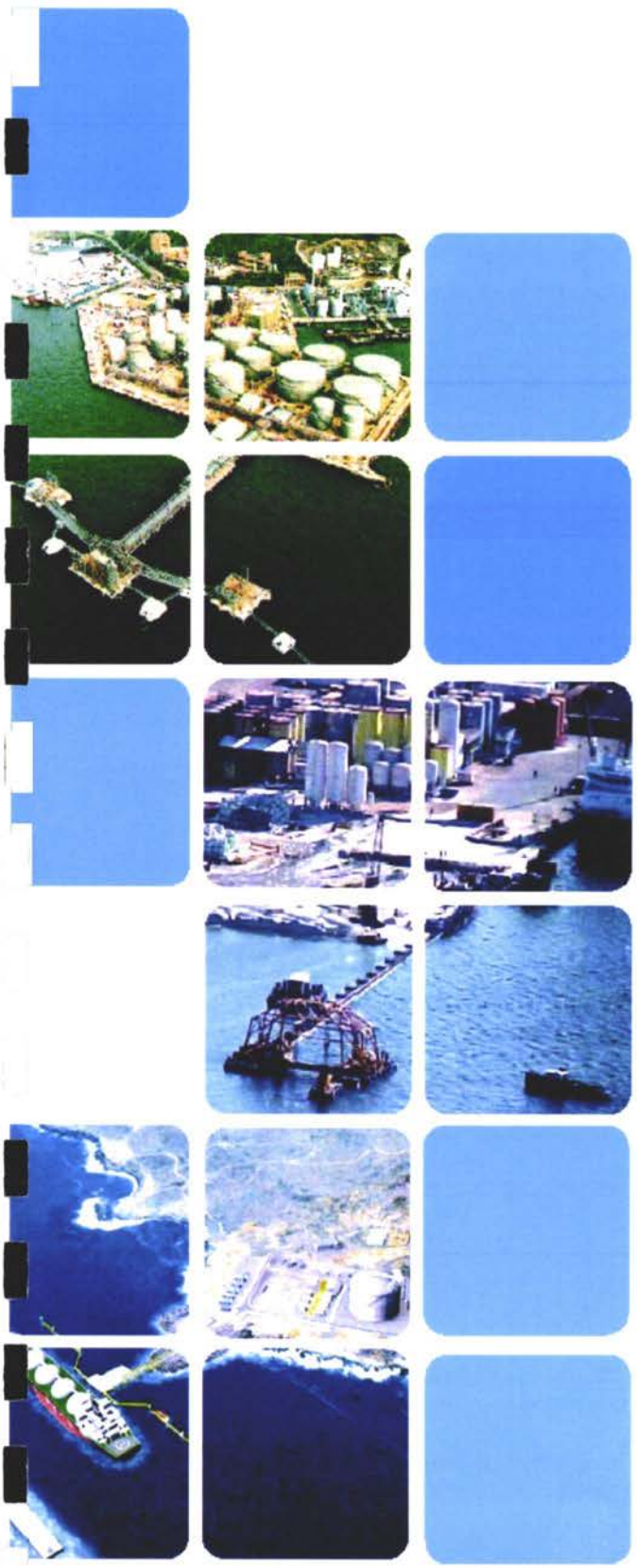


AKTAU PORT DEVELOPMENT

Masterplanning & Feasibility Study for the Port of Aktau, Kazakhstan

Project №: EuropeAid/123967/C/SER/KZ

MASTER PLAN

Prepared for:

June 2008

Table of Contents

List of Tables

List of Figures

1 Executive Summary

1.1 Basis for this study

The report presents the findings of a Master Plan study for the expansion of Aktau Port and is one of the key deliverables for this regional TACIS project.

The Master Plan Report provides the physical master planning steps to be taken to enable AISCP to develop the port to match the future traffic scenarios given in the Feasibility Report. The Feasibility Report examines the financial and economic analysis of the proposed physical developments and should be read in conjunction with this report. Where necessary some of the material in the Feasibility report has been reproduced in the Master Plan Report so that each report is self contained.

The Feasibility Report, the Master Plan Report and the Design Report, due in April 2008, cover the requirements of Sections 4.2.1; 4.2.2 and 4.2.3 of the Terms of Reference (ToR) for this project.

Although it is concluded that future expansion of the port is an economic necessity for Kazakhstan, the Feasibility Report has shown that there are uncertainties concerning the possible increases in volumes of all future traffic at Aktau. To ensure that investments in new port facilities are not wasted, it is necessary to have a master plan which contains flexibility so that the implementation schedule can be varied to match changing demands. Although some of the potential flexibility has been lost by the initiation of the North Port development before future cargo volumes and the nature of the trade have been fully determined, where possible flexibility within the North Port layout has been maximised.

1.2 Current port traffic

The port of Aktau handled 11.5 million tonnes of cargo in 2006, of which 87% was oil exports. The average growth rate was 12.6% p.a. over the last five years (see Table 1).

TABLE 1 : Aktau Port Traffic 2002-2006 (000 tonnes)

	2001	2002	2003	2004	2005	2006	Growth (% p.a.) 2001-2006
Oil	5,035	5,553	6,971	8,289	8,913	9,960	14.6%
Steel etc	1060	574	836	1,011	1,024	1,029	-0.6%
Grain	84	209	5	13	33	118	7.0%
Others	181	615	268	378	399	398	17.1%
Total	**6,360**	**6,951**	**8,080**	**9,691**	**10,369**	**11,505**	**12.6%**

1.3 Current port facilities

The port consists of four dedicated oil berths, berths 4, 5, 9 and 10; three multipurpose general cargo berths, berths 1, 2 and 3; a grain berth, berth 6, which is also used by quarter ramp roro vessels; and a jetty, berth 8, for the rail ferries which is also used as an oil jetty. Berth 11 has been refurbished for use as an extra oil berth but is not currently in operation due to safety concerns. There is also a small area for port craft.

The berths on the breakwater are limited in their availability per year due to wave transmission through the breakwater and overtopping of the breakwater.

