

ABSHERON BLOCK

ABX-2, ENVIRONMENTAL BASELINE STUDY



TOTAL E&P
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Acronyms and abbreviation

Abbreviation	Definition
ug/kg	micrograms per kilogram
ug/L	micrograms per litre
<	less than
‰	promille (1‰= 0.1%)
AAS	atomic absorption spectrometry
AAFL	atomic absorption with flame atomizer
AAGF	atomic absorption with graphite furnace atomizer
ACG	Azeri-Chirag-Guneshli field
AEL	Label used in Azecolab projects
Azecolab	Azecolab company lab
As	Arsenic
Ba	Barium
Bot	Bottom (means for sea water column)
BP	British Petroleum Company (means branch establishment in Azerbaijan too)
°C	Centigrade
Cd	Cadmium
cm	Centimetres
COC	Chain of Custody
Cr	Chromium
CTD	Conductivity, temperature and depth (+ others)
CVAA	Cold vapour atomic absorption spectrometry
EBS	Environmental Baseline Study
ERL	Effects Range Low
ERM	Effects Range Medium
GC/FID	Gas chromatography
GC/MS	Gas chromatography/mass spectrometry
Hg	Mercury
ICP	Inductively coupled plasma spectrometry
kg	Kilogram
L	Litre
m	Meter
mg/kg	Milligrams per kilogram
mg/L	Milligrams per litre
MDL	Method detection limit
Mid	Middle (means for sea water column)
mL	Millilitre
mln	Million
mm	Millimetre
ng/L	nanogramme per litre
PAH	Polycyclic aromatic hydrocarbons
Pb	Lead
ppm	per part million (=mg/kg dry sediment in this project or mg/L)
ppb	per part billion (=ug/kg dry sediment in this project or ug/L)
PSA	Production Sharing Agreement
SD	Shah-Denis field
SOCAR	State Oil Company of the Azerbaijan Republic
SOP	Standard Operating Procedures
Sur	Surface (means for sea water column)
TOC	Total organic carbon
TSS	Total suspended solids
ug	micrograms (recommend to use instead of µg)
ug/L	Micrograms per litre
ug/kg	Micrograms per kg (means per kg dry weight of sediment in this project)
USEPA	United States Environmental Protection Agency
Zn	Zinc

1 General Presentation of the study

An environmental baseline study (EBS) survey on research vessel Alif Gajiyev was conducted from 04-06 March 2010 in the Absheron Block area, where are established 28 bottom sediment and 4 water column quality monitoring stations in frame of contract TEPab-09-04-00 between Total E&P ABSHERON B.V- Azecolab companies. Deepness of sampling stations changes between 215 and 606 m. 17 sampling stations were distributed directly around proposed drilling location for well ABX-2, additional 11 station placed in locations which allow to control of sea water current effects and influence of oil-gas production activities in adjacent ACG (Azeri-Chirag-Guneshli) and SD (Shah Deniz) oil-gas fields.

This EBS document are giving of Caspian Sea survey and lab tests results, and describes the chemical, physical and biological properties of Absheron Block sediments and the water column.

Sediments

Sediments were sampled from all 28 monitoring stations and consisted primarily of fine and very fine silts. Grain size was not significantly correlated with depth. Average clay composition was about 20%, indicating a general compatibility with clay based drilling mud. Most of the sites had well-sorted sediments, particularly at shallower depths in the western portion of the block.

Average sediment organic carbon exceeded 3% of sediment dry weight, indicating a relatively high capacity for binding of contaminants. Total organic carbon concentrations generally increased from west to east within the prospect, and were positively correlated with increasing depth and with finer sediments.

Study of inputs of petroleum related hydrocarbons, measured as TPH and PAH were one of the targets of this study, because previous drilling activity in this area and oil production activity in adjacent ACG and SD oil-gas fields. Between 28 sediments samples only in 2 sampling points, TPH were below applied method detection limit (10 ppm) and totally in 8 samples were below 50 ppm, which is determined as indicator concentration for applying of following PAHs and BTEX study. Between all 20 sediments samples intended for additional hydrocarbons tests, summary contents of 16EPA PAHs concentrations are changing between 315 to 1004 ppb, and no BTEX compounds were registered (MDL=95 ppb for sum of all BTEX compounds). There are not discovered direct relationship between maximum and minimum of hydrocarbons and dispositions or deepness of sampling points on base of current study database, which could be related by difference history and sceneries of accumulation of hydrocarbons in separate sampling points.

Eleven sediment “metals” were evaluated in sediment samples: arsenic, barium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, tin and zinc. Between them concentration of cadmium, cobalt, copper, mercury and nickel were below the average continental crust concentrations for these metals. Concentrations of arsenic, barium, chromium, lead, tin and zinc were above of average continental crust concentrations, but mainly were below or between the environmental risk assessments indicators limits ERL and ERM.

12 different group of species was found in the 28 bottom sediment sampling stations. The common benthic community indicators of total abundance, species density and biomass were highly variable between stations, with declining levels significantly correlated with increasing depth. In general, the biota were characterized by fewer species and relatively low abundance and biomass in comparison with the benthic community described from similar depths other area of Caspian sea.

Water Column

Water column physical parameters- temperature, pH, salinity, dissolved oxygen and transparency were studied in 4 study points by CTD profiling equipments with relevant sensors. Temperature had changed from 10.45 to 6.28°C, pH from 8.43 to 8.11, Conductivity from 19.36 to 19.99 mS/cm, salinity from 11.33 to 11.48 g/L, and dissolved oxygen from 7.89 to 3.21 mg/L during profiling from the surface till the bottom. In all study water columns turbidity were below sensor detection limit.

Discrete water column samples were collected from the surface, mid-water and near-bottom for chemistry (hydrocarbons, metals, suspended matter and nutrients,). Separate sampling program were implemented for phytoplankton and zooplankton taxonomy.

Trace concentration of TPH were below of indicator value 50 ppb for all 12 samples taken from 4 water sampling stations. Due to these low concentrations of TPH, PAH and BTEX study were not implemented in this case.

Between 9 studied heavy metals, concentration of Arsenic, Cadmium, Chromium, Copper, Mercury and Nickel were below applied method detection limits. Measurable concentration of metals were discovered for Zinc (between 2.2 and 18.9 ppb) and Barium (from 10.8 to 30.8 ppb). Unexpected elevation of Barium concentrations in several deep sampling points could be results of continuing drilling operations in adjacent oil-gas fields, although suspended particles concentration for all studied points were below MDL.

Between nutrients concentration of nitrates and nitrites have the same level for all samples. But concentration of orthophosphates were demonstrated of unusual elevations in deep water samples from station S12 (around 100 ppb) and bottom water samples of station St13 (35 ppb).

Phytoplankton were represented by species of dinoflagellates and diatoms typical of south Caspian sea waters. They were concentrated near the surface, showing no significant differences between sampling stations. Zooplankton consisted of Caspian species of crustaceans (mysids, copepods, amphipods) and fish larvae, showing little variation between stations. Zooplankton biomass levels were similar to previously reported values for the regions.

General view

In spite of intensive drilling and oil production activity in adjacent ACG, SD oil-gas fields, long term SOCAR activity, disposition of Absheron block not-far from industrial Baku region, predominate direction of currents from pollution sources situated in North-West and North, and previous drilling activity in same block, study results have demonstrated limited evidence of pollutions both in water column and bottom sediments. We consider, that surface and bottom water currents transport of pollutant originated from North and North-West through Absheron Block area without settling process, because contract area situated in reverse slope region of sea bottom compared with adjacent pollution sources. From this view, dense disposition of 17 monitoring stations around ABX-2 well will serve efficiently monitoring of drilling waste products dispersions both manage by wind and water currents and sea bottom slope profile conditions. Additional 11 monitoring stations will allow to collect data about transportation of pollutants from abroad of Absheron Block to contract area and vice versa.

2 Establishment of monitoring points

2.1 Disposition of contract area

Caspian sea is dividing into 3 section, North, Middle and South as is shown in Figure 2.1.

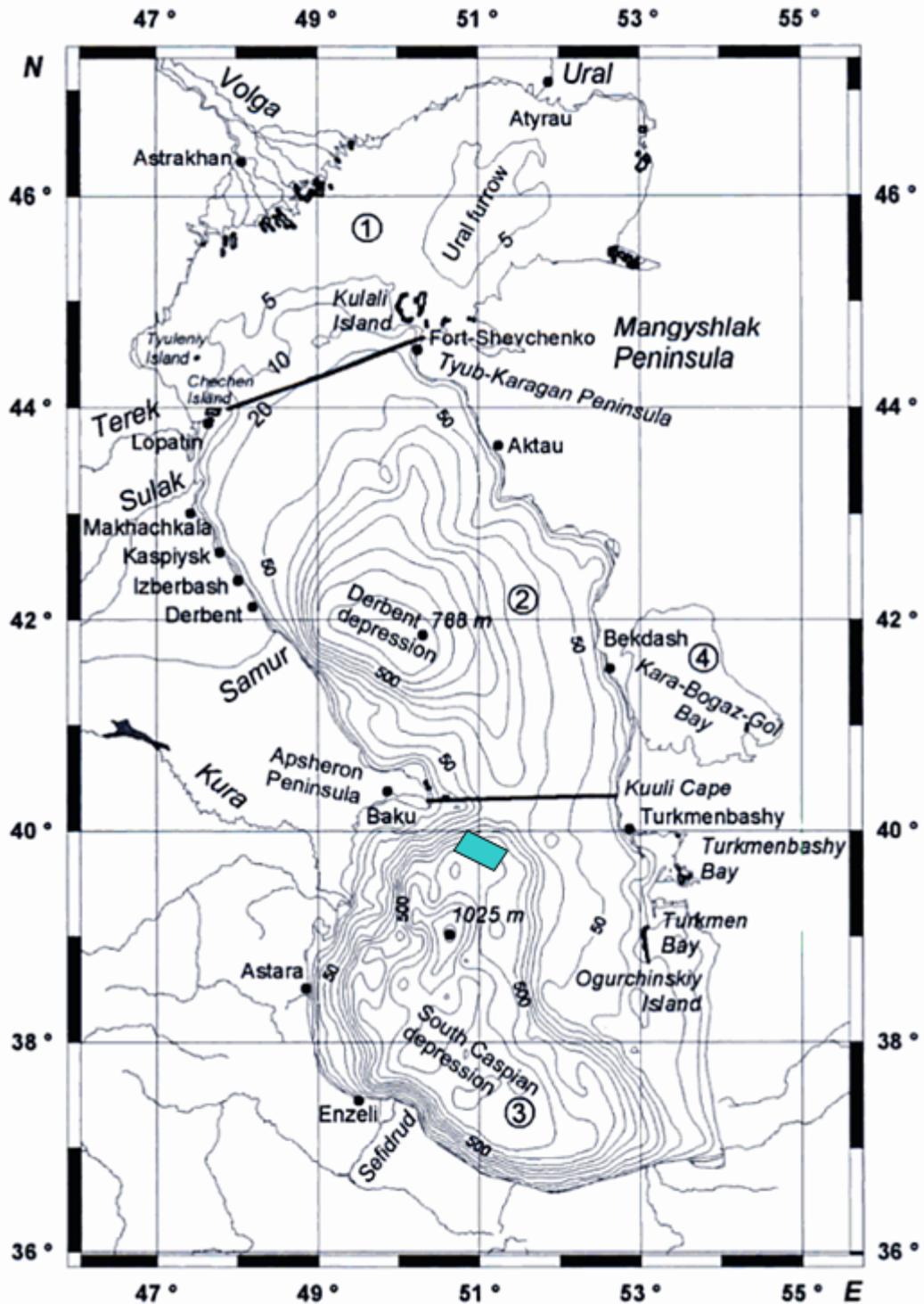


Figure 2.1 North Caspian-1, Middle Caspian-2, South Caspian-3 [1]

Absheron Block area are situated in South Caspian between already intensive used BP contract area Azeri-Chirag-Guneshli (ACG) and Shah-Deniz (SD) (Figure 2.2).

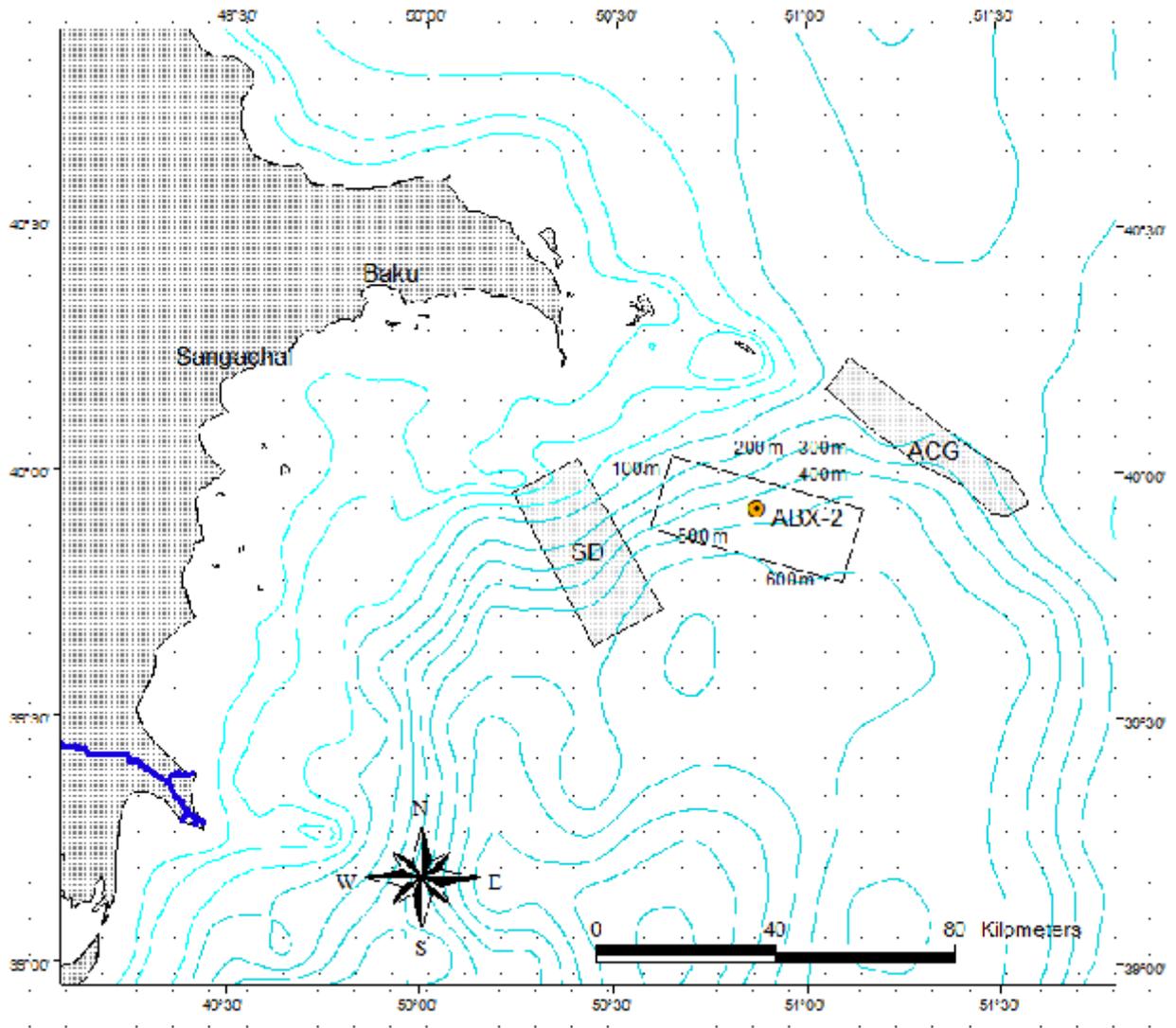


Figure 2.2 Absheron Block disposition

Table 2.1 collect of main geographic parameters of contract area. All coordinates are given according projection Gaus-Kruger in Pulkovo 1942 coordinate system for zone 9.

Table 2.1 Absheron Block coordinates (Pulkovo 1942, Gaus-Kruger-Zone9)

	Longitude (East)- DMS	Longitude (North)- DMS	Longitude (East)-meter	Longitude (North)-meter
Corner point-1, North-West	50° 38 '56"	40° 02' 15	9470033	4433830
Corner point-2, North-East	51° 08 '53"	39° 55' 39"	9512657	4421568
Corner point-3, South-East	51° 05 '36"	39° 46' 55"	9507996	4405400
Corner point-4, South-West	50° 35 '45"	39° 53' 28"	9465431	4417595
Proposed drilling point	50° 52 '19"	39° 55' 42"	9489045	4421655

One important aspect for contract area is related to its situation between 2 BP operating oil-gas fields:

- Azeri-Chirag-Guneshli in North-East
- Shah-Deniz in South-West

SOCAR oil fields, which are working for a long period, are also affecting the environmental condition in area from North and West directions,. Additional sources for environmental influence to contract area is Baku industrial zone (from North-West side).

2.2 Geological characterization of Absheron Block

The Absheron Block is located along the lower slope of the northern sector of the south Caspian Basin. Prospect depths range from 220-640 m, defining a topographically complex region of variable slope and configuration, including the presence of a mud volcano mound, evident in the eastern portion of the prospect.

A large sediment overburden typifies the entire south Caspian Basin, consisting of terrigenous minerals mixed with carbonate chemical precipitates and fragmented remains of biogenic origin, primarily mollusc shells and siliceous diatom skeletons. Regional sediments are typified by shelf-depth sands grading into silts and clays over offshore slopes and basins.

Sediment chemical concentration in the Absheron region are influenced by a history of onshore and offshore activities dating back over 100 years. Contaminants enter the Caspian Sea from urban and agricultural runoff, municipal wastes, industrial effluents, petroleum exploration and production, ship ballast waters and atmospheric deposition. Seeps from active mud volcanoes may provide additional sources of hydrocarbons to surrounding sediments. Although inputs from anthropogenic sources have been reduced in recent years, Baku Bay and surrounding coastal waters remain polluted (Kosarev and Yoblanska, 1994), and in turn may influence contaminant concentration in offshore sediments. Contaminants mainly consist of hydrocarbons, heavy metals, pesticides, phenols and surfactants, although only those contaminants potentially associated with offshore oil exploration and development (i.e., hydrocarbons and select metals) were included in this study.

2.2.1 Meteorological and Oceanographic Setting

Offshore air temperatures surrounding the Absheron prospect are expected to fall within an annual range of 4-26° C. Coastline temperatures on the Absheron Peninsula range from an average low of 1-2° C in January to 25° C in July. Annual precipitation is typically 200-300 mm. The wind field is mixed, prevailing most strongly from the north and northeast in winter, and from both north and south-eastern sectors in summer. Wind speeds exceeding 15 m-s-1 are present about one-third of the time, most frequently in winter and mid-summer. Transport of offshore surface waters toward shore may frequently occur.

Water column structure is significantly affected by the wind-field, which determines the depth of the mixed layer and drives the processes of regional water mass transport. In summer, upper water column properties are highly stratified leading and a strong density gradient develops below the surface mixed layer. Vertical convection occurs during the winter period of minimal density stratification, typically extending to depths of around 100-200 m. During severe winters, uniform cooling of the water column may extend convective transport to depths exceeding 500 m, thus bottom water characteristics (e.g., oxygen replenishment) may be driven by irregular and episodic climatic events. Temperatures below a depth of 200 m range from 5-8° C year round.

Under moderate wind conditions (<15 m-s-1), wave heights between 1 and 2 m are the norm. Waves of 3 m or more develop over most of the south Caspian Sea when winds exceed 15 m-s-1, occurring up to 37% of the time. From the Absheron Peninsula, south to the Kura River, net movement of weak currents offshore is primarily to the south. Closer to shore, movement is frequently to the north, indicating the presence of a cyclonic gyre.

Salinity of the Caspian Sea is presently about one-third of seawater strength at 11 parts-per-thousand (‰), varying over the last century by 3-4 ‰ in response to long term climatic changes affecting rainfall, evaporation and volume of freshwater input from rivers. Seasonal changes may be expected to change on the order of 0,5‰.

Biological Setting

The marine life of the Caspian Sea has derived its origin and evolution from previous connects with the Black, Azov, Aral and Mediterranean Seas. Over geological time, conditions have fluctuated between connections with basins of freshwater and marine origin. This lack of

stability of the physical-chemical regime provides an explanation for the relatively low biodiversity of the Caspian biota in comparison with stable marine habitats.

The sea furnishes a major portion of the world's sturgeon stock and about 40 fish species have commercial value, mainly sturgeon, salmon, shads and carps. Algae and sea grasses form the base of the food chain for the demersal (bottom) fisheries. This food source, often in detrital form, supports a well-developed shallow-water benthic invertebrate fauna dominated by crustaceans and molluscs. Small diatom and dinoflagellate species of phytoplankton are primary producers at the base of the open-water food chain. Peak plankton production occurs in spring and summer months. Sufficient sources of nutrients (nitrogen, phosphorous) are available to support high levels of primary production, up to 3 g-m-2-d-1. Secondary production in open-water is primarily from smaller species of copepod and larger mysid crustaceans. Fish species, such as kilka, shad, and silversides spend their entire life cycle in open-water habitat, generally in shallower areas of the shelf and upper slope, relying upon planktonic food sources.

More than 40 species of wildfowl inhabit the near shore region to the southwest of the area, mainly along the Absheron Peninsula and in the Kura River delta region. Limited data are available regarding offshore bird populations. The Caspian seal is the only aquatic mammal present. It occurs in shallow shelf habitat throughout the Caspian and has been classified as vulnerable due to degradation of beach haul-out habitats and effects of coastal industrialization.

2.3 Water currents in contract area

There are some discussion about water current in South Caspian and therefore in contract area too. Generally, current direction in Caspian sea are fully determined by wind direction modified by sea bottom profiles and sea salinity. Although in literature was noted, that there is absent permanent currents, during long period, predominate water current direction in this area considered as “South West”. But during last decade, Caspian sea scientists have made series of new models, based both offshore experiments and application of computer modeling. As results currently predominate surface water current direction in contract area considered as “North-East”, which are confirming by preliminary results of ongoing NATO SfP project.

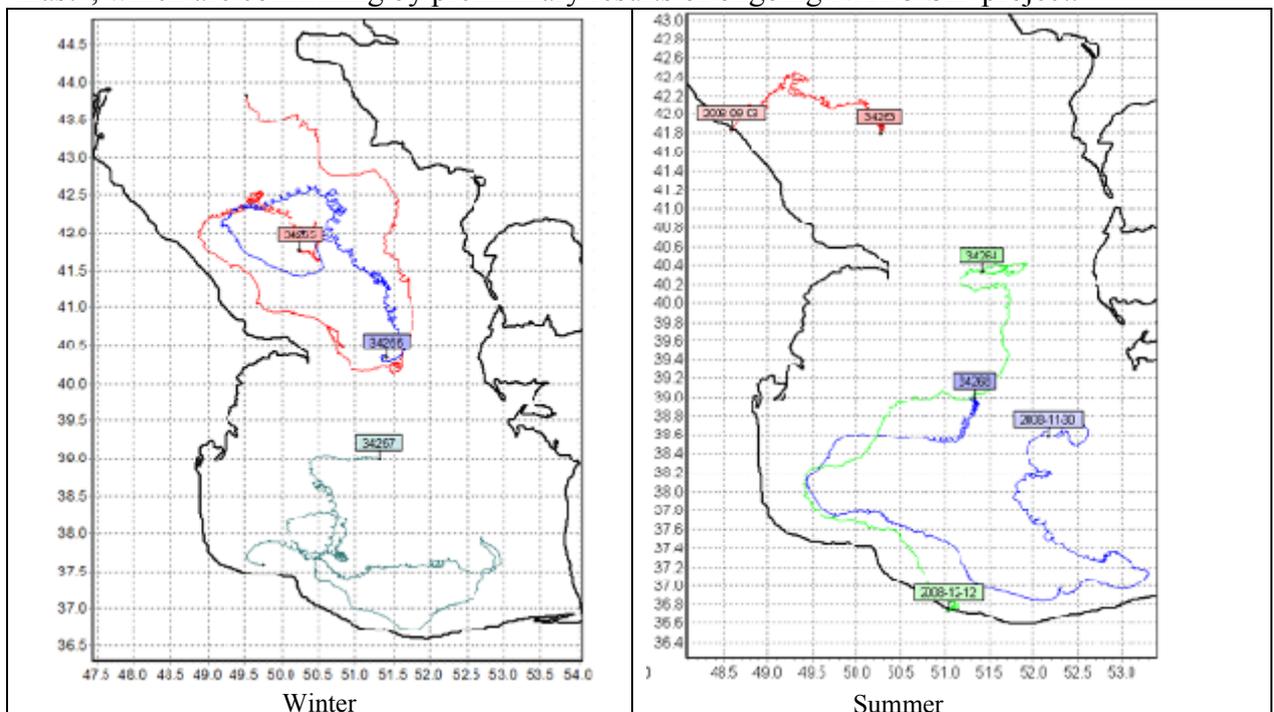


Figure 2.3 Drifter study of water current in Caspian sea

It is important to note, that treatment of drifter study results were implemented namely for this EBS project, and even before starting of project MENR of Azerbaijan had considered as South-

West direction as predominate for current in contract area. Results of modelling implemented in frame of current project (Dr Ramiz Mamedov group) had given new output for forecasting of predominate water current. This results are complying by modelling of Prof. Kosarev.

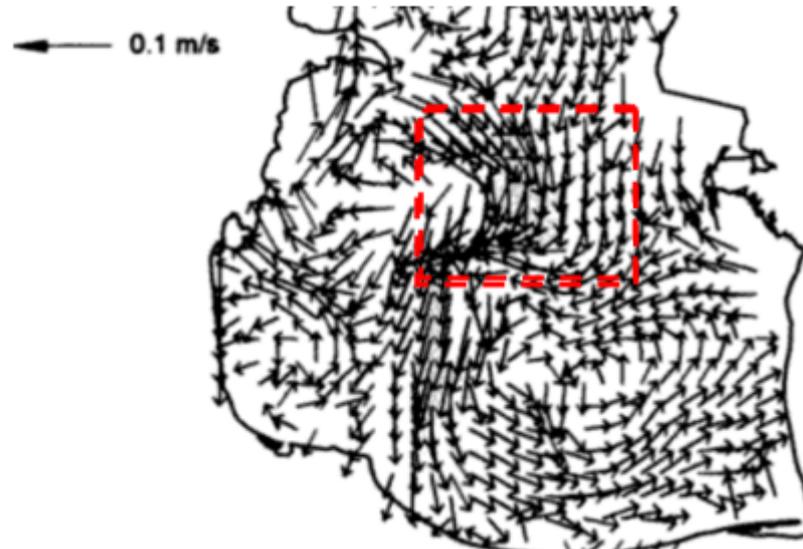


Figure 2.4 Predominate surface current directions in contract area

2.4 Marine transport activity in contract area

A detailed description of the shipping activity in Azerbaijan waters and in the whole of the Caspian Sea has not been provided at detailed level here. Historically the overall transportation pattern indicating substantial traffic in the west-east-west direction in the southern part of the Caspian Sea, which cover also Absheron block area. Figure 2.5 indicates 3 ship routes to Iran and Turkmenistan, which could be taken into consideration.



Figure 2.5 Ship routes in the Caspian Sea

2.5 Oil production activity in adjacent fields

Azeri-Chirag-Guneshli and Shah-Denis are main oil-gas production fields in the Azeri sector of the Caspian sea now. ACG is situated in North-East of Absheron-Block and SD is situated in South-West of Absheron Block. Series of exploration and production wells were drilled in both fields and it is realistic to expect possible influence of both drilling and production activity in ACG and SD to the environmental condition in Absheron Block. Figure 2.4 is demonstrated that more probable effects could be expected from activity in ACG. Therefore monitoring strategy have to consider ACG influence in 1st approach.

Established sampling stations

As results of Azecolab consultation with Total-Absheron and MENR, 28 sediment and 4 water column monitoring stations were established on base of updated view for surface water currents in contract area and to monitor of active ACG-BP and SD-BP oil-gas fields influences (Figure 2.6).

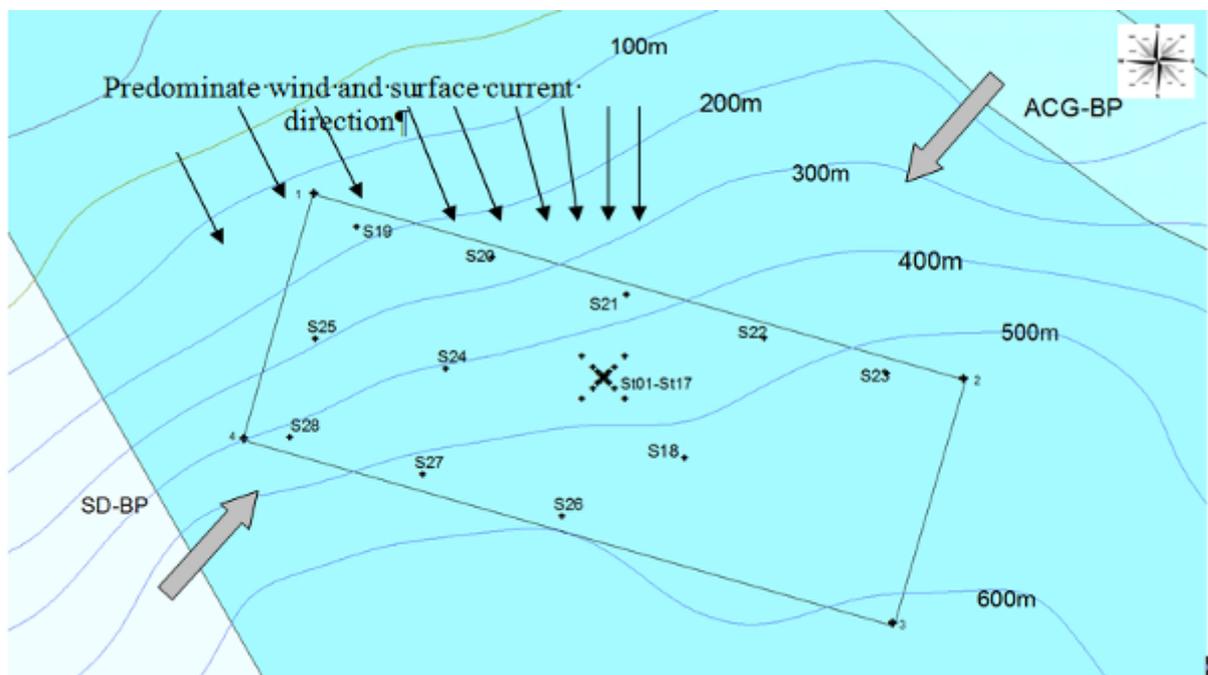


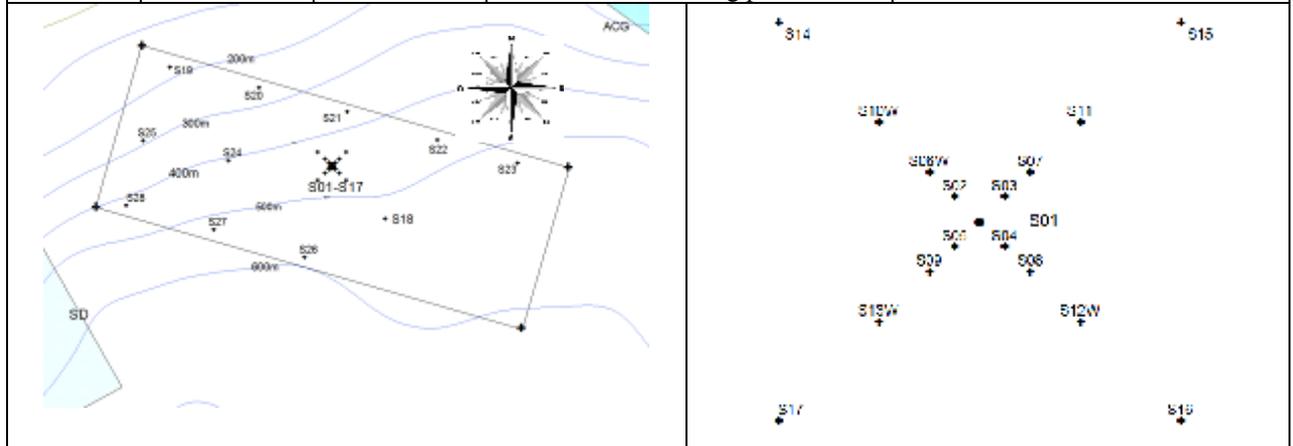
Figure 2.6 Approved disposition of monitoring stations

Figure 2.6 have demonstrated of final agreed disposition of 17 “intersection” monitoring stations (from ST01 to St17) directly around of proposed drilling point St01, and 11 additional stations pointed to collect of regional environmental influence data.

In 2 intersection lines (from North-West and North-East) are distributed 17 stations, where numbering were made beginning from drilling points and from nearing north-west points in round base. Distances from drilling point (S01) are 250 m, 500 m, 1000 m and 2000 m in intersection lines. Table 2.2 are describing of disposition and roles of monitoring stations both for interpretation of environmental baseline study results and for organization of environmental monitoring of Total-Absheron activity in contract area.

Table 2.2 Description of established 28 monitoring stations

St#	Long-m	Latt-m	Disposition details	Proposed monitoring roles
S01	9489045	4421655	This is proposed drilling point	Basic description in work place
S02	9488868	4421832	250 m north-west from St01	Drill cutting accumulation
S03	9489222	4421832	250 m north-east from St01	Drill cutting accumulation
S04	9489222	4421478	250 m south-east from St01	Drill cutting accumulation
S05	9488868	4421478	250 m south-west from St01	Drill cutting accumulation
S06W	9488691	4422009	500 m north-west from St01	Drill cutting accumulation
S07	9489399	4422009	500 m north-east from St01	Drill cutting accumulation
S08	9489399	4421301	500 m south-east from St01	Drill cutting accumulation
S09	9488691	4421301	500 m south-west from St01	Drill cutting accumulation
S10W	9488338	4422362	1000 m north-west from St01	Drill cutting accumulation
S11	9489752	4422362	1000 m north-east from St01	Drill cutting accumulation
S12W	9489752	4420948	1000 m south-east from St01	Drill cutting accumulation
S13W	9488338	4420948	1000 m south-west from St01	Drill cutting accumulation
S14	9487631	4423069	2000 m north-west from St01	Drill cutting accumulation
S15	9490459	4423069	2000 m north-east from St01	Drill cutting accumulation
S16	9490459	4420241	2000 m south-east from St01	Drill cutting accumulation
S17	9487631	4420241	2000 m south-west from St01	Drill cutting accumulation
S18	9494348	4416352	7500 m south-east from St01	South-east surface current inflow
S19	9472835	4431614	In North-West of contract area	Shallow and reverse current point
S20	9481732	4429574	In North-West of contract area	Reference station, reverse current
S21	9490548	4427125	North to drilling point	Influence from ACG
S22	9499567	4424268	North-East to drilling point	Influence from ACG
S23	9507608	4421942	North-East to drilling point	Influence from ACG
S24	9478702	4422235	West to drilling point	Influence from ACG and SD
S25	9470138	4424207	West to drilling point	Influence from ACG and SD
S26	9486303	4412473	South to drilling point	Influence from SD
S27	9477202	4415248	South-West to drilling point	Influence from SD
S28	9468468	4417697	South-West to drilling point	Influence from SD



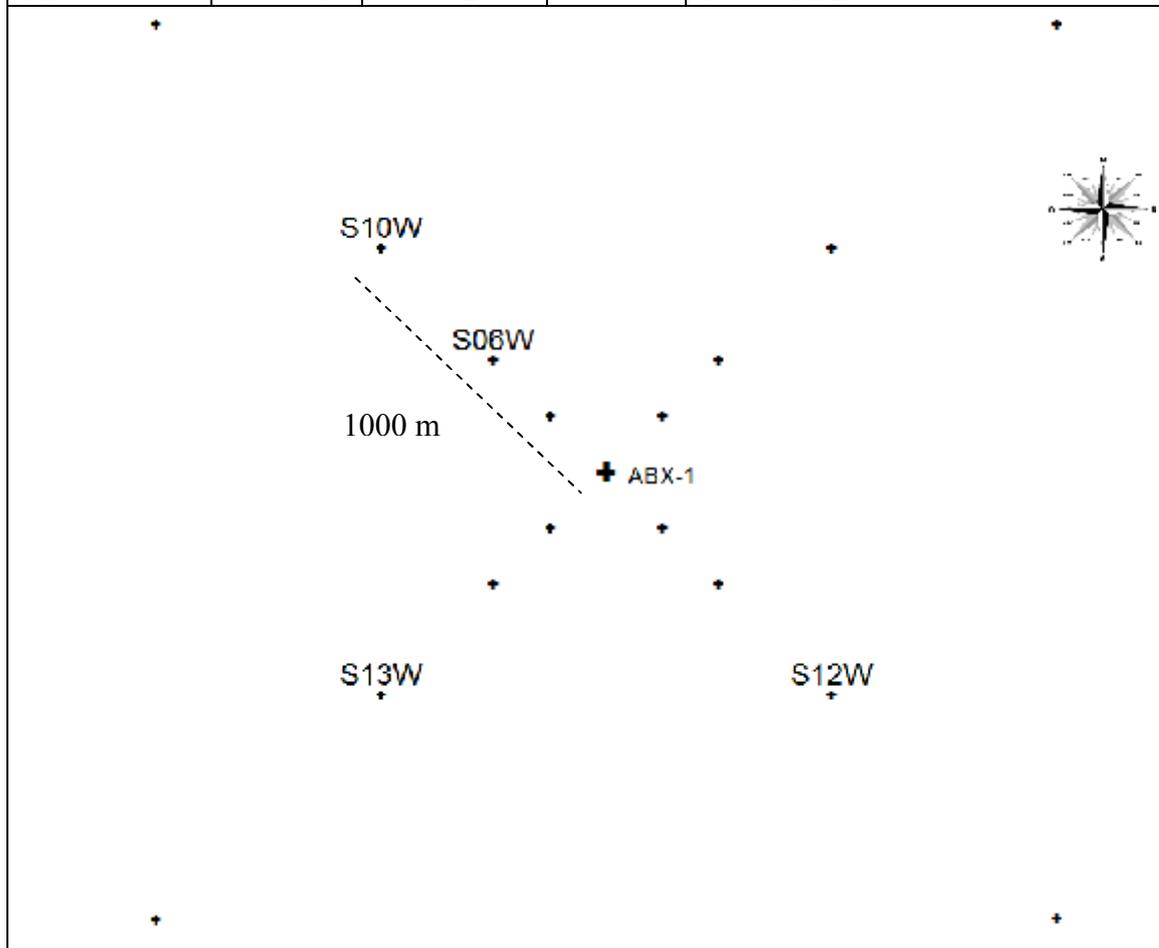
3 Absheron Block- water column quality

3.1 Water monitoring station descriptions

For physical description of water column around ABX-2 drilling well 4 monitoring stations were established. Monitoring stations S12W (1000 m South-East from ABX-2) and S13W (1000 m South-West from ABX-2) intended to control of water quality in direction of main surface water currents in drilling area, stations S06W (500 m North-West from ABX-2) and S10W (1000 m North-West from ABX-2) established in reverse direction for surface water currents and more probable direction for sea bottom water currents.

Table 3.1 Water column monitoring stations

St#	Long-m	Latt-m	Deep.-m	Role
S01 (ABX-2)	9489045	4421655	484	Proposed drilling point
S06W	9488691	4422009	480	500 North-West, reverse current
S10W	9488338	4422362	470	1000 North-West, reverse current
S12W	9489752	4420948	484	1000 South-West
S13W	9488338	4420948	496	1000 South-East



The deepness of all 4 water quality monitoring station were comparable- between 470-496 m and maximal distance (between S10W and S12W) was 2000 m. Such disposition allow to use average values of physical parameters of water column of 4 studied stations and fix them as representative water quality parameters for contract area.

