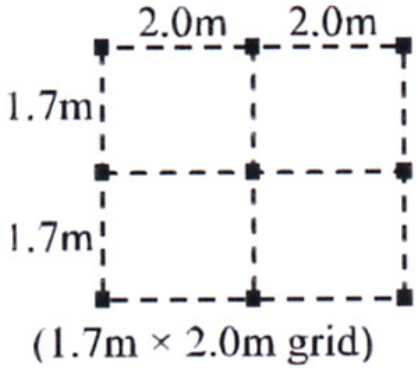


Figure 9. Spacing of sand drain piles






クローラークレーン(150t吊)
GPSアンテナ
連動式パイプロ
センターホールドチャック
スライド架台
タンパ
スパッド付台船
1800
2800
1000
25000
34000
敷砂
砂杭
盛砂

① Start of construction
(July 1999)

The second phase construction began with installing light markers to indicate the construction area.

③ Sand-spreading construction
(July 1999)

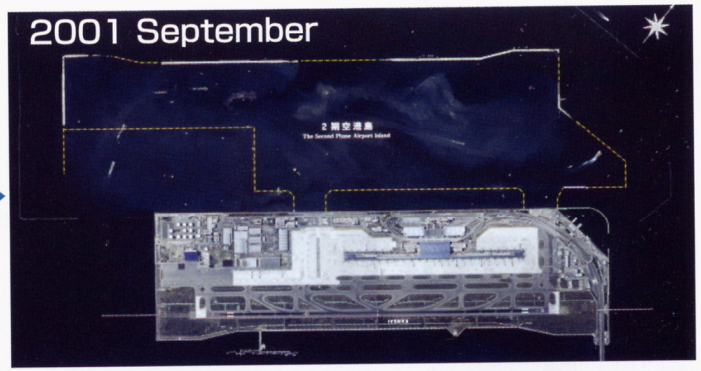
Sand-spreading vessels began laying 1.5m thick sand layer to drain water contained in the sea bottom ground through sand drains piled into the ground.

⑤ Sand drain
(August 1999)

Approximately 1,200,000 sand piles are driven into the alluvial clay layer on the sea bottom to drain water through the piles for ground improvement.

⑦ Sand fill work
(December 1999)

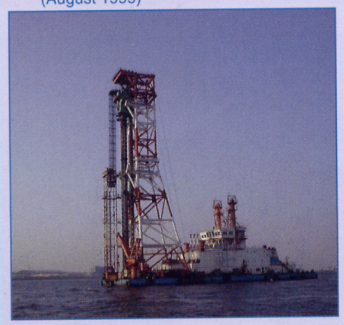
Sand fill work began using large sand carriers. Sand was transported by barges from the pier at the sand production pit to the construction site where sand was dumped directly on the sea floor.



② Setup of contamination-preventive sheets
(July 1999)

Contamination-prevention sheets of both hanging type and independent type were laid to prevent contaminated seawater from spreading outside the construction area due to reclamation work.

④ Deep-ground treatment by mixing with coagulants
(August 1999)



Ground improvement started using clay and cement. Clay and cement were injected into the sea bottom ground and mixed with an agitator previously penetrated into the ground.

⑥ Import of overseas sand
(November 1999)

Chinese marine sand was imported, which was directly transported to the site, to compensate the insufficient domestic supply of sand required for sand spreading.

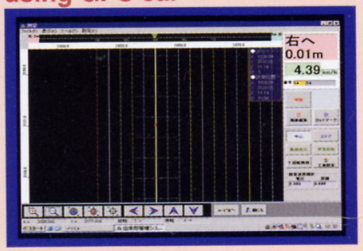
⑧ Rubble placement work
(May 2000)

Rubble was placed with a grab bucket vessel to form foundation, on which concrete blocks were installed.