The lengths and drafts of the berths are as shown in Table 2.

TABLE 2: Lengths and Drafts of Main Berths

Berth	Length (m)	Draft (m)
1 Dry Cargo	150	6.3
2 Dry Cargo	150	6.3
3 Dry Cargo	100	6.3
4 Oil	205	8.7
5 Oil	205	9.0
6 Grain	150	6-7.0
7	65	7-8.0
8 Ferry	100	6-7.0
9 Oil	175	7.0-9.0
10 Oil	190	9.0
11 Oil (unused)	123	3-12.0

The capacities of the main berths (excluding the ferry berth) are estimated to be approximately as shown in Table 3 on the basis of existing handling speeds.

TABLE 3: Existing Throughput Capacity

Cargo	Capacity (million tonnes)
Oil	11.5
Metals & dry cargo	1.6
Grains	0.4

1.4 Current rail and pipeline capacity

Cargo is transported to and from Aktau port by rail and to a lesser extend by pipeline and road. The rail access is managed by KTZ on the main line and KTS on the local lines.

Pipelines: There is a 500mm diameter pipeline from the Buzachi field with a capacity of 4 – 4.2 mt/y.

Rail Access: *KTZ* rail access to Aktau Port is constrained in terms of capacity by the last section of the route between Sai Utes and Mangyshlak. The present capacity of this section is 12.6 mt/y and after allowing for 2.5 mt/y of non-oil cargo, the maximum oil capacity on this stretch of line is approximately 10.1 mt/y.

Assuming that additional pipelines are not constructed the total pipeline/rail throughput capacity of oil is 14.1 to 14.3 mt/y.

To increase capacity beyond this level, which is essential if projected volumes of cargo are to reach Aktau, KTZ would need to either double the track section at a cost of approximately US$70m, or to investigate provision of additional locomotive power for trains using this section of route. Track capacity cannot be increased quickly, even if funding were available, and a lead-time of at least 24 months from the date of authority should be assumed to be the minimum achievable.

KTS currently controls rail access to the port and its key customers. Current system capacity is assessed by KTS themselves at 8-9 million tonnes/year. However the system is configured to serve former industry rather than being totally appropriate for the needs of the current terminals and the port. Some reconfiguration of the network would therefore be appropriate to assist in increasing volumes.

The key action which would improve system throughput would be to encourage terminals and KTS to co-operate in basing as much traffic movement as possible on trainload (block) working rather than staging trains at Aktau port station. This would cut down the amount of shunting and remarshallings required, and simplify wagon handover between KTZ and KTS.

Given current resources and track capacity on the KTS network it appears that there is capacity within this system to increase traffic by up to 50% given reasonable modifications to the track layout, methods of working and concentration on trainload traffic movements. This will require co-operation between KTS, terminals and the port, but should be achievable to match projected traffic build up. KTS has already indicated that it is able to handle the projected additional TCO traffic forecast for 2008.

KTZ has prepared plans to construct an independent rail access on its own network infrastructure to serve both the port and some or all of the oil terminals. Details are still provisional, but this access would further boost the rail capacity of the port and surrounding industry.

1.5 Current situation in the North Port

The North Port breakwater and mole have been partially constructed but the construction contract was terminated in 2006 when the work was less than 25% complete. A contract to complete the mole and breakwater was awarded in November 2007 with a scheduled completion date of December 2008.

As a consequence of the layout of the mole and the position of the entrance channels it is only possible to create three new dry cargo berths in the North Port and of these three one is proposed to be a dedicated grain berth. The land reclamation proposed with these three berths is approximately 30 Ha which is a very large area to support three small berths and results in approximately 50% of the land area not being effectively utilised.

1.6 Projected future cargoes

Oil: Future cargo volumes are very sensitive to the assumptions made on the future movement of oil. At present the main exporter in the region, Tengizchevroil, has short term plans to transport large volumes of oil exports by rail to the port of Odessa; and in the long term they may divert some of their exports to the new port likely to be built at Kuryk, 70 kilometres south of Aktau. Kuryk is being built by the operators of the new Kashagan oilfield, and will open around 2012-2013.

Three scenarios have been examined:

Scenario A: Aktau wins traffic back from the rail route to Odessa, and Kuryk handles only exports from the Kashagan oilfield when it opens in 2012/13. On this basis, Aktau's annual traffic would peak at about 23 million tonnes just before Kuryk opens and then settle down to 14-17 million tonnes. ***This would be the least cost scenario,*** as routes via Aktau have lower costs than via Odessa or Kuryk (as demonstrated in the economic evaluation).

Scenario B: Aktau does ***not*** win traffic back from the Odessa route, and Kuryk handles only Kashagan's exports. On this basis, Aktau's annual traffic would reach peaks of 18-19 million tonnes in 2011-2013, and then settle down in the range 8-9 million tonnes.

Scenario C: Kuryk handles Tengizchevroil as well as Kashagan exports. On this basis it is estimated that Aktau's annual traffic would peak at 16 million tonnes in 2012, before falling back to around 8 million tonnes.

Dry Cargo: For dry cargo the projected future volumes are well above the AISCP forecast. The main reasons for the higher forecast are (i) the exports planned by the new fertiliser plant; (ii) the additional grain exports likely to result from the new export strategy of JSC Ak Biday and their investment in new coastal silos in Iran, Azerbaijan and Georgia; and (iii) imports of construction materials and later consumer goods from Dubai and Turkey for the New City.

Steel exports to Iran account for a large proportion of Aktau's dry cargo. Mittal and Castings have forecast that future exports will rise to about 1.5 million tonnes via Aktau by 2010. This seems slightly high; as Mittal has no plans to increase production at present (its investment programme is focussing on quality improvements). But Castings is planning an increase in production of 0.4 million tonnes – equivalent to a 10% increase in national production - and the Iranian and Kazakhstan governments recently agreed to an Iranian company constructing a modern steel plant in Kazakhstan. Given the strong growth of imports into Iran, and the fact that the fast-growing Kazakh economy has a well-established steel industry in Kazakhstan dominated by Mittal, it seems likely that the steel exports via Aktau will increase. However, in view of the negligible growth in recent years it has been assumed that future growth will be modest, at around 5% p.a.