3.2 CTD study results

Water column physical parameters- temperature, pH, salinity, dissolved oxygen and transparency were studied in 4 study points by CTD profiling equipments with relevant sensors. During profiling from the surface till the bottom CTD temperature and pH sensors had registered of below spans during profiling from the surface till the bottom (see as example in Figure 3.1 profiles for water column in station S13W):

- Temperature from 10.45 to 6.28°C
- pH from 8.43 to 8.11

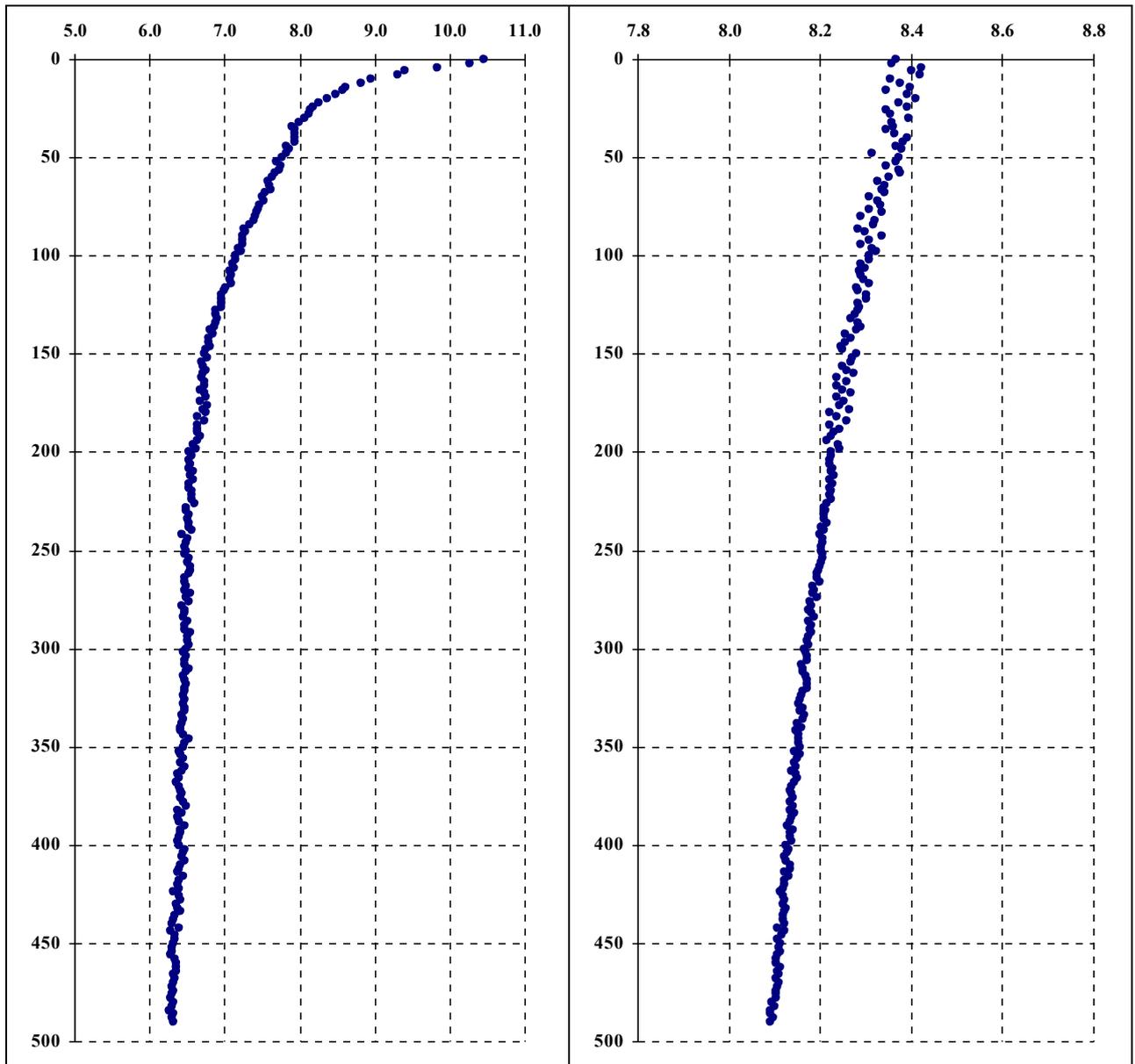


Figure 3.1 Temperature and pH for water column profiles- S13W

Electric conductivity sensor have registered below spans for conductivity and salinity spans in study regions (see as example in Figure 3.2 profiles for water column in station S13W):

- Conductivity from 19.36 to 19.99 mS/cm
- Salinity from 11.33 to 11.48 g/L

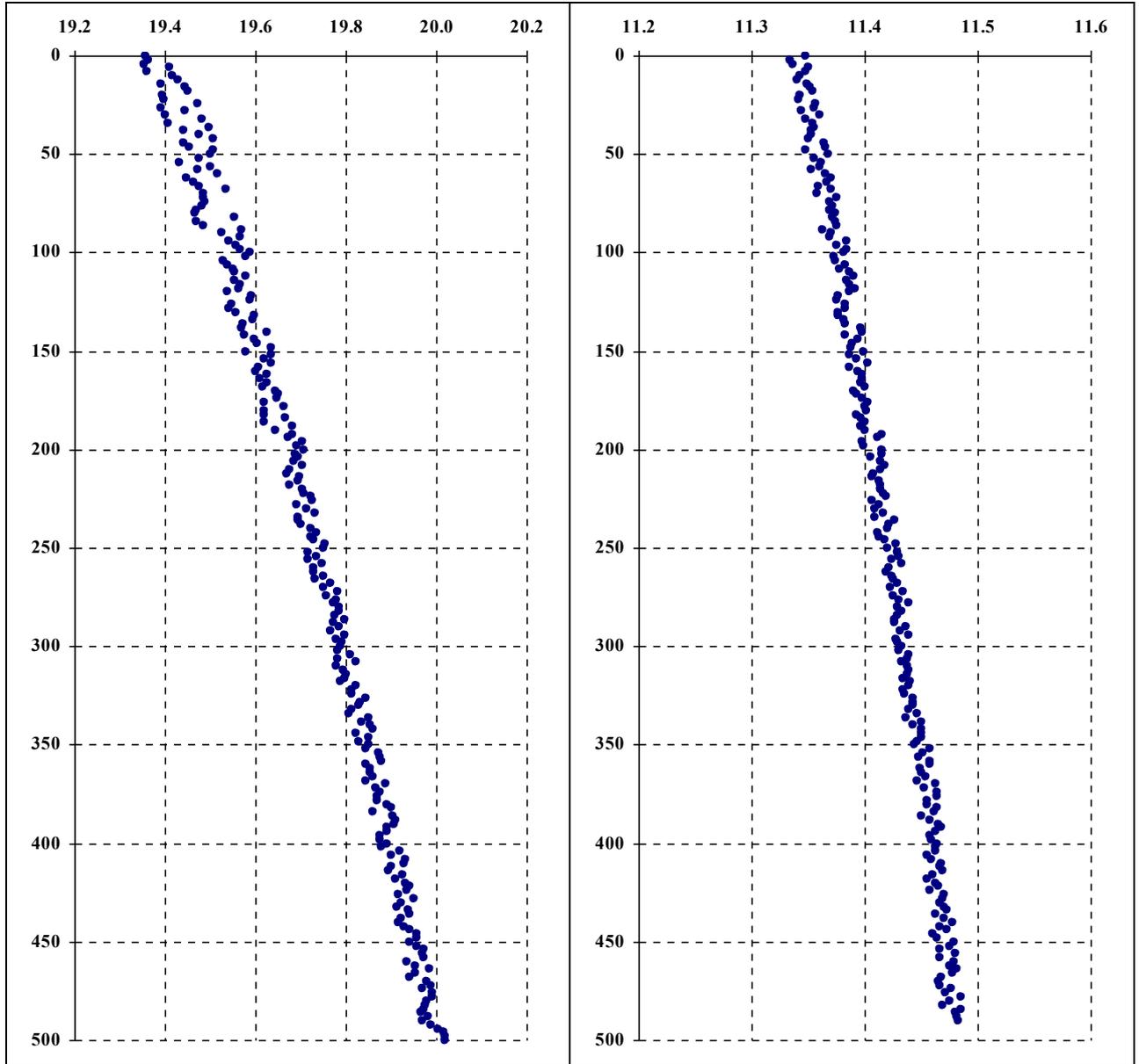


Figure 3.2 Conductivity and salinity for water column profiles- S13W

In all study water columns turbidity were below sensor detection limit.

Dissolved oxygen sensor have registered below spans in study regions (see as example in Figure 3.3) profiles for water column in station S13W):

- Dissolved oxygen from 7.89 to 3.21 mg/L

during profiling from the surface till the bottom. In all study water columns turbidity were below sensor detection limit.

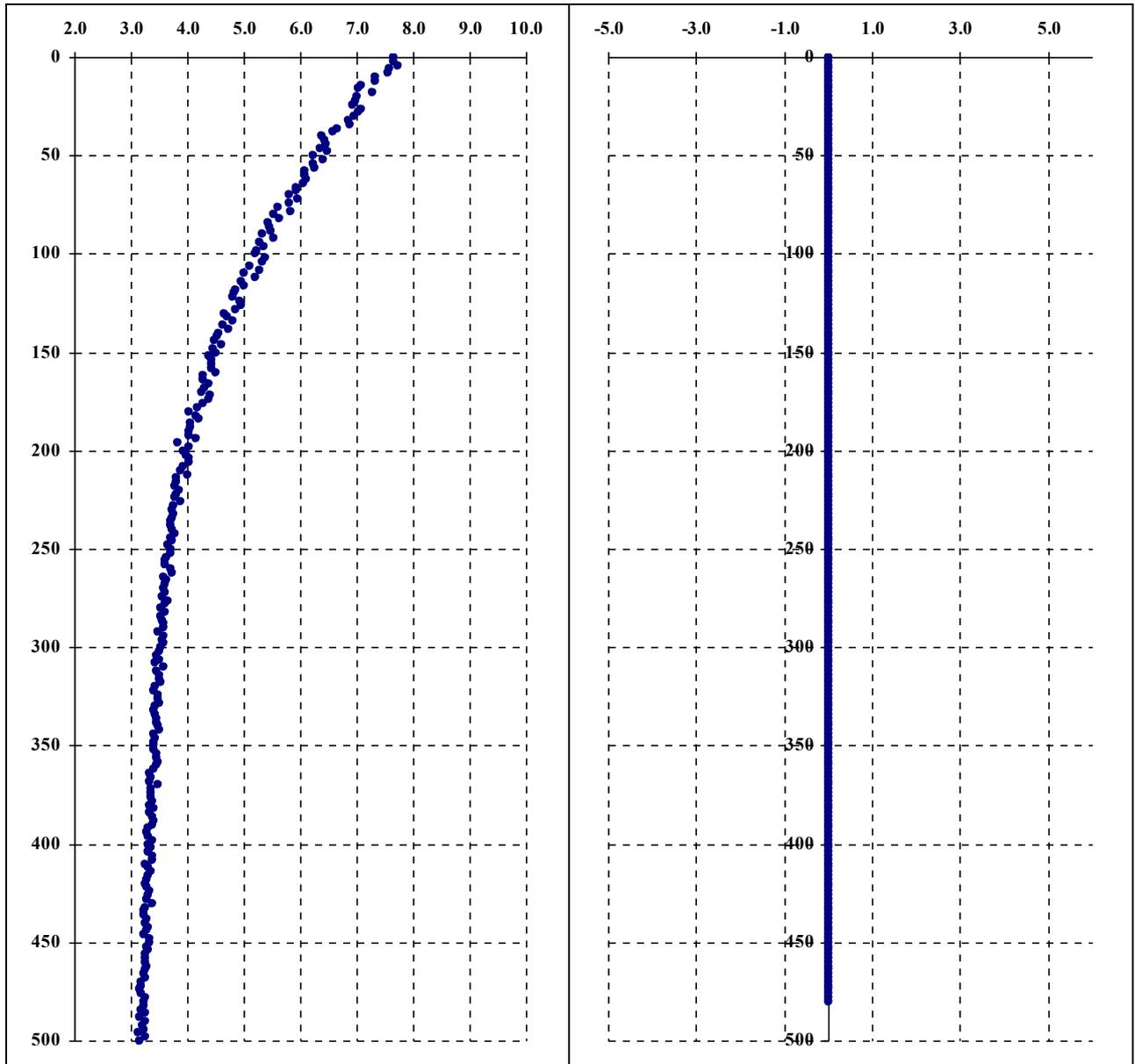


Figure 3.3 Dissolved oxygen and turbidity for water column profiles- S13W

Table 3.2 are collecting of water column physical parameters in surface, middle and bottom points of water column in sampling stations, where were taken of water samples for lab chemical tests.

Table 3.2 Water physical parameters in water sampling points

		St06	St10	St12	St13
	Deepness	484	470	484	496
T (°C)	Sur	9.61	9.58	10.24	10.45
T (°C)	Mid	6.47	6.46	6.45	6.47
T (°C)	Bot	6.28	6.30	6.30	6.32
pH	Sur	8.36	8.43	8.39	8.37
pH	Mid	8.20	8.22	8.20	8.20
pH	Bot	8.11	8.11	8.10	8.09
DO (mg/l)	Sur	7.70	7.89	7.52	7.65
DO (mg/l)	Mid	3.71	3.79	3.77	3.64
DO (mg/l)	Bot	3.21	3.25	3.23	3.25
Ec (mSm/cm)	Sur	19.37	19.36	19.41	19.36
Ec (mSm/cm)	Mid	19.74	19.69	19.71	19.75
Ec (mSm/cm)	Bot	19.99	19.96	19.97	19.97
Sal (g/l)	Sur	11.33	11.33	11.35	11.35
Sal (g/l)	Mid	11.42	11.41	11.42	11.43
Sal (g/l)	Bot	11.48	11.48	11.47	11.48
Turb (NTU)	Sur	0	0	0	0
Turb (NTU)	Mid	0	0	0	0
Turb (NTU)	Bot	0	0	0	0

3.3 Nutrients- Nitrates, Nitrites, Orthophosphates

Nitrates, Nitrites and Orthophosphates compose main nutrients for phytoplankton and therefore it is important to monitor their contents. Concentration of nitrates and nitrites had the same level for all samples. But concentration of orthophosphates had demonstrated unusual elevations in deep of water column of station S12 (around 100 ppb) and bottom of St13 (35 ppb) in compare with samples from 9 other samples (4÷15 ppb).

Table 3.3 Nutrient compounds in water monitoring station

ppm	Deepness	St06	St10	St12	St13
		484	470	484	496
Nitrates	Sur	1.6	1.4	1.5	1.3
Nitrates	Mid	1.3	1.6	2.0	1.2
Nitrates	Bot	1.6	1.4	1.9	1.5
Nitrites	Sur	0.012	0.007	0.012	0.007
Nitrites	Mid	0.012	0.012	0.009	0.016
Nitrites	Bot	0.015	0.008	0.011	0.011
Orthophosphates	Sur	0.004	0.006	0.009	0.015
Orthophosphates	Mid	0.014	0.015	0.088	0.016
Orthophosphates	Bot	0.013	0.013	0.104	0.035

3.4 Total suspended solids

Total suspended solids is important parameters to control of particulate contamination of studied waters.

Table 3.4 Total suspended solids study results

ppm	Deepness	St06	St10	St12	St13
		484	470	484	496
TSS	Sur	<4	<4	<4	<4
TSS	Mid	<4	<4	<4	<4
TSS	Bot	<4	<4	<4	<4

3.5 TPH, PAHs, BTEX

According agreement with Customer and MENR, at 1st stage of hydrocarbons study in water, all samples are testing for TPH level. EPA 16 PAHs and BTEX tests were planned to apply for samples, where TPH > 0.05 ppm.

Table 3.5 TPH test results

ppm	Deepness	St06	St10	St12	St13
		484	470	484	496
TPH	Sur	<0.05	<0.05	<0.05	<0.05
TPH	Mid	<0.05	<0.05	<0.05	<0.05
TPH	Bot	<0.05	<0.05	<0.05	<0.05

As, TPH contents were below <0.05 mg/L for all samples, according for project conditions, both PAHs and BTEX tests were not implemented.

3.6 Heavy metals: As, Ba, Cd, Cr, Cu, Hg, Pb, Ni and Zn

All water samples had tested by AAS methods for detection of heavy metals content in sea water of Absheron Block. Between 9 studied heavy metals, concentration of Arsenic, Cadmium, Chromium, Copper, Lead, Mercury and Nickel were below applied method detection limits. Measurable concentration of metals was discovered for Zinc (between 2.2 and 18.9 ppb) and Barium (between 10.8 and 30.8 ppb). Unexpected elevation of Barium concentrations (till 30.8 ppb) in several deep sampling points could be results of continuing drilling operations in adjacent oil-gas fields, although suspended particles concentration for all studied points were below MDL.

Table 3.6 Heavy metals in water samples

ug/L		As	Ba	Cd	Cr	Cu	Ni	Pb	Zn	Hg
		1.5	1.7	0.15	0.3	2.1	2.1	2.1	0.3	0.2
S06W	Surf	<1.5	12.1	<0.15	<0.3	<2.1	<2.1	<2.1	6.8	<0.2
S06W	Mid	<1.5	29.6	<0.15	<0.3	<2.1	<2.1	<2.1	6.4	<0.2
S06W	Bot	<1.5	14.8	<0.15	<0.3	<2.1	<2.1	<2.1	6.8	<0.2
S10W	Surf	<1.5	12.4	<0.15	<0.3	<2.1	<2.1	<2.1	9.8	<0.2
S10W	Mid	<1.5	24.8	<0.15	<0.3	<2.1	<2.1	<2.1	12.6	<0.2
S10W	Bot	<1.5	15.7	<0.15	<0.3	<2.1	<2.1	<2.1	8.12	<0.2
S12W	Surf	<1.5	11.9	<0.15	<0.3	<2.1	<2.1	<2.1	7.6	<0.2
S12W	Mid	<1.5	30.8	<0.15	<0.3	<2.1	<2.1	<2.1	18.9	<0.2
S12W	Bot	<1.5	29.6	<0.15	<0.3	<2.1	<2.1	<2.1	5.7	<0.2
S13W	Surf	<1.5	10.8	<0.15	<0.3	<2.1	<2.1	<2.1	2.2	<0.2
S13W	Mid	<1.5	15.5	<0.15	<0.3	<2.1	<2.1	<2.1	9.2	<0.2
S13W	Bot	<1.5	27.2	<0.15	<0.3	<2.1	<2.1	<2.1	15.6	<0.2

3.7 Planktons in ABX-2 drilling area

3.7.1 Phytoplanktons

24 type phytoplankton species were discovered in region of ABX-2 drilling well position, including 4 species of Cyanophyta, 13 species of Bacillariophyta 2 species of Chlorophyta and 4 species of Dinophyta.

Total number of phytoplankton in all studied sampling stations are changing between 150.4 mln col/m³ (S13) to 170.2 mln col/m³ (S06) with average value of 162.5 mln col/m³. Total biomass in studied stations are changing between 1143.1 mg/m³ (S10) till 1960.1 mg/m³ (S12) with mean value as 1579 mg/m³.

Number of phytoplanktons per isolates are changing as following:

- 0÷25 m level- beginning from 75.7 mln col/m³ (S10) to 102.1 mln col/m³ (S12) with average value of 86.7 mln col/m³
- 25÷50 m level- beginning from 64.0 mln col/m³ (S13) to 79.6 mln col/m³ (S06) with average value of 71.8 mln col/m³
- 50÷100 m level- beginning from 2.9 mln col/m³ (S13) to 5.1 mln col/m³ (S06) with average value of 3.9 mln col/m³

Biomass of phytoplanktons per isolates are changing as following:

- 0÷25 m level- beginning from 549.4 mg/m³ (S10) to 1206.7 mg/m³ (S12) with average value of 892.4 mg/m³
- 25÷50 m level- beginning from 460.1 mg/m³ (S13) to 667.9 mg/m³ (S12) with average value of 572.1 mg/m³
- 50÷100 m level- beginning from 85.8 mg/m³ (S12) to 185.0 mg/m³ (S13) with average value of 114.5 mg/m³

In all studied stations phytoplankton distribution dynamics were similar, and its number and biomass are consecutively decreasing with studying of more deepness water level. Thus, quantitative indexes on level 0÷25 m were higher compared with level 25÷50 m, and less indexes were registered for water level 50÷100 m.

The predominate type of phytoplankton species in all studied water levels were diatomic alga, and in level 0÷25 m they compose 89% from summary number of phytoplankton, in level 25÷50 m diatomic alga contents 91.5% and in level 50÷100 m 96.3% from total biomass of phytoplanktons.

Table 3.7 Water column S06- Phytoplankton species

N-number (mln col/m ³) B- biomass (mg/m ³)		0÷25 m		25÷50 m		50÷100 m	
		N	B	N	B	N	B
Cyanophyta	<i>Gomphosphaeria aponina</i> Kutza	-	-	-	-	-	-
	<i>Microcystis grtvillei</i> Elenk	0.8	4.0	0.5	2.5	0.2	1.0
	<i>Microcystis aureginosa</i> Kutza	0.1	1.5	0.3	3.45	-	-
	<i>Anabaenopsis tanganyikale</i> Phil.	1.6	0.032	1.9	0.038	-	-
Bacillariophyta	<i>Pseudosolenia calcar-avis</i> Scülz.	5.0	850.0	2.8	476.0	1.0	170.0
	<i>Pseudosolenia fragilissima</i> Ber.	12.8	76.8	12.5	75.0	1.8	10.8
	<i>Chaetoceros rigidus</i> Ostf.	-	-	2.6	0.22	0.3	0.025
	<i>Chaetoceros socialis</i> Laut.	2.0	1.0	-	-	-	-
	<i>Chaetoceras wighamii</i> Bright	48.0	48.0	50.0	50.0	1.5	1.5
	<i>Thalassiosira incerta</i> Makar.	-	-	-	-	-	-
	<i>Thalassiosira caspica</i> Makar.	1.2	0.6	1.5	0.75	-	-
	<i>Thalassiosira variabilis</i> Makar.	0.6	0.3	0.4	0.2	-	-
	<i>Coscinodiscus granii</i> Gough.	0.8	60.0	0.5	37.5	-	-
	<i>Coscinodiscus jonesianus</i> Ostf.	1.0	3.75	0.4	1.5	-	-
	<i>Coscinodiscus radiatus</i> Ehr.	-	-	0.5	1.87	-	-
	<i>Thalassionema nitzkchioides</i> Grun.	1.5	1.95	0.6	0.78	-	-
<i>Sceletonema costatum</i> Grev.	5.6	1.68	2.4	0.72	-	-	
Chlorophyta	<i>Scenedesmus quadricauda</i> Breb.	0,5	0,01	0,8	0,016	-	-
	<i>Binuclearia lauterbornii</i> Pr.-I	0,8	0,14	0,3	0,052	-	-
Dinophyta	<i>Glenodinium capsicum</i> Ostf	0.6	7.8	0.4	5.2	-	-
	<i>Exuviaella cordata</i> Ostf.	1.4	2.8	0.6	1.2	0.2	0.4
	<i>Goniaulax polyedra</i> Stein.	0.5	2.5	0.2	1.0	-	-
	<i>Goniaulax spinifera</i> Dies.	-	-	-	-	-	-
	<i>Prorocentrum scutellum</i> Schröd.	0.6	7.5	0.4	5.0	0.1	1.25
Total		85.4	1070.3	79.6	663.0	5.1	185.0

Table 3.8 Water column S10- Phytoplankton species

N-number (mln col/m ³) B- biomass (mg/m ³)		0÷25 m		25÷50 m		50÷100 m	
		N	B	N	B	N	B
Cyanophyta	<i>Gomphosphaeria aponina</i> Kutza	1.0	62.5	0.6	37.5	-	-
	<i>Microcystis grtvillei</i> Elenk	0.4	2.0	0.2	1.0	-	-
	<i>Microcystis aureginosa</i> Kutza	-	-	0.2	2.3	-	-
	<i>Anabaenopsis tanganyikale</i> Phil.	1.0	0.02	0.8	0.016	-	-
Bacillariophyta	<i>Pseudosolenia calcar-avis</i> Scülz.	1.2	204.0	1.5	255.0	0.5	85,0
	<i>Pseudosolenia fragilissima</i> Ber.	11.6	69.6	12.2	73.2	1.5	9,0
	<i>Chaetoceros rigidus</i> Ostf.	1.5	0.09	2.0	0.13	-	-
	<i>Chaetoceros socialis</i> Laut.	1.5	0.75	2.5	1.5	-	-
	<i>Chaetoceras wighamii</i> Bright	36.5	36.5	34.0	34.0	2.0	2,0
	<i>Thalassiosira incerta</i> Makar.	1.4	4.2	0.8	2.4	0.1	0,3
	<i>Thalassiosira caspica</i> Makar.	0.8	0.4	1.0	0.5	-	-
	<i>Thalassiosira variabilis</i> Makar.	1.0	0.5	0.8	0.4	-	-
	<i>Coscinodiscus granii</i> Gough.	1.4	105.0	0.9	67.5	-	-
	<i>Coscinodiscus jonesianus</i> Ostf.	1.6	23.4	0.5	0.73	-	-
	<i>Coscinodiscus radiatus</i> Ehr.	0.5	1.87	0.3	1.12	-	-
	<i>Thalassionema nitzkchioides</i> Grun.	2.4	3.12	1.0	1.3	-	-
<i>Sceletonema costatum</i> Grev.	4.5	1.35	3.8	1.14	-	-	
Chlorophyta	<i>Scenedesmus quadricauda</i> Breb.	1.2	0.024	0.9	0.018	-	-
	<i>Binuclearia lauterbornii</i> Pr.-I	1.4	0.245	0.6	0.1	-	-
Dinophyta	<i>Glenodinium capsicum</i> Ostf	1.0	13.0	0.6	7.8	-	-
	<i>Exuviaella cordata</i> Ostf.	1.8	3.6	1.0	2.0	0.4	0,8
	<i>Goniaulax polyedra</i> Stein.	0.8	4.0	0.3	1.5	-	-
	<i>Goniaulax spinifera</i> Dies.	0.2	0.7	-	-	-	-
	<i>Prorocentrum scutellum</i> Schröd.	1.0	12.5	12.5	6.25	-	-
Total		75.7	549.4	79.0	497.4	4.5	96.3

Table 3.9 Water column S12- Phytoplankton species

N-number (mln col/m ³) B- biomass (mg/m ³)		0÷25 m		25÷50 m		50÷100 m	
		N	B	N	B	N	B
Cyanophyta	Gomphosphaeria aponina Kutza	1.8	112.5	1.2	75.0	0.2	12,5
	Microcystis grtvillei Elenk	1.5	7.5	0.6	3.0	-	-
	Microcystis aureginosa Kutza	0.2	2.3	-	-	-	-
	Anabaenopsis tanganyikale Phil.	1.5	0.3	1.0	0.02	-	-
Bacillariophyta	Pseudosolenia calcar-avis Scülz.	4.8	816.0	2.6	442.0	0.4	68,0
	Pseudosolenia fragilissima Ber.	14.1	84.1	8.5	51.1	0.6	3,6
	Chaetoceros rigidus Ostf.	3.5	0.296	1.9	0.16	-	-
	Chaetoceros socialis Laut.	1.5	0.75	0.8	0.4	-	-
	Chaetoceras wighamii Bright	52.0	52.0	36.0	36.0	1.5	1,5
	Thalassiosira incerta Makar.	2.0	6.0	1.2	3.6	-	-
	Thalassiosira caspica Makar.	1.6	0.8	1.0	0.5	-	-
	Thalassiosira variabilis Makar.	-	-	0.5	0.25	-	-
	Coscinodiscus granii Gough.	1.0	75.0	0.4	30.0	-	-
	Coscinodiscus jonesianus Ostf.	1.8	6.75	0.8	3.0	-	-
	Coscinodiscus radiatus Ehr.	0.8	2.99	0.6	2.24	-	-
	Thalassionema nitzkchioides Grun.	2.2	2.86	0.8	1.04	-	-
	Skeletonema costatum Grev.	6.4	1.92	3.8	1.14	0.5	0,171
Chlorophyta	Scenedesmus quadricauda Breb.	1.5	0.3	1.0	0.2	-	-
	Binuclearia lauterbornii Pr.-I	0.5	0.087	-	-	-	-
Dinophyta	Glenodinium capsicum Ostf	1.5	19.5	0.6	7.8	-	-
	Exuviaella cordata Ostf.	-	-	0.5	1.0	-	-
	Goniaulax polyedra Stein.	0.6	3.0	0.4	2.0	-	-
	Goniaulax spinifera Dies.	0.5	1.75	-	-	-	-
	Prorocentrum scutellum Schröd.	0.8	10.0	0.6	7.5	-	-
Total		102.1	1206.7	64.8	667.9	3.2	85.8

Table 3.10 Water column S13- Phytoplankton species

N-number (mln col/m ³) B- biomass (mg/m ³)		0÷25 m		25÷50 m		50÷100 m	
		N	B	N	B	N	B
Cyanophyta	Gomphosphaeria aponina Kutza	0.8	50.0	0.5	31.25	-	-
	Microcystis grtvillei Elenk	0.5	2.5	-	-	-	-
	Microcystis aureginosa Kutza	0.1	1.15	0.1	1.15	-	-
	Anabaenopsis tanganyikale Phil.	1.8	0.036	1.2	0.024	0.1	0,002
Bacillariophyta	Pseudosolenia calcar-avis Scülz.	2.9	493.0	1.8	306.0	0.5	85,0
	Pseudosolenia fragilissima Ber.	12.5	75.1	9.0	54.1	0.8	4,8
	Chaetoceros rigidus Ostf.	2.8	0.236	1.6	0.135	0.1	0,008
	Chaetoceros socialis Laut.	1.2	0.6	0.5	0.25	-	-
	Chaetoceras wighamii Bright	43.5	43.5	38.0	38.0	1.2	1,2
	Thalassiosira incerta Makar.	-	-	0.6	1.8	-	-
	Thalassiosira caspica Makar.	1.2	0.6	0.8	0.4	-	-
	Thalassiosira variabilis Makar.	0.8	0.4	0.6	0.3	-	-
	Coscinodiscus granii Gough.	0.5	37.5	-	-	-	-
	Coscinodiscus jonesianus Ostf.	1.2	4.5	0.6	2.25	-	-
	Coscinodiscus radiatus Ehr.	1.0	3.74	0.4	1.49	-	-
	Thalassionema nitzkchioides Grun.	1.6	2.08	0.8	1.04	-	-
	Skeletonema costatum Grev.	5.0	1.71	3.5	1.28	0.2	0,073
Chlorophyta	Scenedesmus quadricauda Breb.	1.2	0.24	0.5	0.1	-	-
	Binuclearia lauterbornii Pr.-I	1.6	0.28	0.8	0.14	-	-
Dinophyta	Glenodinium capsicum Ostf	1.2	15.6	0.8	10.4	-	-
	Exuviaella cordata Ostf.	1.0	2.0	0.6	1.2	-	-
	Goniaulax polyedra Stein.	-	-	0.5	2.5	-	-
	Goniaulax spinifera Dies.	0.6	2.1	0.4	1.4	-	-
	Prorocentrum scutellum Schröd.	0.5	6.25	0.4	5.0	-	-
Total		83.5	743.1	64.0	460.1	2.9	91.1

3.7.2 Chlorophyll pigments and pheopigments

Table 3.11 Chlorophyll pigments and pheopigments for waters 0÷25 m

ug/L	Phytoplankton	chl a	chl b	chl c1+c2	pheo a
S06W	1070	0.64	0.12	0.11	0.43
S10W	549	0.51	0.12	0.10	0.19
S12W	1207	0.91	0.21	0.09	0.51
S13W	743	0.30	0.07	0.14	0.28

Table 3.12 Chlorophyll pigments and pheopigments for waters 25÷50 m

ug/L	Phytoplankton	chl a	chl b	chl c1+c2	pheo a
S06W	663	0.50	0.16	0.11	0.21
S10W	497	0.49	0.08	0.04	0.14
S12W	668	0.75	0.13	0.07	0.30
S13W	460	0.41	0.10	0.06	0.16

Table 3.13 Chlorophyll pigments and pheopigments for waters 50÷100 m

ug/L	Phytoplankton	chl a	chl b	chl c1+c2	pheo a
S06W	185	0.20	0.03	0.03	0.06
S10W	96	0.09	0.02	0.01	0.03
S12W	86	0.09	0.02	0.01	0.03
S13W	91	0.05	0.02	0.01	0.02

3.7.3 Zooplankton

12 groups of zooplankton were discovered in study area including 5 species of Copepoda, 6 species of Cladocera and 1 species of Ctenophora. Additionally numbers of maggots of Molluska and Balanus and Copepoda were registered.

Total numbers of zooplanktons are changing between sampling points from 566/m³ (S10) to 811 (S13) with mean numbers 660/m³. Total biomass of zooplankton are changing from 20.7 mg/m³ to 32.4 mg/m³ with mean value 25.2 mg/m³.

Distribution of zooplanktons in water level are changing as following:

- 0÷25 m level- beginning from 117/m³ (S10) to 211/m³ (S13) with average value of 154/m³
- 25÷50 m level- beginning from 194/m³ (S10) to 249/m³ (S13) with average value of 211/m³
- 50÷100 m level- beginning from 255/m³ (S10) to 351/m³ (S13) with average value of 294/m³

Biomass of zooplanktons per isolates are changing as following:

- 0÷25 m level- beginning from 2.2 mg/m³ (S10) to 4.5 mg/m³ (S13) with average value of 3.2 mg/m³
- 25÷50 m level- beginning from 6.7 mg/m³ (S10) to 11.0 mg/m³ (S13) with average value of 8.4 mg/m³
- 50÷100 m level- beginning from 11.8 mg/m³ (S10) to 16.9 mg/m³ (S13) with average value of 13.6 mg/m³

In all studied stations zooplankton distribution dynamics were similar, and its number and biomass are consecutively increasing with studying of more deepness water level. Thus, quantitative indexes on level 0÷25 m were less in compare with level 25÷50 m, and maximal indexes were registered for water level 50÷100 m.

Table 3.14 Water column S06- Zooplankton species

N-number (mln col/m ³) B- biomass (mg/m ³)		0÷25 m		25÷50 m		50÷100 m	
		N	B	N	B	N	B
Copepoda	<i>Eurytemora grimmi</i> G.O. Sars	8	0.32	14	0.56	20	0,8
	<i>E. minor</i> Sars	10	0.4	12	0.48	24	0,96
	<i>Limnocalanus grimaldi</i> Guer.	-	-	10	3.25	16	5,2
	<i>Acartia (clausi+tonsa)</i> Dana	12	0.78	18	1.17	24	1,56
Cladocera	<i>Cercopagis pengoi</i> Ostr.	8	1.2	15	2.25	18	2,7
	<i>Podon polyphemoides</i>	-	-	10	0.3	10	0,3
	<i>Evadne anonyx typica</i> Sars	8	0.16	-	-	14	0,28
	<i>Podonevadne trigona typica</i> Sars	6	0.09	10	0.15	14	0,21
Ctenophora	<i>Mnemiopsis leidyi</i> (Agassiz)	68	-	60	-	85	-
Others	Maggot-Molluska	8	0.08	6	0.06	14	0,14
	Maggot-Balanus	10	0.1	16	0.16	20	0,2
	Maggot-Copepoda	20	0.04	24	0.048	32	0,064
Total		158	3.2	195	8.4	291	12.4

Table 3.15 Water column S10- Zooplankton species

N-number (mln col/m ³) B- biomass (mg/m ³)		0÷25 m		25÷50 m		50÷100 m	
		N	B	N	B	N	B
Copepoda	Eurytemora grimmeri G.O. Sars	8	0.32	14	0.56	16	0,64
	E. minor Sars	2	0.08	12	0.48	18	0,72
	Limnocalanus grimaldi Guer.	-	-	6	1.95	17	5,525
	Acartia (clausi+tonsa) Dana	14	0.91	18	1.7	26	1,69
Cladocera	Cercopagis pengoi Ostr.	3	0.45	8	1.2	14	2,1
	Podon polyphemoides	5	0.15	-	-	8	0,24
	Evadne anonyx typica Sars	-	-	16	0.32	18	0,36
	Podonevadne trigona typica Sars	6	0.09	10	0.15	14	0,21
Ctenophora	Mnemiopsis leidyi (Agassiz)	41	-	53	-	62	-
Others	Maggot-Molluska	8	0.08	12	0.12	12	0,12
	Maggot-Balanus	6	0.06	14	0.14	16	0,16
	Maggot-Copepoda	24	0.048	31	0.062	34	0,068
Total		117	2.2	194	6.7	255	11.8

Table 3.16 Water column S12- Zooplankton species

N-number (mln col/m ³) B- biomass (mg/m ³)		0÷25 m		25÷50 m		50÷100 m	
		N	B	N	B	N	B
Copepoda	Eurytemora grimmeri G.O. Sars	10	0.4	16	0.64	18	0,72
	E. minor Sars	6	0.24	16	0.64	20	0,8
	Limnocalanus grimaldi Guer.	-	-	8	2.6	19	6,2
	Acartia (clausi+tonsa) Dana	16	1.04	20	1.3	28	1,82
Cladocera	Cercopagis pengoi Ostr.	5	0.75	10	1.5	16	2,4
	Podon polyphemoides	8	0.24	-	-	10	0,3
	Evadne anonyx typica Sars	-	-	18	0.36	20	0,4
	Podonevadne trigona typica Sars	8	0.12	12	0.18	16	0,24
Ctenophora	Mnemiopsis leidyi (Agassiz)	45	-	50	-	65	-
Others	Maggot-Molluska	10	0.1	12	0.12	15	0,15
	Maggot-Balanus	8	0.08	14	0.14	18	0,18
	Maggot-Copepoda	26	0.052	31	0.062	34	0,068
Total		132	3,0	207	7,6	279	13,3

Table 3.17 Water column S13- Zooplankton species

N-number (mln col/m ³) B- biomass (mg/m ³)		0÷25 m		25÷50 m		50÷100 m	
		N	B	N	B	N	B
Copepoda	Eurytemora grimmeri G.O. Sars	12	0.48	10	0.4	16	0,64
	E. minor Sars	16	0.64	18	0.72	27	1,08
	Limnocalanus grimaldi Guer.	-	-	14	4.55	24	7,8
	Acartia (clausi+tonsa) Dana	12	0.78	25	1.625	32	2,08
Cladocera	Cercopagis pengoi Ostr.	12	1.8	22	3.3	26	3,9
	Podon polyphemoides	8	0.24	-	-	17	0,51
	Evadne anonyx typica Sars	12	0.24	10	0.2	16	0,32
	Podonevadne trigona typica Sars	10	0.15	-	-	12	0,18
Ctenophora	Mnemiopsis leidyi (Agassiz)	86	-	104	-	123	-
Others	Maggot-Molluska	6	0.06	8	0.08	14	0,14
	Maggot-Balanus	10	0.1	12	0.12	16	0,16
	Maggot-Copepoda	27	0.054	26	0.052	28	0,056
Total		211	4.5	249	11.0	351	16.9

4 Absheron Block bottom sediments study

4.1 Bottom sediment physical description

Sediment grain size characteristics have been emphasized for their controlling influence upon the benthic community, because they correlate with biologically meaningful variables such as sediment porosity, compaction, oxygen tension, water content and retention of organic matter. Grain size characteristics are equally important in controlling sediment chemical concentrations due to the increase in adsorptive capacity with finer-grained particles. Grain Sizes are conventionally expressed in Phi units, based on a constant ratio of 2 between successive size classes. Wentworth Scale descriptions of grain sizes (Folk 1980) are summarized in Table 4.1.

Table 4.1 Wentworth Scale descriptions of grain sizes (Folk 1980)

Sediment Type	Wentworth Scale (mm)	Phi Units
Boulder	>256	<-8.0
Cobble	>64 to 256	-8.0 to -6.0
Gravel	>4 to 64	-6.0 to -2.0
Very Fine Gravel	>2 to 4	-2.0 to -1.0
Very Coarse Sand	>1 to 2	-1.0 to 0.0
Coarse Sand	>0.5 to 1	0.0 to 1.0
Medium Sand	>0.25 to 0.5	1.0 to 2.0
Fine Sand	>0.125 to 0.25	2.0 to 3.0
Very Fine Sand	>0.0625 to 0.125	3.0 to 4.0
Coarse Silt	>0.0312 to 0.0625	4.0 to 5.0
Medium Silt	>0.0156 to 0.0312	5.0 to 6.0
Fine Silt	>0.0078 to 0.0156	6.0 to 7.0
Very Fine Silt	>0.0039 to 0.0078	7.0 to 8.0
Coarse Clay	>0.00195 to 0.0039	8.0 to 9.0
Medium Clay	>0.00098 to 0.00195	9.0 to 10.0

A common feature of marine and brackish sediments is the high positive correlation between finer-grained mineral particles and organic carbon. Since many contaminants bind organic matter, there is good potential for contaminant accumulation in habitats where settlement of finer-grained sediment pore space and water content, which influence biological activities and chemical exchange between soluble and particle bound phases of contaminants. Sorting is expressed as the standard deviation of the Phi size distribution, where a higher value indicates a greater spread in the size distribution and more poorly sorted sediments. Skewness is a measure of asymmetry in the grain size Phi distribution. Positive values indicate an excessive spread in the distribution of finer sediments; negative values indicate a tail in the coarse distribution. Kurtosis is a measure that compares the relative degree of sorting within the tails and central range of the sediment Phi size distribution.