Compaction management system

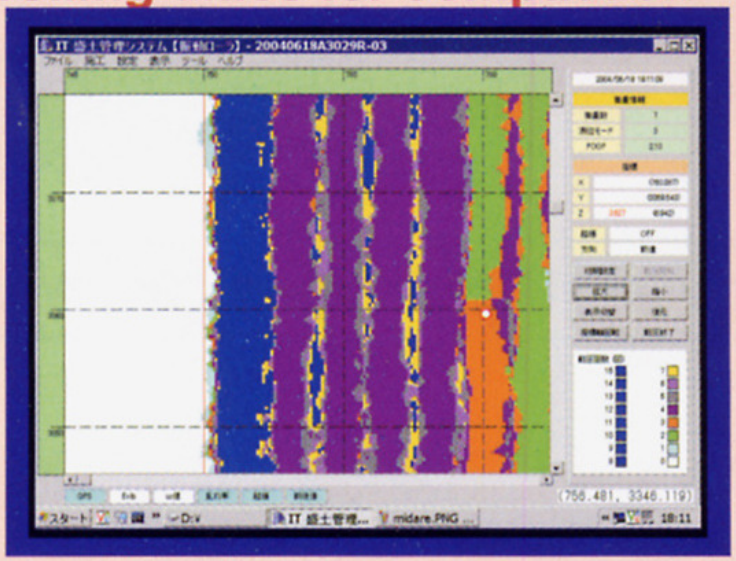
For reclamation-2, ground compaction by heavy vibration rollers was performed eight times. The vibration rollers were equipped with the accelerometer and GPS, and which confirmed whether the compaction was achieved as designed. Thus, the number of rolling times performed for compaction and deviation of compaction were confirmed.