In the longer term the Special Economic Zone should generate additional traffic, but it will take time. None of the projects currently in the pipeline will generate significant port traffic, and no distribution companies, which are the key players at other successful SEZs such as Jebel Ali, have yet been set up in the SEZ. Also, additional traffic may be attracted away from their current overland routes to Novorossiysk and Ukrainian ports on to Traceca routes via Aktau - if key reforms are carried out, especially in rail pricing and cross border procedures. But these reforms will take time. They have been under discussion for several years and there is little sign of progress as yet.

Total Volumes: Table 4 summarizes the total projected volumes (oil volumes are based on Scenario "A").

TABLE 4: Traffic Forecasts (Scenario A) (000 tonnes/year)

	2006	2010	2015	2020
Oil	**9,900**	**(a) 14,000**	**15,000**	**17,000**
Dry Cargoes				
Steel	947	1,151	1,469	1,875
Scrap	51	100	200	300
Grain	118	400	1,000	1,250
Other	30	30	40	50
Rail ferry inbound, existing traffic	148	259	417	613
Rail ferry inbound, New City cargo	0	330	330	330
Rail ferry outbound (fertilisers)	0	0	1,000	1,200
Containers, existing Traffic	10	51	154	310
Containers, New City Cargoes	0	330	330	330
Total Dry Cargo	**1,304**	**2,651**	**4,940**	**6,258**
Total Liquid and dry	**11,204**	**16,651**	**19,940**	**23,258**

(a) Rising to 23 millions tonnes in 2012, before declining to 15 million tonnes.

1.7 Additional berths needed in Existing Port and North Port: 2008 to 2020

To handle the projected volumes additional facilities and berths will be needed in both the existing and North port.

Existing Port: To a certain extent some of the projected volumes can be handled by increasing the capacity of the existing port by relatively minor modifications to the existing berths and a reduction in the time taken for paperwork before and after loading oil tankers. These modifications would result in the revised port capacity shown in Table 5.

TABLE 5: Existing Port Throughput Capacity Following Upgrade

Cargo	Proposed Upgrade	New capacity (million tonnes/year)	Approximate cost of upgrade (US$ million)
Oil	▪ Increase pumping rates and number of loading arms at all berths; ▪ Upgrade berth 9 to take 12000dwt tankers; ▪ Complete works on berth 11 and commission the berth. ▪ Reduce time spent on paperwork before and after loading oil tankers	14.4 (16.4 if paperwork time on 12000DWT tankers reduced to 4 hours)	8.0
Metals & dry cargo	▪ Upgrade berth 12 to create 220m of new dry cargo berth with back-up land and yard;	1.85	10.0
Grains	▪ Upgrade berth 6 with additional silo and loading chute.	0.5-0.75	Covered by grain operator
Total			**18.0**

North Port: As can be seen in Figures 1, 2 and 3 below the upgrades to the existing port will not be sufficient to meet all traffic requirements over the forecasting period. In addition to the upgrading work in the existing port, additional berths will be required in the North Port. In the case of oil however, the peak demand for new berths will be relatively short-lived under all three Scenarios, "A", "B" and "C".

The peak will occur around 2012-2013, after which traffic will settle down to lower levels. It should also be noted that, as mentioned above, the current total pipeline/rail throughput capacity of oil is 14.1 to 14.3 mt/y. which is similar to the capacity of the existing port after upgrading works. Therefore any further investment in berths, as in the North Port, will need to be matched by investment in new pipelines or rail if the potential of the new berths is to be realised.

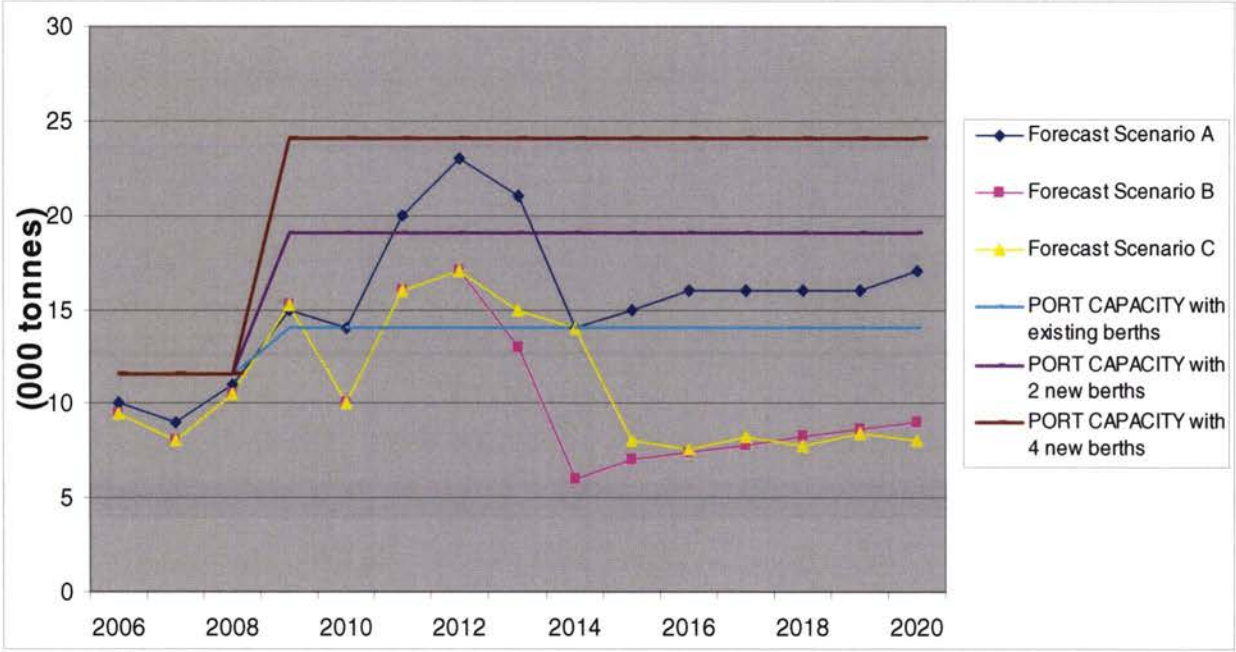
In the case of dry cargo the situation is more straightforward but may in the longer term, after 2020, reach the situation where the three proposed dry cargo berths are insufficient and a reconfiguration of the North Port will then be required to provide space for additional berths.