28 bottom sediments samples were studied by sieve and pipette methods. Sediments were characterized primarily by fine silts (15 stations) and very fine silts (13 stations). Silt particles (0.004-0.063 mm) were the prevalent grain category, averaging 74.67% of sediment dry-weight, ranging from 63.25% to 86.57%. All sites had silt fractions exceeding 60%. The smaller clay fraction (<0.004 mm) average 24.58%, with lowest values recorded in the S26 area. The sand fraction (particles 0.063-2.0 mm) was typically less than 2% of sample weight, ranging from 0.42% (S14) to 1.32% (S22).

Grain size for each station are presented in Table 4.2, where also are giving of TOC results too. Absheron region contour plots for mean grain size and TOC distributions are shown in Figure 4.1.

Table 4.2 Sediments grain size parameters and TOC

	Depth (m)	Category	Sand %	Silt %	Clay %	TOC %
S01	484	Fine silt	0.54	80.97	18.49	3.0
S02	482	Very fine silt	0.47	72.82	26.71	3.4
S03	480	Fine silt	0.65	75.66	23.69	3.1
S04	485	Fine silt	0.77	80.41	18.82	2.9
S05	487	Very fine silt	0.82	73.17	26.01	3.4
S06	480	Very fine silt	0.51	70.08	29.41	3.5
S07	482	Fine silt	0.92	79.75	19.33	3.4
S08	487	Very fine silt	0.56	64.33	35.11	3.3
S09	490	Fine silt	0.78	77.59	21.63	3.2
S10	470	Very fine silt	0.58	66.74	32.68	3.2
S11	472	Very fine silt	0.75	71.32	27.93	3.0
S12	484	Fine silt	0.69	74.49	24.82	3.3
S13	496	Fine silt	0.84	81.53	17.63	3.0
S14	445	Very fine silt	0.42	63.25	36.33	3.0
S15	447	Fine silt	0.95	83.43	15.62	3.0
S16	492	Very fine silt	0.73	69.16	30.11	3.3
S17	496	Very fine silt	0.86	75.04	24.10	3.1
S18	553	Very fine silt	0.64	69.56	29.80	3.2
S19	215	Fine silt	1.02	67.47	31.51	2.9
S20	304	Fine silt	0.93	78.32	20.75	2.0
S21	395	Fine silt	0.81	76.56	22.63	4.5
S22	452	Very fine silt	1.32	74.41	24.27	3.2
S23	541	Fine silt	0.92	79.34	19.74	3.4
S24	419	Fine silt	0.89	76.55	22.56	3.5
S25	342	Very fine silt	0.69	74.53	24.78	2.9
S26	606	Fine silt	0.46	86.57	12.97	3.7
S27	547	Fine silt	0.53	78.05	21.42	3.6
S28	438	Very fine silt	0.91	69.57	29.52	3.1

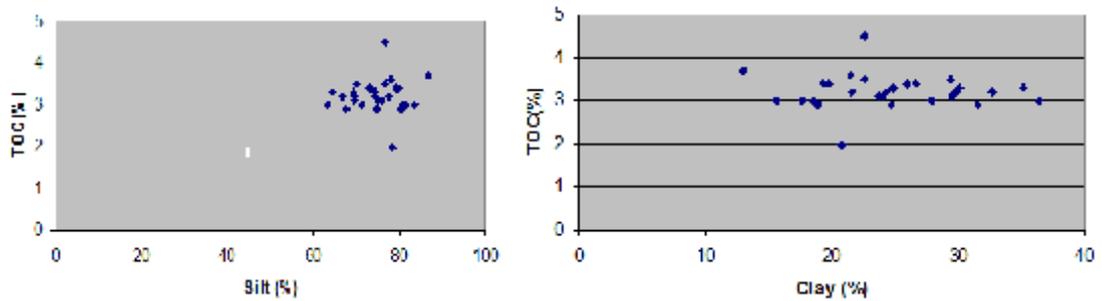


Figure 4.1 TOC-Sediment fraction relationship

4.2 Total organic matter, TOC, total nitrogen and phosphorus

Table 2.1 collects of results of total organics, TOC, total nitrogen and total phosphorous test results. There were maximum contents of total organics in sample S21 (=5.05 %), which is demonstrated also maximum for TOC. Maximum for total nitrogen we registered for sample from station S04 and for total phosphorous for sample S21.

Table 4.3 Total organics, TOC, Total nitrogen and phosphorous values

		Total Organics	Total Carbon	Total Nitrogen	Total Phosphorous
	Unit	%	%	%	%
	MDL	0.1	0.1	0.003	0.002
	Min	3.12	2.0	0.28	0.067
	Max	5.05	4.5	0.37	0.103
	Average	3.80	3.2	0.33	0.079
m	Median	3.74	3.2	0.33	0.074
484	S01	3.61	3.0	0.34	0.073
482	S02	3.96	3.4	0.36	0.073
480	S03	3.66	3.1	0.32	0.073
485	S04	3.58	2.9	0.37	0.073
487	S05	3.92	3.4	0.34	0.075
480	S06	3.98	3.5	0.31	0.072
482	S07	3.87	3.4	0.33	0.068
487	S08	3.76	3.3	0.34	0.073
490	S09	3.68	3.2	0.34	0.074
470	S10	3.73	3.2	0.33	0.072
472	S11	3.47	3.0	0.31	0.073
484	S12	3.80	3.3	0.36	0.074
496	S13	3.50	3.0	0.32	0.075
445	S14	3.65	3.0	0.31	0.073
447	S15	3.60	3.0	0.34	0.077
492	S16	3.82	3.3	0.31	0.084
496	S17	3.75	3.1	0.31	0.073
553	S18	3.67	3.2	0.29	0.067
215	S19	3.80	2.9	0.34	0.084
304	S20	3.12	2.0	0.35	0.081
395	S21	5.05	4.5	0.34	0.103
452	S22	3.72	3.2	0.31	0.073
541	S23	4.00	3.4	0.36	0.079
419	S24	4.10	3.5	0.31	0.102
342	S25	3.48	2.9	0.36	0.092
606	S26	4.26	3.7	0.37	0.094
547	S27	4.22	3.6	0.30	0.089
438	S28	3.53	3.1	0.28	0.083

4.3 Total petroleum hydrocarbons (TPH), Total PAHs and Total BTEX

According project conditions, below petroleum hydrocarbons measurements were implemented:

- TPH- in all 28 sediments samples
- PAHs, if TPH>50 ppm
- BTEX, if TPH>50 ppm

		TPH	Total PAHs	Total BTEX
	Unit	ppm	ppb	ppb
	MDL	10.0	7.2	95
	Min	10	315	
	Max	510	1004	
	Average	106	628	
m	Median	74	624	
484	S01	74	1004	<95
482	S02	62	315	<95
480	S03	73	846	<95
485	S04	10	ND	ND
487	S05	44	ND	ND
480	S06	46	ND	ND
482	S07	57	822	<95
487	S08	25	ND	ND
490	S09	73	701	<95
470	S10	64	710	<95
472	S11	22	ND	ND
484	S12	200	957	<95
496	S13	147	399	<95
445	S14	<10	ND	ND
447	S15	<10	ND	ND
492	S16	15	ND	ND
496	S17	510	495	<95
553	S18	282	400	<95
215	S19	198	641	<95
304	S20	142	537	<95
395	S21	84	383	<95
452	S22	87	813	<95
541	S23	78	753	<95
419	S24	159	375	<95
342	S25	77	450	<95
606	S26	57	607	<95
547	S27	85	759	<95
438	S28	67	592	<95

4.4 PAHs (16 US-EPA list)

4.4.1 PAHs for samples from stations S01-S10

ppb	S01	S02	S03	S07	S09	S10	ERL	ERM	MDL
Naphthalene	3.9	35.4	39.2	28.7	2.8	1.8	160	2100	1.1
Acenaphthene+Fluorene	7.1	33.2	4.8	3.3	7.5	5.6	16	500	0.6
Phenanthrene	21.8	42.6	17.8	17.5	14.8	19.5	240	1500	0.6
Anthracene	0.2	33.6	1.5	1.4	1.4	1.5	85.3	1100	0.1
Fluoranthene	496	33.7	420	435	371	397	600	5100	0.4
Pyrene	0.9	46.2	0.6	0.9	0.8	0.9	665	2600	0.6
Benzo(a)anthracene	15.3	33.6	13	12.7	15.4	13.4	261	1600	0.4
Chrysene	109	32.2	94.6	98.7	82.1	92.3	384	2800	0.9
Benzo(b)fluoranthene	224	84.7	160	148	129	141	ND	ND	0.5
Benzo(k)fluoranthene	10.6	5.9	14.6	6.6	6.9	4.2	ND	ND	0.4
Benzo(a)pyrene	43.4	16.8	34.9	12.6	29.1	23.8	430	1600	0.3
Dibenzo(a,h)anthracene	53.5	2.9	6.2	18.4	34.2	3.4	6304	260	0.3
Benzo(ghi)perylene	12.0	46.5	31.7	31.7	4.2	3.7	ND	ND	0.6
Indeno(1,2,3-cd)pyrene	7.3	10.4	7.4	6	1.4	1.2	ND	ND	0.4
Total PAHs	1004	315	847	822	701	710	4022	44792	

PAHs were not measured for samples from stations S04, S05, S06, S08

4.4.2 PAHs for samples from stations S11-S20

ppb	S12	S13	S17	S18	S19	S20	ERL	ERM	MDL
Naphthalene	22.3	10.5	22.8	10.3	9.6	7.9	160	2100	1.1
Acenaphthene+Fluorene	4.3	0.9	3.2	3.4	1.3	1.3	16	500	0.6
Phenanthrene	21.2	0.6	11.3	7.2	9.9	9.9	240	1500	0.6
Anthracene	1.9	<0.1	0.9	0.5	0.7	0.5	85.3	1100	0.1
Fluoranthene	509	80.1	237	202	360	291	600	5100	0.4
Pyrene	0.8	4.4	0.6	5.2	1.1	0.8	665	2600	0.6
Benzo(a)anthracene	15.8	13.5	8.7	5.3	6.5	5.6	261	1600	0.4
Chrysene	130	99.4	29.8	33.4	37.5	43	384	2800	0.9
Benzo(b)fluoranthene	161	113	90.2	61.3	121	106	ND	ND	0.5
Benzo(k)fluoranthene	5.6	6.5	2.4	4.3	10.5	3.9	ND	ND	0.4
Benzo(a)pyrene	24.8	15.2	19.8	11	14.1	17.5	430	1600	0.3
Dibenzo(a,h)anthracene	19.8	19.4	13.3	9.1	16.2	15.8	6304	260	0.3
Benzo(ghi)perylene	34.1	32.4	48.7	41.5	41.8	30.9	ND	ND	0.6
Indeno(1,2,3-cd)pyrene	6.5	6.2	6.3	6.1	11.1	2.9	ND	ND	0.4
Total PAHs	957	402	495	401	642	537	4022	44792	

PAHs were not measured for samples from stations S11, S14, S15, S16

4.4.3 PAHs for samples from stations S21-S28

ppb	S21	S22	S23	S24	S25	S26	S27	S28	ERL	ERM	MDL
Naphthalene	4.7	28.5	7.9	11.4	17.4	3.84	2.9	1.5	160	2100	1.1
Acenaphthene+Fluorene	11.2	5.2	1.1	2.7	3.9	17.1	9.7	9.4	16	500	0.6
Phenanthrene	16.4	18.2	15.8	5	23.7	12	17	26.8	240	1500	0.6
Anthracene	0.4	0.3	1.2	0.8	0.82	2.8	1.2	0.82	85.3	1100	0.1
Fluoranthene	116	411.6	433.5	150	106	270	408	307	600	5100	0.4
Pyrene	1.2	6.9	0.7	1.4	1.9	0.8	0.5	0.85	665	2600	0.6
Benzo(a)anthracene	10.8	11.4	12.6	7.2	7.25	7.17	10.5	18.2	261	1600	0.4
Chrysene	74.2	85.8	65.3	18	107	64	72.8	47.4	384	2800	0.9
Benzo(b)fluoranthene	56.4	159.9	133.2	84.3	95.4	107	141	118	ND	ND	0.5
Benzo(k)fluoranthene	7.1	17	9.8	6.2	9.72	10.2	17.2	9.29	ND	ND	0.4
Benzo(a)pyrene	28.4	29.8	27.5	25	10.4	46	25.6	16.6	430	1600	0.3
Dibenzo(a,h)anthracene	41.8	9.2	17.6	11.3	7.27	19.2	15.9	8.94	6304	260	0.3
Benzo(ghi)perylene	10.3	22.4	16.6	47	48	38	29.1	22.6	ND	ND	0.6
Indeno(1,2,3-cd)pyrene	4.1	6.8	10.3	5.1	11.1	9.1	7.6	4.8	ND	ND	0.4
Total PAHs	383	813	753	375.4	450	607	760	592	4022	44792	

4.5 BTEX

BTEX were tested for all samples, where TPH were above 50 ppm.

All samples were demonstrated below MDL level of BTEX compounds, as indicated below:

Table 4.4 Determined level of BTEX compounds in sediment samples

BTEX compounds	ppb
Benzene	<35
Toluene	<12.5
EthylBenzene	<10
p-Xylene	<12.5
o-Xylene	<12.5
m-Xylene	<12.5
Total BTEX	<95

4.6 Heavy metals

Sediment samples have applied for acid digestion procedures by microwave sample digestion system and analysed in Atomic Absorption Spectrometry in flame, graphite furnace and cold vapour modes. Result were tabulated with calculation of minimum, maximum, average and median values between 28 sediment samples.

	ppm	As	Ba	Cd	Co	Cr	Cu	Hg	Ni	Pb	Sn	Zn
	MDL	0.25	3.4	0.025	0.3	1.0	0.3	0.02	0.3	1.4	0.8	0.6
	Min	10.1	516	0.014	13.5	100.2	25.8	0.022	37.6	13.17	1.83	85.8
	Max	33.7	889	0.094	20.7	120	46.2	0.052	52.2	22.86	3.91	122.2
	Average	19.8	631	0.053	15.3	108.6	37.1	0.033	42.8	16.5	2.66	93.4
m	Median	18.7	618	0.049	14.95	108.6	36.8	0.03	42.3	16.6	2.68	92.1
484	S01	28.9	667	0.046	15.2	114	36.6	0.041	41.8	17.7	3.58	96.8
482	S02	27.1	696	0.049	16.9	109	39.8	0.032	44.8	17.34	3.09	91.7
480	S03	27.9	624	0.042	14.2	114	34.6	0.025	40.9	17.13	2.59	91.4
485	S04	21.8	889	0.044	14.4	108.6	36.8	0.022	45.1	16.1	2.85	94.7
487	S05	21.9	612	0.032	16.2	107.4	36.8	0.022	45.2	17.31	1.93	93.6
480	S06	20.6	624	0.079	16.4	106.2	42.8	<0.02	48.4	13.17	2.37	88.4
482	S07	23.4	630	0.036	14.6	102	37.1	0.028	42.8	16.71	2.12	93.8
487	S08	20.1	582	0.058	15.1	112	42.2	0.034	47.9	15.78	3.42	96.9
490	S09	21.7	594	0.067	15.2	105.6	37.9	0.028	42.4	15.36	2.04	91.3
470	S10	33.7	630	0.082	18.2	109.2	44.9	0.046	48.2	22.86	2.94	122.2
472	S11	18.1	618	0.044	15.1	102	25.8	0.028	39.9	16.5	2.09	89.3
484	S12	15.4	792	0.059	15.2	102.3	41.7	0.022	44.3	18.01	1.98	95.1
496	S13	19.3	552	0.044	14.4	105	42.1	<0.02	41.2	15.02	2.69	92.5
445	S14	16.1	636	0.046	15.8	116.4	37.8	<0.02	43.4	13.53	1.85	91.5
447	S15	12.9	618	0.057	14.1	111.6	35.4	<0.02	38.8	17.58	2.85	93.8
492	S16	16.9	618	0.094	15.6	110.4	40.6	<0.02	45.5	13.29	2.89	90.9
496	S17	17.4	516	0.059	14.2	116.4	32.4	<0.02	38.6	16.02	2.54	85.8
553	S18	17.4	540	0.062	15.2	120	44.6	<0.02	47.2	13.77	2.45	97.2
215	S19	20.5	616	0.051	13.7	105	27.8	<0.02	37.6	17.16	2.66	88.9
304	S20	17.1	660	0.056	14.2	109.8	31.2	<0.02	38.1	17.07	1.83	90.8
395	S21	13.6	546	0.014	13.95	114.6	35.4	<0.02	42.2	18.9	3.52	96.5
452	S22	10.1	540	0.027	13.6	109.2	33.2	<0.02	38.6	15.32	3.15	90.2
541	S23	13.3	828	0.079	13.5	104.4	42.6	<0.02	43.8	15.12	2.76	91.5
419	S24	17.1	534	0.033	14.7	106.2	33.6	<0.02	39.6	18.03	2.71	95.6
342	S25	17.5	672	0.047	14.8	102.6	33.7	<0.02	39.1	17.4	2.69	92.9
606	S26	22.6	741	0.081	20.7	106.8	46.2	0.04	52.2	16.08	2.38	93.1
547	S27	15.1	552	<0.025	18.8	100.2	33.6	0.038	40.8	15.45	3.91	87.7
438	S28	26.8	552	0.036	14.8	108.6	32.2	0.052	39.4	17.37	2.53	91.7

Additionally results had compared with heavy metals data from EBS project in same area implemented at April 1999 (Table 4.5), compared by regional background values collected in frame of International environmental background study projects (Table 4.6) for Azerbaijan Sector of Caspian sea.

Table 4.5 Heavy metals data from 1999 EBS project for Absheron Block

ppm	As	Ba	Cd	Co	Cr	Cu	Pb	Hg	Ni	Sn	Zn
Min	0.14	614			85	35	19	0.32	62		86
Max	0.37	1123			100	60	31	1.29	79		112
Average	0.23	834			94.7	47.3	28	0.62	68		97

Table 4.6 Azerbaijan Sector of Caspian sea- Heavy metals background values (2002)

ppm	As	Ba	Cd	Co	Cr	Cu	Pb	Hg	Ni	Sn	Zn
Min	8.87	314	0.08	11.5	56.4	14.5	12.2	0.05	34.5	0.95	51.1
Max	22.6	1080	0.19	18.1	100	57.6	28.6	0.45	68	2.51	110
Average	14.7	643	0.14	14.9	85.3	31.9	19.6	0.15	50.1	2.03	83.2

Additional comparison of study data could be implemented by internationally discussed sediment quality criteria (Table 4.7). This table involve USEPA, Canada, Australia and Netherlands sediment quality reference criteria. As Azerbaijan have not locally prepared sediment quality criteria, local scientists are using EPA Effects Range Low (ERL) and an Effects Range Medium (ERM) values to compare of sediments from different sampling points.

Table 4.7 Marine sediment quality criterias

Chemical ppm	USA		Canada		Australia		Netherlands	
	ERL	ERM	ISQG	PEL	ISQG-Low	ISQG-High	NEC	MPC
Ag	1.0	3.7			1	3.7		
As	8.2	70	7.24	41.6	20	70	29	55
Cd	1.2	9.6	0.7	4.2	1.5	10	0.8	12
Cr	81	370	52.3	160	80	370	100	380
Cu	34	270	18.7	108	65	270	36	73
Hg	0.15	0.71	0.13	0.7	0.15	1	0.3	10
Ni	20.9	51.6			21	52	35	44
Pb	46.7	218	30.2	112	50	220	85	530
Zn	150	410	124	271	200	410	140	520

Finally, metal contents data in Earth crust are using for comparison issues, which are prepared as average values from estimation by different scientists.

Table 4.8 Average in Earth crust

As	Ba	Cd	Co	Cr	Cu	Hg	Ni	Pb	Sn	Zn
1.8	425	0.15	25	102	60	0.085	84	14	2.3	70

4.6.1 Heavy metals correlation matrix for Absheron Block

Table 4.9 Heavy metals correlation matrix

	As	Ba	Cd	Co	Cr	Cu	Hg	Ni	Pb	Sn
Ba	0.11									
Cd	0.12	0.30								
Co	0.36	0.09	0.46							
Cr	0.06	-0.27	-0.05	-0.18						
Cu	0.19	0.28	0.57	0.45	0.15					
Hg	0.47	-0.42	0.32	0.42	0.21	0.13				
Ni	0.31	0.34	0.53	0.64	0.11	0.85	0.06			
Pb	0.45	0.05	-0.24	0.08	-0.10	-0.14	0.35	-0.12		
Sn	0.00	-0.16	-0.12	0.08	0.10	0.04	0.45	-0.02	0.16	
Zn	0.49	0.08	0.17	0.27	0.14	0.44	0.35	0.40	0.68	0.16

Correlation matrix of Arsenic, Barium, Cadmium, Cobalt, Chromium, Copper, Mercury, Nickel, Lead, Tin, Zinc (n=28+2=30) in the Absheron Block sediment.

Bold values show correlation coefficients significant at the 95% level, underlined values in italic show correlation coefficients significant at the >99% level.

- As are correlated by Co, Hg, Pb and Zn
- Ba is correlated by other metals
- Cd are correlated by Cu and Ni
- Co are correlated by As, Cu and Ni
- Cr are not correlated by other metals
- Cu are correlated by Cd, Co, Ni and Zn
- Hg are correlated by As and Sn
- Ni are correlated by Cd, Co, Cu, Zn
- Pb are correlated by As, Hg, Zn
- Sn are correlated by Hg
- Zn are correlated by As, Cu, Ni, Pb

4.6.2 Arsenic (As)

The natural level of As in soils depends on the rock type, the normal range being 1 to 40 ppm with average concentration 1.8 ppm (Table 4.8). In general, arsenic levels in uncontaminated and untreated soils seldom exceed 10 ppm. The European Community recommended for total arsenic levels in soil not to exceed 20 ppm. EPA recommend taking into consideration of Arsenic in marine sediments, if it is above ERL=8.2 ppm (Table 4.7), and initiate of cleaning actions in sediments, if concentration of arsenic is above ERM=70 ppm. Discovered in frame of this study Arsenic concentrations in bottom sediments were mainly above regional mean value- 14.9 ppm (Table 4.6) and above both mean Arsenic content in earth crust and EPA ERL=8.2 ppm values.

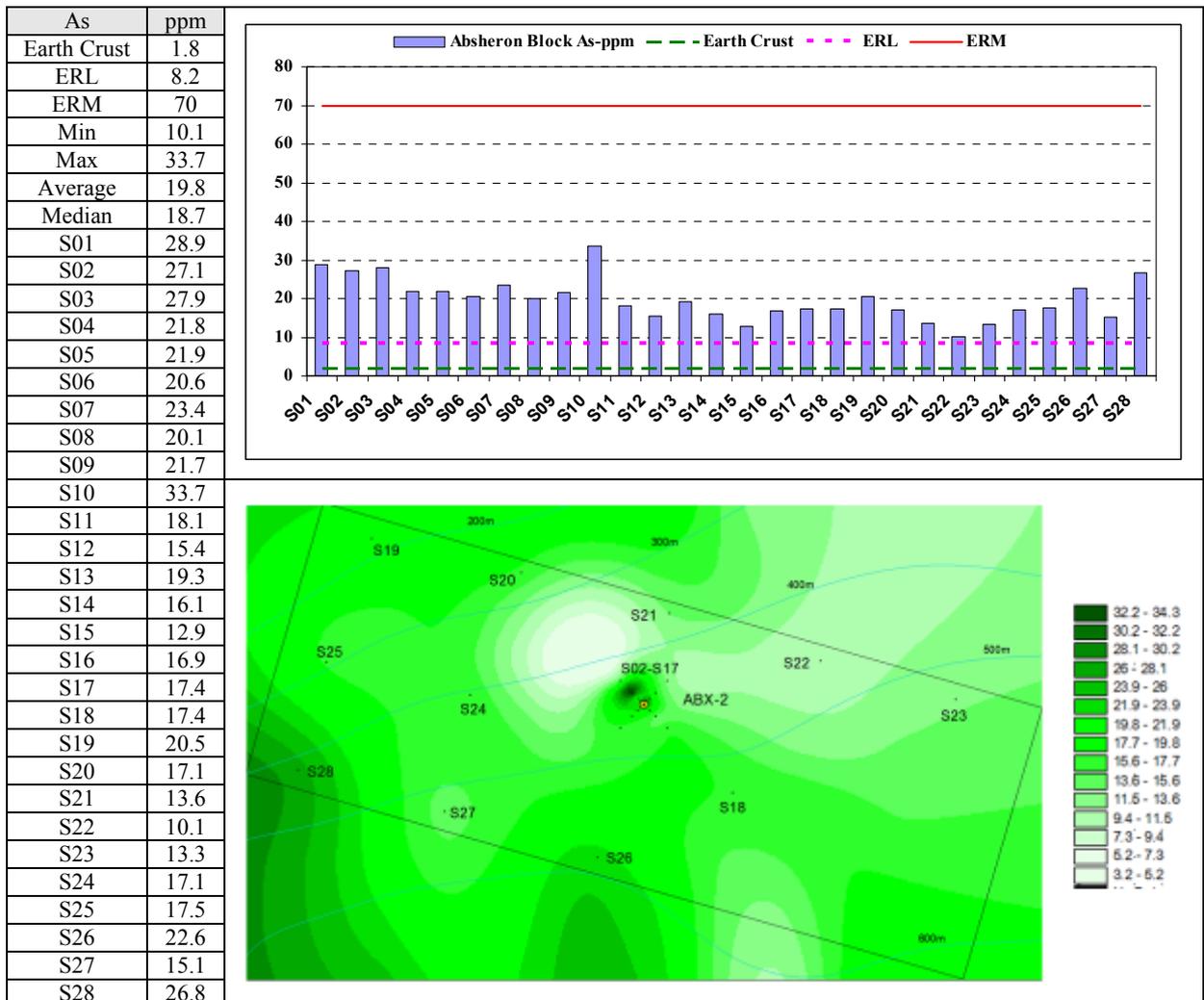


Figure 4.2 Arsenic distribution in contract area sediments

4.6.3 Barium (Ba)

Average concentration of Ba in Earth Crust is estimated as 425 ppm. For all sediments samples Ba concentration were above average Earth Crust concentration. But these results were in same level with 1999 EBS and 2002 International environmental background study project (Table 4.6) for Azerbaijan Sector of Caspian sea.

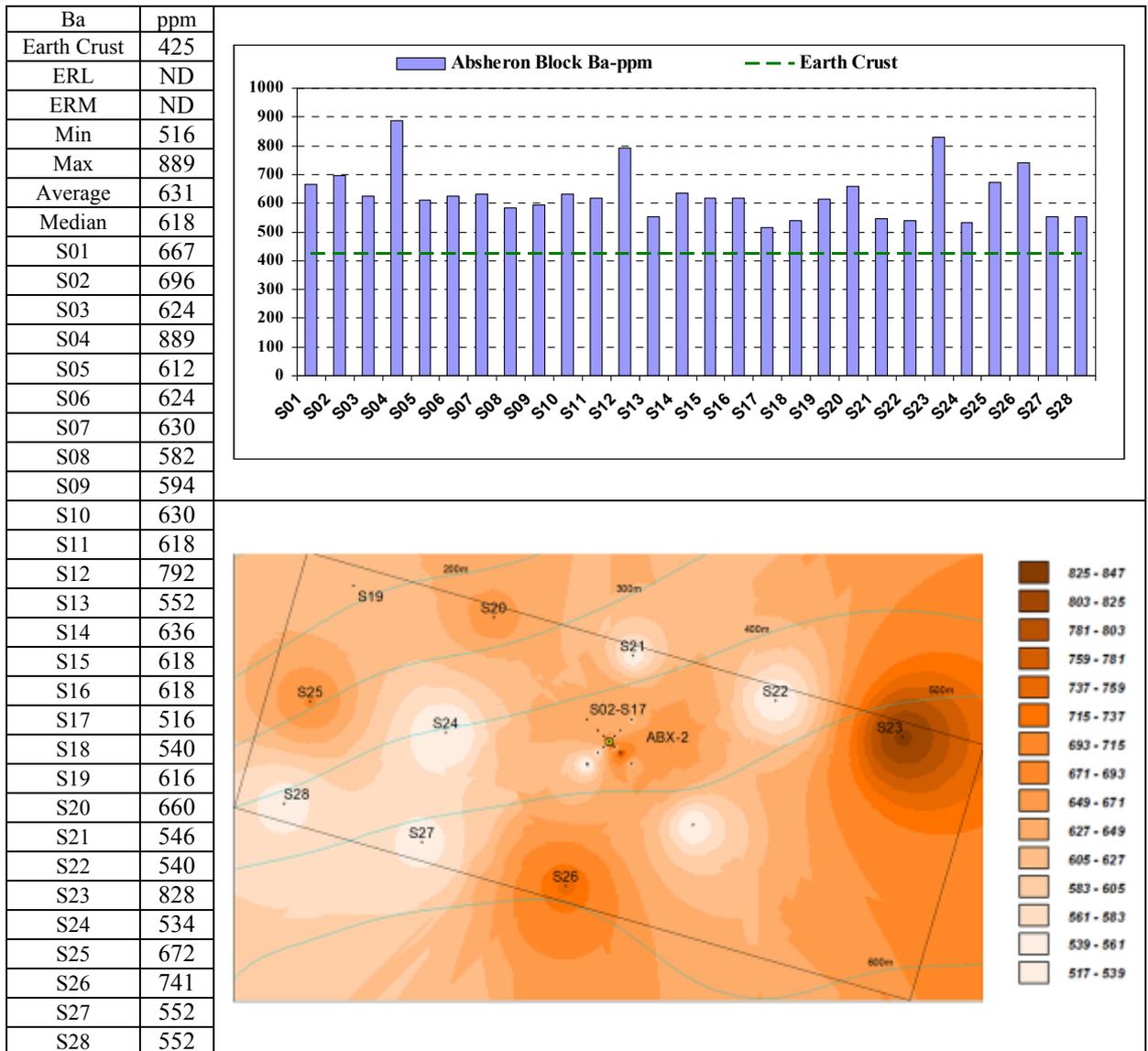


Figure 4.3 Barium distribution in contract area sediments

4.6.4 Cadmium (Cd)

Concentration of Cadmium in sampling points were below mean for Earth Crust, ERL and ERM values.

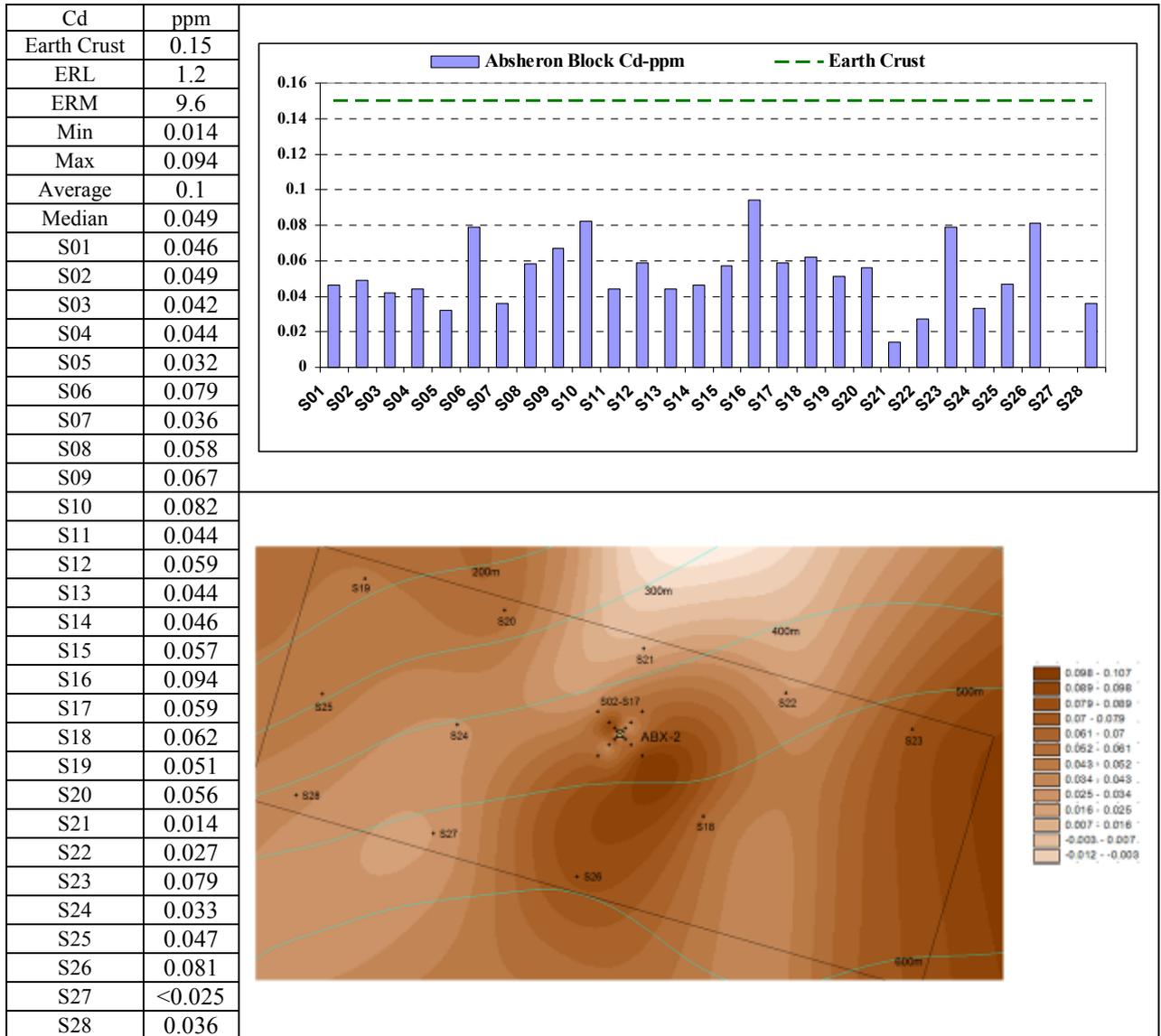


Figure 4.4 Cadmium distribution in contract area sediments

4.6.5 Cobalt (Co)

Concentration of Cobalt in sampling points were below mean for Earth Crust.

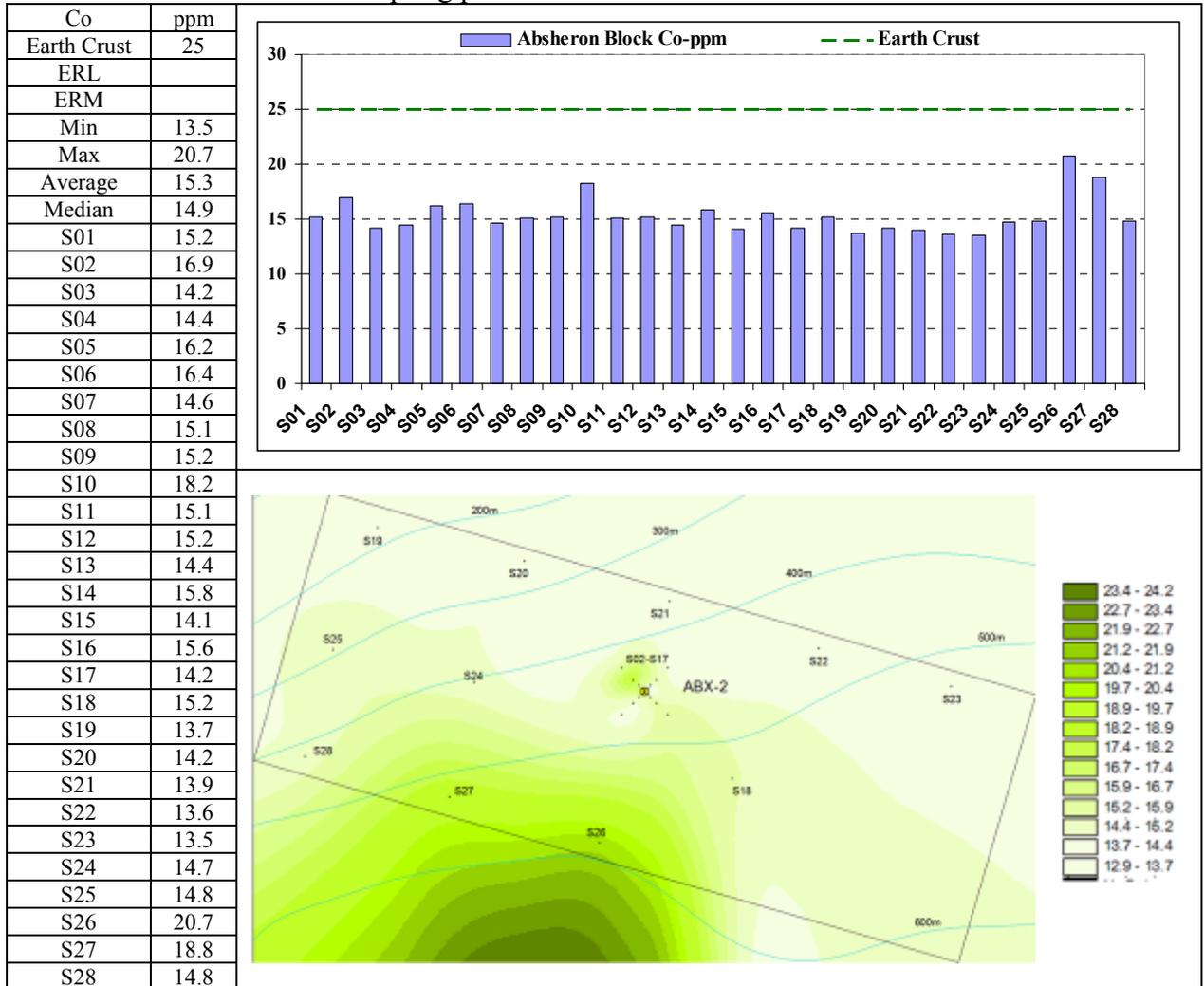


Figure 4.5 Cobalt distribution in contract area sediments

4.6.6 Chromium (Cr)

Average concentration of Chromium (109 ppm) in sampling points were above for mean value of Earth Crust (102 ppm) and ERL criteria, but below of ERM sediment quality criteria.