The display of measurement using GPS car

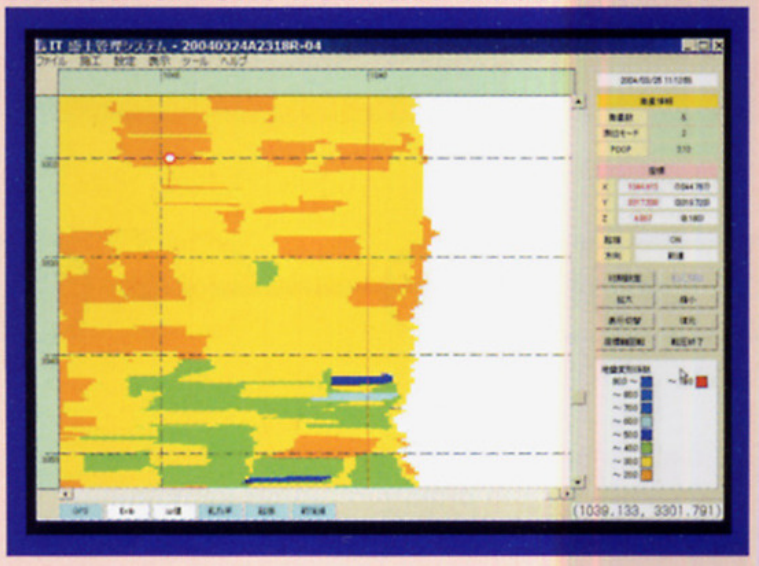


Accelerometer mounted on the roller

The display of the Number of rolling times for compaction

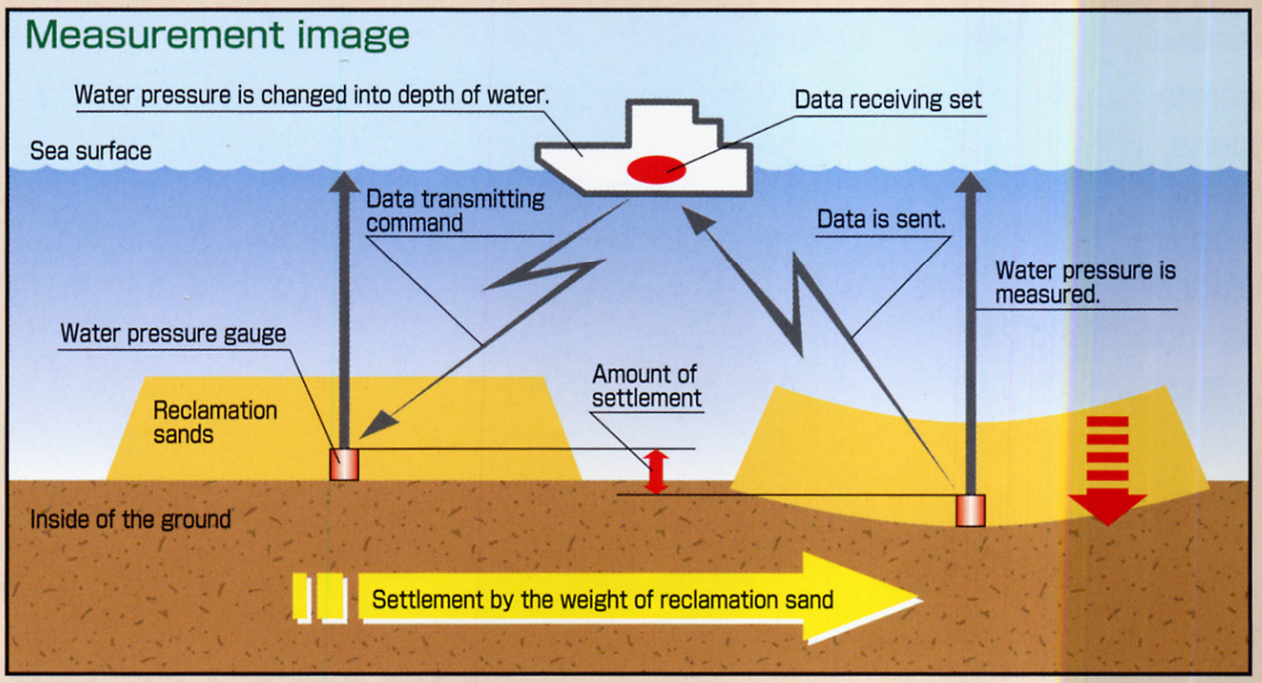


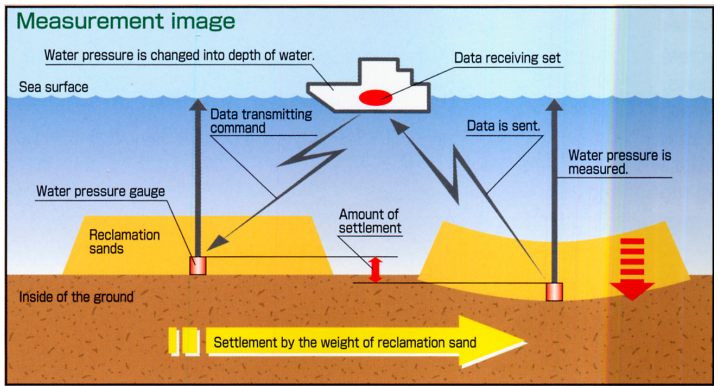
The display of compaction measurement with the accelerometer