As in the case of oil the capacity of the mainline rail will need to be increased in parallel with the development of the North Port dry cargo berths.

It should be noted that the viability of development of the North Port depends on projected oil volumes exceeding the capacity of the existing port (10-16MT/yr depending on the extent of upgrading) AND the rail/pipeline system being expanded to match these volumes.

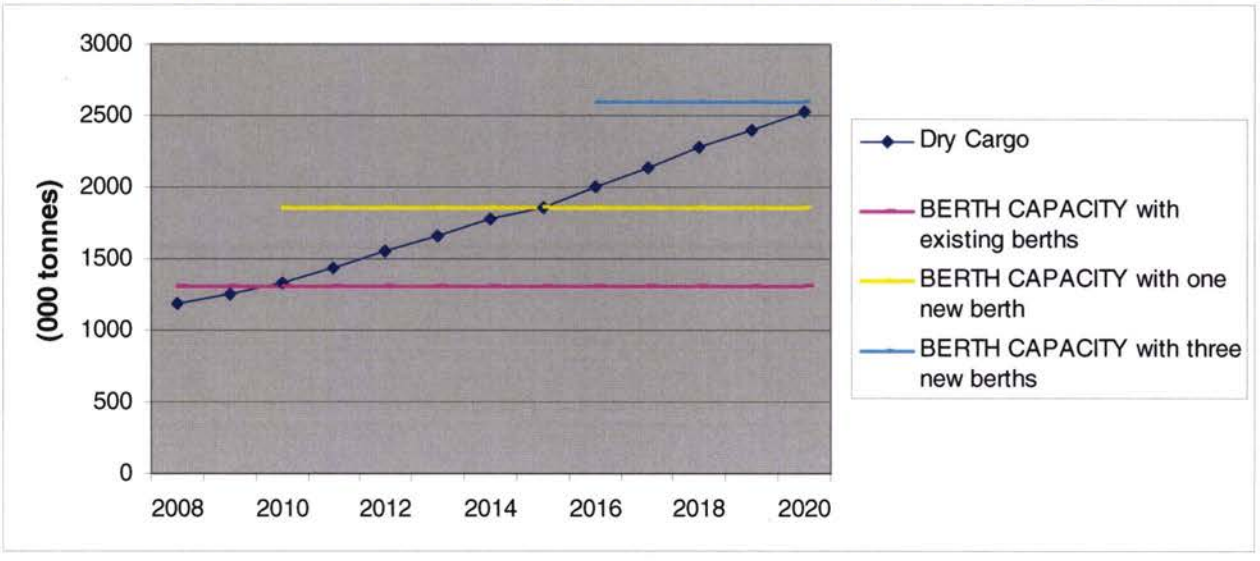
Figures 1 to 3 show initial estimates of port capacity against the traffic forecast and are presented for illustration purposes only.

FIGURE 1: Forecast Oil Traffic and Existing Port Capacity



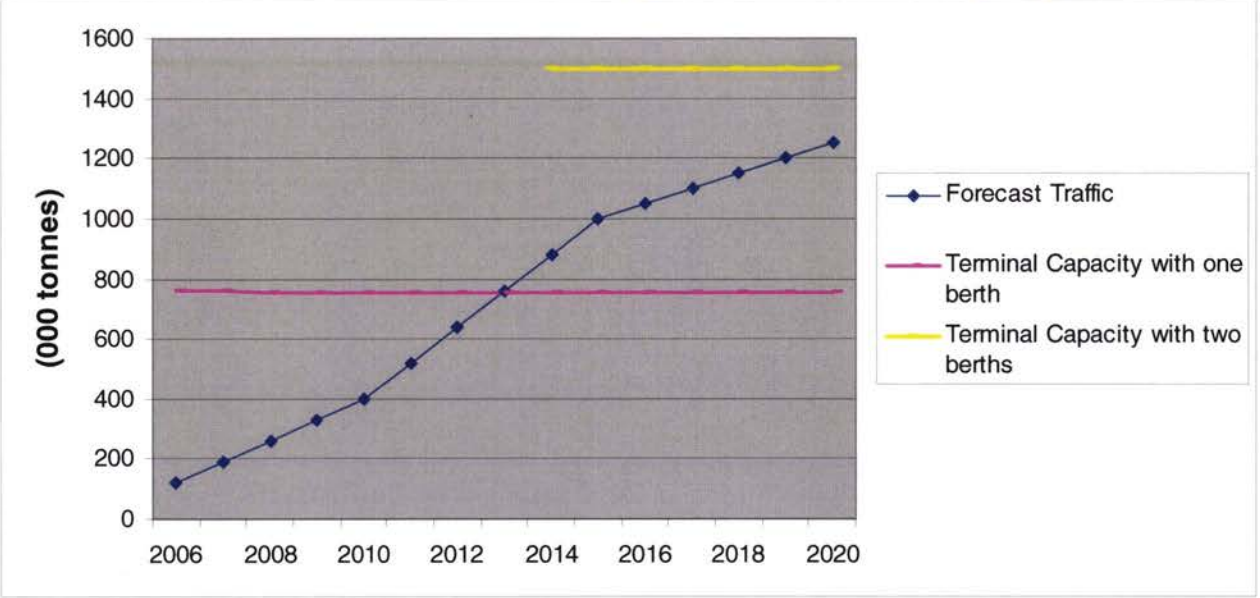
Note: existing port figure is based on oil capacity expanded to 14.4 Mt/yr although it may be possible to increase to 16.4 Mt/yr if paperwork time can be reduced

FIGURE 2: Forecast Dry Cargo Traffic and Existing Port Capacity



Note: existing port figure is based current port capacity

FIGURE 3: Forecast Grain Cargo Traffic and Port Capacity



The options evaluated to meet the forecast traffic volumes are summarized Table 6.