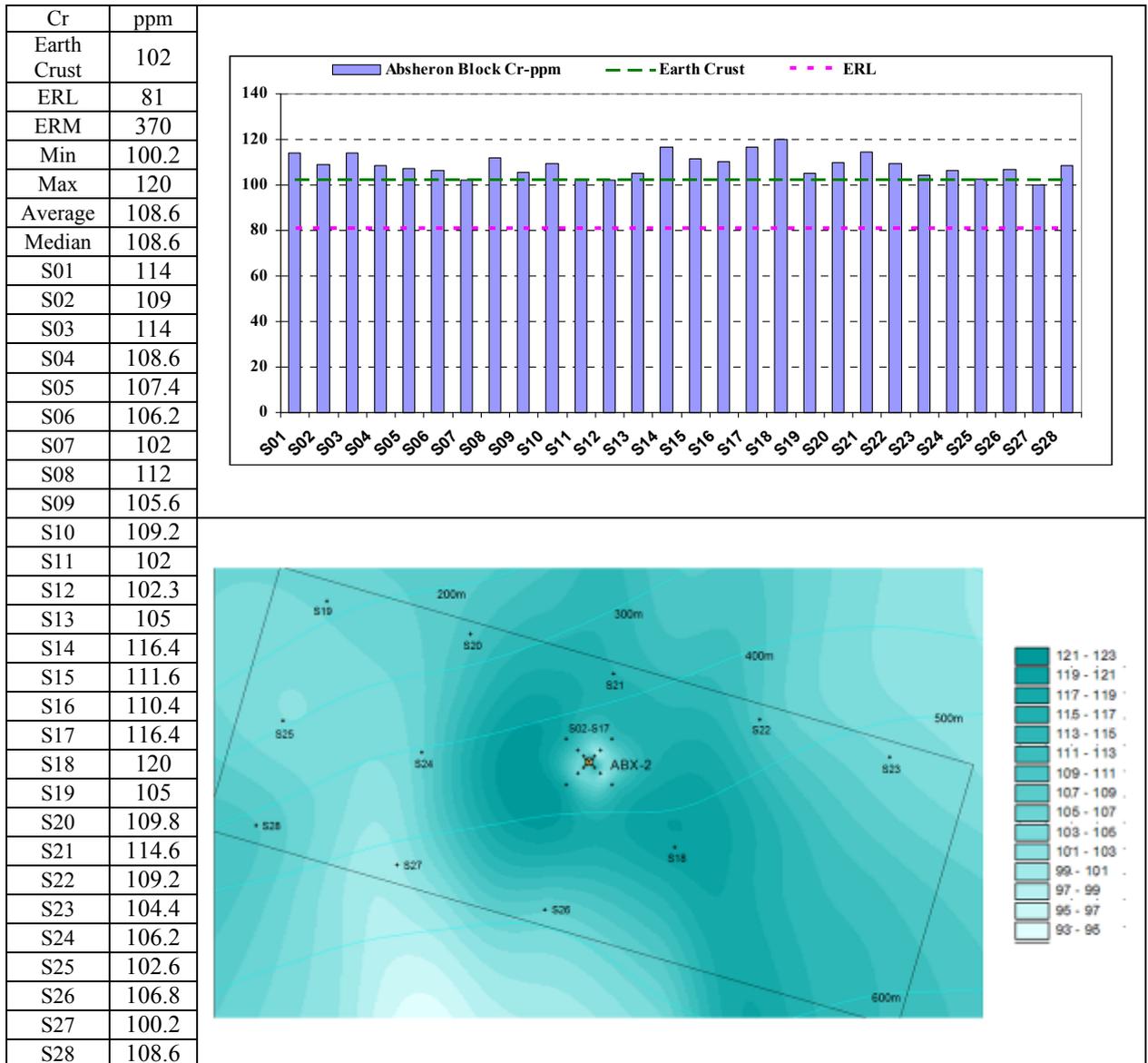


Figure 4.6 Chromium distribution in contract area sediments

4.6.7 Copper (Cu)

Average concentration of Copper (37 ppm) in sampling points were below mean for Earth Crust (60 ppm) and ERM value (270 ppm)m but was slightly above ERL value.

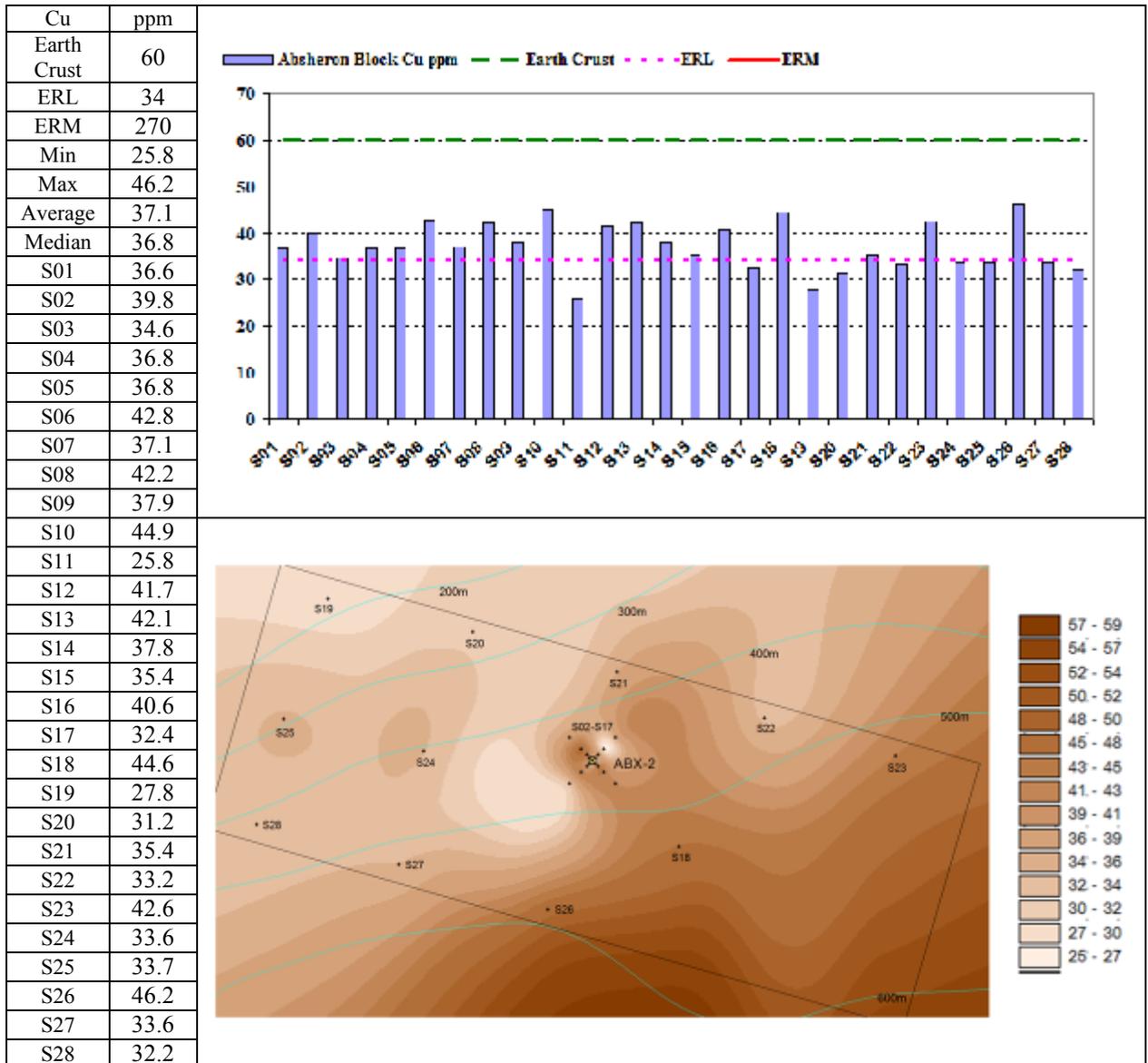


Figure 4.7 Copper distribution in contract area sediments

4.6.8 Lead (Pb)

Average concentration of Lead (17 ppm) in sampling points were above mean for Earth Crust (14 ppm), but was below ERL (47 ppm) and ERM (218 ppm) criteria.

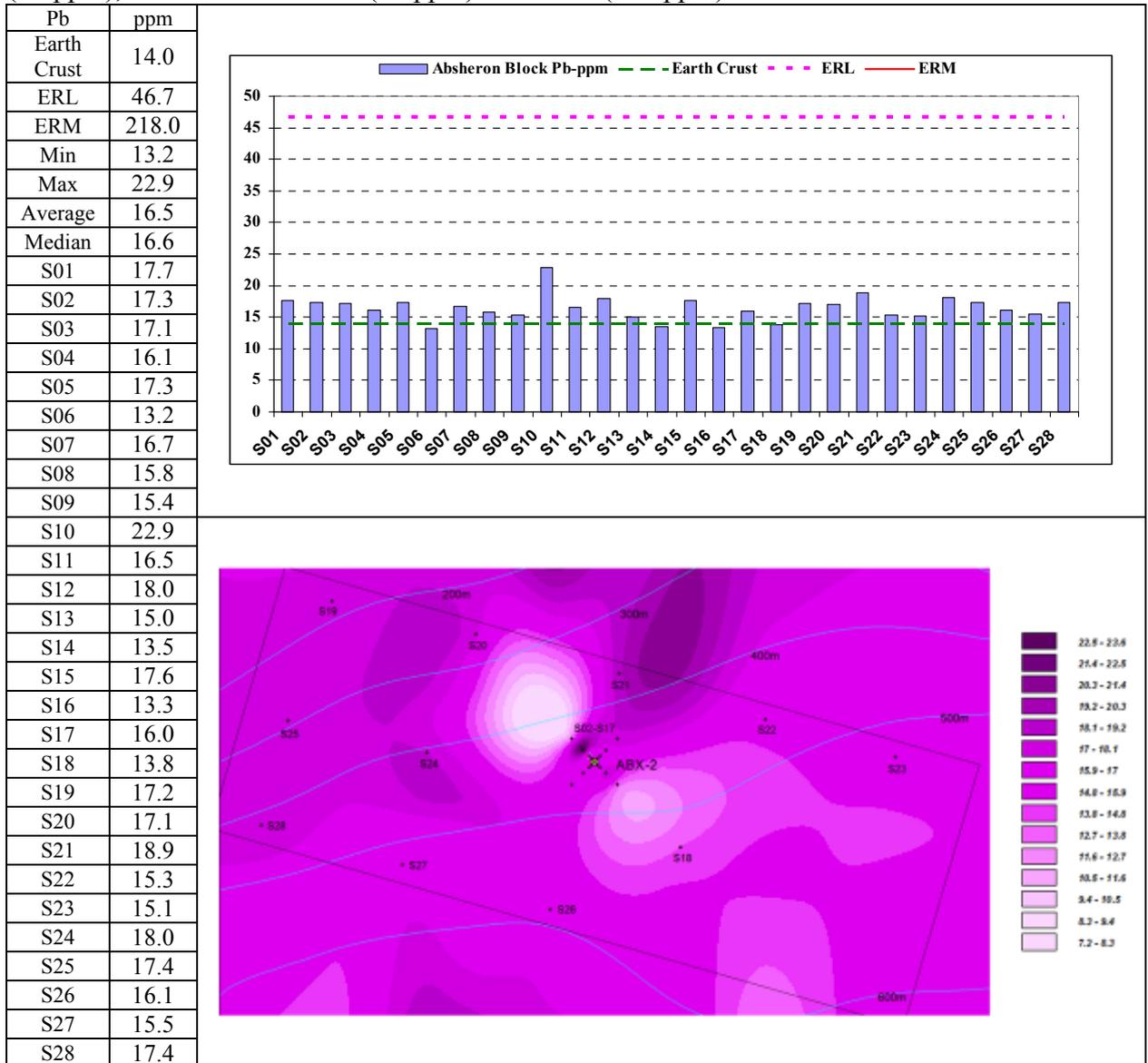


Figure 4.8 Lead distribution in contract area sediments

4.6.9 Mercury (Hg)

For most of sampling points Mercury concentration were below detection limit of applied test method (0.02 ppm). For sediment samples, where were detected registrable level, concentration of Mercury were below of average value for Earth Crust, as well as indicative level of ERL and ERM.

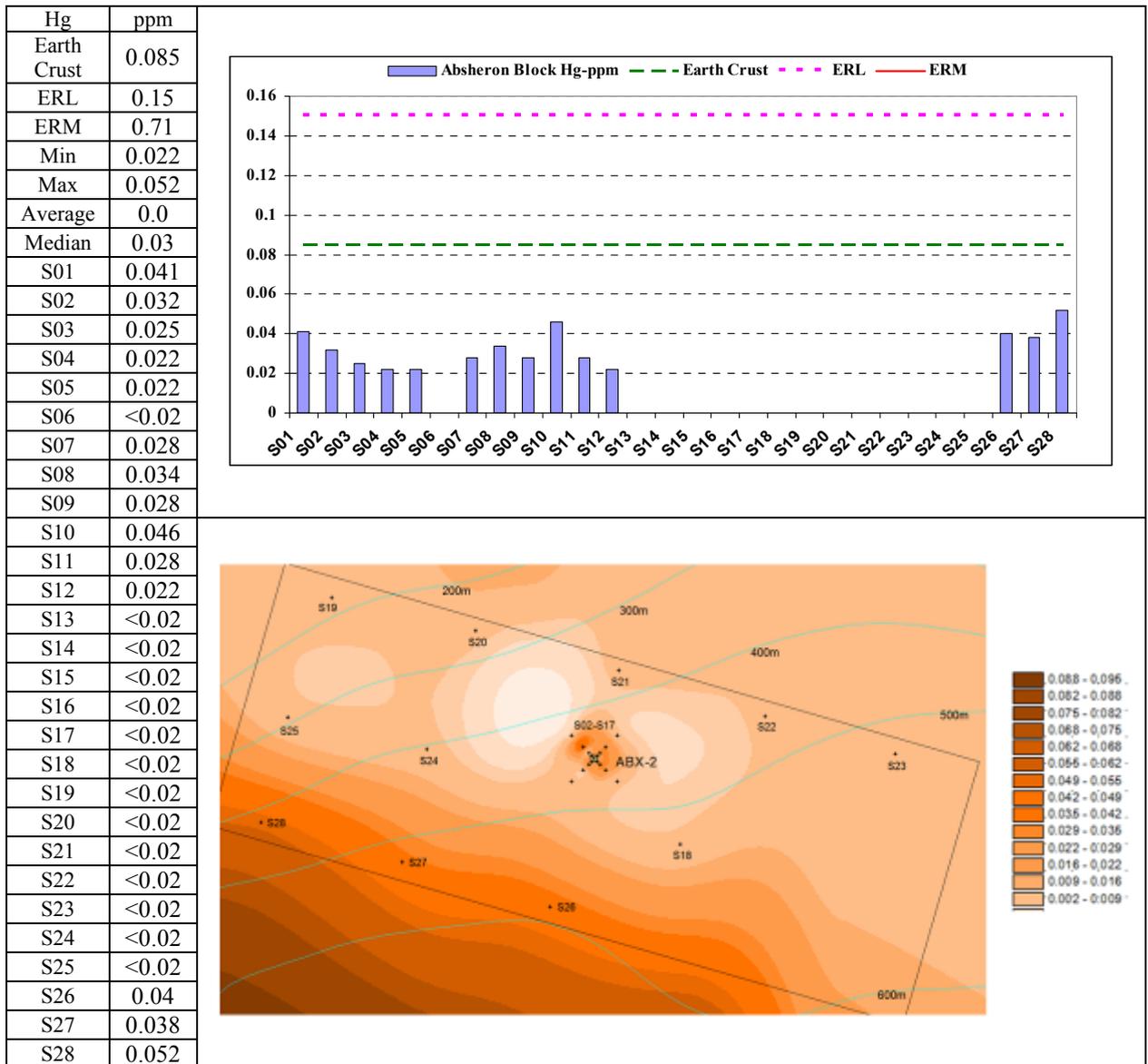


Figure 4.9 Mercury distribution in contract area sediments

4.6.10 Nickel (Ni)

For all samples, concentration of Nickel were below of of average value for Earth Crust. In the meantime, concentration of Nickel were above of indicative ERL value, but below of ERM.

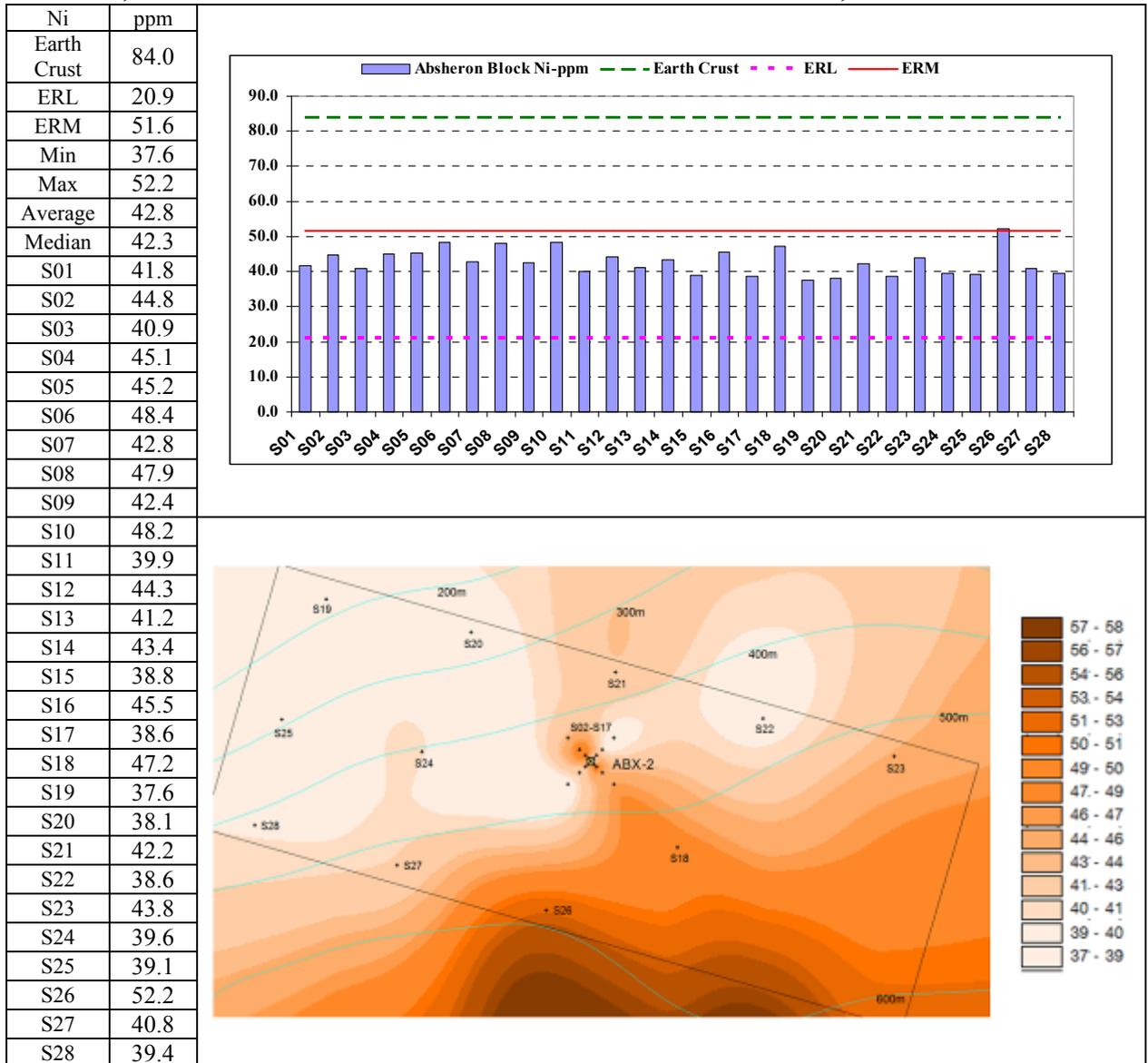


Figure 4.10 Nickel distribution in contract area sediments

4.6.11 Tin (Sn)

For Tin are not developed of ERL and ERM criteria. Between sampling points, for 21 sediments samples from 28, concentration of Tin were above average concentration of this metals for Earth Crust.

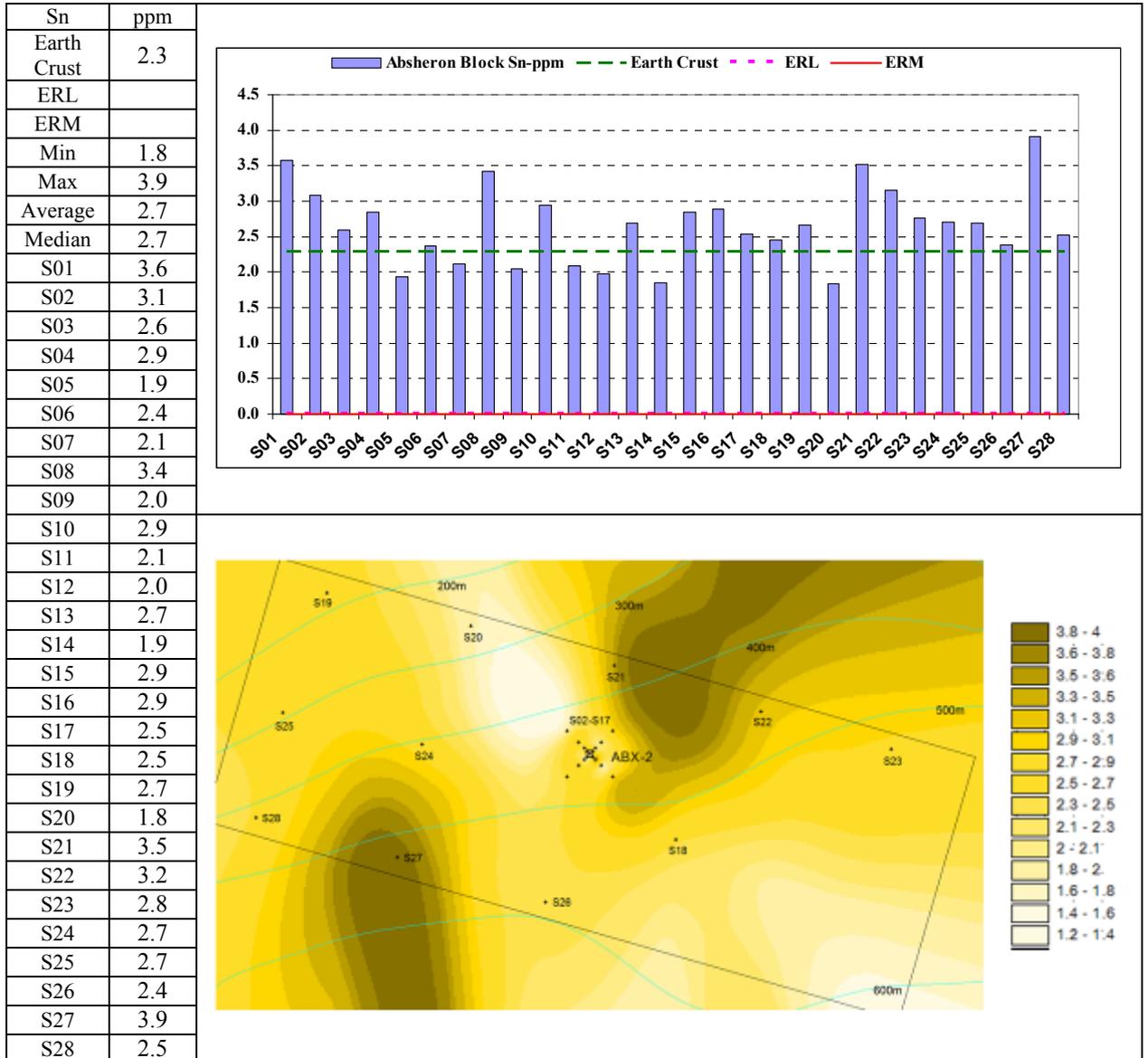


Figure 4.11 Tin distribution in contract area sediments

4.6.12 Zinc (Zn)

For all sediment samples concentration of Zinc were above average concentration of Zinc in Earth Crust, but below of both ERL and ERM indicative values for estimation of sediment criteria.

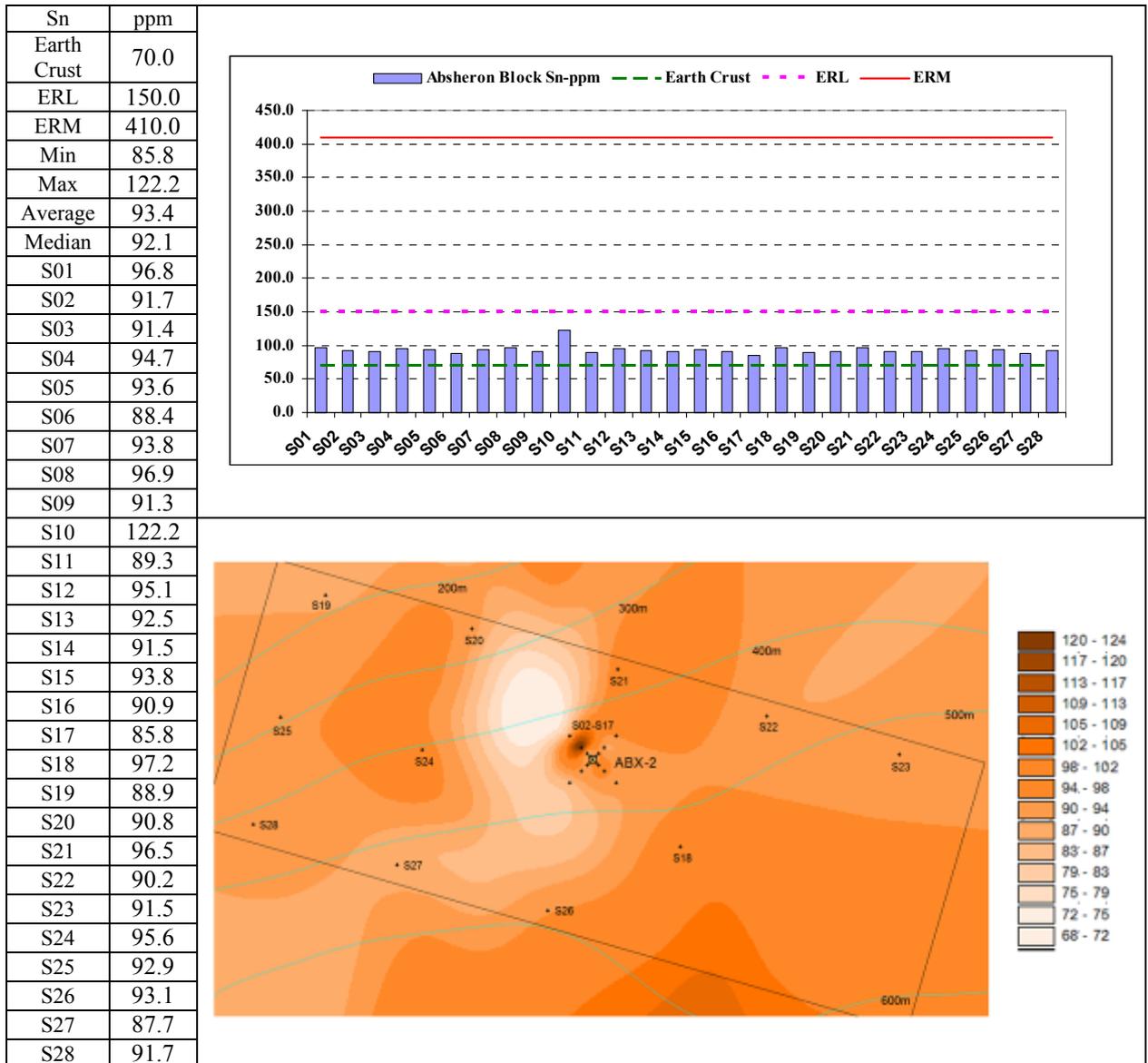


Figure 4.12 Zinc distribution in contract area sediments

4.7 Absheron Block benthic organisms description

During current benthic study (04-06 Alril 2010) in 28 sediment samples taken from Absheron-Block were discovered 12 groups of benthic organisms, including 4 species of worms (Annelides), 5 species of Crustacea and 3 species of Mollusca.

Total number of benthic species are changing from 20/m² (S26) till 1020/m² (S10) with mean number 195/m². The predominated group for numbers was worms (49.4%), next Crustacea species (35.1%) and last Mollusca species (15.5%). For biomass predominated group were Mollusca species (80.2%), then Crustacea species (12.4.1%) and last worm species (7.4%). In benthic species from stations S24 and S27 were registered of oil films.

Absheron block area are dividing into 3 zones per deepness:

- shallow station S19
- inclined stations- all stations S01÷S17 around drilling point and stations S20, S21, S22, S24, S25, S28
- deep stations (>500m) S18, S23, S26, S27

Numbers and biomass of zoobentos are characterizing by appropriate landscape distribution for above 3 zones of bottom of contract area. Minimum of numbers and biomass of benthic species were registered in deep stations (500-600 m) and maximum in shallow station S19. In inclined stations were registered consecutive decreasing of indexes with deepness.

Table 4.10 S01÷S04, Zoobentos species, number/m² and biomass (g/m²)

Species		S01		S02		S03		S04	
		N	B	N	B	N	B	N	B
Annelides	<i>Isochaetides michaelsoni</i> Last.	20	0.04	-	-	-	-	40	0.08
	<i>Enoplodes fluviatilis</i> Mic.	-	-	30	0.001	-	-	-	-
	<i>Psammorictes deserticola</i> Geimm	40	0.01	-	-	-	-	60	0.015
	<i>Stylodrilus cernosvitovi</i> Hrabec	-	-	30	0.052	-	-	-	-
Crustacea	<i>Mysis macrolepis</i> G.O. Sars	20	0.065	10	0.032	-	-	20	0.065
	<i>Mysis amblyops</i> G.O. Sars	-	-	15	0.19	-	-	-	-
	<i>Ostracoda</i> sp	5	0.025	-	-	-	-	-	-
	<i>Schizorhynchus eudorelloides</i> G.O. Sars	-	-	20	0.01	-	-	10	0.005
	<i>Mysis macrolepis</i> G.O. Sars	40	0.024	-	-	20	0.012	5	0.003
Mollusca	<i>Didacna profundicola</i> L.-S.	20	1.1	10	0.05	5	0.3	-	-
	<i>Anisus kolesnikovi</i> L.-S.	-	-	-	-	5	0.05	-	-
	<i>Pargula dimidata</i> Eichwald.	10	0.1	-	-	-	-	5	0.05
Total		155	1.264	115	0.335	30	0.362	140	0.218

Table 4.11 S05÷S08, Zoobentos species, number/m² and biomass (g/m²)

Species		S05		S06		S07		S08	
		N	B	N	B	N	B	N	B
Annelides	<i>Isochaetides michaelsoni</i> Last.	-	-	-	-	-	-	10	0.02
	<i>Enoplodes fluviatilis</i> Mic.	30	0.001	-	-	-	-	-	-
	<i>Psammorictes deserticola</i> Geimm	20	0.005	-	-	20	0.005	-	-
	<i>Stylodrilus cernosvitovi</i> Hrabec	-	-	-	-	-	-	-	-
Crustacea	<i>Mysis macrolepis</i> G.O. Sars	-	-	5	0.016	5	0.016	10	0.032
	<i>Mysis amblyops</i> G.O. Sars	25	0.31	-	-	-	-	-	-
	<i>Ostracoda</i> sp	-	-	25	0.125	10	0.05	-	-
	<i>Schizorhynchus eudorelloides</i> G.O. Sars	-	-	-	-	-	-	50	0.025
	<i>Mysis macrolepis</i> G.O. Sars	20	0.012	-	-	25	0.015	20	0.012
Mollusca	<i>Didacna profundicola</i> L.-S.	-	-	-	-	-	-	-	-
	<i>Anisus kolesnikovi</i> L.-S.	10	0.1	20	0.2	-	-	15	0.15
	<i>Pargula dimidata</i> Eichwald.	-	-	-	-	10	0.1	-	-
Total		105	0.428	50	0.341	70	0.186	105	0.239

Table 4.12 S9÷S12, Zoobentos species, number/m² and biomass (g/m²)

Species		S09		S10		S11		S12	
		N	B	N	B	N	B	N	B
Annelides	Ísochaetides michaelsoni Last.	-	-	-	-	-	-	20	0.04
	Enoplodes fluviatilis Mic.	-	-	30	0.001	-	-	-	-
	Psammorictes deserticola Geimm	20	0.005	-	-	-	-	20	0.005
	Stylodrilus cernosvitovi Hrabe	10	0.017	-	-	-	-	-	-
Crustacea	Mysis macrolepis G.O. Sars	-	-	-	-	-	-	20	0.065
	Mysis amblyops G.O. Sars	5	0.062	-	-	-	-	-	-
	Ostracoda sp	5	0.025	10	0.05	-	-	-	-
	Schizorhynchus eudorelloides G.O. Sars	-	-	30	0.015	-	-	-	-
	Mysis macrolepis G.O. Sars	-	-	-	-	20	0.012	5	0.003
Mollusca	Didacna profundicola L.-S.	20	0.95	10	0.55	5	0.3	-	-
	Anisus kolesnikovi L.-S.	-	-	15	0.15	5	0.05	-	-
	Pargula dimidata Eichwald.	10	0.01	-	-	-	-	-	-
Total		70	1.069	95	0.776	30	0.362	65	0.113

Table 4.13 S13÷S16, Zoobentos species, number/m² and biomass (g/m²)

Species		S13		S14		S15		S16	
		N	B	N	B	N	B	N	B
Annelides	Ísochaetides michaelsoni Last.	-	-	10	0.02	40	0.08	-	-
	Enoplodes fluviatilis Mic.	-	-	-	-	-	-	60	0.002
	Psammorictes deserticola Geimm	-	-	-	-	80	0.02	-	-
	Stylodrilus cernosvitovi Hrabe	-	-	-	-	-	-	60	0.1
Crustacea	Mysis macrolepis G.O. Sars	5	0.016	10	0.032	40	0.13	20	0.07
	Mysis amblyops G.O. Sars	-	-	-	-	-	-	30	0.37
	Ostracoda sp	10	0.06	-	-	10	0.06	-	-
	Schizorhynchus eudorelloides G.O. Sars	-	-	50	0.025	-	-	40	0.02
	Mysis macrolepis G.O. Sars	25	0.015	20	0.012	80	0.048	-	-
Mollusca	Didacna profundicola L.-S.	-	-	-	-	40	2.0	20	1.0
	Anisus kolesnikovi L.-S.	-	-	15	0.15	-	-	-	-
	Pargula dimidata Eichwald.	10	0.1	-	-	20	0.2	-	-
Total		50	0.191	105	0.239	310	2.538	230	1.562

Table 4.14 S17÷S20, Zoobentos species, number/m² and biomass (g/m²)

Species		S17		S18		S19		S20	
		N	B	N	B	N	B	N	B
Annelides	Ísochaetides michaelsoni Last.	-	-	-	-	180	0.36	120	0.24
	Enoplodes fluviatilis Mic.	60	0.002	-	-	120	0.004	30	0.001
	Psammorictes deserticola Geimm	40	0.01	-	-	120	0.03	60	0.015
	Stylodrilus cernosvitovi Hrabe	-	-	-	-	90	0.16	40	0.07
Crustacea	Mysis macrolepis G.O. Sars	-	-	10	0.032	80	0.026	50	0.162
	Mysis amblyops G.O. Sars	50	0.6	-	-	-	-	-	-
	Ostracoda sp	-	-	50	0.25	-	-	-	-
	Schizorhynchus eudorelloides G.O. Sars	-	-	-	-	60	0.003	-	-
	Mysis macrolepis G.O. Sars	40	0.024	-	-	200	0.12	90	0.054
Mollusca	Didacna profundicola L.-S.	-	-	-	-	120	6.0	80	4.0
	Anisus kolesnikovi L.-S.	20	0.2	40	0.4	-	-	-	-
	Pargula dimidata Eichwald.	-	-	-	-	50	0.5	30	0.3
Total		210	0.836	100	0.682	1020	7.203	500	4.842

Table 4.15 S21÷S24, Zoobentos species, number/m² and biomass (g/m²)

Species		S21		S22		S23		S24	
		N	B	N	B	N	B	N	B
Annelides	<i>Isochaetides michaelsoni</i> Last.	50	0.1	-	-	20	0.04	20	0.04
	<i>Enoplodes fluviatilis</i> Mic.	-	-	-	-	-	-	30	0.001
	<i>Psammorictes deserticola</i> Geimm	40	0.01	20	0.005	-	-	20	0.005
	<i>Stylodrilus cernovitovi</i> Hrabec	-	-	-	-	-	-	20	0.035
Crustacea	<i>Mysis macrolepis</i> G.O. Sars	10	0.032	20	0.065	-	-	20	0.065
	<i>Mysis amblyops</i> G.O. Sars	-	-	-	-	40	0.5	10	0.12
	Ostracoda sp	20	0.1	-	-	20	0.1	20	0.1
	<i>Schizorhynchus eudorelloides</i> G.O. Sars	-	-	100	0.05	-	-	10	0.005
	<i>Mysis macrolepis</i> G.O. Sars	50	0.03	40	0.024	-	-	-	-
Mollusca	<i>Didacna profundicola</i> L.-S.	40	2.0	-	-	-	-	40	2.0
	<i>Anisus kolesnikovi</i> L.-S.	-	-	-	-	30	0.3	-	-
	<i>Pargula dimidata</i> Eichwald.	-	-	20	0.2	-	-	20	0.2
Total		210	2.272	200	0.344	110	0.94	210	2.571

Table 4.16 S25÷S28, Zoobentos species, number/m² and biomass (g/m²)

Species		S25		S26		S27		S28	
		N	B	N	B	N	B	N	B
Annelides	<i>Isochaetides michaelsoni</i> Last.	180	0.36	-	-	-	-	80	0.016
	<i>Enoplodes fluviatilis</i> Mic.	120	0.004	-	-	-	-	30	0.001
	<i>Psammorictes deserticola</i> Geimm	160	0.04	-	-	-	-	120	0.03
	<i>Stylodrilus cernovitovi</i> Hrabec	75	0.13	-	-	-	-	-	-
Crustacea	<i>Mysis macrolepis</i> G.O. Sars	65	0.211	-	-	-	-	40	0.13
	<i>Mysis amblyops</i> G.O. Sars	-	-	-	-	-	-	-	-
	Ostracoda sp	-	-	20	0.1	-	-	-	-
	<i>Schizorhynchus eudorelloides</i> G.O. Sars	20	0.01	-	-	-	-	20	0.01
	<i>Mysis macrolepis</i> G.O. Sars	90	0.054	-	-	40	0.024	10	0.006
Mollusca	<i>Didacna profundicola</i> L.-S.	60	3.0	-	-	10	0.5	-	-
	<i>Anisus kolesnikovi</i> L.-S.	-	-	-	-	10	0.1	-	-
	<i>Pargula dimidata</i> Eichwald.	20	0.2	-	-	-	-	10	0.1
Total		790	4.01	20	0.1	60	0.624	310	0.293

5 Annexes

5.1 Field report

5.1.1 Sea survey team

Mehman Akhundov- Sea Survey Manager
 Geys Ibrahimov- Marine chemist
 Rovshan Hasanov- Marine chemist
 Salamat Nadirov- Marine biologist
 Tofiq Mukhtarov- Marine biologist
 Panah Namazli- MENR representative
 Tariel Chalabli- MENR representative
 Hasan Akhundov- Total representative



Figure 5.1 Field survey team

5.1.2 List of equipments

Table 5.1 Used sampling equipments

Description	Number
Sample boxes	7
PE packages for HM sediment sampling	100
Glass bottles for Organic sediment sampling	32
Metallic sampler for organics	4
Plastic samplers for metals	4
Glass bottles for organics tests	16
Plastic bottles for inorganic tests	16
Plastic bottles for biology water sampling	24
Digital camera	1
GPS	1
Sampling gloves	200
CTD equipment	1
Horiba U10	1
DO meter	1
Zooplankton net	2
Phytoplankton net	2
Freezing cameras	4
Shakers for bottom sediment sieving	2
Multi analyser	2
Bottom sediment sampler	2
Water sampler	4
PPEs for survey team	7

5.1.3 Sea Survey schedule

Sea survey was implemented at 04-06 March 2010.
 Below is sampling schedule and chain.