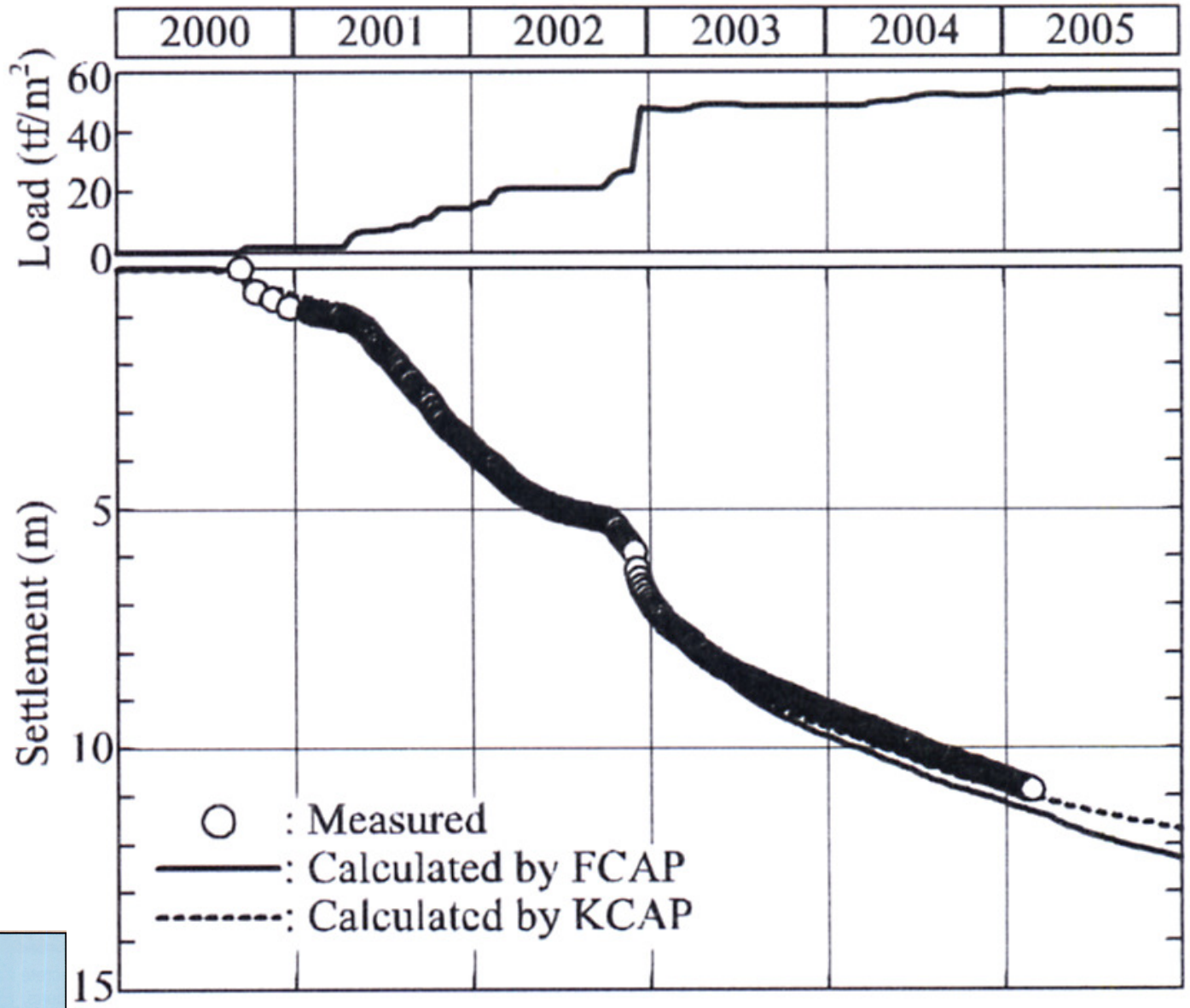


Magnetic-transmission type water pressure gauge for measuring settlement

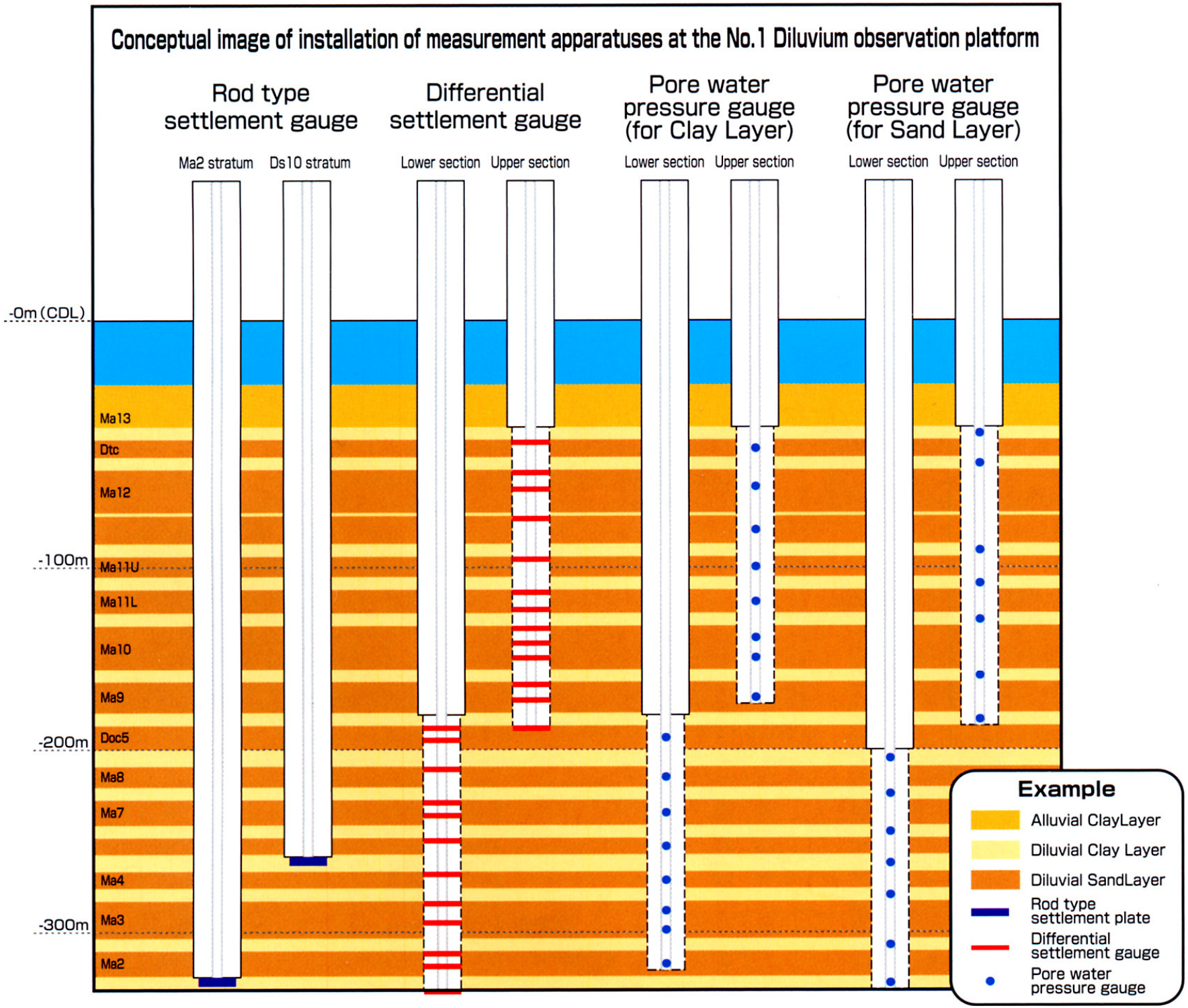
With this system, settlement data can be acquired on board from the seabed by magnetic data transfer. For this reason, measurements can be taken even if the measuring apparatus is buried in sand. Moreover, since it does not obstruct construction, measuring devices can be installed much more densely than in the case of settlement plates.In the 2nd phase construction, in order to measure the settlement of a reclamation area, the gauges are installed at 37 points.