TABLE 6: Possible Investments in New Infrastructure

Cost Item	Description of Possible Investments	Cost US$ million
COSTS ALREADY COMMITTED		
Facilities already constructed by Mobilex	Partially constructed mole and reclamation.	25.0
Facilities already committed via breakwater contract signed in Nov.07	Complete the mole and breakwater that were started by Mobilex	72.0
COSTS OF PROPOSED NEW BERTHS		
Oil berths	Construct Berths 14,15,16 and 17 Equipment such as loading arms and pipe work which might be provided by AISCP **or** private operator	35.0 Plus 25.0 = 60.0
Additional basic infrastructure to be completed at the same time as the oil berths	Dredge North Port Harbour basin, 1.6 million cubic metres	30.0
General cargo berths	One general cargo berth at berth 12 in the **Existing Port**	10.0
	Construct Berths 21 and 22	40.0
Additional basic infrastructure that must be completed at the same time as the dry cargo berths	Completion of reclamation that was started by Mobilex Roads, rail, services, buildings to serve berths 21,22 and 23	10.0 50.0
Grain berth	Construct Berth 23 as a new dedicated grain berth. It is assumed that private operator provides silos and loading shutes	20.0
PORT EQUIPMENT	Quay cranes, forklifts for general port work assumed to be provided by AISCP	20.0
TOTAL		**337**

1.8 Economic and Financial Evaluations

Extensive economic and financial evaluations of the proposed development plans have been carried out and the results are reported in full in the Feasibility Study.

In addition forecasts have been made of the revenues and expenditures for AISCP resulting from the proposed developments and these results are also given in full in the Feasibility Study.

1.9 Conclusions

There is an opportunity for Aktau port to handle increased volumes of cargo providing the existing port is upgraded; the proposed North Port expansion is constructed; and the railway and/or the pipeline transporting oil into Aktau is expanded to match the projected future oil volumes.

The projected increased volumes are predominantly oil but the study has shown a large potential spread in the volume that might be exported through Aktau. This means that there is a risk that new facilities will be underutilised in the future unless AISCP can obtain guarantees from Government or binding commitments from oil companies that the projected volumes, that are used as the basis for constructing new facilities, will be underwritten.

1.10 Recommendations

The study has shown that there are several actions that need to be taken immediately to meet the projected demand to handle future cargo volumes. To assist AISCP with identifying these actions, the following recommendations are made for the key development areas.

General Recommendations on actions to be taken before implementation of the Master Plans

1. AISCP seek meetings with Ministry of Transport, Ministry of Energy and Ministry of Economy to clarify the inconsistencies in State forecasts of oil volumes and to seek guaranteeing of oil volumes or underwriting the repayments of the loan if the volumes do not materialize.
2. AISCP should seek meetings with the oil companies, notably Tengiz Chevroil, to discuss sharing the costs of investment in the oil berths as is common in many oil terminals worldwide.
3. AISCP should build on existing arrangements and work more closely with the oil companies to determine the optimum procurement strategy and port tariffs for the new oil berths, given the possible short term requirement for these berths.

4. To compete with alternative transport routes AISCP should establish a forum for working with the oil, rail, pipeline and tank storage companies to ensure that oil exporting facilities and procedures at Aktau are as attractive as the alternative transport routes that are available and that the capacity of the railway and pipeline are increased so that they can handle the projected future volumes.
5. AISCP should source as much funding as possible through an increase in equity/capital, but be prepared to provide sovereign guarantees to attract external funding institutions.
6. The management of the SEZ falls under the jurisdiction of the City Administration of Aktau City. To ensure the correct level of synergy is formed between the development of the Port and the SEZ it is essential that the existing links between the port and the city are used to their fullest extent in the future planning of the port and the surrounding areas.

Existing Port Recommendations

1. Upgrading work should be carried out immediately in the existing port to meet immediate projected increases in traffic volumes.
2. AISCP should put in hand efficiency improvements to the existing cargo operations.
3. As part of the next stage of this study, AISCP and the Consultants should initiate an institutional reform review amongst the agencies involved in customs clearance, immigration, security and quality testing to improve oil berth productivity. A large proportion of the tanker loading time is taken up by procedures required to complete the loading schedule. The times allowed by the Port, 8 hours per tanker, is twice the time found in comparable oil ports elsewhere. In particular the Consultants should consider if international procedures such as "International Safety Guide for Oil Tankers & Terminals", known as "ISGOTT", would be beneficial to AISCP.
4. AISCP should complete as soon as possible their investigations which are currently in hand, to confirm the practicality of increasing oil volumes through the Existing Port; this involves:
   - Re-evaluation of the allocation of berths to terminals;
   - Carry out pumping trials at berths 4, 5, 9 and 10 from Kaztransoil, Terminalex and Artis Terminals as appropriate;
   - Check operating envelope of marine arms at berths 4, 5, 9 and 10; and establish requirements to provide 2000 TPH at berths 4, 5, 9 and 10;
   - Establish dredging requirements for berth 9;
   - Commission berth 11.

5. Examine the need for additional tankage: the 3 supply terminals have tankage sufficient only for between 3 days and 7 days of throughput, which is a very low figure: additional tankage would balance out fluctuations in supply. If new tankage were provided at the Port then this would allow the supply terminals to supply to the Port Depot at the current flowrate of 1000 TPH over a 15 hour period, and the Port Depot would then supply to the tanker at a loading rate of 2000 TPH over a 7.5 hour period.
6. Consider that all port oil loading operations should be carried out from a central location. A Port Oil Depot could be located adjacent to the proposed new berths on the recently reclaimed area.