Table 5.2 Sampling schedule

St#	Matrix	Deepness	Date	Time start	Time finish
S19	sediment, benthic fauna	215	04.03.2010	21:41	22:00
S20	sediment, benthic fauna	304	04.03.2010	22:30	22:40
S21	sediment, benthic fauna	395	05.03.2010	00:05	00:11
S14	sediment, benthic fauna	445	05.03.2010	01:09	01:55
S10W	sediment, benthic fauna, water, plankton	470	05.03.2010	03:04	03:10
S06W	sediment, benthic fauna, water, plankton	480	05.03.2010	05:01	05:09
S02	sediment, benthic fauna	482	05.03.2010	07:00	07:15
S01	sediment, benthic fauna (ABX-2)	484	05.03.2010	08:00	08:10
S04	sediment, benthic fauna	485	05.03.2010	08:35	08:42
S08	sediment, benthic fauna	487	05.03.2010	09:06	09:14
S12W	sediment, benthic fauna, water, plankton	484	05.03.2010	10:50	11:00
S16	sediment, benthic fauna	492	05.03.2010	11:45	11:53
S17	sediment, benthic fauna	496	05.03.2010	12:50	13:00
S13W	sediment, benthic fauna, water, plankton	496	05.03.2010	14:00	14:09
S09	sediment, benthic fauna	490	05.03.2010	14:43	14:51
S05	sediment, benthic fauna	487	05.03.2010	15:26	15:35
S03	sediment, benthic fauna	480	05.03.2010	16:05	16:15
S07	sediment, benthic fauna	482	05.03.2010	16:50	17:00
S11	sediment, benthic fauna	472	05.03.2010	17:30	17:43
S15	sediment, benthic fauna	447	05.03.2010	18:10	18:20
S22	sediment, benthic fauna	452	05.03.2010	19:00	19:07
S23	sediment, benthic fauna	541	05.03.2010	20:00	20:10
S18	sediment, benthic fauna	553	05.03.2010	22:00	22:08
S26	sediment, benthic fauna	606	05.03.2010	23:20	23:30
S27	sediment, benthic fauna	547	06.03.2010	00:48	00:56
S28	sediment, benthic fauna	438	06.03.2010	02:00	02:09
S24	sediment, benthic fauna	419	06.03.2010	03:05	03:15
S25	sediment, benthic fauna	342	06.03.2010	04:05	04:15

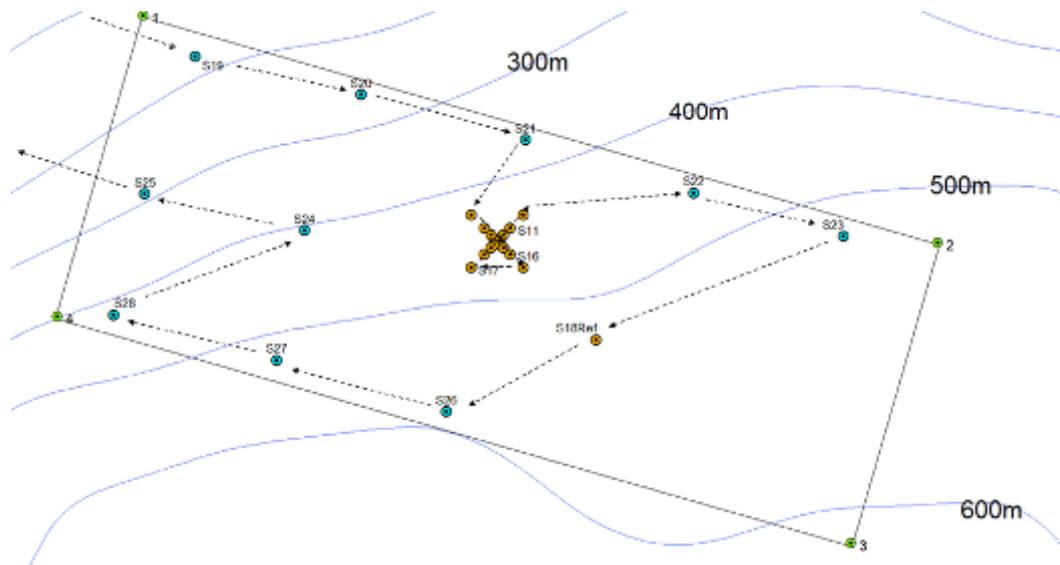


Figure 5.2 Sampling chain

5.1.4 Sampling stations coordinates

Table 5.3 Sampling station coordinates

St	X	Y	Long	Lat	Deg.Min.Sec
S01 (ABX-2)	9489045	4421655	50.8718482	39.9283094	50°52'18.653"; 39°55'41.914"
S02	9488868	4421832	50.8697772	39.9298991	50°52'11.198"; 39°55'47.637"
S03	9489222	4421832	50.8739132	39.9299037	50°52'26.087"; 39°55'47.653"
S04	9489222	4421478	50.873919	39.9267196	50°52'26.108"; 39°55'36.19"
S05	9488868	4421478	50.8697833	39.926715	50°52'11.22"; 39°55'36.174"
S06W	9488691	4422009	50.8677062	39.9314889	50°52'3.742"; 39°55'53.36"
S07	9489399	4422009	50.8759783	39.931498	50°52'33.522"; 39°55'53.393"
S08	9489399	4421301	50.8759898	39.9251297	50°52'33.563"; 39°55'30.467"
S09	9488691	4421301	50.8677184	39.9251206	50°52'3.786"; 39°55'30.434"
S10W	9488338	4422362	50.8635638	39.9346682	50°51'48.83"; 39°56'4.806"
S11	9489752	4422362	50.8801088	39.9346865	50°52'48.392"; 39°56'4.871"
S12W	9489752	4420948	50.880131	39.9219499	50°52'48.472"; 39°55'19.02"
S13W	9488338	4420948	50.8635891	39.9219316	50°51'48.921"; 39°55'18.954"
S14	9487631	4423069	50.8552779	39.9410265	50°51'19"; 39°56'27.695"
S15	9490459	4423069	50.8883709	39.9410631	50°53'18.135"; 39°56'27.827"
S16	9490459	4420241	50.8884123	39.9155899	50°53'18.284"; 39°54'56.123"
S17	9487631	4420241	50.8553315	39.9155533	50°51'19.193"; 39°54'55.992"
S18	9494348	4416352	50.9339321	39.8805988	50°56'2.156"; 39°52'50.156"
S19	9472835	4431614	50.6818051	40.0176382	50°40'54.498"; 40°1'3.498"
S20	9481732	4429574	50.7860783	39.9994993	50°47'9.882"; 39°59'58.198"
S21	9490548	4427125	50.8893469	39.9775898	50°53'21.649"; 39°58'39.323"
S22	9499567	4424268	50.994938	39.9519126	50°59'41.777"; 39°57'6.885"
S23	9507608	4421942	51.0889981	39.930927	51°5'20.393"; 39°55'51.337"
S24	9478702	4422235	50.7508333	39.9333333	50°45'3"; 39°56'0"
S25	9470138	4424207	50.6505556	39.9508333	50°39'2"; 39°57'3"
S26	9486303	4412473	50.8399653	39.8455734	50°50'23.875"; 39°50'44.064"
S27	9477202	4415248	50.7335291	39.870373	50°44'0.705"; 39°52'13.343"
S28	9468468	4417697	50.6313274	39.8921476	50°37'52.779"; 39°53'31.731"

5.1.5 CTD measurements

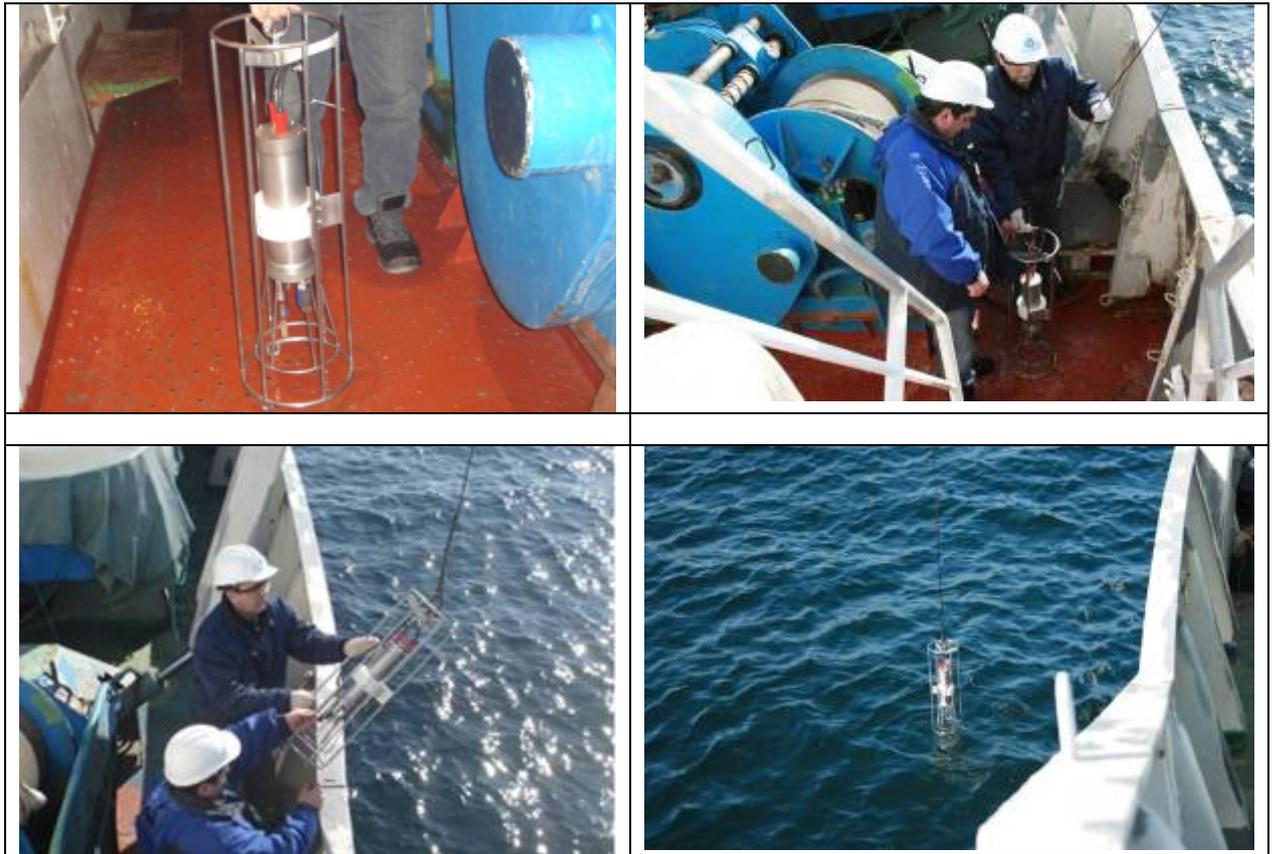


Figure 5.3 CTD equipments measurements

5.2 Samples registration report

Below samples had taken during 04-06 March Sea Survey.

- 28 seabed sediment sampling for chemical tests (+2 quality control samples)
- 28 seabed sediment screening products for mactofauna taxonomy
- 4 x 3=12 water samples for chemical tests (+2 quality control samples)
- 4 x 2 seawater screening product for plankton taxonomy

All samples for chemical tests were delivered to Azecolab. Seabed and seawater screening products were delivered to cooperative lab between Azecolab and Azerbaijan Fishing Institute for macrobentos and plankton taxonomy.



Figure 5.4 Water columns surface, middle and bottom samples

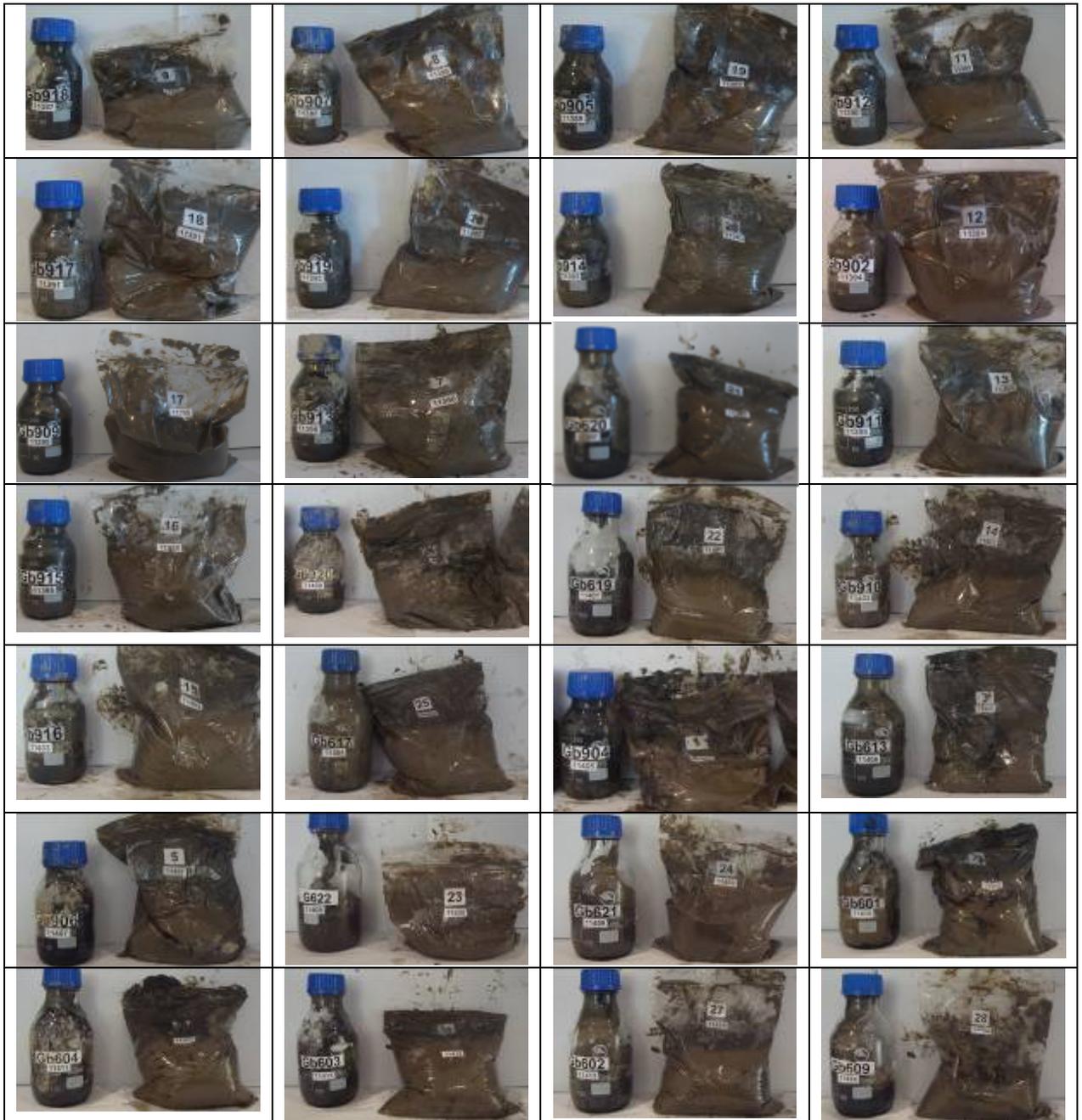


Figure 5.5 Bottom sediment samples

5.3 CTD results

5.3.1 Water column temperature profiling

Table 5.4 T(d) profile, S06W- 484 m

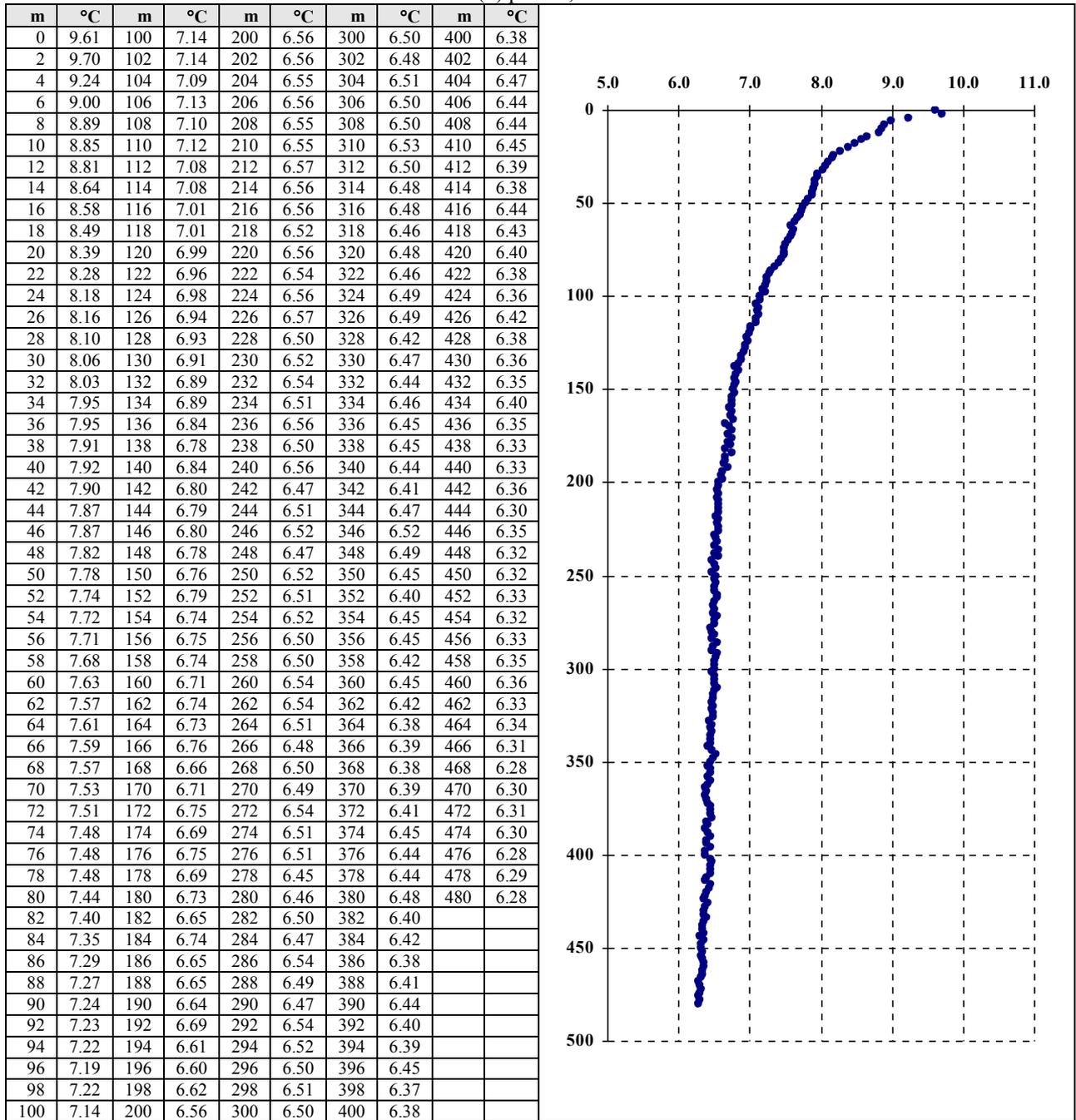


Table 5.5 T(d) profile, S10W- 470 m

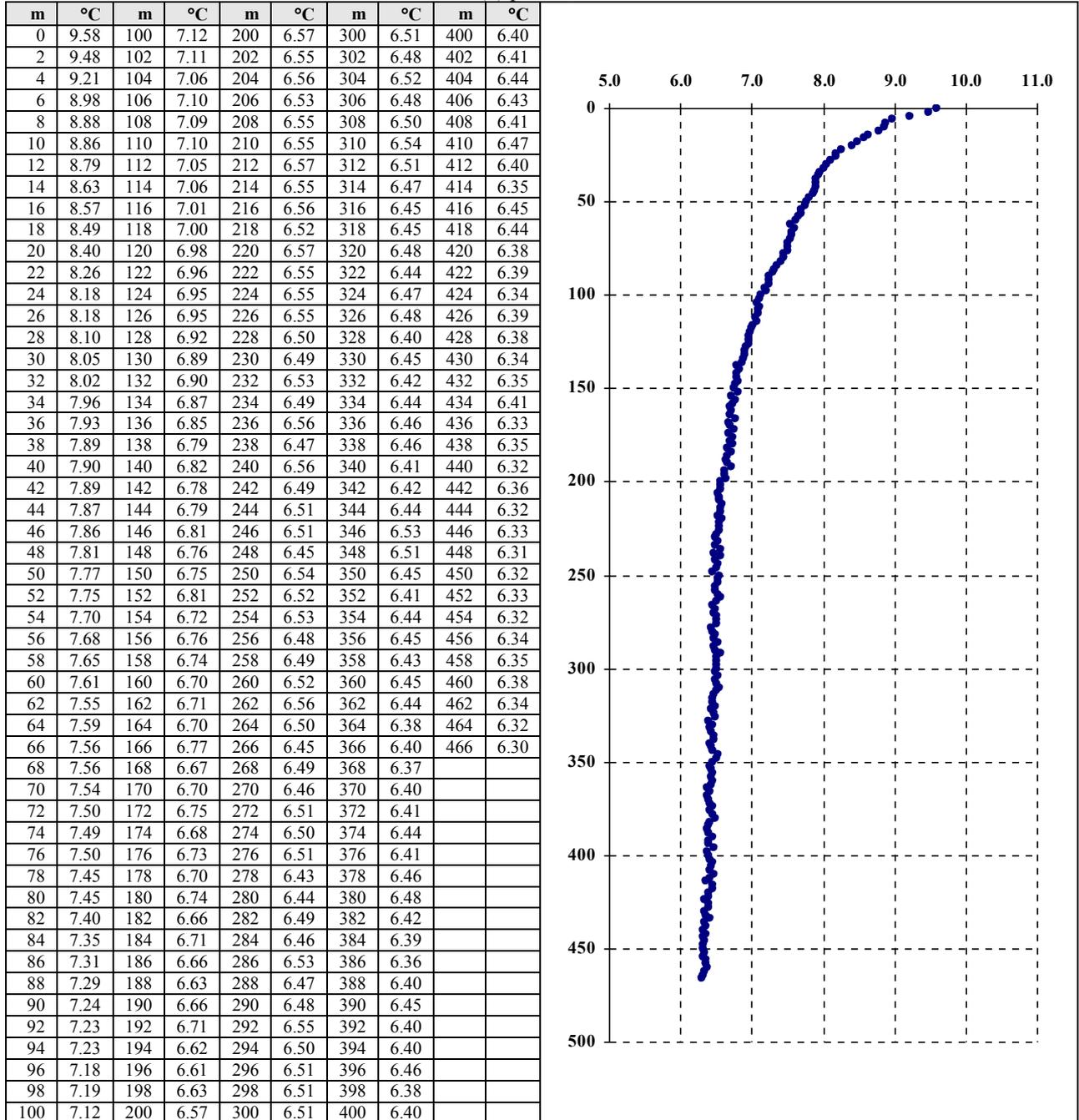


Table 5.6 T(d) profile, S12W- 484 m

m	°C	m	°C	m	°C	m	°C	m	°C
0	10.24	100	7.13	200	6.56	300	6.48	400	6.39
2	10.11	102	7.15	202	6.57	302	6.47	402	6.46
4	9.83	104	7.09	204	6.53	304	6.51	404	6.48
6	9.42	106	7.14	206	6.57	306	6.48	406	6.45
8	9.29	108	7.09	208	6.54	308	6.50	408	6.46
10	8.97	110	7.09	210	6.56	310	6.53	410	6.42
12	8.80	112	7.06	212	6.56	312	6.49	412	6.40
14	8.61	114	7.09	214	6.58	314	6.47	414	6.40
16	8.59	116	7.00	216	6.56	316	6.45	416	6.45
18	8.47	118	6.98	218	6.54	318	6.48	418	6.42
20	8.39	120	6.97	220	6.57	320	6.47	420	6.37
22	8.27	122	6.97	222	6.55	322	6.48	422	6.38
24	8.17	124	6.95	224	6.55	324	6.46	424	6.34
26	8.13	126	6.94	226	6.58	326	6.46	426	6.42
28	8.11	128	6.91	228	6.48	328	6.44	428	6.39
30	8.04	130	6.90	230	6.52	330	6.47	430	6.34
32	8.00	132	6.89	232	6.52	332	6.44	432	6.36
34	7.93	134	6.88	234	6.49	334	6.43	434	6.39
36	7.93	136	6.85	236	6.54	336	6.43	436	6.32
38	7.93	138	6.79	238	6.52	338	6.45	438	6.31
40	7.92	140	6.86	240	6.55	340	6.42	440	6.33
42	7.92	142	6.79	242	6.45	342	6.42	442	6.37
44	7.85	144	6.77	244	6.50	344	6.48	444	6.29
46	7.88	146	6.80	246	6.50	346	6.53	446	6.36
48	7.82	148	6.76	248	6.47	348	6.47	448	6.32
50	7.76	150	6.75	250	6.52	350	6.43	450	6.34
52	7.71	152	6.77	252	6.48	352	6.38	452	6.32
54	7.73	154	6.71	254	6.51	354	6.43	454	6.30
56	7.71	156	6.72	256	6.52	356	6.46	456	6.31
58	7.67	158	6.76	258	6.52	358	6.39	458	6.34
60	7.65	160	6.72	260	6.54	360	6.44	460	6.35
62	7.59	162	6.72	262	6.55	362	6.42	462	6.34
64	7.59	164	6.71	264	6.49	364	6.37	464	6.34
66	7.60	166	6.74	266	6.46	366	6.39	466	6.32
68	7.54	168	6.66	268	6.51	368	6.38	468	6.32
70	7.52	170	6.72	270	6.47	370	6.39	470	6.31
72	7.52	172	6.76	272	6.56	372	6.42	472	6.31
74	7.45	174	6.71	274	6.50	374	6.45	474	6.31
76	7.45	176	6.76	276	6.51	376	6.41	476	6.31
78	7.46	178	6.70	278	6.43	378	6.46	478	6.31
80	7.42	180	6.73	280	6.47	380	6.49	480	6.30
82	7.40	182	6.63	282	6.48	382	6.38		
84	7.36	184	6.76	284	6.47	384	6.42		
86	7.27	186	6.63	286	6.52	386	6.39		
88	7.27	188	6.66	288	6.49	388	6.40		
90	7.22	190	6.63	290	6.49	390	6.46		
92	7.23	192	6.68	292	6.53	392	6.41		
94	7.22	194	6.62	294	6.51	394	6.39		
96	7.18	196	6.58	296	6.49	396	6.42		
98	7.24	198	6.61	298	6.50	398	6.37		
100	7.13	200	6.56	300	6.48	400	6.39		

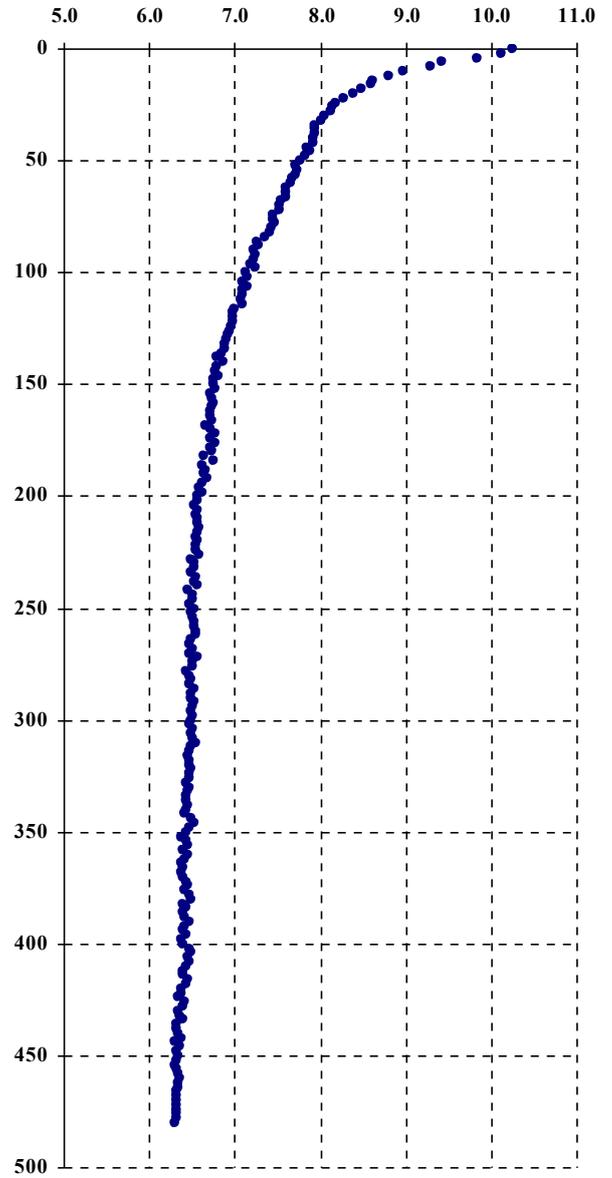
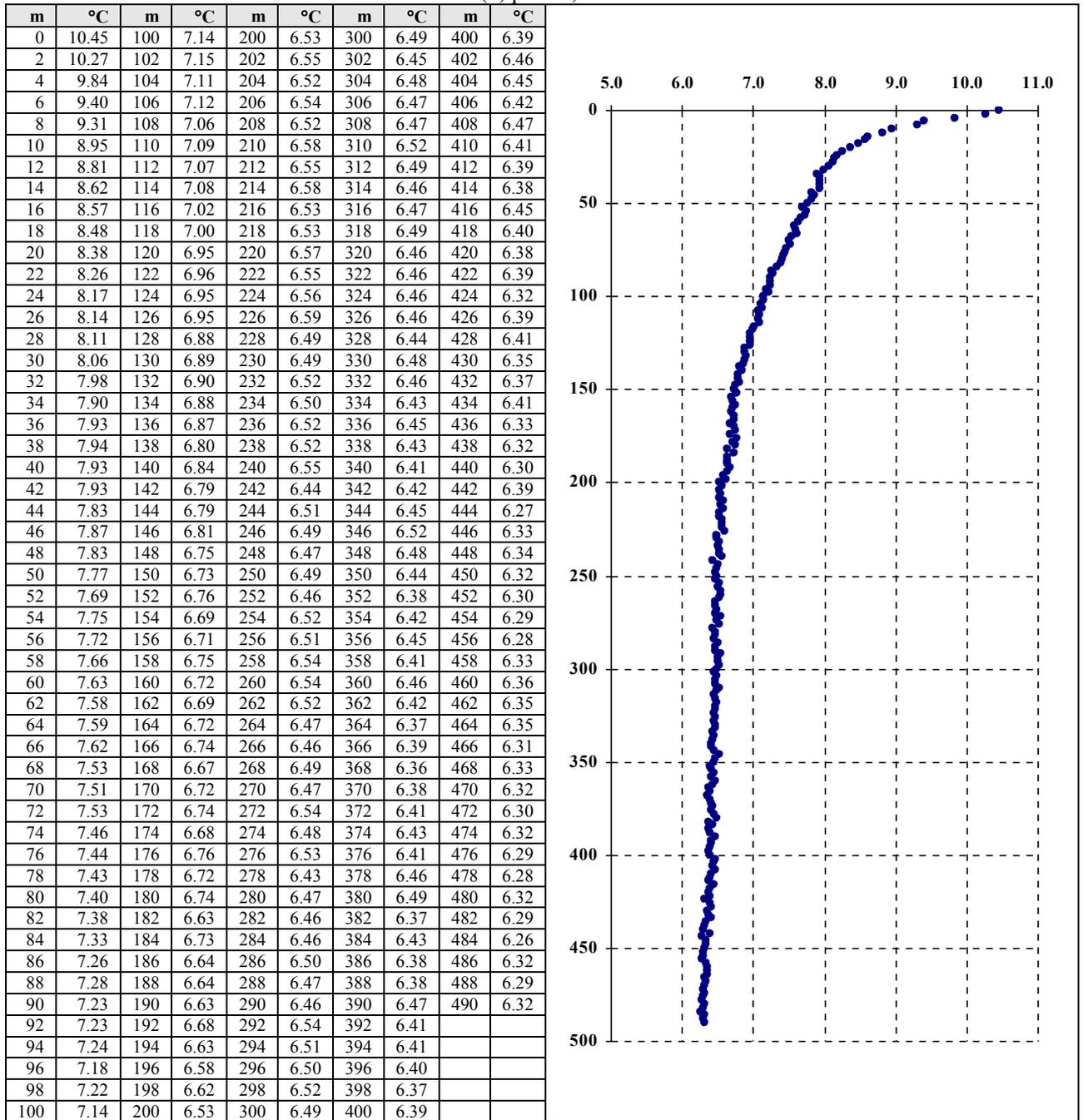


Table 5.7 T(d) profile, S13W-496 m



5.3.2 Water column pH profiling

Table 5.8 pH(d) profile, S06W-484 m

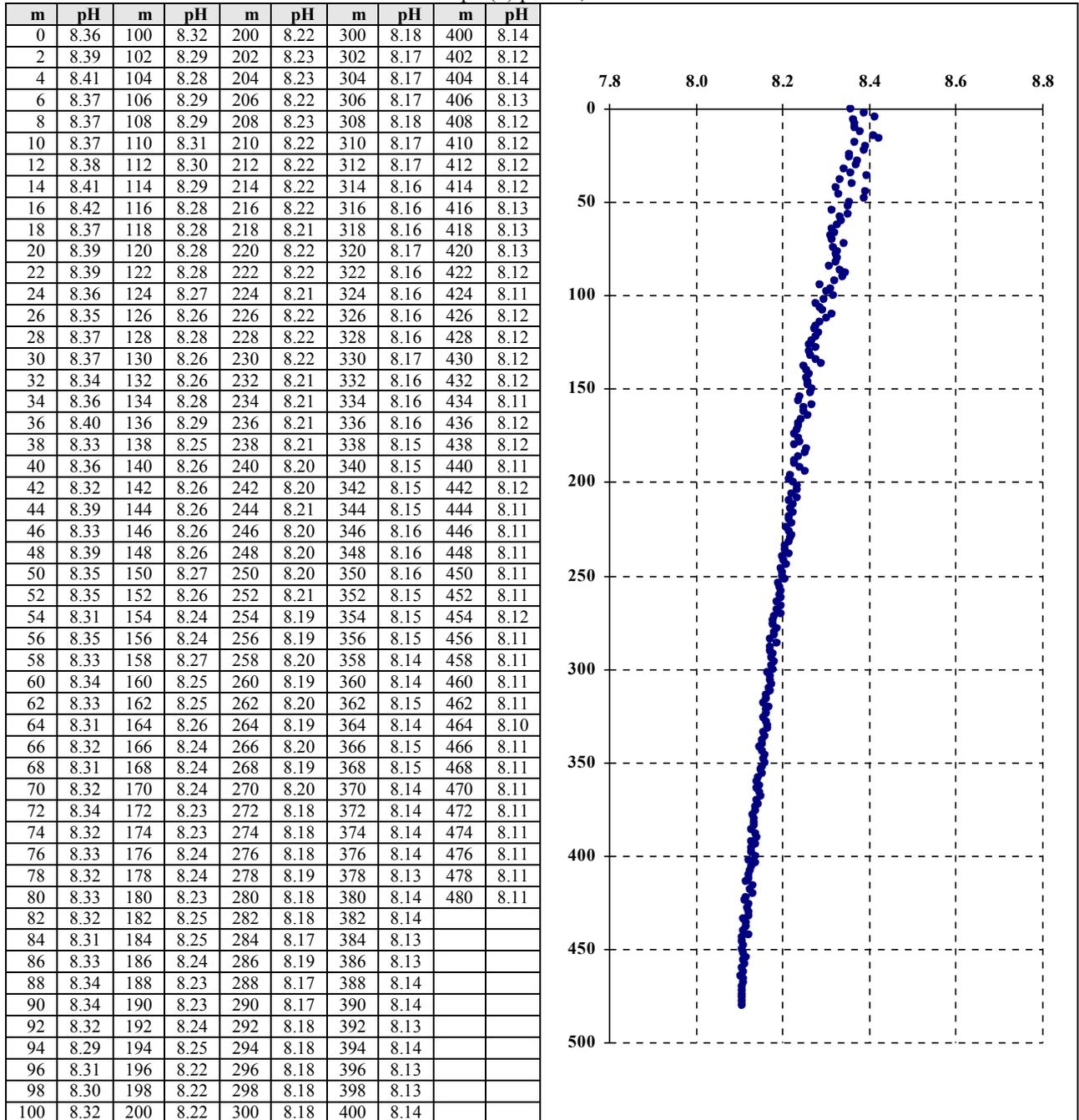


Table 5.9 pH(d) profile, S10W- 470 m

m	pH								
0	8.43	100	8.31	200	8.23	300	8.18	400	8.12
2	8.39	102	8.28	202	8.23	302	8.17	402	8.14
4	8.37	104	8.31	204	8.23	304	8.18	404	8.13
6	8.41	106	8.29	206	8.23	306	8.18	406	8.13
8	8.43	108	8.30	208	8.23	308	8.17	408	8.13
10	8.39	110	8.29	210	8.22	310	8.17	410	8.12
12	8.41	112	8.30	212	8.22	312	8.16	412	8.13
14	8.43	114	8.29	214	8.23	314	8.16	414	8.12
16	8.36	116	8.29	216	8.22	316	8.16	416	8.13
18	8.35	118	8.27	218	8.22	318	8.16	418	8.12
20	8.38	120	8.30	220	8.22	320	8.17	420	8.12
22	8.35	122	8.26	222	8.22	322	8.15	422	8.12
24	8.40	124	8.28	224	8.22	324	8.15	424	8.12
26	8.41	126	8.26	226	8.22	326	8.16	426	8.13
28	8.36	128	8.28	228	8.22	328	8.16	428	8.12
30	8.36	130	8.28	230	8.22	330	8.17	430	8.12
32	8.35	132	8.26	232	8.22	332	8.16	432	8.11
34	8.34	134	8.29	234	8.22	334	8.15	434	8.12
36	8.35	136	8.28	236	8.22	336	8.16	436	8.12
38	8.38	138	8.28	238	8.21	338	8.16	438	8.11
40	8.39	140	8.27	240	8.20	340	8.16	440	8.11
42	8.40	142	8.29	242	8.21	342	8.15	442	8.11
44	8.37	144	8.28	244	8.20	344	8.16	444	8.12
46	8.32	146	8.25	246	8.20	346	8.15	446	8.11
48	8.32	148	8.26	248	8.21	348	8.15	448	8.11
50	8.33	150	8.25	250	8.21	350	8.15	450	8.11
52	8.36	152	8.27	252	8.19	352	8.16	452	8.10
54	8.37	154	8.26	254	8.20	354	8.15	454	8.11
56	8.38	156	8.25	256	8.20	356	8.15	456	8.11
58	8.32	158	8.26	258	8.19	358	8.15	458	8.11
60	8.37	160	8.23	260	8.19	360	8.15	460	8.11
62	8.37	162	8.23	262	8.19	362	8.15	462	8.11
64	8.32	164	8.27	264	8.18	364	8.15	464	8.11
66	8.31	166	8.26	266	8.19	366	8.15	466	8.11
68	8.31	168	8.26	268	8.19	368	8.14		
70	8.33	170	8.25	270	8.19	370	8.15		
72	8.33	172	8.23	272	8.19	372	8.14		
74	8.32	174	8.26	274	8.19	374	8.14		
76	8.33	176	8.23	276	8.19	376	8.14		
78	8.29	178	8.25	278	8.18	378	8.14		
80	8.33	180	8.24	280	8.18	380	8.15		
82	8.33	182	8.26	282	8.18	382	8.13		
84	8.30	184	8.23	284	8.17	384	8.15		
86	8.28	186	8.24	286	8.17	386	8.13		
88	8.32	188	8.25	288	8.18	388	8.14		
90	8.30	190	8.24	290	8.18	390	8.14		
92	8.29	192	8.25	292	8.18	392	8.13		
94	8.33	194	8.23	294	8.18	394	8.14		
96	8.29	196	8.22	296	8.16	396	8.13		
98	8.32	198	8.23	298	8.18	398	8.13		
100	8.31	200	8.23	300	8.18	400	8.12		