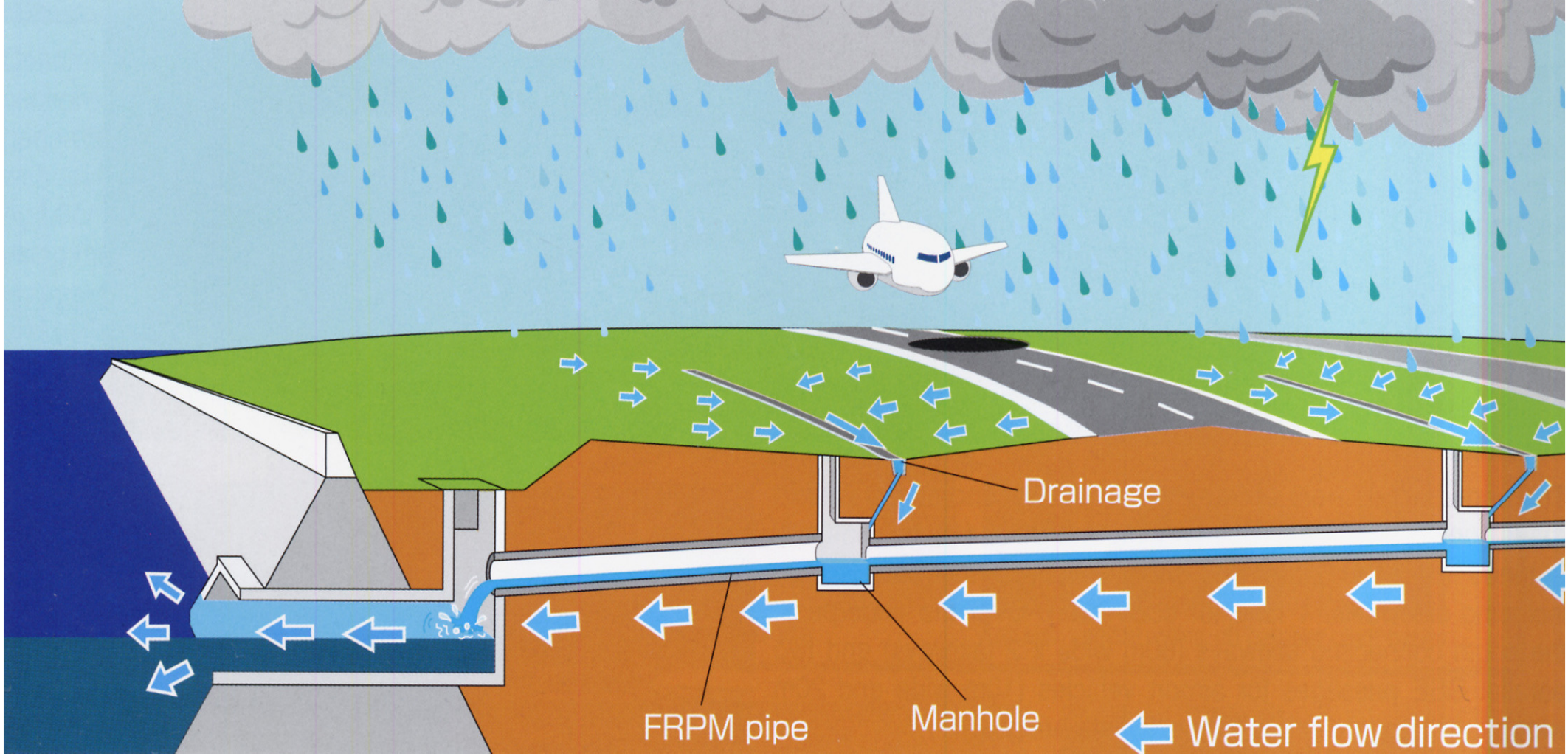


Observed vs. calculated settlement


Conceptual image of installation of measurement apparatuses at the No.1 Diluvium observation platform
Rod type settlement gauge
Differential settlement gauge
Pore water pressure gauge (for Clay Layer)
Pore water pressure gauge (for Sand Layer)
Ma2 stratum
Ds10 stratum
Lower section
Upper section
Lower section
Upper section
Lower section
Upper section
-0m (CDL)
-100m
-200m
-300m
Ma13
Dtc
Ma12
Ma11U
Ma11L
Ma10
Ma9
Doc5
Ma8
Ma7
Ma4
Ma3
Ma2
Example
Alluvial ClayLayer
Diluvial Clay Layer
Diluvial SandLayer
Rod type settlement plate
Differential settlement gauge
Pore water pressure gauge

Differential settlement gauge

By measuring the magnetized elements that are installed in each diluvia layer, changes in thickness of each layer can be determined.


Drainage
FRPM pipe
Manhole
Water flow direction