North Port Recommendations

1. To maintain AISCPs role as a key player in the export of Kazak crude oil at least two new oil berths should be operational in the North Port by 2010.
2. AISCP should plan to construct a new grain terminal in the North Port by 2014 and two new dry cargo berths in the North Port by 2017.
3. AISCP should consider finding additional/alternative use for the large reclamation in the North Port, such as tank farms or industrial development, both for the temporary condition until the new dry cargo berths are required and for the permanent condition where a significant proportion of the reclamation is unlikely to be needed for port operations.
4. Following the Second Steering Committee Meeting held in Astana on 27th March 2008 the Consultant should proceed with designs and tender documents based on FIDIC conditions of contract for new oil berths in the North Port. Designs will be prepared for four berths. It is expected that by the time the designs are completed, the forecasts of demand for oil shipment will have been clarified through the AISCP activities listed under points 1, 2 and 3 of the General Recommendations on Actions to be taken before implementation of the Master Plan". It will then be possible to firm up the scope and financing of the oil berth procurement package.

2 Introduction

This report, the Master Plan Report, provides the physical Master Planning steps to be taken to enable AISCP to develop the port to match the future traffic scenarios given in the Feasibility Report. The Feasibility Report examines the financial and economic analysis of the proposed physical developments and should be read in conjunction with this report. In some cases the material in the Feasibility Report has been reproduced in the Master Plan Report so that each report is self contained.

The Feasibility Report, the Master Plan Report and the Design Report, due in April 2008, cover the requirements of Sections 4.2.1; 4.2.2 and 4.2.3 of the Terms of Reference (ToR) for this project.

The Feasibility Report has shown that there are uncertainties concerning the possible increases in volumes of all future traffic at Aktau, although it is concluded that future expansion of the port is an economic necessity for Kazakhstan. However, to ensure that investments in new port facilities are not wasted it is necessary to have a master plan which contains flexibility so that the implementation schedule can be varied to match changing demands. Although some of the potential flexibility has been lost by the initiation of the North Port development before future cargo volumes and the nature of the trade have been fully determined, where possible flexibility within the North Port layout has been maximised.

The Feasibility Report has also shown that there is considerable scope for upgrading the existing port facilities and procedures, thereby increasing throughput in return for modest and rapid investment. This type of investment is ideally suited for immediate investment whilst the North Port is being developed.

The rail study, which forms part of the Feasibility Report, has shown that the capacity of the existing rail system into Aktau and the existing oil pipeline are insufficient to meet the demands of the high scenario cargo forecast, Scenario A. It is estimated that without further development the rail and pipeline system is only able to match the capacity of the existing port, following upgrading work to the existing port. Thus, the North Port development is in danger of being underutilised unless this development is matched by development of the rail and pipeline systems.

This report concentrates on the development of the land and marine zone within the control and ownership of AISCP. Where possible reference has been made to planning studies being carried out for areas adjacent to the port, which constitutes the Special Economic Zone (SEZ), but at this stage it is understood by the Consultants that these studies are incomplete and no relevant reports have been made available to the Consultants. The management of the SEZ falls under the jurisdiction of the City Administration of Aktau. To ensure the correct level of synergy is formed between the development of the Port and the SEZ, it is essential that the existing links between the port and the city are used to their fullest extent in the future planning of the port and the surrounding areas.

3 Capacity of Port

3.1 Introduction

There have been a number of previous assessments made of the port capacity. These have all been re-examined and are indicated for comparison purposes with this operational assessment. Given the nature of the traffic and continuous fluctuations in daily demand, it is recognized that such an assessment is based on best estimates.

Typical photographs of the existing port and its operations, taken in November 2007, are included for reference in Appendix 2.

3.2 Existing Port Capacity - Oil

There are currently three oil terminals that receive and store oil prior to pumping it to the port for export. These are:

- Kaztransoil;
- Terminalex;
- Artis.

Kaztransoil Terminal

The Kaztransoil Terminal is supplied by railcars and by pipeline.

The capacity of each railcar is 66 tonnes. The Summer Offloading Rate (for 9 months) is 252 railcars per day and the Winter Offloading Rate (for 3 months) is 210 railcars per day.

On the basis of 295 operational days per year the Annual Supply Rate is calculated as follows:-

Summer Offloading Rate	= 252 x 66 TPD	= 16,632 TPD
Winter Offloading Rate	= 210 x 66 TPD	= 13,860 TPD
Summer Operational Days	= 75% x 295 days	= 221 days
Winter Operational Days	= 25% x 295 days	= 74 days
Summer Offloading Quantity	= (16,632 x 221)T	= 3.68 MT
Winter Offloading Quantity	= (13,860 x 74) T	= 1.03 MT
Annual Offloading Quantity	= (3.68 + 1.03) MT	= 4.71 MT
The Annual Supply from the Pipeline is advised as 4.20 MT		
The Total Annual Supply to the Terminal (4.71 + 4.20) MT = 8.91 MT		

The tank storage at the terminal comprises:

2 No. 20,000 tanks	= 40,000T
8 No. 5,000 tanks	= 40,000T
Total	= 80,000T

This represents storage for 3.3 days' supply.

The Kaztransoil Terminal is located 3000m from the oil berths at the Port. 3 No. supply lines – each 500 dia. – run from the terminal to berths 4, 5 and 8. 2 No. supply lines – each 700 dia. – run from the terminal to berths 9 and 10.

At present each line supplies 1000 TPH – with a pump discharge pressure of 7.0 bar and a ship's manifold pressure of 2.5 bar – using a single 250 dia. marine arm at each berth.