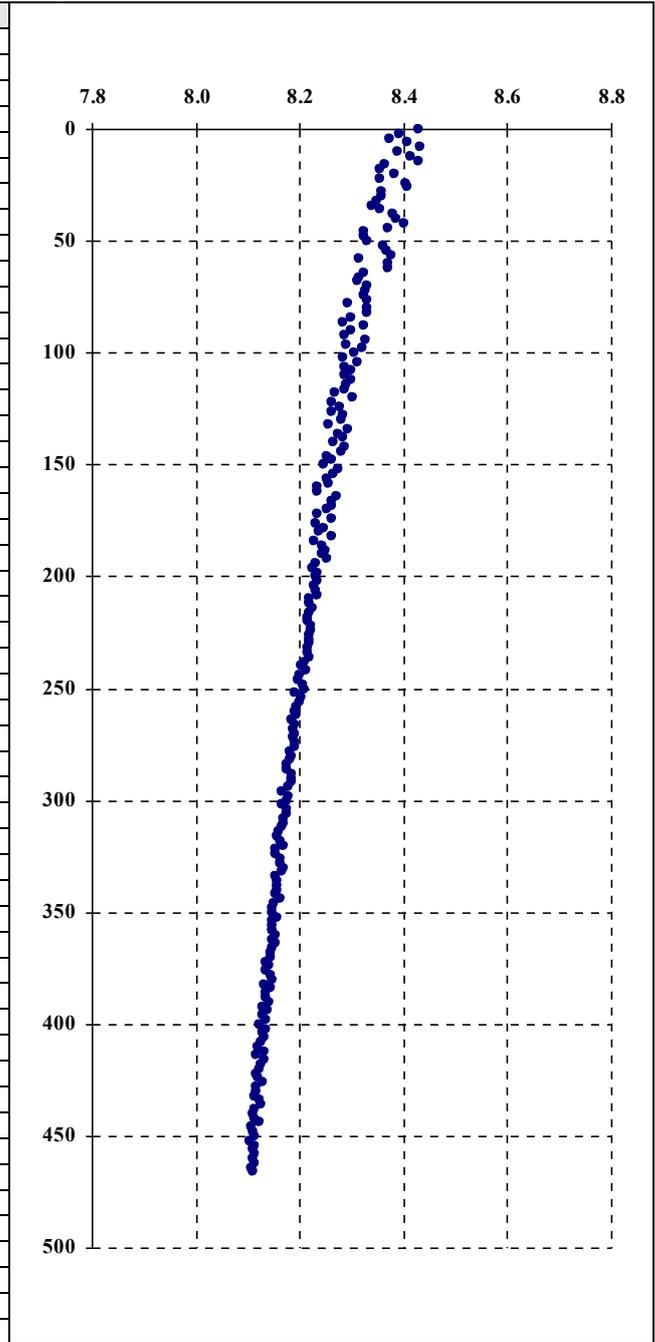


Table 5.10 pH(d) profile, S12W-484 m

m	pH								
0	8.39	100	8.31	200	8.23	300	8.17	400	8.13
2	8.41	102	8.30	202	8.23	302	8.17	402	8.14
4	8.36	104	8.30	204	8.23	304	8.17	404	8.13
6	8.36	106	8.30	206	8.23	306	8.17	406	8.12
8	8.39	108	8.29	208	8.23	308	8.17	408	8.13
10	8.37	110	8.30	210	8.23	310	8.16	410	8.13
12	8.35	112	8.29	212	8.22	312	8.16	412	8.12
14	8.41	114	8.31	214	8.22	314	8.17	414	8.12
16	8.43	116	8.31	216	8.22	316	8.16	416	8.12
18	8.39	118	8.27	218	8.22	318	8.17	418	8.12
20	8.42	120	8.30	220	8.21	320	8.17	420	8.12
22	8.36	122	8.29	222	8.22	322	8.17	422	8.12
24	8.38	124	8.29	224	8.22	324	8.16	424	8.12
26	8.39	126	8.29	226	8.22	326	8.16	426	8.11
28	8.36	128	8.26	228	8.21	328	8.16	428	8.13
30	8.34	130	8.27	230	8.22	330	8.16	430	8.11
32	8.34	132	8.26	232	8.21	332	8.15	432	8.12
34	8.39	134	8.28	234	8.21	334	8.16	434	8.11
36	8.39	136	8.27	236	8.21	336	8.15	436	8.11
38	8.35	138	8.29	238	8.21	338	8.15	438	8.11
40	8.34	140	8.27	240	8.21	340	8.15	440	8.11
42	8.40	142	8.28	242	8.20	342	8.15	442	8.11
44	8.37	144	8.25	244	8.21	344	8.15	444	8.12
46	8.34	146	8.27	246	8.21	346	8.15	446	8.11
48	8.37	148	8.28	248	8.20	348	8.16	448	8.12
50	8.36	150	8.24	250	8.20	350	8.15	450	8.11
52	8.36	152	8.26	252	8.20	352	8.15	452	8.11
54	8.32	154	8.25	254	8.20	354	8.14	454	8.11
56	8.31	156	8.24	256	8.19	356	8.15	456	8.11
58	8.34	158	8.24	258	8.20	358	8.14	458	8.11
60	8.31	160	8.25	260	8.19	360	8.15	460	8.11
62	8.33	162	8.24	262	8.19	362	8.14	462	8.10
64	8.31	164	8.27	264	8.19	364	8.15	464	8.11
66	8.31	166	8.25	266	8.19	366	8.14	466	8.10
68	8.30	168	8.24	268	8.20	368	8.14	468	8.10
70	8.30	170	8.24	270	8.18	370	8.14	470	8.11
72	8.32	172	8.23	272	8.19	372	8.14	472	8.10
74	8.33	174	8.26	274	8.19	374	8.14	474	8.09
76	8.32	176	8.25	276	8.18	376	8.13	476	8.10
78	8.31	178	8.25	278	8.18	378	8.14	478	8.10
80	8.32	180	8.24	280	8.18	380	8.14	480	8.10
82	8.29	182	8.25	282	8.19	382	8.13		
84	8.30	184	8.26	284	8.18	384	8.14		
86	8.33	186	8.24	286	8.18	386	8.14		
88	8.34	188	8.23	288	8.17	388	8.14		
90	8.34	190	8.23	290	8.18	390	8.14		
92	8.28	192	8.23	292	8.18	392	8.14		
94	8.29	194	8.24	294	8.17	394	8.14		
96	8.29	196	8.24	296	8.18	396	8.13		
98	8.31	198	8.22	298	8.17	398	8.13		
100	8.31	200	8.23	300	8.17	400	8.13		

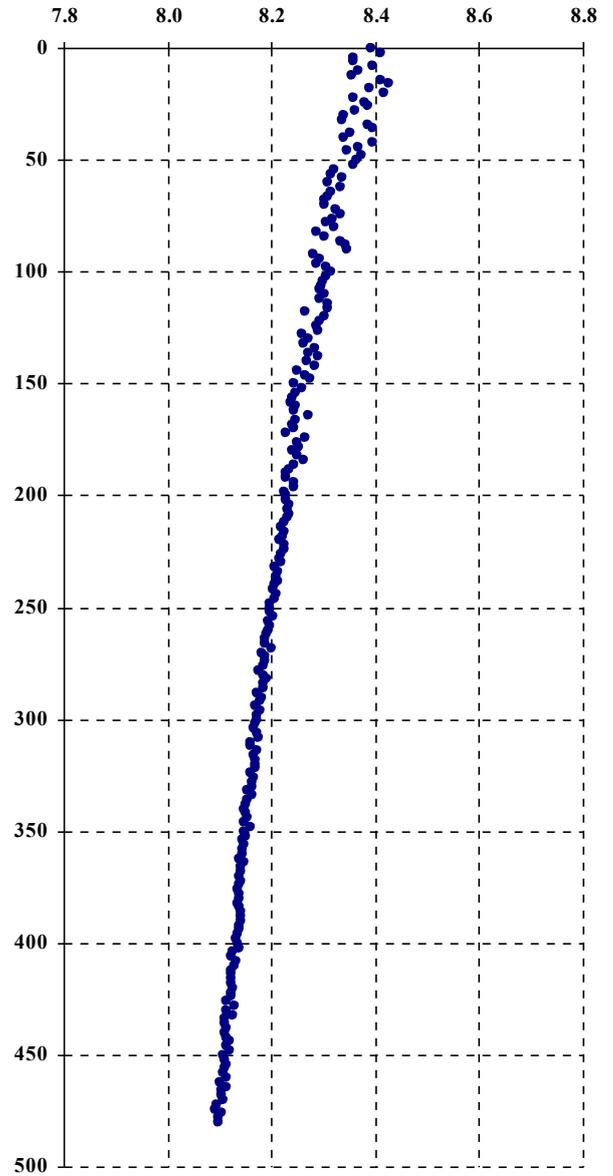
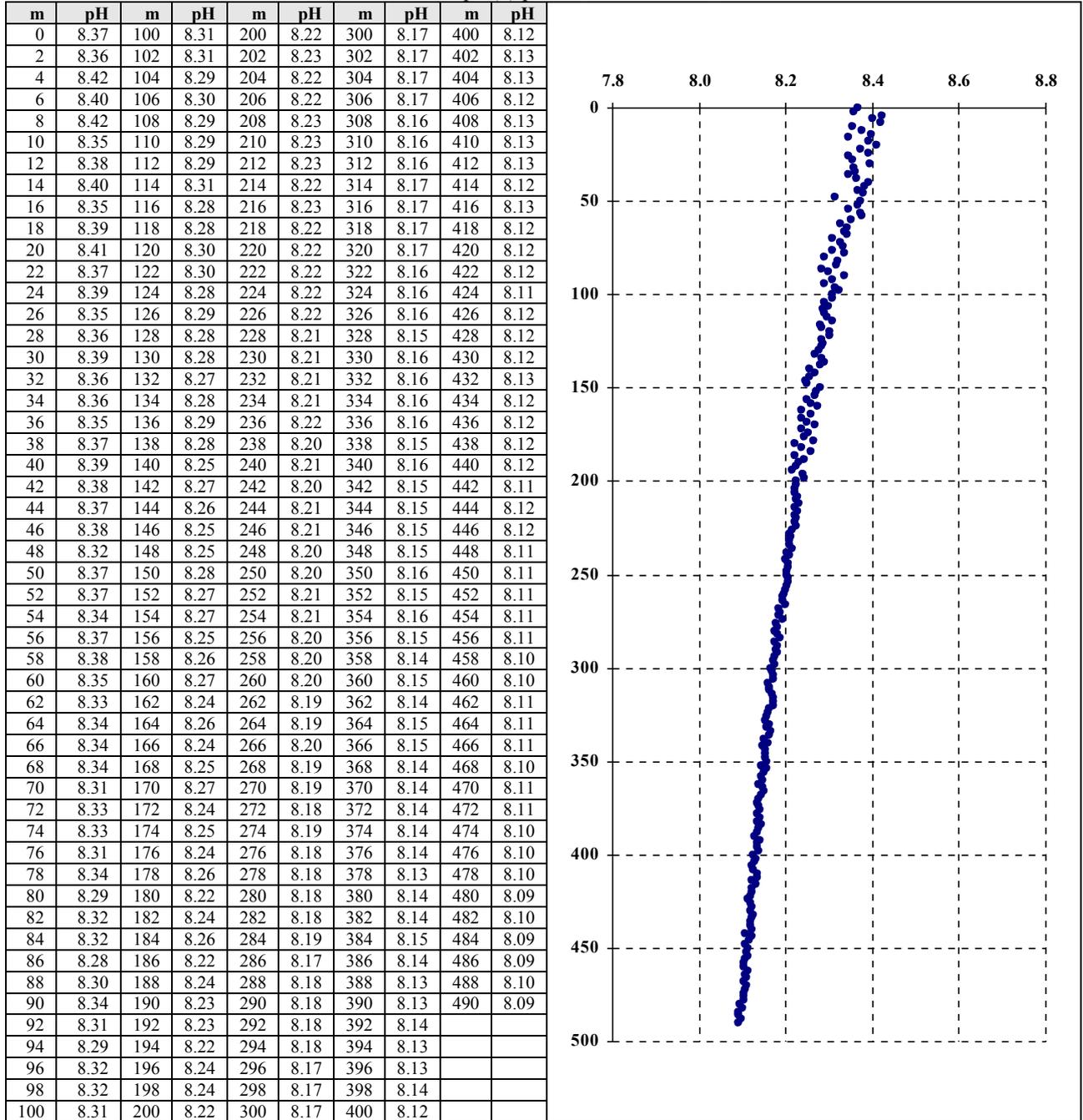


Table 5.11 pH(d) profile, S13W-496 m,



5.3.3 Water column DO profiling

Table 5.12 DO(d) profile, S06W- 484 m

m	mg/l								
0	7.70	100	5.35	200	4.01	300	3.52	400	3.26
2	7.53	102	5.22	202	3.97	302	3.53	402	3.33
4	7.74	104	5.28	204	4.09	304	3.47	404	3.30
6	7.50	106	5.21	206	4.04	306	3.49	406	3.39
8	7.42	108	5.15	208	3.98	308	3.49	408	3.34
10	7.30	110	5.06	210	3.87	310	3.60	410	3.27
12	7.15	112	5.08	212	3.97	312	3.42	412	3.31
14	7.39	114	5.01	214	3.83	314	3.50	414	3.31
16	7.40	116	5.13	216	3.79	316	3.44	416	3.32
18	7.21	118	5.03	218	3.78	318	3.55	418	3.25
20	7.14	120	4.86	220	3.82	320	3.48	420	3.30
22	7.10	122	4.77	222	3.73	322	3.42	422	3.36
24	6.91	124	4.92	224	3.76	324	3.46	424	3.25
26	6.89	126	4.78	226	3.88	326	3.49	426	3.22
28	6.71	128	4.89	228	3.75	328	3.43	428	3.25
30	6.64	130	4.91	230	3.79	330	3.46	430	3.37
32	6.93	132	4.83	232	3.68	332	3.39	432	3.29
34	6.76	134	4.83	234	3.70	334	3.43	434	3.30
36	6.55	136	4.73	236	3.74	336	3.49	436	3.24
38	6.70	138	4.59	238	3.75	338	3.50	438	3.27
40	6.62	140	4.53	240	3.71	340	3.46	440	3.26
42	6.51	142	4.59	242	3.71	342	3.49	442	3.28
44	6.51	144	4.58	244	3.72	344	3.49	444	3.24
46	6.42	146	4.64	246	3.71	346	3.43	446	3.27
48	6.23	148	4.51	248	3.67	348	3.37	448	3.35
50	6.31	150	4.61	250	3.72	350	3.45	450	3.24
52	6.20	152	4.64	252	3.63	352	3.35	452	3.26
54	6.10	154	4.53	254	3.69	354	3.42	454	3.21
56	6.19	156	4.51	256	3.62	356	3.41	456	3.23
58	6.00	158	4.38	258	3.62	358	3.44	458	3.25
60	6.08	160	4.31	260	3.67	360	3.40	460	3.21
62	6.16	162	4.39	262	3.72	362	3.38	462	3.24
64	5.84	164	4.29	264	3.64	364	3.30	464	3.27
66	5.85	166	4.48	266	3.62	366	3.38	466	3.26
68	5.98	168	4.41	268	3.65	368	3.34	468	3.15
70	5.95	170	4.43	270	3.58	370	3.43	470	3.23
72	5.82	172	4.38	272	3.59	372	3.34	472	3.17
74	5.79	174	4.35	274	3.58	374	3.34	474	3.17
76	5.84	176	4.25	276	3.59	376	3.40	476	3.24
78	5.66	178	4.31	278	3.60	378	3.31	478	3.22
80	5.69	180	4.08	280	3.57	380	3.31	480	3.21
82	5.54	182	3.99	282	3.57	382	3.40		
84	5.55	184	4.31	284	3.50	384	3.27		
86	5.45	186	4.11	286	3.60	386	3.39		
88	5.47	188	4.00	288	3.57	388	3.37		
90	5.56	190	4.21	290	3.52	390	3.39		
92	5.29	192	4.12	292	3.52	392	3.36		
94	5.24	194	4.26	294	3.54	394	3.23		
96	5.40	196	4.10	296	3.53	396	3.33		
98	5.19	198	4.13	298	3.58	398	3.39		
100	5.35	200	4.01	300	3.52	400	3.26		

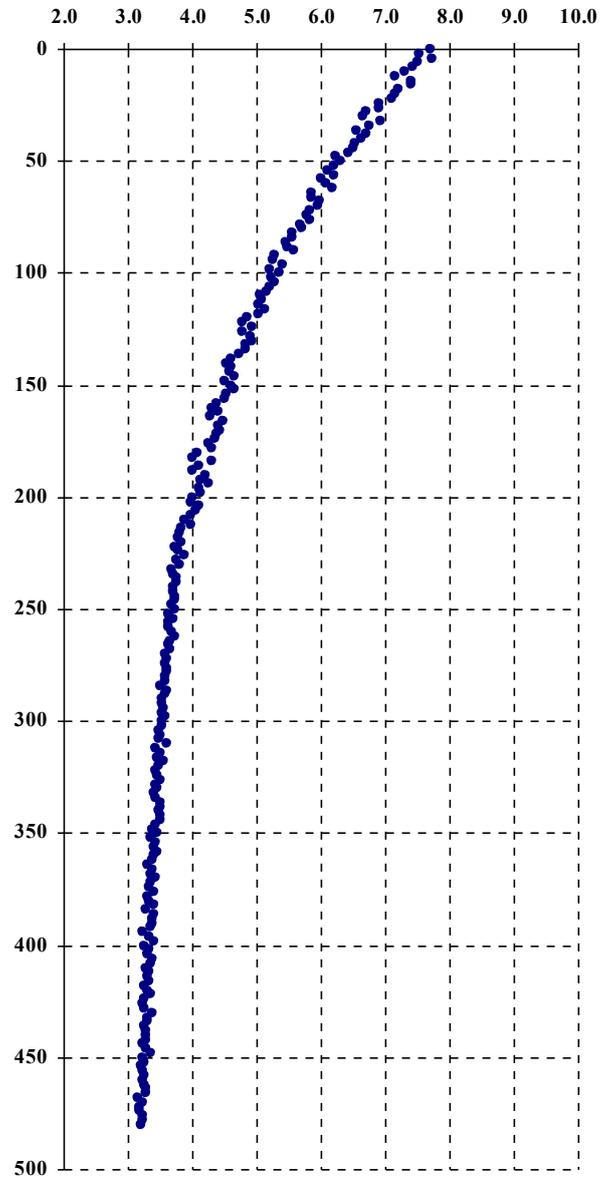


Table 5.13 DO(d) profile, S10W-470 m

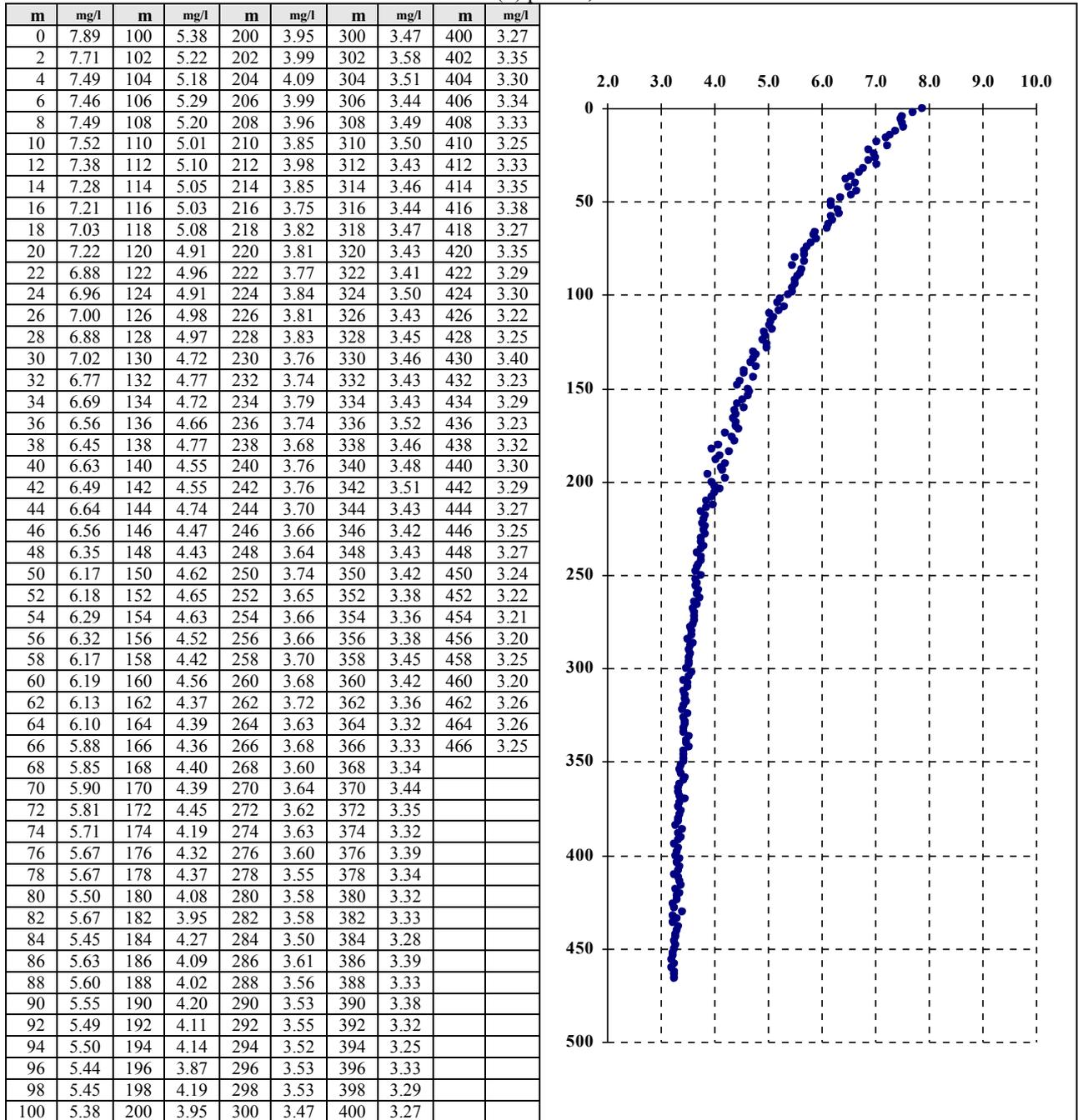


Table 5.14 DO(d) profile, S12W-484 m

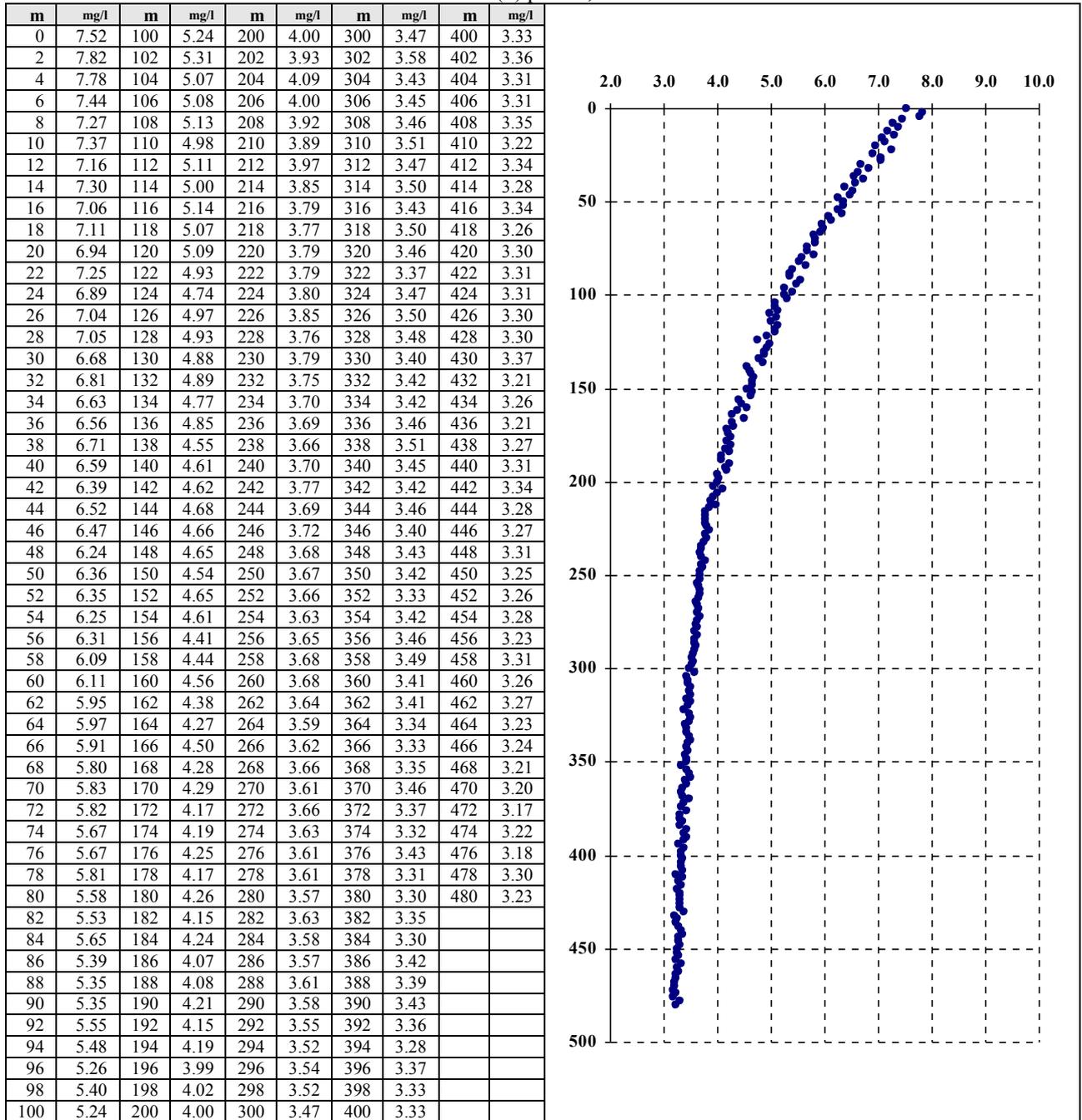
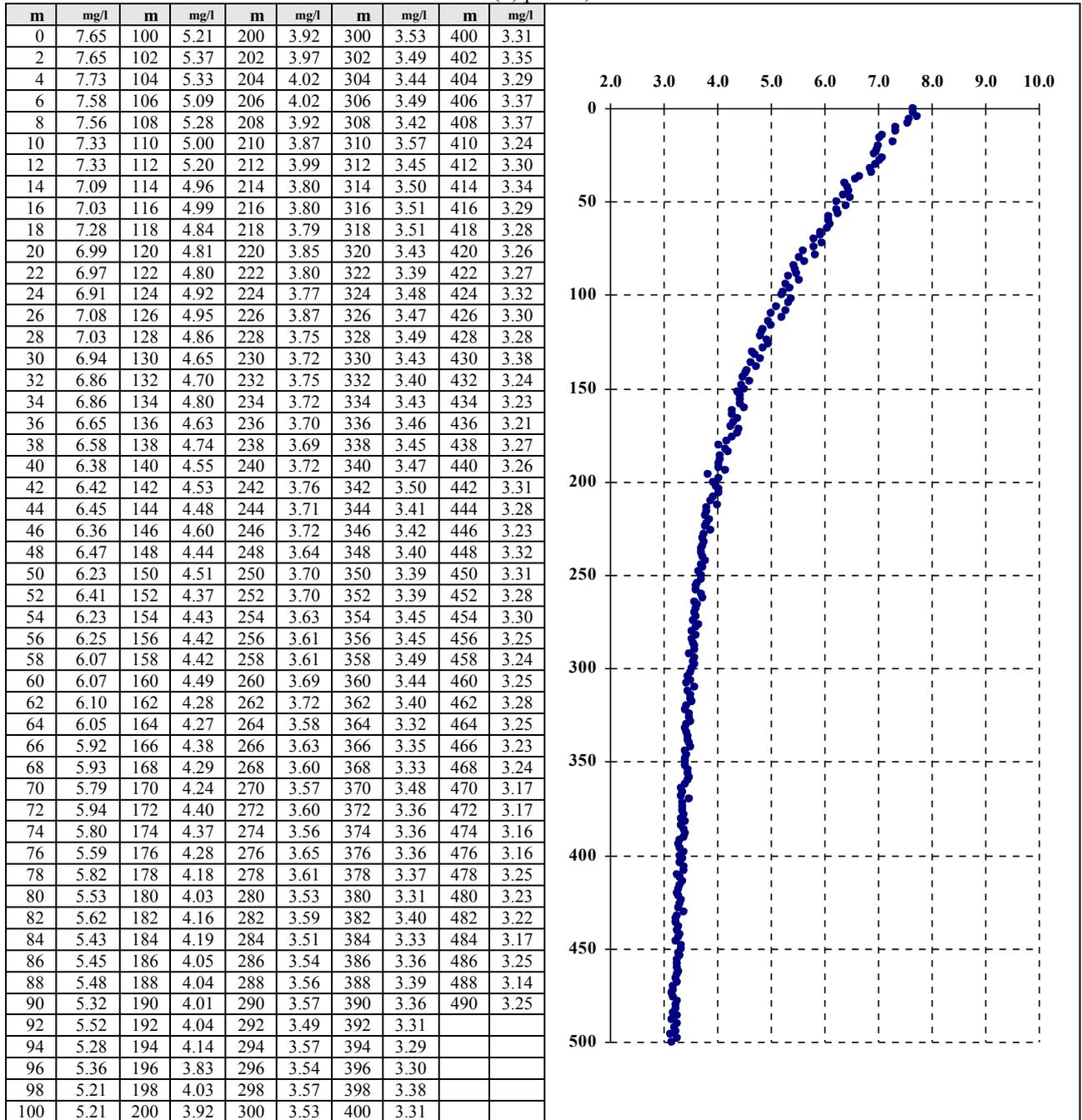


Table 5.15 DO(d) profile, S13W- 496 m



5.3.4 Water column conductivity profiling

Table 5.16 Ec(d) profile (msm/cm), S06W-484 m

m	Ec								
0	19.37	100	19.50	200	19.67	300	19.78	400	19.88
2	19.39	102	19.58	202	19.68	302	19.80	402	19.91
4	19.43	104	19.58	204	19.65	304	19.77	404	19.93
6	19.36	106	19.57	206	19.66	306	19.79	406	19.89
8	19.44	108	19.54	208	19.70	308	19.80	408	19.90
10	19.45	110	19.57	210	19.68	310	19.82	410	19.91
12	19.46	112	19.60	212	19.67	312	19.81	412	19.93
14	19.39	114	19.53	214	19.68	314	19.80	414	19.94
16	19.41	116	19.57	216	19.70	316	19.79	416	19.91
18	19.44	118	19.59	218	19.71	318	19.83	418	19.94
20	19.41	120	19.59	220	19.71	320	19.83	420	19.91
22	19.39	122	19.60	222	19.72	322	19.82	422	19.94
24	19.48	124	19.55	224	19.71	324	19.81	424	19.91
26	19.41	126	19.54	226	19.72	326	19.84	426	19.94
28	19.47	128	19.55	228	19.72	328	19.83	428	19.91
30	19.46	130	19.56	230	19.73	330	19.82	430	19.95
32	19.46	132	19.59	232	19.70	332	19.81	432	19.91
34	19.42	134	19.56	234	19.74	334	19.81	434	19.91
36	19.41	136	19.55	236	19.74	336	19.84	436	19.93
38	19.41	138	19.62	238	19.69	338	19.86	438	19.93
40	19.49	140	19.58	240	19.72	340	19.84	440	19.95
42	19.48	142	19.60	242	19.74	342	19.86	442	19.96
44	19.45	144	19.61	244	19.75	344	19.85	444	19.96
46	19.43	146	19.56	246	19.74	346	19.84	446	19.95
48	19.45	148	19.60	248	19.73	348	19.87	448	19.93
50	19.48	150	19.61	250	19.71	350	19.84	450	19.94
52	19.51	152	19.59	252	19.76	352	19.84	452	19.96
54	19.46	154	19.59	254	19.76	354	19.87	454	19.93
56	19.45	156	19.59	256	19.72	356	19.87	456	19.98
58	19.48	158	19.64	258	19.77	358	19.86	458	19.94
60	19.49	160	19.65	260	19.76	360	19.88	460	19.96
62	19.48	162	19.59	262	19.74	362	19.88	462	19.97
64	19.54	164	19.60	264	19.74	364	19.86	464	19.94
66	19.46	166	19.62	266	19.74	366	19.85	466	19.95
68	19.52	168	19.64	268	19.78	368	19.89	468	19.95
70	19.46	170	19.66	270	19.75	370	19.87	470	19.98
72	19.45	172	19.65	272	19.76	372	19.88	472	19.96
74	19.52	174	19.64	274	19.77	374	19.89	474	19.96
76	19.50	176	19.66	276	19.76	376	19.88	476	19.99
78	19.55	178	19.62	278	19.77	378	19.90	478	19.95
80	19.52	180	19.66	280	19.76	380	19.90	480	19.99
82	19.54	182	19.65	282	19.78	382	19.90		
84	19.52	184	19.69	284	19.76	384	19.91		
86	19.49	186	19.65	286	19.79	386	19.88		
88	19.52	188	19.62	288	19.78	388	19.89		
90	19.52	190	19.63	290	19.80	390	19.88		
92	19.55	192	19.64	292	19.80	392	19.90		
94	19.56	194	19.70	294	19.78	394	19.91		
96	19.48	196	19.63	296	19.80	396	19.88		
98	19.49	198	19.70	298	19.79	398	19.89		
100	19.50	200	19.67	300	19.78	400	19.88		

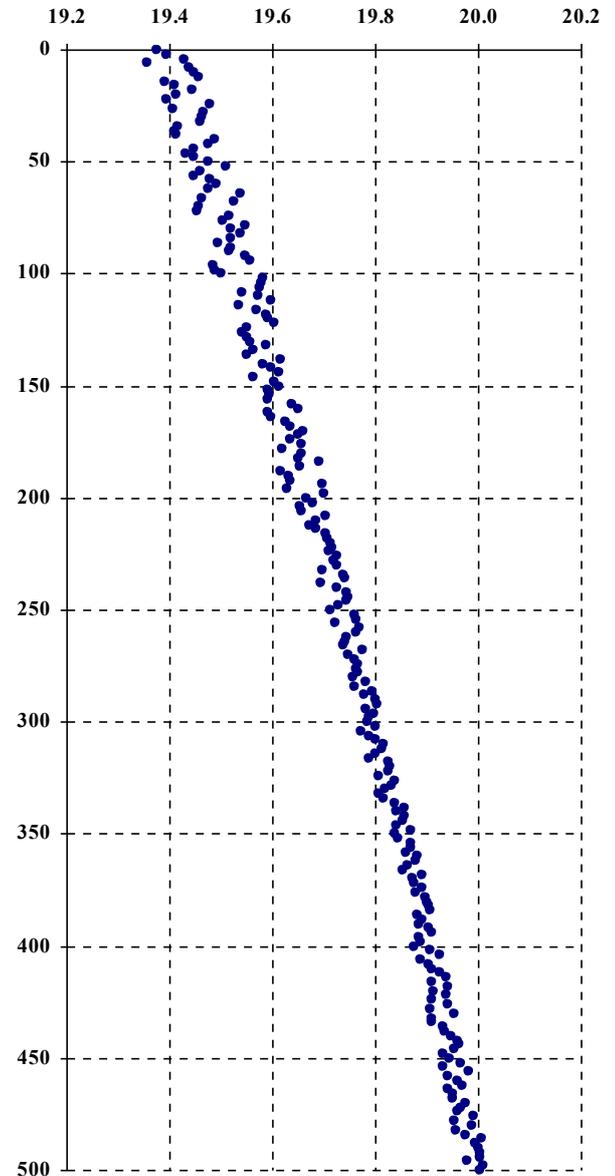


Table 5.17 Ec(d) profile (msm/cm), S10W-470 m

m	Ec								
0	19.36	100	19.51	200	19.64	300	19.80	400	19.88
2	19.44	102	19.55	202	19.69	302	19.78	402	19.89
4	19.40	104	19.56	204	19.70	304	19.81	404	19.91
6	19.43	106	19.51	206	19.69	306	19.79	406	19.88
8	19.43	108	19.54	208	19.68	308	19.79	408	19.91
10	19.40	110	19.54	210	19.71	310	19.79	410	19.91
12	19.41	112	19.59	212	19.66	312	19.79	412	19.94
14	19.38	114	19.57	214	19.71	314	19.81	414	19.91
16	19.43	116	19.54	216	19.70	316	19.79	416	19.92
18	19.45	118	19.57	218	19.72	318	19.81	418	19.94
20	19.46	120	19.53	220	19.72	320	19.80	420	19.91
22	19.47	122	19.55	222	19.69	322	19.82	422	19.94
24	19.45	124	19.53	224	19.72	324	19.80	424	19.93
26	19.45	126	19.56	226	19.71	326	19.82	426	19.93
28	19.42	128	19.57	228	19.72	328	19.82	428	19.91
30	19.46	130	19.56	230	19.69	330	19.81	430	19.94
32	19.41	132	19.56	232	19.72	332	19.82	432	19.94
34	19.46	134	19.55	234	19.72	334	19.84	434	19.91
36	19.47	136	19.63	236	19.69	336	19.85	436	19.93
38	19.44	138	19.58	238	19.70	338	19.86	438	19.94
40	19.47	140	19.63	240	19.73	340	19.82	440	19.96
42	19.43	142	19.63	242	19.70	342	19.84	442	19.94
44	19.47	144	19.60	244	19.74	344	19.85	444	19.94
46	19.45	146	19.59	246	19.72	346	19.84	446	19.96
48	19.49	148	19.61	248	19.75	348	19.86	448	19.94
50	19.46	150	19.60	250	19.75	350	19.83	450	19.94
52	19.52	152	19.61	252	19.71	352	19.85	452	19.93
54	19.43	154	19.59	254	19.74	354	19.86	454	19.98
56	19.44	156	19.59	256	19.76	356	19.86	456	19.95
58	19.52	158	19.63	258	19.73	358	19.86	458	19.95
60	19.53	160	19.63	260	19.75	360	19.87	460	19.98
62	19.44	162	19.61	262	19.77	362	19.86	462	19.97
64	19.53	164	19.65	264	19.75	364	19.85	464	19.94
66	19.47	166	19.63	266	19.74	366	19.88	466	19.96
68	19.52	168	19.60	268	19.76	368	19.84		
70	19.51	170	19.62	270	19.78	370	19.88		
72	19.47	172	19.65	272	19.77	372	19.85		
74	19.53	174	19.68	274	19.77	374	19.88		
76	19.47	176	19.68	276	19.78	376	19.86		
78	19.51	178	19.64	278	19.79	378	19.88		
80	19.50	180	19.64	280	19.77	380	19.88		
82	19.53	182	19.65	282	19.76	382	19.90		
84	19.52	184	19.65	284	19.77	384	19.89		
86	19.48	186	19.62	286	19.79	386	19.87		
88	19.56	188	19.62	288	19.78	388	19.89		
90	19.57	190	19.69	290	19.78	390	19.90		
92	19.54	192	19.69	292	19.76	392	19.90		
94	19.54	194	19.70	294	19.79	394	19.92		
96	19.58	196	19.65	296	19.76	396	19.88		
98	19.55	198	19.66	298	19.76	398	19.91		
100	19.51	200	19.64	300	19.80	400	19.88		