Terminalex Terminal

The Terminalex Terminal is supplied by railcars only. The Summer Offloading rate is 240 railcars per day and that the Winter Offloading rate is 180 railcars per day. The annual rail supply rate is calculated as follows:

Summer Offloading Rate	= 240 x 66 TPD	= 15,840 TPD
Winter Offloading Rate	= 180 x 66 TPD	= 11,880 TPD
Summer Operational Days	= 221 days	
Winter Operational Days	= 74 days	
Summer Offloading Quantity	= (15,840 x 221) T	= 3.50 MT
Winter Offloading Quantity	= (11,880 x 74) T	= 0.88 MT
Annual Offloading Quantity	= (3.50 + 0.88) T	= 4.38 MT

The Total Annual Supply to the Terminal is 4.38 MT

The tank storage at the terminal comprises:

2 No. 10,000 T Tanks	= 20,000 T
8 No. 5,000 T Tanks	= 40,000 T
Total	= 60,000 T

This represents storage for 5.0 days' supply.

The Terminalex Terminal is located 5000m from the oil berths at the Port. 4 No. supply lines – 2 No. 500 dia. insulated and 2 No. 300 dia. – run from the Terminal to berths 4, 5, 8 and 11.

At present each line supplies 1000 TPH – with a pump discharge pressure of 20.0 bar and a ships manifold pressure of 1.0 bar – using a single 250 dia. marine arm at each berth.

Artis Terminal

The Artis Terminal is supplied by railcars only. The Summer Offloading rate is 107 railcars per day and that the Winter Offloading rate is 87 railcars per day.

The Annual Rail Supply Rate is calculated as follows:

Summer Offloading Rate	= 107 x 66 TPD	= 7,062 TPD
Winter Offloading Rate	= 87 x 66 TPD	= 5,742 TPD
Summer Operational Days	= 221 days	
Winter Operational Days	= 74 days	
Summer Offloading Quantity	= (7,062 x 221) T	= 1.56 MT
Winter Offloading Quantity	= (5,742 x 74) T	= 0.42 MT
Annual Offloading Quantity	= (1.56 + 0.42) MT	= 1.98 MT
The Total Annual Supply to the Terminal is 1.98 MT		

The tank storage at the terminal comprises:

4 No. 10,000 T Tanks	= 40,000 T
3 No. 5,000 T Tanks	= 15,000 T
Total	= 55,000 T
This represents storage for 6.5 days' supply.	

The Artis Terminal is located 1300m from the oil berths at the Port. 3 No. supply lines – 1 No. 500 dia., 1 No. 400 dia. and 1 No. 400 dia. insulated – run from the Terminal to berths 4, 5 and 8.

At present each line supplies 1200 TPH - with a pump discharge pressure of 12.0 bar and a ship's manifold pressure of 4.5 bar – using a single 250 dia. marine arm at each berth.

Existing Oil Berth Facilities

TABLE 7 : Facilities at Existing Oil Berths

Berth No.	Max. Tanker Capacity	Supply Terminal	Supply Pipelines	Supply Flow rate per Line	Available Marine Arms
4	12000 T	Kaztransoil	3 No. 500 dia.	1000 TPH	4 No. 250 dia.
		Terminalex	2 No. 500 dia. 2 No. 300 dia.	1000 TPH 1000 TPH	
		Artis	1 No. 500 dia. 2 No. 400 dia.	1200 TPH 1200 TPH	
5	12000 T	Kaztransoil	3 No. 500 dia.	1000 TPH	4 No. 250 dia.
		Terminalex	2 No. 500 dia. 2 No. 300 dia.	1000 TPH 1000 TPH	
		Artis	1 No. 500 dia.	1200 TPH	
8	5000 T	Kaztransoil	2 No. 300 dia.	1000 TPH	2 No. 250 dia.
		Artis	1 x 500 dia. 2 x 300 dia.	1200 TPH 1200 TPH	
9	5000 T	Kaztransoil	2 No. 700 dia.	1000 TPH	2 No. 250 dia.*
10	12000 T	Kaztransoil	2 No. 700 dia.	1000 TPH	2 No. 250 dia.
11	5000 T	Terminalex	2 No. 500 dia. 2 No. 300 dia.	1000 TPH 1000 TPH	2 No. 250 dia.

* One of these marine arms has been dismantled and is not in use at present.

Throughput for Existing Oil Berths

We are advised that agreements are in place at the Port which determines the loading time for oil tankers. These agreement times are listed below:

For 5000 DWT Tankers	- Pumping time	= 9 hours
	- Paperwork time	= 8 hours
	Total Time	= 17 hours
For 12000 DWT Tankers	- Pumping time	= 12 hours
	- Paperwork time	= 8 hours
	Total Time	= 20 hours

Calculation of Present Oil Berth Occupancy

Based on 295 operational days per year and a berth occupancy of 100%, throughput for an oil berth using 5000 DWT tankers is calculated as:

5,000 x 295 x 24/17 x 100% Tonnes = 2.08 MT

Similarly for an oil berth using 12000 DWT tankers is calculated as:-

12,000 x 295 x 24/20 x 100% tonnes = 4.25 MT

Berths 4, 5 and 10 are available for 12000 DWT tankers
Hence total 12000 DWT throughput = 3 x 4.25 MT = 12.74 MT

Berths 8, 9 and 11 are available for 5000 DWT tankers
Hence total 5000 DWT throughput = 3 x 2.08 MT = 6.24 MT

Total throughput (at 100% B.O.) = (12.74 + 6.24) MT

= 18.98 MT

But actual throughput for 2007 was 10.0 MT

Hence actual berth occupancy for 2007 = 10.0/18.98

= 53%

Existing Oil Throughputs

Based on this calculation of berth occupancy, the annual throughput for an oil berth can be calculated as follows:

With 5000 DWT tankers:-

5,000 x 295 x 24/17 x 53% T = 1.10 MT per year

With 12000 DWT tankers:-

12,000 x 295 x 24/20 x 53% T = 2.25 MT per year

Table 8 shows how these results may be used to estimate the total throughput of the existing port.