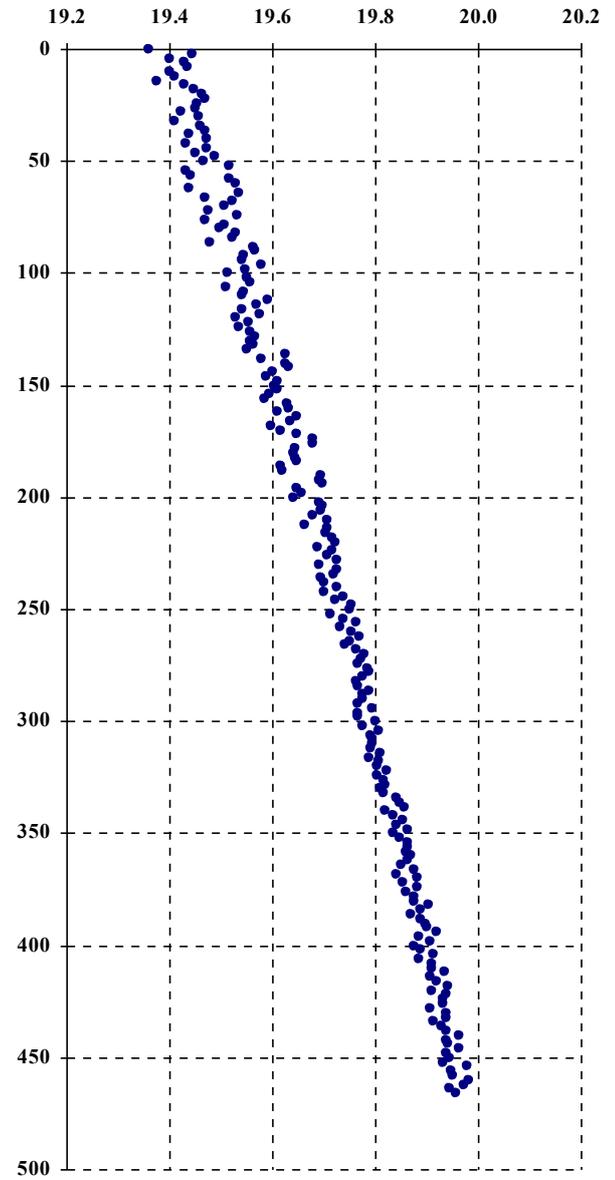


Table 5.18 Ec(d) profile (msm/cm), S12W-484 m

m	Ec								
0	19.41	100	19.56	200	19.70	300	19.81	400	19.91
2	19.39	102	19.52	202	19.66	302	19.81	402	19.91
4	19.45	104	19.56	204	19.67	304	19.80	404	19.90
6	19.38	106	19.56	206	19.66	306	19.79	406	19.89
8	19.45	108	19.56	208	19.66	308	19.78	408	19.91
10	19.45	110	19.55	210	19.66	310	19.82	410	19.92
12	19.44	112	19.54	212	19.71	312	19.82	412	19.89
14	19.46	114	19.56	214	19.68	314	19.80	414	19.93
16	19.38	116	19.55	216	19.68	316	19.79	416	19.92
18	19.39	118	19.55	218	19.71	318	19.84	418	19.91
20	19.44	120	19.54	220	19.70	320	19.80	420	19.93
22	19.41	122	19.58	222	19.71	322	19.80	422	19.90
24	19.39	124	19.54	224	19.71	324	19.80	424	19.91
26	19.42	126	19.55	226	19.69	326	19.81	426	19.94
28	19.48	128	19.56	228	19.72	328	19.83	428	19.91
30	19.45	130	19.56	230	19.71	330	19.82	430	19.93
32	19.42	132	19.59	232	19.71	332	19.83	432	19.96
34	19.45	134	19.61	234	19.70	334	19.85	434	19.93
36	19.43	136	19.59	236	19.73	336	19.81	436	19.92
38	19.40	138	19.61	238	19.71	338	19.84	438	19.95
40	19.45	140	19.58	240	19.72	340	19.82	440	19.92
42	19.50	142	19.60	242	19.71	342	19.83	442	19.94
44	19.45	144	19.56	244	19.72	344	19.82	444	19.96
46	19.46	146	19.61	246	19.72	346	19.83	446	19.96
48	19.51	148	19.57	248	19.74	348	19.85	448	19.95
50	19.48	150	19.62	250	19.73	350	19.84	450	19.94
52	19.46	152	19.59	252	19.72	352	19.86	452	19.95
54	19.51	154	19.65	254	19.75	354	19.83	454	19.93
56	19.50	156	19.58	256	19.76	356	19.85	456	19.96
58	19.50	158	19.59	258	19.72	358	19.85	458	19.94
60	19.45	160	19.64	260	19.76	360	19.88	460	19.96
62	19.53	162	19.66	262	19.76	362	19.85	462	19.96
64	19.48	164	19.60	264	19.75	364	19.84	464	19.94
66	19.53	166	19.63	266	19.75	366	19.86	466	19.96
68	19.50	168	19.64	268	19.76	368	19.87	468	19.96
70	19.53	170	19.64	270	19.78	370	19.85	470	19.95
72	19.48	172	19.60	272	19.78	372	19.86	472	19.99
74	19.51	174	19.66	274	19.78	374	19.89	474	19.95
76	19.46	176	19.66	276	19.79	376	19.87	476	19.95
78	19.47	178	19.65	278	19.74	378	19.87	478	20.00
80	19.56	180	19.66	280	19.76	380	19.90	480	19.97
82	19.49	182	19.68	282	19.79	382	19.87		
84	19.54	184	19.64	284	19.79	384	19.87		
86	19.51	186	19.64	286	19.76	386	19.90		
88	19.56	188	19.65	288	19.76	388	19.88		
90	19.53	190	19.67	290	19.78	390	19.91		
92	19.55	192	19.65	292	19.76	392	19.89		
94	19.52	194	19.69	294	19.76	394	19.92		
96	19.55	196	19.70	296	19.77	396	19.89		
98	19.54	198	19.67	298	19.81	398	19.90		
100	19.56	200	19.70	300	19.81	400	19.91		

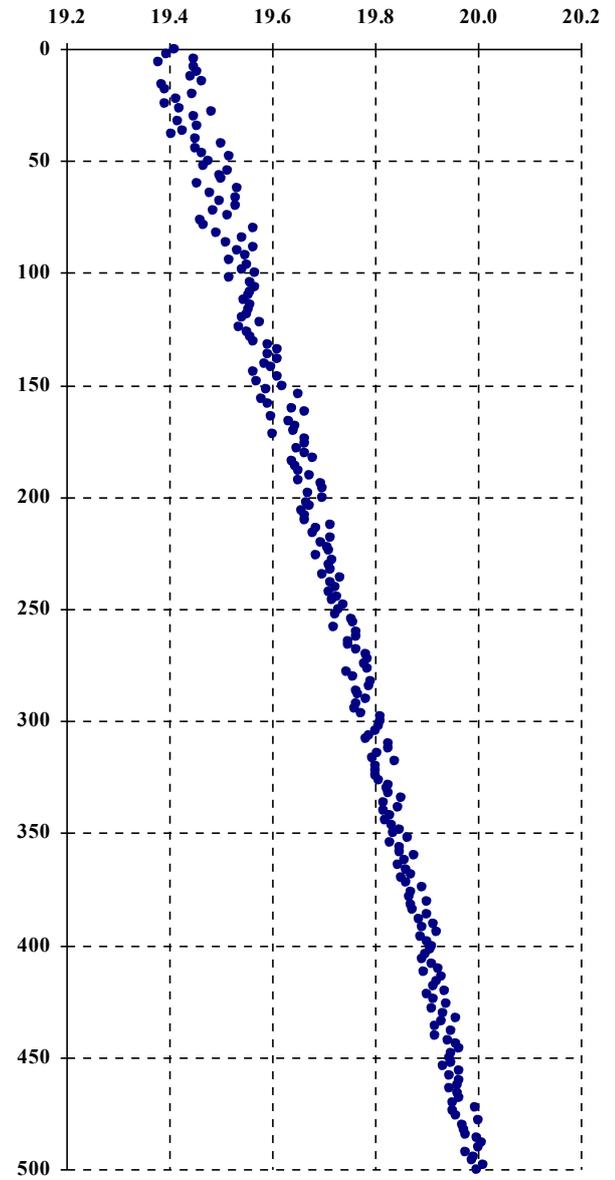
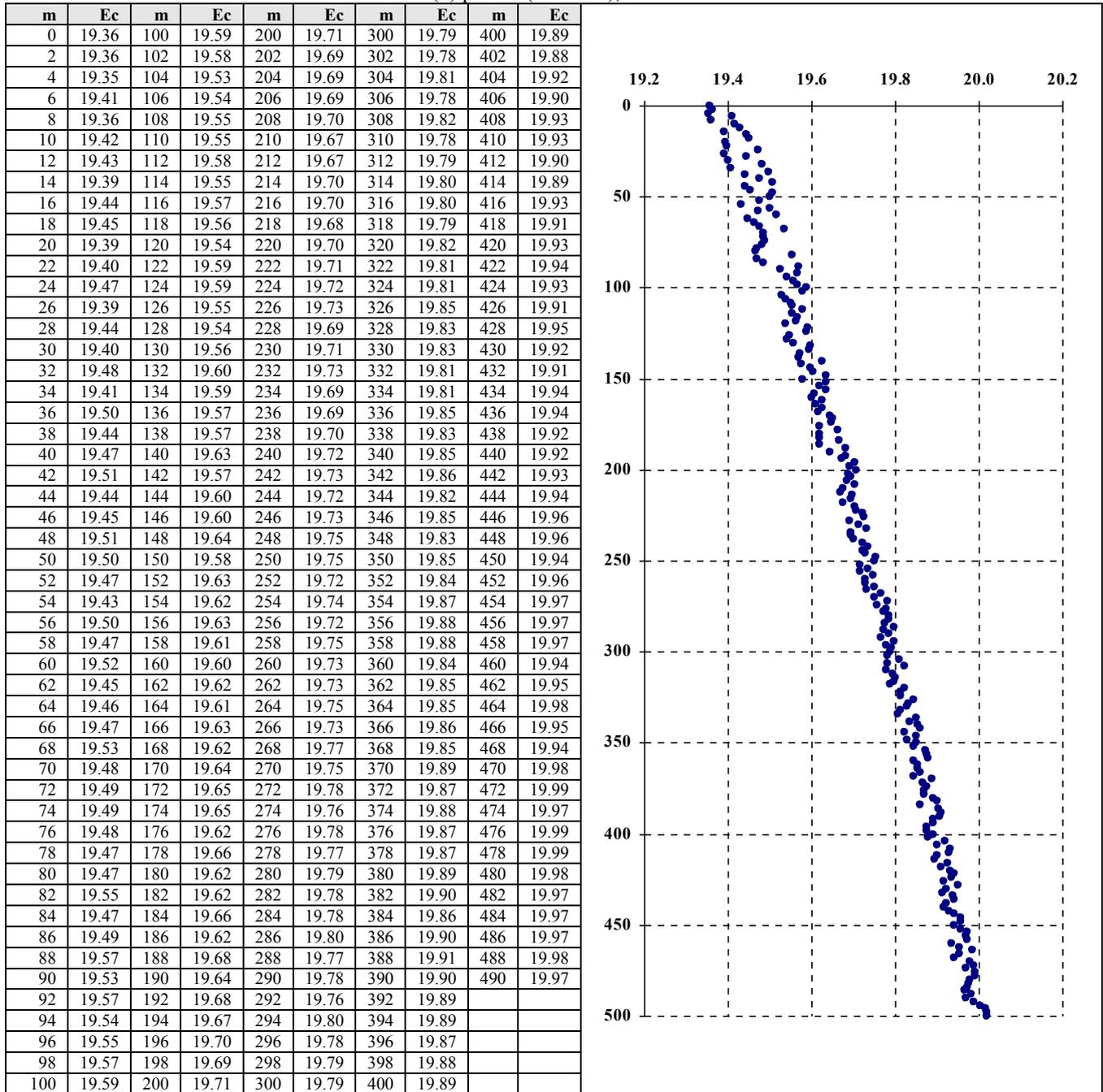


Table 5.19 Ec(d) profile (msm/cm), S13W-496 m



5.3.5 Water column salinity profiling

Table 5.20 Salinity profile, S06W-484 m

m	g/l								
0	11.33	100	11.37	200	11.41	300	11.43	400	11.47
2	11.33	102	11.37	202	11.40	302	11.43	402	11.45
4	11.35	104	11.39	204	11.42	304	11.45	404	11.46
6	11.35	106	11.38	206	11.40	306	11.43	406	11.46
8	11.35	108	11.37	208	11.42	308	11.44	408	11.46
10	11.34	110	11.38	210	11.41	310	11.44	410	11.46
12	11.35	112	11.37	212	11.41	312	11.44	412	11.45
14	11.34	114	11.38	214	11.41	314	11.43	414	11.45
16	11.34	116	11.39	216	11.42	316	11.44	416	11.46
18	11.35	118	11.39	218	11.41	318	11.44	418	11.47
20	11.34	120	11.39	220	11.41	320	11.45	420	11.47
22	11.35	122	11.38	222	11.41	322	11.44	422	11.46
24	11.36	124	11.39	224	11.42	324	11.45	424	11.47
26	11.35	126	11.38	226	11.41	326	11.44	426	11.47
28	11.36	128	11.38	228	11.41	328	11.44	428	11.46
30	11.36	130	11.39	230	11.41	330	11.43	430	11.47
32	11.36	132	11.38	232	11.41	332	11.44	432	11.47
34	11.34	134	11.39	234	11.41	334	11.44	434	11.46
36	11.35	136	11.39	236	11.41	336	11.44	436	11.48
38	11.36	138	11.38	238	11.42	338	11.45	438	11.46
40	11.35	140	11.39	240	11.41	340	11.45	440	11.47
42	11.35	142	11.39	242	11.42	342	11.44	442	11.48
44	11.36	144	11.39	244	11.42	344	11.44	444	11.47
46	11.36	146	11.39	246	11.42	346	11.44	446	11.47
48	11.35	148	11.38	248	11.41	348	11.44	448	11.48
50	11.36	150	11.39	250	11.43	350	11.45	450	11.48
52	11.36	152	11.40	252	11.43	352	11.45	452	11.47
54	11.37	154	11.40	254	11.43	354	11.44	454	11.48
56	11.36	156	11.39	256	11.43	356	11.46	456	11.47
58	11.36	158	11.40	258	11.43	358	11.45	458	11.47
60	11.36	160	11.40	260	11.42	360	11.46	460	11.47
62	11.36	162	11.40	262	11.42	362	11.44	462	11.47
64	11.36	164	11.40	264	11.44	364	11.46	464	11.47
66	11.37	166	11.40	266	11.42	366	11.45	466	11.47
68	11.37	168	11.40	268	11.42	368	11.45	468	11.47
70	11.37	170	11.40	270	11.42	370	11.46	470	11.47
72	11.36	172	11.39	272	11.43	372	11.45	472	11.48
74	11.36	174	11.41	274	11.42	374	11.46	474	11.48
76	11.38	176	11.40	276	11.43	376	11.45	476	11.49
78	11.37	178	11.39	278	11.44	378	11.45	478	11.49
80	11.36	180	11.40	280	11.43	380	11.46	480	11.48
82	11.36	182	11.41	282	11.43	382	11.45		
84	11.37	184	11.41	284	11.44	384	11.47		
86	11.37	186	11.41	286	11.43	386	11.46		
88	11.36	188	11.41	288	11.44	388	11.46		
90	11.37	190	11.41	290	11.44	390	11.45		
92	11.37	192	11.41	292	11.44	392	11.46		
94	11.37	194	11.40	294	11.44	394	11.45		
96	11.37	196	11.40	296	11.43	396	11.46		
98	11.37	198	11.41	298	11.43	398	11.46		
100	11.37	200	11.41	300	11.43	400	11.47		

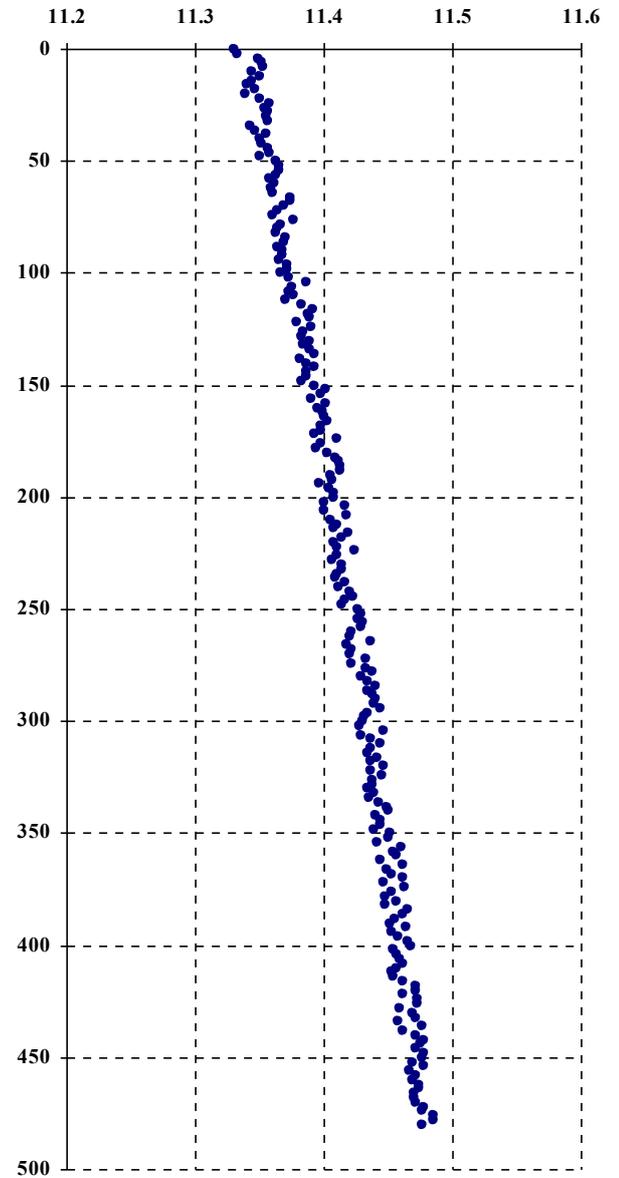


Table 5.21 Salinity profile, S10W-470 m

m	g/l								
0	11.33	100	11.37	200	11.41	300	11.43	400	11.45
2	11.35	102	11.37	202	11.41	302	11.44	402	11.45
4	11.33	104	11.38	204	11.41	304	11.44	404	11.47
6	11.34	106	11.38	206	11.40	306	11.43	406	11.46
8	11.33	108	11.39	208	11.41	308	11.43	408	11.47
10	11.35	110	11.37	210	11.40	310	11.43	410	11.47
12	11.35	112	11.38	212	11.41	312	11.43	412	11.46
14	11.35	114	11.37	214	11.42	314	11.44	414	11.47
16	11.35	116	11.38	216	11.42	316	11.43	416	11.46
18	11.34	118	11.38	218	11.42	318	11.45	418	11.47
20	11.35	120	11.38	220	11.42	320	11.44	420	11.46
22	11.35	122	11.39	222	11.42	322	11.43	422	11.47
24	11.34	124	11.38	224	11.41	324	11.44	424	11.46
26	11.34	126	11.38	226	11.42	326	11.45	426	11.46
28	11.36	128	11.38	228	11.42	328	11.45	428	11.47
30	11.36	130	11.38	230	11.41	330	11.45	430	11.47
32	11.36	132	11.39	232	11.43	332	11.44	432	11.47
34	11.35	134	11.38	234	11.41	334	11.44	434	11.47
36	11.34	136	11.39	236	11.42	336	11.44	436	11.47
38	11.35	138	11.39	238	11.43	338	11.45	438	11.47
40	11.36	140	11.39	240	11.41	340	11.45	440	11.46
42	11.36	142	11.38	242	11.43	342	11.44	442	11.48
44	11.35	144	11.40	244	11.42	344	11.45	444	11.47
46	11.36	146	11.38	246	11.43	346	11.45	446	11.46
48	11.35	148	11.39	248	11.43	348	11.45	448	11.47
50	11.35	150	11.40	250	11.42	350	11.45	450	11.47
52	11.36	152	11.39	252	11.42	352	11.46	452	11.47
54	11.36	154	11.39	254	11.43	354	11.44	454	11.47
56	11.36	156	11.39	256	11.42	356	11.45	456	11.48
58	11.35	158	11.39	258	11.42	358	11.44	458	11.47
60	11.36	160	11.40	260	11.43	360	11.45	460	11.48
62	11.37	162	11.39	262	11.42	362	11.45	462	11.48
64	11.35	164	11.40	264	11.42	364	11.45	464	11.48
66	11.37	166	11.39	266	11.43	366	11.44	466	11.48
68	11.36	168	11.40	268	11.43	368	11.45		
70	11.37	170	11.41	270	11.43	370	11.46		
72	11.36	172	11.39	272	11.43	372	11.46		
74	11.38	174	11.39	274	11.43	374	11.45		
76	11.38	176	11.39	276	11.43	376	11.45		
78	11.37	178	11.41	278	11.42	378	11.46		
80	11.36	180	11.40	280	11.43	380	11.46		
82	11.36	182	11.41	282	11.43	382	11.45		
84	11.36	184	11.41	284	11.43	384	11.46		
86	11.37	186	11.40	286	11.42	386	11.45		
88	11.38	188	11.40	288	11.42	388	11.46		
90	11.36	190	11.40	290	11.43	390	11.46		
92	11.38	192	11.41	292	11.43	392	11.47		
94	11.38	194	11.42	294	11.44	394	11.47		
96	11.37	196	11.40	296	11.44	396	11.46		
98	11.37	198	11.42	298	11.44	398	11.47		
100	11.37	200	11.41	300	11.43	400	11.45		

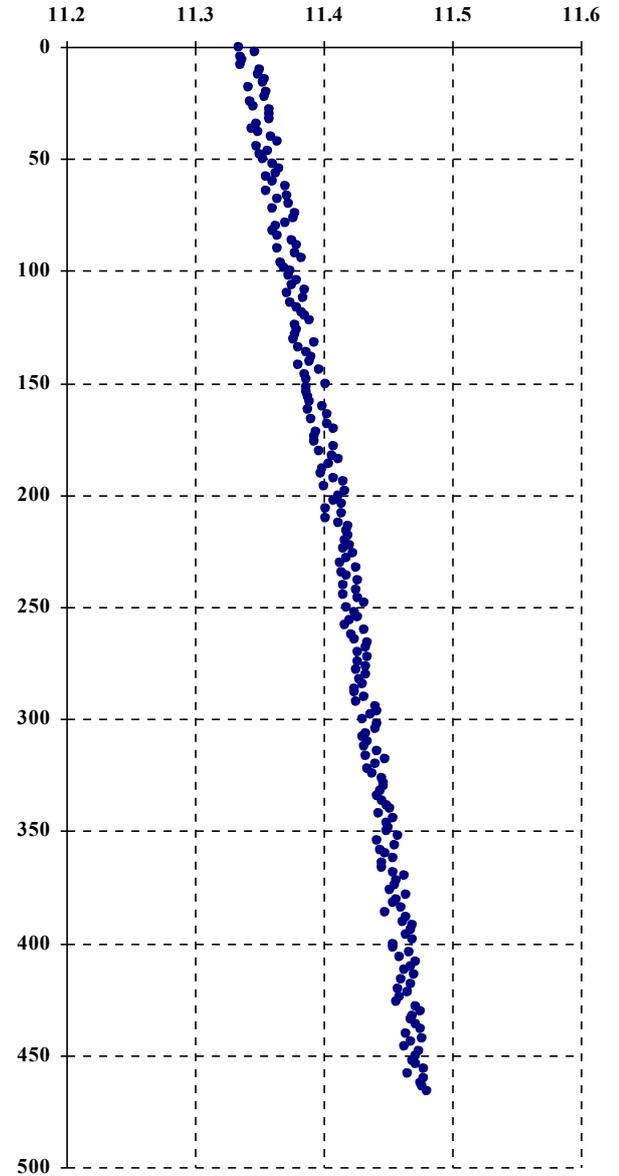


Table 5.22 Salinity profile, S12W-484 m

m	g/l								
0	11.35	100	11.37	200	11.41	300	11.44	400	11.46
2	11.34	102	11.38	202	11.42	302	11.43	402	11.47
4	11.34	104	11.38	204	11.40	304	11.44	404	11.47
6	11.35	106	11.38	206	11.42	306	11.44	406	11.46
8	11.34	108	11.37	208	11.42	308	11.44	408	11.46
10	11.34	110	11.37	210	11.42	310	11.43	410	11.47
12	11.35	112	11.38	212	11.42	312	11.44	412	11.47
14	11.35	114	11.38	214	11.41	314	11.44	414	11.46
16	11.36	116	11.38	216	11.42	316	11.45	416	11.46
18	11.35	118	11.39	218	11.41	318	11.44	418	11.47
20	11.35	120	11.39	220	11.42	320	11.45	420	11.47
22	11.34	122	11.39	222	11.42	322	11.44	422	11.46
24	11.36	124	11.39	224	11.42	324	11.43	424	11.46
26	11.34	126	11.38	226	11.41	326	11.44	426	11.46
28	11.36	128	11.38	228	11.42	328	11.43	428	11.46
30	11.35	130	11.38	230	11.42	330	11.44	430	11.47
32	11.34	132	11.38	232	11.43	332	11.43	432	11.46
34	11.36	134	11.39	234	11.41	334	11.44	434	11.47
36	11.36	136	11.38	236	11.42	336	11.44	436	11.47
38	11.36	138	11.39	238	11.42	338	11.45	438	11.47
40	11.35	140	11.38	240	11.41	340	11.45	440	11.47
42	11.35	142	11.38	242	11.42	342	11.45	442	11.47
44	11.35	144	11.38	244	11.43	344	11.45	444	11.46
46	11.36	146	11.40	246	11.41	346	11.46	446	11.46
48	11.35	148	11.38	248	11.42	348	11.46	448	11.47
50	11.36	150	11.40	250	11.42	350	11.45	450	11.46
52	11.37	152	11.39	252	11.42	352	11.45	452	11.48
54	11.37	154	11.40	254	11.42	354	11.45	454	11.48
56	11.37	156	11.40	256	11.42	356	11.44	456	11.48
58	11.35	158	11.40	258	11.42	358	11.46	458	11.46
60	11.36	160	11.39	260	11.43	360	11.46	460	11.47
62	11.36	162	11.40	262	11.42	362	11.44	462	11.47
64	11.37	164	11.39	264	11.43	364	11.45	464	11.48
66	11.36	166	11.39	266	11.43	366	11.46	466	11.47
68	11.37	168	11.40	268	11.42	368	11.45	468	11.47
70	11.36	170	11.39	270	11.43	370	11.45	470	11.46
72	11.36	172	11.39	272	11.43	372	11.45	472	11.47
74	11.37	174	11.40	274	11.44	374	11.45	474	11.47
76	11.36	176	11.40	276	11.42	376	11.45	476	11.47
78	11.38	178	11.40	278	11.44	378	11.46	478	11.48
80	11.37	180	11.41	280	11.42	380	11.45	480	11.47
82	11.37	182	11.41	282	11.43	382	11.46		
84	11.38	184	11.41	284	11.44	384	11.45		
86	11.37	186	11.41	286	11.44	386	11.46		
88	11.38	188	11.40	288	11.44	388	11.46		
90	11.38	190	11.40	290	11.43	390	11.46		
92	11.37	192	11.40	292	11.43	392	11.45		
94	11.38	194	11.40	294	11.44	394	11.46		
96	11.38	196	11.40	296	11.43	396	11.45		
98	11.38	198	11.42	298	11.43	398	11.47		
100	11.37	200	11.41	300	11.44	400	11.46		

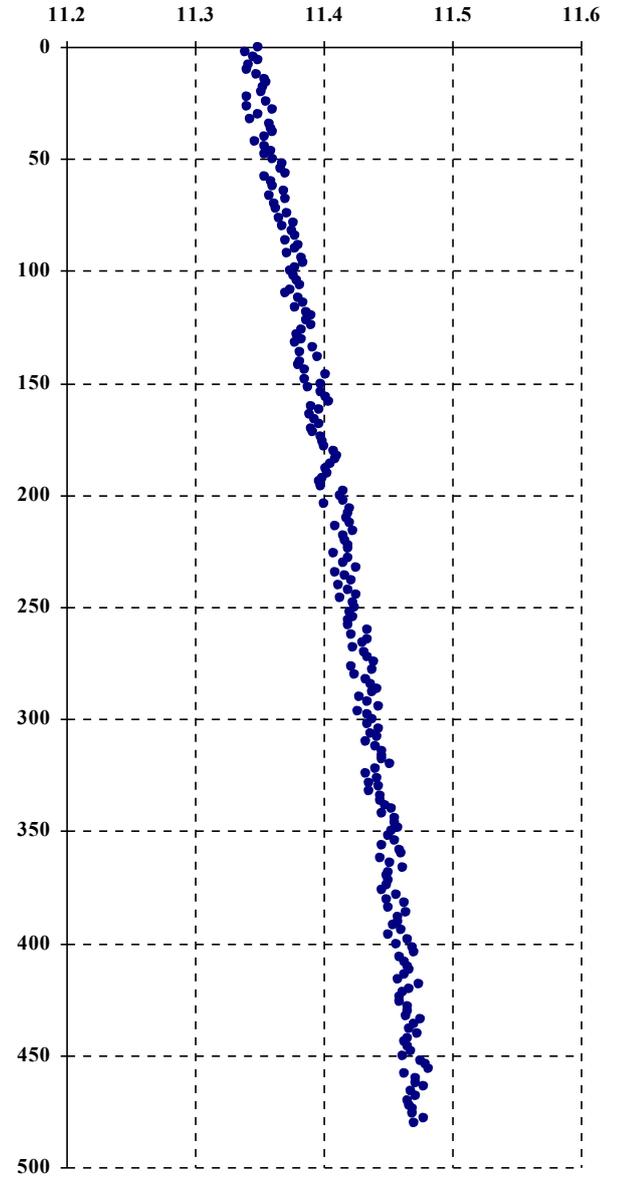
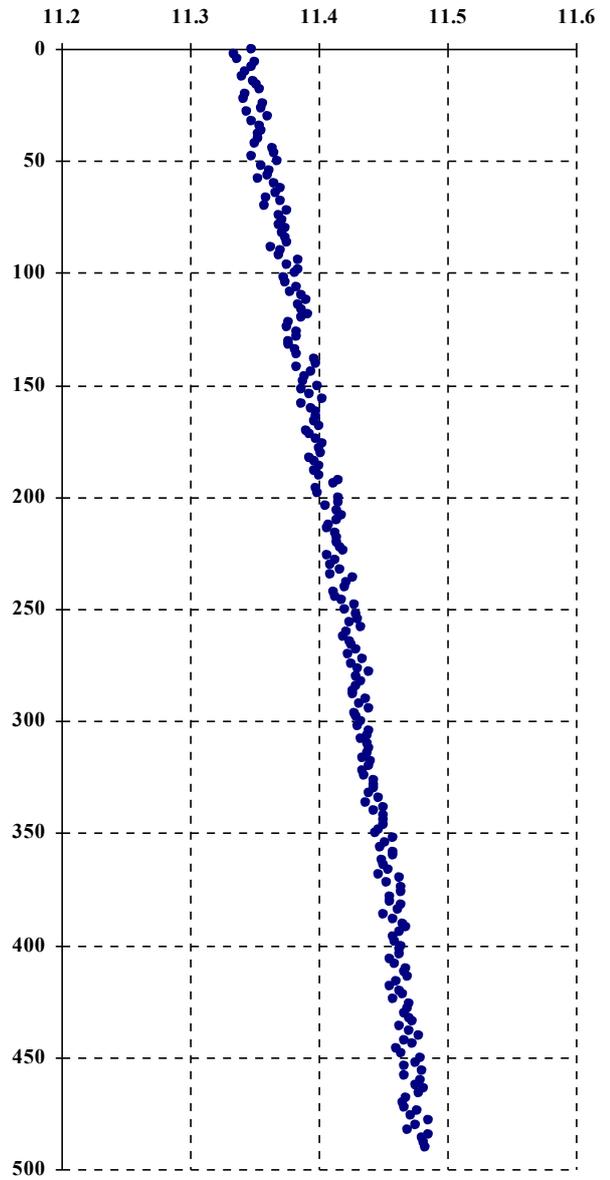


Table 5.23 Salinity profile, S13W-496 m

m	Ec								
0	11.35	100	11.38	200	11.42	300	11.43	400	11.46
2	11.33	102	11.37	202	11.41	302	11.43	402	11.46
4	11.34	104	11.37	204	11.41	304	11.44	404	11.46
6	11.35	106	11.38	206	11.41	306	11.44	406	11.45
8	11.35	108	11.38	208	11.42	308	11.43	408	11.46
10	11.34	110	11.39	210	11.41	310	11.44	410	11.47
12	11.34	112	11.39	212	11.41	312	11.44	412	11.47
14	11.35	114	11.38	214	11.41	314	11.44	414	11.47
16	11.35	116	11.39	216	11.41	316	11.43	416	11.46
18	11.35	118	11.39	218	11.41	318	11.44	418	11.45
20	11.34	120	11.39	220	11.41	320	11.44	420	11.46
22	11.34	122	11.38	222	11.42	322	11.43	422	11.47
24	11.36	124	11.37	224	11.42	324	11.44	424	11.46
26	11.35	126	11.38	226	11.41	326	11.44	426	11.47
28	11.34	128	11.38	228	11.41	328	11.44	428	11.47
30	11.36	130	11.38	230	11.41	330	11.44	430	11.47
32	11.35	132	11.38	232	11.42	332	11.44	432	11.47
34	11.35	134	11.38	234	11.41	334	11.45	434	11.47
36	11.35	136	11.38	236	11.43	336	11.44	436	11.46
38	11.35	138	11.40	238	11.42	338	11.45	438	11.47
40	11.35	140	11.40	240	11.42	340	11.44	440	11.48
42	11.35	142	11.38	242	11.41	342	11.45	442	11.47
44	11.36	144	11.39	244	11.41	344	11.45	444	11.47
46	11.36	146	11.39	246	11.42	346	11.45	446	11.46
48	11.35	148	11.39	248	11.43	348	11.45	448	11.46
50	11.37	150	11.40	250	11.42	350	11.44	450	11.48
52	11.36	152	11.39	252	11.43	352	11.46	452	11.47
54	11.36	154	11.39	254	11.43	354	11.45	454	11.47
56	11.36	156	11.40	256	11.42	356	11.45	456	11.48
58	11.35	158	11.39	258	11.43	358	11.46	458	11.47
60	11.36	160	11.39	260	11.42	360	11.46	460	11.48
62	11.37	162	11.40	262	11.42	362	11.45	462	11.47
64	11.37	164	11.40	264	11.42	364	11.45	464	11.48
66	11.36	166	11.40	266	11.43	366	11.45	466	11.48
68	11.37	168	11.40	268	11.43	368	11.45	468	11.47
70	11.36	170	11.39	270	11.42	370	11.46	470	11.46
72	11.37	172	11.39	272	11.43	372	11.45	472	11.47
74	11.37	174	11.40	274	11.43	374	11.46	474	11.48
76	11.37	176	11.40	276	11.43	376	11.46	476	11.47
78	11.37	178	11.40	278	11.44	378	11.46	478	11.48
80	11.37	180	11.40	280	11.43	380	11.45	480	11.47
82	11.37	182	11.39	282	11.43	382	11.46	482	11.47
84	11.37	184	11.40	284	11.43	384	11.46	484	11.48
86	11.37	186	11.40	286	11.43	386	11.45	486	11.48
88	11.36	188	11.40	288	11.43	388	11.46	488	11.48
90	11.37	190	11.40	290	11.44	390	11.47	490	11.48
92	11.37	192	11.41	292	11.43	392	11.47		
94	11.38	194	11.41	294	11.44	394	11.46		
96	11.38	196	11.40	296	11.43	396	11.46		
98	11.38	198	11.40	298	11.43	398	11.46		
100	11.38	200	11.42	300	11.43	400	11.46		



5.3.6 Water column turbidity profiling

Table 5.24 Turbidity, S06W-484 m

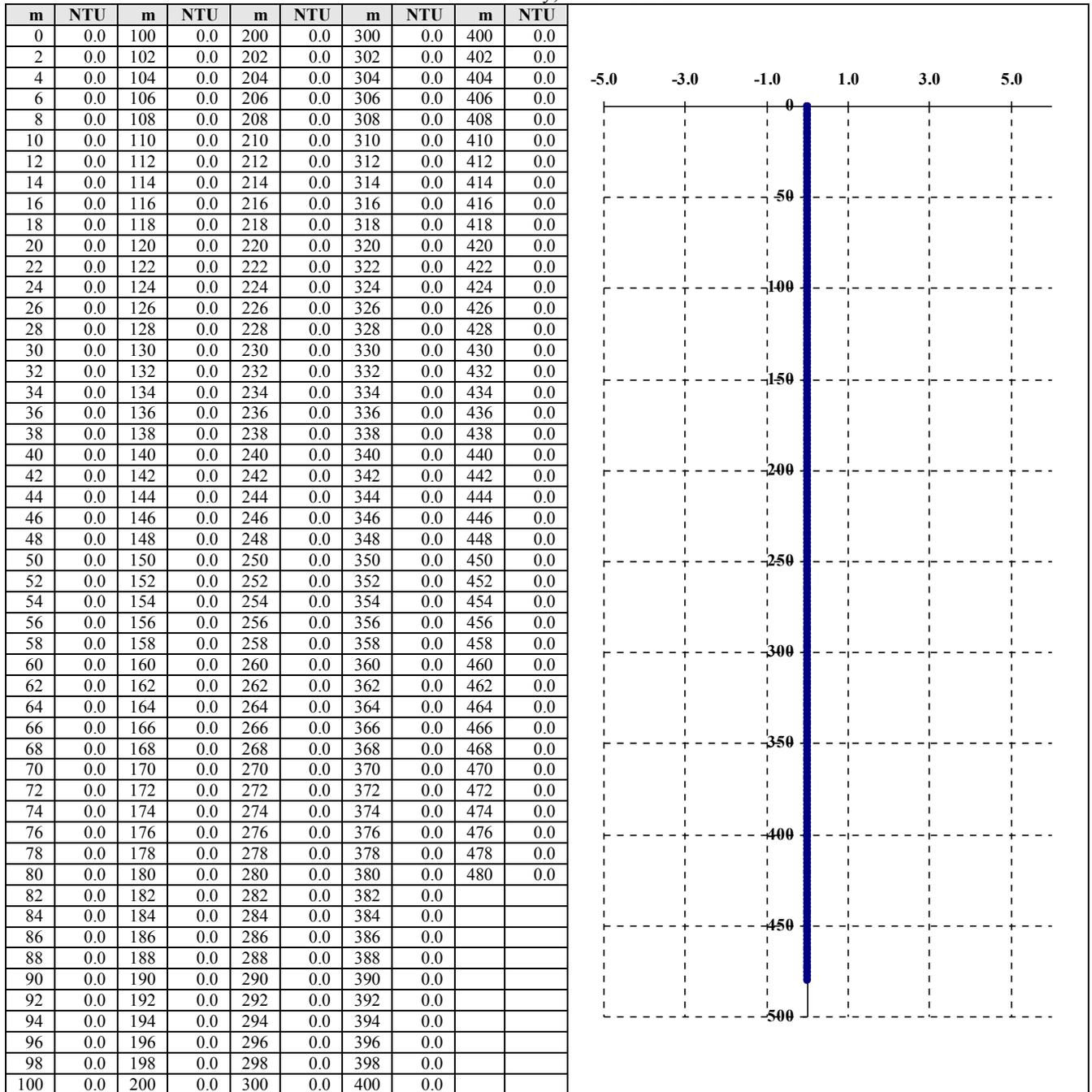


Table 5.25 Turbidity profile, S10W-470 m

m	NTU								
0	0.0	100	0.0	200	0.0	300	0.0	400	0.0
2	0.0	102	0.0	202	0.0	302	0.0	402	0.0
4	0.0	104	0.0	204	0.0	304	0.0	404	0.0
6	0.0	106	0.0	206	0.0	306	0.0	406	0.0
8	0.0	108	0.0	208	0.0	308	0.0	408	0.0
10	0.0	110	0.0	210	0.0	310	0.0	410	0.0
12	0.0	112	0.0	212	0.0	312	0.0	412	0.0
14	0.0	114	0.0	214	0.0	314	0.0	414	0.0
16	0.0	116	0.0	216	0.0	316	0.0	416	0.0
18	0.0	118	0.0	218	0.0	318	0.0	418	0.0
20	0.0	120	0.0	220	0.0	320	0.0	420	0.0
22	0.0	122	0.0	222	0.0	322	0.0	422	0.0
24	0.0	124	0.0	224	0.0	324	0.0	424	0.0
26	0.0	126	0.0	226	0.0	326	0.0	426	0.0
28	0.0	128	0.0	228	0.0	328	0.0	428	0.0
30	0.0	130	0.0	230	0.0	330	0.0	430	0.0
32	0.0	132	0.0	232	0.0	332	0.0	432	0.0
34	0.0	134	0.0	234	0.0	334	0.0	434	0.0
36	0.0	136	0.0	236	0.0	336	0.0	436	0.0
38	0.0	138	0.0	238	0.0	338	0.0	438	0.0
40	0.0	140	0.0	240	0.0	340	0.0	440	0.0
42	0.0	142	0.0	242	0.0	342	0.0	442	0.0
44	0.0	144	0.0	244	0.0	344	0.0	444	0.0
46	0.0	146	0.0	246	0.0	346	0.0	446	0.0
48	0.0	148	0.0	248	0.0	348	0.0	448	0.0
50	0.0	150	0.0	250	0.0	350	0.0	450	0.0
52	0.0	152	0.0	252	0.0	352	0.0	452	0.0
54	0.0	154	0.0	254	0.0	354	0.0	454	0.0
56	0.0	156	0.0	256	0.0	356	0.0	456	0.0
58	0.0	158	0.0	258	0.0	358	0.0	458	0.0
60	0.0	160	0.0	260	0.0	360	0.0	460	0.0
62	0.0	162	0.0	262	0.0	362	0.0	462	0.0
64	0.0	164	0.0	264	0.0	364	0.0	464	0.0
66	0.0	166	0.0	266	0.0	366	0.0	466	0.0
68	0.0	168	0.0	268	0.0	368	0.0	468	0.0
70	0.0	170	0.0	270	0.0	370	0.0	470	0.0
72	0.0	172	0.0	272	0.0	372	0.0	472	0.0
74	0.0	174	0.0	274	0.0	374	0.0	474	0.0
76	0.0	176	0.0	276	0.0	376	0.0	476	0.0
78	0.0	178	0.0	278	0.0	378	0.0	478	0.0
80	0.0	180	0.0	280	0.0	380	0.0	480	0.0
82	0.0	182	0.0	282	0.0	382	0.0		
84	0.0	184	0.0	284	0.0	384	0.0		
86	0.0	186	0.0	286	0.0	386	0.0		
88	0.0	188	0.0	288	0.0	388	0.0		
90	0.0	190	0.0	290	0.0	390	0.0		
92	0.0	192	0.0	292	0.0	392	0.0		
94	0.0	194	0.0	294	0.0	394	0.0		
96	0.0	196	0.0	296	0.0	396	0.0		
98	0.0	198	0.0	298	0.0	398	0.0		
100	0.0	200	0.0	300	0.0	400	0.0		

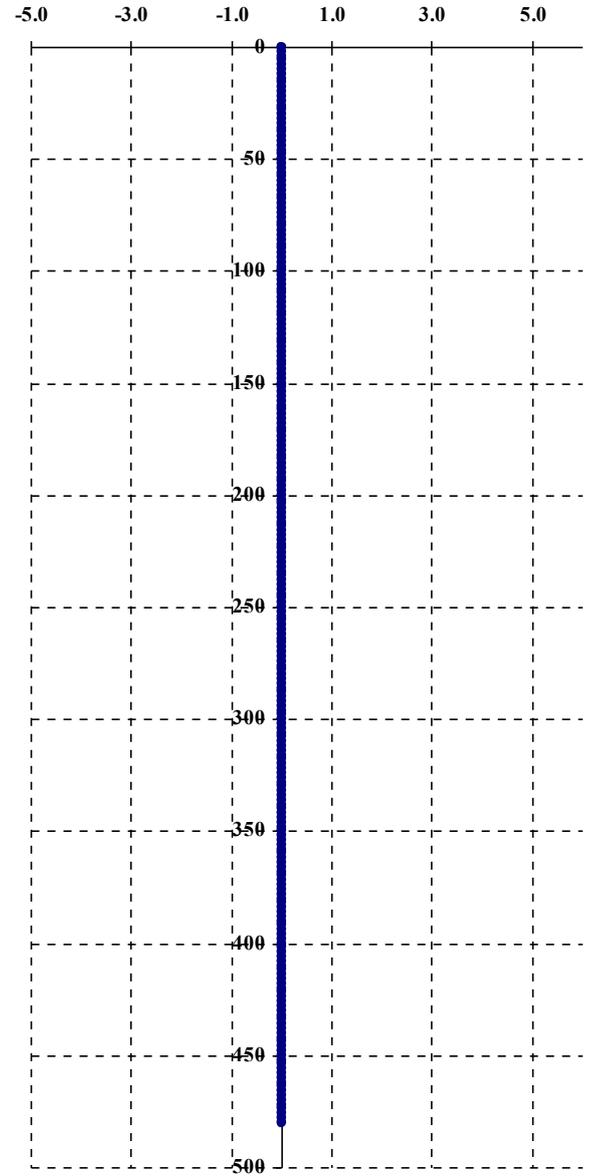


Table 5.26 Turbidity profile, S12W- 484 m

m	NTU								
0	0.0	100	0.0	200	0.0	300	0.0	400	0.0
2	0.0	102	0.0	202	0.0	302	0.0	402	0.0
4	0.0	104	0.0	204	0.0	304	0.0	404	0.0
6	0.0	106	0.0	206	0.0	306	0.0	406	0.0
8	0.0	108	0.0	208	0.0	308	0.0	408	0.0
10	0.0	110	0.0	210	0.0	310	0.0	410	0.0
12	0.0	112	0.0	212	0.0	312	0.0	412	0.0
14	0.0	114	0.0	214	0.0	314	0.0	414	0.0
16	0.0	116	0.0	216	0.0	316	0.0	416	0.0
18	0.0	118	0.0	218	0.0	318	0.0	418	0.0
20	0.0	120	0.0	220	0.0	320	0.0	420	0.0
22	0.0	122	0.0	222	0.0	322	0.0	422	0.0
24	0.0	124	0.0	224	0.0	324	0.0	424	0.0
26	0.0	126	0.0	226	0.0	326	0.0	426	0.0
28	0.0	128	0.0	228	0.0	328	0.0	428	0.0
30	0.0	130	0.0	230	0.0	330	0.0	430	0.0
32	0.0	132	0.0	232	0.0	332	0.0	432	0.0
34	0.0	134	0.0	234	0.0	334	0.0	434	0.0
36	0.0	136	0.0	236	0.0	336	0.0	436	0.0
38	0.0	138	0.0	238	0.0	338	0.0	438	0.0
40	0.0	140	0.0	240	0.0	340	0.0	440	0.0
42	0.0	142	0.0	242	0.0	342	0.0	442	0.0
44	0.0	144	0.0	244	0.0	344	0.0	444	0.0
46	0.0	146	0.0	246	0.0	346	0.0	446	0.0
48	0.0	148	0.0	248	0.0	348	0.0	448	0.0
50	0.0	150	0.0	250	0.0	350	0.0	450	0.0
52	0.0	152	0.0	252	0.0	352	0.0	452	0.0
54	0.0	154	0.0	254	0.0	354	0.0	454	0.0
56	0.0	156	0.0	256	0.0	356	0.0	456	0.0
58	0.0	158	0.0	258	0.0	358	0.0	458	0.0
60	0.0	160	0.0	260	0.0	360	0.0	460	0.0
62	0.0	162	0.0	262	0.0	362	0.0	462	0.0
64	0.0	164	0.0	264	0.0	364	0.0	464	0.0
66	0.0	166	0.0	266	0.0	366	0.0	466	0.0
68	0.0	168	0.0	268	0.0	368	0.0	468	0.0
70	0.0	170	0.0	270	0.0	370	0.0	470	0.0
72	0.0	172	0.0	272	0.0	372	0.0	472	0.0
74	0.0	174	0.0	274	0.0	374	0.0	474	0.0
76	0.0	176	0.0	276	0.0	376	0.0	476	0.0
78	0.0	178	0.0	278	0.0	378	0.0	478	0.0
80	0.0	180	0.0	280	0.0	380	0.0	480	0.0
82	0.0	182	0.0	282	0.0	382	0.0		
84	0.0	184	0.0	284	0.0	384	0.0		
86	0.0	186	0.0	286	0.0	386	0.0		
88	0.0	188	0.0	288	0.0	388	0.0		
90	0.0	190	0.0	290	0.0	390	0.0		
92	0.0	192	0.0	292	0.0	392	0.0		
94	0.0	194	0.0	294	0.0	394	0.0		
96	0.0	196	0.0	296	0.0	396	0.0		
98	0.0	198	0.0	298	0.0	398	0.0		
100	0.0	200	0.0	300	0.0	400	0.0		

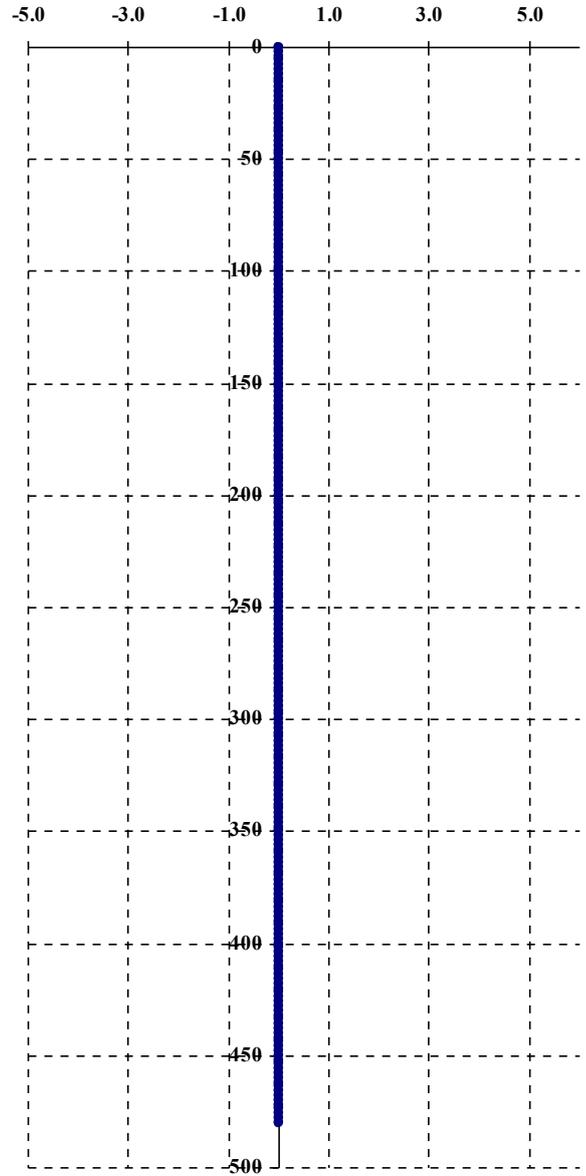
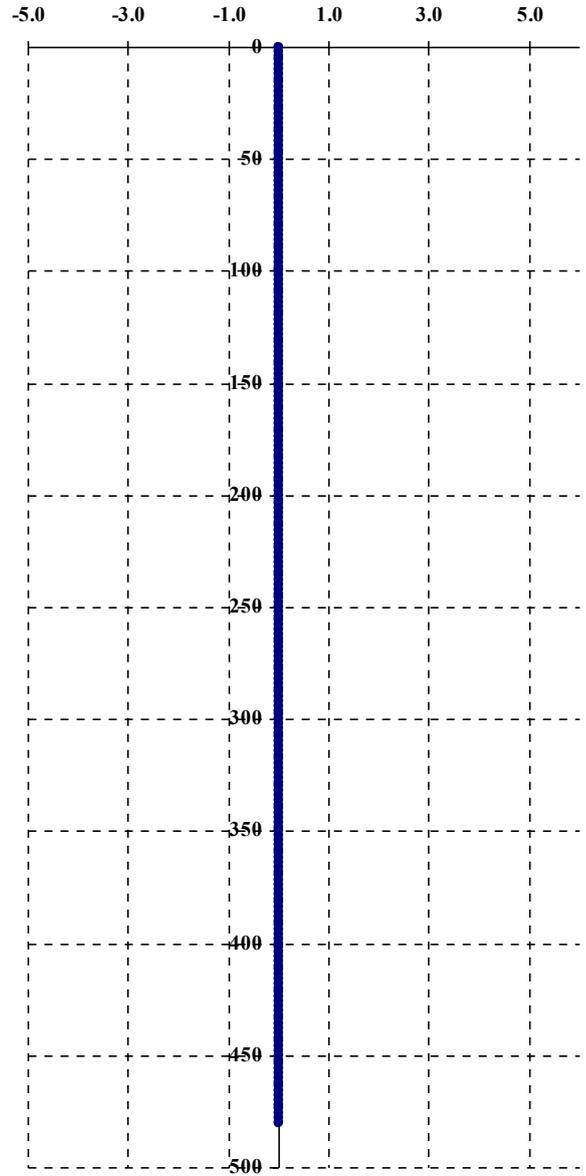


Table 5.27 Turbidity profile, S13W-496 m

m	NTU								
0	0.0	100	0.0	200	0.0	300	0.0	400	0.0
2	0.0	102	0.0	202	0.0	302	0.0	402	0.0
4	0.0	104	0.0	204	0.0	304	0.0	404	0.0
6	0.0	106	0.0	206	0.0	306	0.0	406	0.0
8	0.0	108	0.0	208	0.0	308	0.0	408	0.0
10	0.0	110	0.0	210	0.0	310	0.0	410	0.0
12	0.0	112	0.0	212	0.0	312	0.0	412	0.0
14	0.0	114	0.0	214	0.0	314	0.0	414	0.0
16	0.0	116	0.0	216	0.0	316	0.0	416	0.0
18	0.0	118	0.0	218	0.0	318	0.0	418	0.0
20	0.0	120	0.0	220	0.0	320	0.0	420	0.0
22	0.0	122	0.0	222	0.0	322	0.0	422	0.0
24	0.0	124	0.0	224	0.0	324	0.0	424	0.0
26	0.0	126	0.0	226	0.0	326	0.0	426	0.0
28	0.0	128	0.0	228	0.0	328	0.0	428	0.0
30	0.0	130	0.0	230	0.0	330	0.0	430	0.0
32	0.0	132	0.0	232	0.0	332	0.0	432	0.0
34	0.0	134	0.0	234	0.0	334	0.0	434	0.0
36	0.0	136	0.0	236	0.0	336	0.0	436	0.0
38	0.0	138	0.0	238	0.0	338	0.0	438	0.0
40	0.0	140	0.0	240	0.0	340	0.0	440	0.0
42	0.0	142	0.0	242	0.0	342	0.0	442	0.0
44	0.0	144	0.0	244	0.0	344	0.0	444	0.0
46	0.0	146	0.0	246	0.0	346	0.0	446	0.0
48	0.0	148	0.0	248	0.0	348	0.0	448	0.0
50	0.0	150	0.0	250	0.0	350	0.0	450	0.0
52	0.0	152	0.0	252	0.0	352	0.0	452	0.0
54	0.0	154	0.0	254	0.0	354	0.0	454	0.0
56	0.0	156	0.0	256	0.0	356	0.0	456	0.0
58	0.0	158	0.0	258	0.0	358	0.0	458	0.0
60	0.0	160	0.0	260	0.0	360	0.0	460	0.0
62	0.0	162	0.0	262	0.0	362	0.0	462	0.0
64	0.0	164	0.0	264	0.0	364	0.0	464	0.0
66	0.0	166	0.0	266	0.0	366	0.0	466	0.0
68	0.0	168	0.0	268	0.0	368	0.0	468	0.0
70	0.0	170	0.0	270	0.0	370	0.0	470	0.0
72	0.0	172	0.0	272	0.0	372	0.0	472	0.0
74	0.0	174	0.0	274	0.0	374	0.0	474	0.0
76	0.0	176	0.0	276	0.0	376	0.0	476	0.0
78	0.0	178	0.0	278	0.0	378	0.0	478	0.0
80	0.0	180	0.0	280	0.0	380	0.0	480	0.0
82	0.0	182	0.0	282	0.0	382	0.0		
84	0.0	184	0.0	284	0.0	384	0.0		
86	0.0	186	0.0	286	0.0	386	0.0		
88	0.0	188	0.0	288	0.0	388	0.0		
90	0.0	190	0.0	290	0.0	390	0.0		
92	0.0	192	0.0	292	0.0	392	0.0		
94	0.0	194	0.0	294	0.0	394	0.0		
96	0.0	196	0.0	296	0.0	396	0.0		
98	0.0	198	0.0	298	0.0	398	0.0		
100	0.0	200	0.0	300	0.0	400	0.0		



5.4 Sampling methods description

5.4.1 Water sampling

Separate water sampling was implemented for chemical tests and plankton taxonomy.

Sampling for chemical tests had implemented by Niskin type water PVC sampler.

Phytoplankton sampling are implementing by 55 um conical plankton net. Immediately after sampling, samples were preserved by formalin solvent. Zooplankton sampling were made by using of Djedi net having 36 cm diameter and 200 microns mesh. Collected zooplankton species were preserved by 4% formalin solvent.

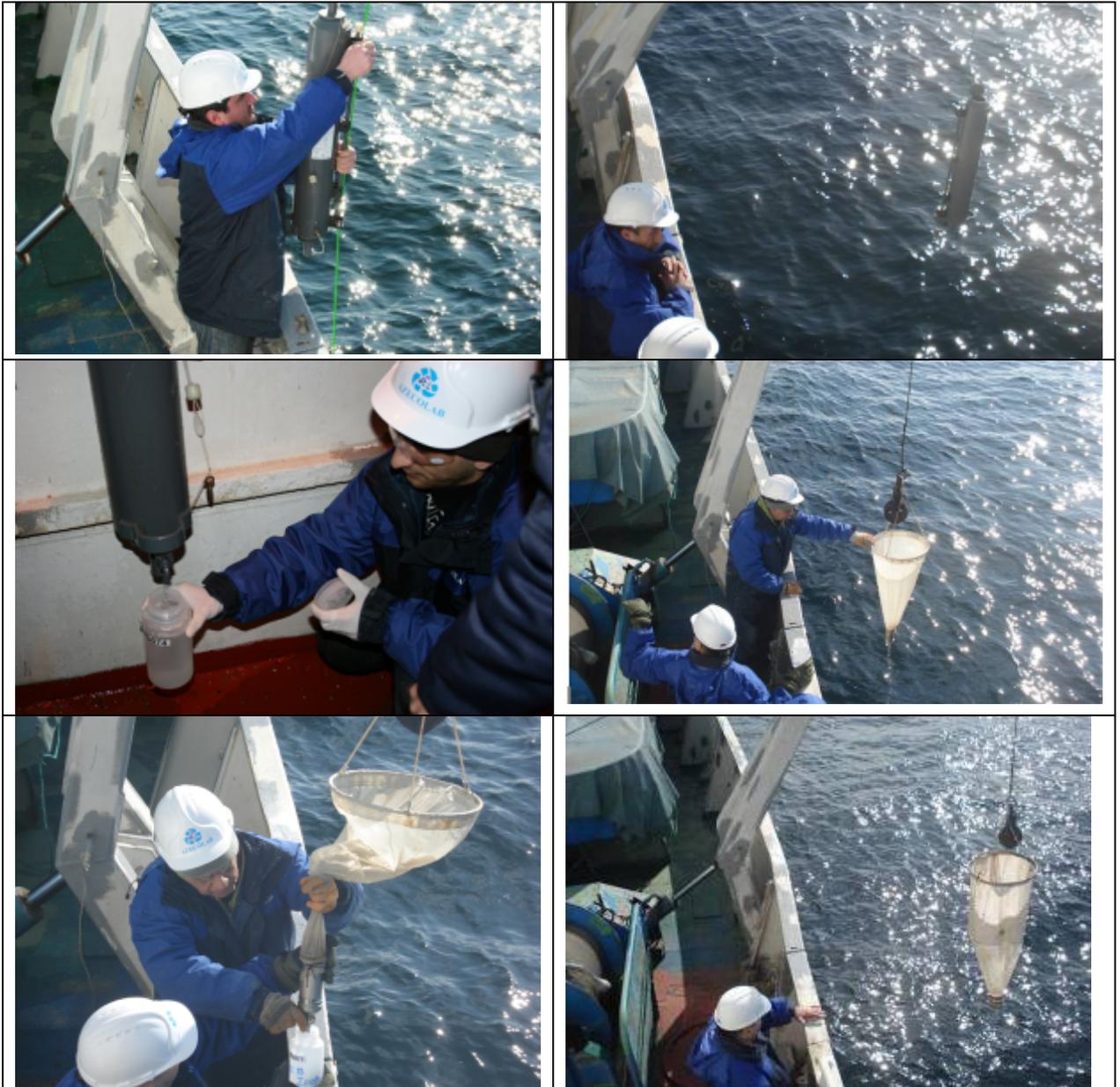


Figure 5.6 Sea water sampling for chemical tests and plankton taxonomy

5.4.2 Bottom sediment sampling

Bottom sediment samples were collected by Van-Veen type grab sampler with 0.2 m² sampling area. In each stations were implemented 3 sampling round, where grab sampler were fulfilled by sediment entirely. Samples for chemicals tests were taken for glass (for organics) and for plastic containers (metals). For benthic organisms, sediments were washed carefully through 1.0 and 0.5 mm sieves. Benthic species separated by this procedures were collected into plastic 2 L bottles and preserved by 5% formalin solvent with added “Rose Bengal” organic dye to accelerate of macrobentic separation of species in lab.

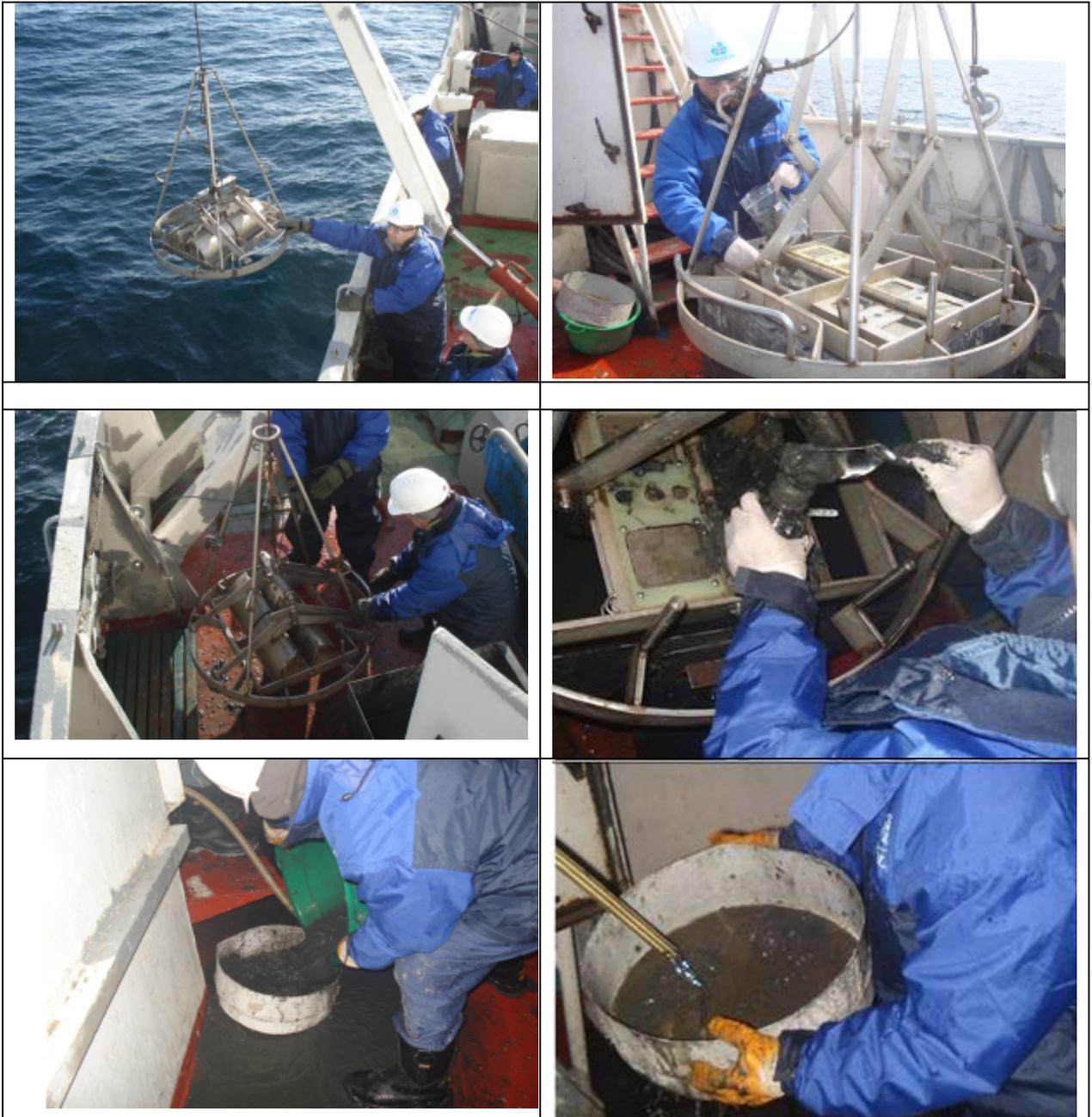


Figure 5.7 Bottom sediment sampling for chemical and macrobentos study

5.5 Lab test methods description

5.5.1 Nitrates, Nitrites and Phosphates

Nitrates, Nitrites and Phosphates in sea water samples were measured by using of Dionex ion chromatograph on base of standard method ISO 10304-2.

5.5.2 Suspended matter

Suspended matter in sea water samples were measured by filtration through 0.45 Millipore filter and weighting by using 0.1 mg sensitivity analytical electronic balance on base of standard method ISO 11923.

5.5.3 Total Petroleum Hydrocarbons

TPH were measured as hydrocarbon index on base of standard method ISO 9377-2.

Varian GC 3800 gas chromatographs are well suited to this application. The instrument use the Split/Splitless inlet system and Flame Ionisation Detector in below regimes:

- Oven temperature Isothermal 35°C (1.5 min), ramp 5°C/min to 60°C hold 0 min, profile ramp 15°C/min to 350°C hold 5 min.
- Inlet (S/SL) 375°C Splitless Mode
- Detector (FID) 375°C
- Carrier Gas Helium
- Carrier Gas 7.4 ml/min Constant Flow Mode
- Injection Volume 1.0 µl
-

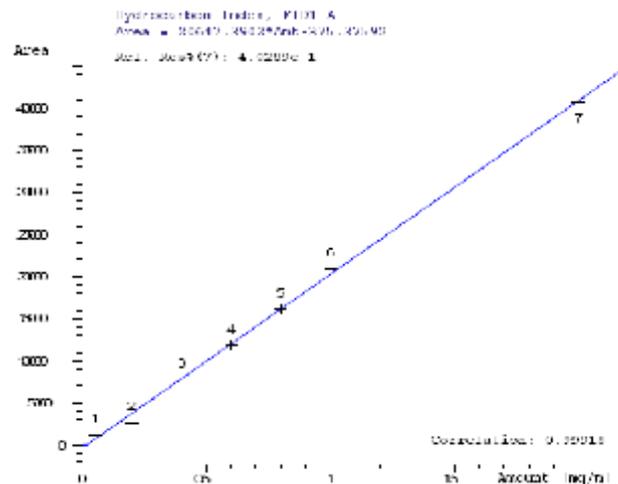


Figure 5.8 GC/FID hydrocarbon index calibration curve

5

5.5.4 Heavy metals in seawater

Heavy metals in sea water were measured by using of Perkin Elmer Analyst AA800 Atomic absorption spectrometer, equipped both with graphite furnace and cold vapour system.

5.5.5 Chlorophyll pigments and pheopigments

Chlorophyll pigments and pheopigments are measuring on base of EPA method 446.0, In Vitro Determination of Chlorophylls a, b, c + c and Pheopigments Marine And Freshwater Algae by Visible Spectrophotometry, which are comply by ISO 10260 test method. Special sampling program, field filtration and freezing were implemented.

5.5.6 Grain size tests

Grain size test were implemented on base of Sediment Grain-Size Analysis Procedures Followed by Battelle Ocean Sciences, Science Applications International Corporation, and Geo Plan, Inc. This procedures are pointed to separate of fine particulates on base of standard pipette procedures and weighting of separated fractions.

5.5.7 Total organics in sediments

Total organic determination in sediment samples were implemented of base of standard method EN 12879 which means determination loss on ignition at 550°C.

5.5.8 Total organic carbon in sediments

According method ISO 10694, at 1st stage total carbon contents determining in soil after dry combustion. The organic carbon content is calculated from this content after correcting for carbonates present in the sample. If carbonates are removed beforehand, the organic carbon content is measured directly.

5.5.9 Total nitrogen in sediments

Total nitrogen is determined by applying of method ISO 11261 (Kjeldahl procedures). This method involves determination of the total nitrogen (ammonium-N, nitrate-N, nitrite-N and organic N) content in sample. Nitrogen in N-N-linkages, N-O-linkages and some heterocyclics (especially pyridine) is only partially determined.

5.5.10 Total phosphorous in sediments

Total phosphorus was determined by application of standard method ISO 11263, which are pointed to detect of phosphorus soluble in sodium hydrogen carbonate solution. Lays down colour development at room temperature and after heating to a high temperature.

5.5.11 16 Oil hydrocarbons in sediments

TPH is determined by method of extraction and Infrared detection of base of method NF X 31-410.

5.5.12 BTEX compounds in sediments

BTEX compounds in sediment samples were studied by application GC/MS head space technology with using of Quadruple GC/MS Thermo-Finigan Trace DSQ. Below are MDLs for BTEX compounds:

	MDL- ug/L
Benzene	35
Toluene	12.5
EthylBenzene	10
p-Xylene	12.5
o-Xylene	12.5
m-Xylene	12.5
Total BTEX	95

5.5.13 EPA 16 PAHs in sediments

A sample was analyzed by method "MADEP-EPH-98-1". First of all it was extracted with methylene chloride in Soxhlet extractor during 20 hours, then was concentrated in Kuderna-Danish apparatus to 10 ml, dried over sodium sulphate, solvent exchanged into hexane, and concentrated in a Kuderna-Danish apparatus to 1mL.

Sample cleanup and separation into aliphatic and aromatic fractions were conducted on silica gel columns (5g of activated silica gel with 1-2cm of anhydrous sodium sulphate on top) using hexane for aliphatic fraction and methylene chloride for aromatic fraction. The two eluted solutions are then re-concentrated to final volumes of 1 mL each (i.e., an aliphatic fraction and an aromatic fraction). The aliphatic fraction is then analyzed by GC/FID.

4mL of cyclohexane was added to the aromatic fraction solution. Then the solution was concentrated to 1-2mL on Kuderna-Danish apparatus. Then cleanup was carried out by the METHOD 3630C SILICA GEL CLEANUP.

A slurry of 10g of activated silica gel in methylene chloride was prepared and placed into a 10 mm ID chromatographic column. 1 to 2 cm of anhydrous sodium sulphate was added to the top of the silica gel. 40mL of pentane were used for pre-elution of column. The rate for all elutions was about 2mL/min. The eluate was discarded and, just prior to exposure of the sodium sulphate layer to the air, the 2 mL cyclohexane sample extract was transferred onto the column using an additional 2mL cyclohexane to complete the transfer. Just prior to exposure of the sodium sulphate layer to the air, 25 mL of pentane was added and the elution of the column continued. This pentane eluate was discarded. The elution of the column was continued with 25 mL of methylene chloride/pentane (4:6)(v/v) into a flask for concentration. The collected fraction was concentrated in Kuderna- Danish to 1-10 mL. 4mL of acetonitrile were added to the extract in the concentrator tube. The solvent was concentrated on Kuderna-Danish apparatus with water bath temperature at 95-100°C. The extract volume was adjusted to 1.0mL. The extract then was analyzed by HPLC System-Varian-Prostar with Fluorescence and DAD detectors.

5.5.14 As, Ba, Cd, Cr, Co, Cu, Ni, Sn, Pb & Zn in sediments

Sample preparation were implemented in microwave sample digestion system ETHOS PLUS produced by Milestone company. Applied sample preparation methods cover NF X 31-151 requirements. Received extract were studied by Atomic Absorption Spectrometer Perkin-Elmer Analyst AA800 equipped graphite furnace and cold vapour atomizers.

5.6 QA/QC report

QA/QC management of project were started from preparatory stage of project and considering as combination of Azecolab QA/QC project pointed standard procedures.

Azecolab quality assurance involve 4 level of management, which involve:

- Management by equipments and personnel qualification
- Participation in regional and world wide intercomparison test program
- Routine procedures for MDL and RSD control
- Blank analyses for each of tests in frame of project
- Duplicate sampling and lab tests

5.6.1 Equipment management

Azecolab laboratory are equipped by top level analytical equipments.

Below is list of main equipments, which were used in frame of project.

Table 5.28 List of main lab equipments used in project

AAS-Spectrometer Varian "SPECTRAA 220FS (FL/GF/CV)
AAS-Spectrometer Perkin-Elmer AAAnalist 800 (FL/GF/CV)
ETHOS PLUS Microwave Digestion System for AA, ICP, ICP-MS
Double beam Spectrophotometer Carry-50 (2005)
Hach spectrometric analyser
Start-E, Milestone Microwave organic extraction system
Ion Trap GC/MS Varian-Saturn-2100T with head space system
Quadruple GC/MS Thermo-Finigan Trace DSQ with head space and SPME systems
Gas Chromatograph-Varian 3800 with FID and ECD detectors
HPLC System-Varian-Prostar with Fluorescence and DAD detectors
Dionex Ion chromatograph
16 canal Soxlet extraction system
16 canal Kuderna Danish concentration system
InfraCal TPG/TOG analyzer, Model CVH
Digital microscope for particulate visualization
Particle grain size analyser BA-200-N (25 ranges between 50 um-5 mm)
Vindum PC-2200 Laser Particle Counting System (1-100 um, with 1 um step)
Hach system for TOC
OHAUS 0.1 mg analytical balance
LAC210 0.1 mg analytical balance
SIMPLICITY deionizer
AS10200 Ultrasonic Cleaner

5.6.2 Participation in regional and world wide intercomparison test program

UNEP, IAEA, Marine Environmental laboratory	2005- Caspian Proficiency Test, Trace Elements in Sediments	Marine Sediment reference sample IAEA-356
UNEP, IAEA, Marine Environmental laboratory	2005- Caspian Proficiency Test, Chlorinated pesticides and petroleum hydrocarbons in sediments	Marine Sediment reference sample IAEA-417
UNEP, IAEA, Marine Environmental laboratory	2007 World-wide intercomparison for the determination of organochlorine compounds, petroleum hydrocarbons in sediment	Marine Sediment reference sample IAEA-159
Tacis, IAEA, Marine Environmental laboratory	2008 Caspian Proficiency Test, Trace Elements in Sediments	Marine Sediment reference sample IAEA-433
Tacis, IAEA, Marine Environmental laboratory	2008 Caspian Proficiency Test, Chlorinated pesticides and petroleum hydrocarbons in sediments	Marine Sediment reference sample IAEA-444
UNEP, IAEA, IOC, Marine Environmental laboratory	2009 World-wide intercomparison for the determination of Chlorinated pesticides, PCBs, and petroleum hydrocarbons in biota samples	Gafrarium (New Caledonia) sample IAEA-451

5.6.3 MDL, RSD and Blank analyses report

	Unit	MDL	RSD-%	Method Blank
Water, suspended matter	mg/L	4	5.0	<4
Water, Nitrate	mg/L	0.1	5.0	<0.1
Water, Nitrite	mg/L	0.002	10	<0.002
Water, Phosphate	mg/L	0.002	5.0	<0.002
Water, TPH	mg/L	0.05	10.0	<0.05
Water, Arsenic	ug/L	1.5	2.0	<1.5
Water, Barium	ug/L	1.7	4.0	<1.7
Water, Cadmium	ug/L	0.15	2.0	<0.15
Water, Chromium	ug/L	0.3	5.0	<0.3
Water, Copper	ug/L	2.1	5.0	<2.1
Water, Nickel	ug/L	2.1	5.0	<2.1
Water, Lead	ug/L	2.1	2.0	<2.1
Water, Zinc	ug/L	0.3	5.0	<0.3
Water, Mercury	ug/L	0.2	8.0	<0.2
Sediment, Total organics	%	0.1	5.0	<0.1
Sediment, Total organic carbon	%	0.1	5.0	<0.1
Sediment, Total nitrogen	%	0.0025	5.0	<0.0025
Sediment, Total phosphorous	%	0.002	5.0	<0.002
Sediment, TPH	ppm	10	10	<10
Sediment, Naphthalene	ppb	1.1	10	<1.1
Sediment, Acenaphthene+Fluorene	ppb	0.6	10	<0.6
Sediment, Phenanthrene	ppb	0.6	10	<0.6
Sediment, Anthracene	ppb	0.1	10	<0.1
Sediment, Fluoranthene	ppb	0.4	10	<0.4
Sediment, Pyrene	ppb	0.6	10	<0.6
Sediment, Benzo(a)anthracene	ppb	0.4	10	<0.4
Sediment, Chrysene	ppb	0.9	10	<0.9
Sediment, Benzo(b)fluoranthene	ppb	0.5	10	<0.5
Sediment, Benzo(k)fluoranthene	ppb	0.4	10	<0.4
Sediment, Benzo(a)pyrene	ppb	0.3	10	<0.3
Sediment, Dibenzo(a,h)anthracene	ppb	0.3	10	<0.3
Sediment, Benzo(ghi)perylene	ppb	0.6	10	<0.6
Sediment, Indeno(1,2,3-cd)pyrene	ppb	0.4	10	<0.4
Sediment, Benzene	ppb	35	15	<35
Sediment, Toluene	ppb	12.5	15	<12.5
Sediment, EthylBenzene	ppb	10	15	<10
Sediment, p-Xylene	ppb	12.5	15	<12.5
Sediment, o-Xylene	ppb	12.5	15	<12.5
Sediment, m-Xylene	ppb	12.5	15	<0.1
Sediment, Arsenic	ppm	0.25	5.0	<0.25
Sediment, Barium	ppm	3.4	3.0	<3.4
Sediment, Cadmium	ppm	0.025	5.0	<0.025
Sediment, Chromium	ppm	1.0	5.0	<1.0
Sediment, Cobalt	ppm	0.3	5.0	<0.3
Sediment, Copper	ppm	0.3	5.0	<0.3
Sediment, Nickel	ppm	0.3	5.0	<0.3
Sediment, Tin	ppm	0.8	5.0	<0.8
Sediment, Lead	ppm	1.4	5.0	<1.4
Sediment, Zinc	ppm	0.6	5.0	<0.6
Sediment, Mercury	ppm	0.02	8.0	<0.02

5.6.4 Duplicate sampling and lab test report

In frame of Sea survey duplicate sampling for lab chemical tests were made for 1 water sampling station and 2 sediment sampling stations.



Figure 5.9 Duplicate water samples from station S12W (Middle depth)



Figure 5.10 Duplicate sediment samples from station S14



Figure 5.11 Duplicate sediment samples from station S19

Suspended matter, nutrients and heavy metals were studied for duplicate of water sample. TPH, PAHs and heavy metals were studied for duplicate of bottom sediment samples.

Table 5.29 Duplicates study results, S12W, Middle

	Unit	S12W, #11382	#11382, Duplicate
Suspended matter	mg/L	<4.0	<4.0
Nitrate	mg/L	2.0	2.1
Nitrite	mg/L	0.009	0.008
Orthophosphates	mg/L	0.088	0.085
Arsenic (As)	ug/L	<1.5	<1.5
Barium (Ba)	ug/L	30.8	30.3
Cadmium (Cd)	ug/L	<0.15	<0.15
Chromium (Cr)	ug/L	<0.3	<0.3
Copper (Cu)	ug/L	<2.1	<2.1
Nickel (Ni)	ug/L	<2.1	<2.1
Lead (Pb)	ug/L	<2.1	<2.1
Zinc (Zn)	ug/L	18.9	19.1
Mercury (Hg)	ug/L	<0.2	<0.2

Table 5.30 Study results for sediment duplicates from station S14 and S14

	Unit	S14, #11400	#11400, Duplicate	S19, #11405	#11405, Duplicate
TPH	ppm	<10	<10	198	206
Naphthalene	ppb	ND	ND	9.6	12.5
Acenaphthene+Fluorene	ppb	ND	ND	1.3	1.83
Phenanthrene	ppb	ND	ND	9.9	9.16
Anthracene	ppb	ND	ND	0.7	1.15
Fluoranthene	ppb	ND	ND	360	398
Pyrene	ppb	ND	ND	1.1	1.18
Benzo(a)anthracene	ppb	ND	ND	6.5	9.4
Chrysene	ppb	ND	ND	37.5	31.6
Benzo(b)fluoranthene	ppb	ND	ND	121	114
Benzo(k)fluoranthene	ppb	ND	ND	10.5	13.6
Benzo(a)pyrene	ppb	ND	ND	14.1	24.0
Dibenzo(a,h)anthracene	ppb	ND	ND	16.2	14.5
Benzo(ghi)perylene	ppb	ND	ND	41.8	35.8
Indeno(1,2,3-cd)pyrene	ppb	ND	ND	11.1	15.1
Total PAHs	ppb	ND	ND	642	682
Arsenic (As)	ppm	16.1	16.7	20.5	18.2
Barium (Ba)	ppm	636	704	616	605
Cadmium (Cd)	ppm	0.046	0.041	0.051	0.044
Cobalt (Co)	ppm	15.8	13.8	13.7	12.6
Chromium (Cr)	ppm	116.4	102.0	105	114
Copper (Cu)	ppm	37.8	45.1	27.8	24.3
Mercury (Hg)	ppm	<0.02	<0.02	<0.02	<0.02
Nickel (Ni)	ppm	43.4	40.4	37.6	36.4
Lead (Pb)	ppm	13.5	12.8	17.16	17.6
Tin (Sn)	ppm	1.85	1.91	2.66	2.61
Zinc (Zn)	ppm	91.5	85.2	88.9	90.3

Both of water and sediment samples lab study results were demonstrated adequate correlations.