TABLE 8 : Existing Annual Throughput for Oil Berths

Berth No.	Max. Tanker Capacity	Existing Annual Throughput
4	12000 T	2.25 MT
5	12000 T	2.25 MT
8	5000 T	1.10 MT
9	5000 T	1.10 MT
10	12000 T	2.25 MT
11	5000 T	1.10 MT
All Berths		10.05 MT

3.3 Existing Port Capacity – Dry Cargo

Berths

There are 3 dedicated dry cargo berths: 1, 2 and 3; and berth 6, which is dedicated to the grain and sundry other vessels not requiring the use of quayside cranes. The main cargo handled at the three dry cargo berths is steel and metal cargoes representing 93% of dry cargo throughput in 2007 (excluding grain and rail ferry). The current handling rate for steel and scrap cargo based on 2007 performance was 2,500 tonnes per ship day at berth net (i.e. excluding non-working time) and 1,570 tonnes per day

gross (i.e. including non-working time). The corresponding rates for steel alone were 3,870 and 2,250 tonnes per day.

If all 3 berths were handling only steel with 70% berth occupancy, this would equate to around 2.45 million tonnes per annum, or 1.7 million tonnes over two berths.

However, it is recognized that the rate is lower for non-steel cargoes and especially scrap metal. On current figures, a dedicated scrap berth would only be able to handle around 100,000 tonnes per annum, and it is doubtful that this would be commercially viable. However, with a mix of general (non-metal) cargoes it might be possible to achieve a single berth throughput of around 200,000 tonnes per annum. Combining these two figures gives a capacity for berths 1-3 of 1.9 million tonnes per annum, which compares with the estimate of 1.6 million tonnes per annum by the Port Operations Department.

It is recognised that these potential throughput levels are significantly higher than the 1.2 million tonnes per annum shown in the October 2000 Calculation of Theoretical Port Capacity produced by Posford Duvivier – Haskoning. However, it should be noted that their assessment was 'theoretical' and did not reflect the actual mix of cargo being handled at Aktau. Thus, it included significant quantities of general cargo, which has much slower handling rates.

The grain cargo capacity on berth 6, assuming it was dedicated, would be around 385,000 tonnes per annum based on current performance and 70% berth occupancy: this would reduce to 290,000 tonnes if the present practice of 3 months closure during the summer continues. The berth is also used for sundry other shipments, which can be slotted into the intervals between grain shipments.

A capacity assessment for the rail ferry services has not been undertaken as it is considered there are no capacity issues on the ferry in the foreseeable future. Indeed, the concern is whether this service will continue given the declining tonnages. In the calculations regarding rail capacity a maximum of 200,000 tonnes per annum in each direction has been assumed.

To summarise: it is considered that the current dry cargo capacity of Aktau port, excluding grain and rail ferry traffic, is 1.9 million tonnes/year maximum, and that above this level operational constraints should be anticipated; however, the practical capacity should be taken as 1.6 million tonnes/year. In addition, the port can handle 400,000 tonnes/year of grain (over 12 months) and 400,000 tonnes/year of rail ferry traffic.

Storage

The port has 72,000 sq metres of open storage area used predominantly for stock storage of steel cargoes. Storage density is currently around 3 tonnes per sq metre. In addition there is 6,000 sq metres of covered storage. Current stock levels of around 200-220,000 tonnes are being retained by the port's steel customers.

It is estimated that the port could probably stack up to 4 tonnes per sq metre or 280,000 tonnes, provided there was no significant increase in other cargoes, such as containers and construction cargo that require significant areas of storage.

4 Capacity of Rail, Pipeline and Tank Farm Systems

4.1 Introduction

This chapter examines the rail infrastructure that serves the port of Aktau, and its associated freight terminals. It reviews the current position with each of the railway operators, assesses the likely changes to rail infrastructure over the next 5 years, and reviews the traffic volumes currently handled by rail and the scope for rail to accommodate possible traffic increases.

Aktau Port is served by road, rail and pipeline, but in practice until now the road connections are of limited value. A new European standard road is being constructed between Atyrau and Aktau, and this will make road movement of freight easier, especially to the major oil developments at Kashagan and Tengiz. However, until now almost all freight through the port is rail based, and this position is likely to continue for major freight traffic flows.

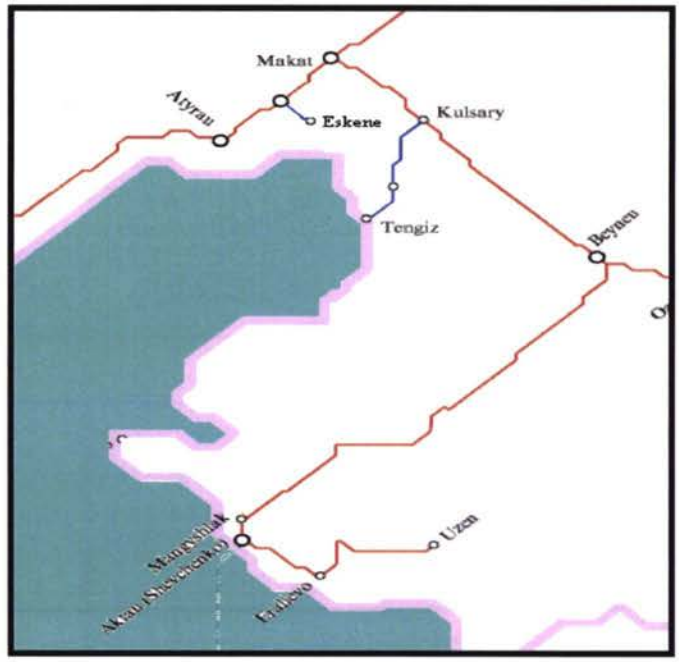
Oil traffic predominates at Aktau Port because of the large oil fields in western Kazakhstan, the lack of pipeline capacity to transport all oil production, and the ability of the port to provide tanker access to the key destinations of Baku in Azerbaijan (for the BTC pipeline to Ceyhan) and Neka in Iran (for the swap market to Bandar Abbas). At present oil represents 70% by volume of all cargo shipped via Aktau Port.

4.2 Rail infrastructure

Rail Access – KTZ

The state rail network of Kazakhstan operated by Kazakhstan Temir Zholy (KTZ) serves the Port of Aktau, though is not linked directly to it. The line to Aktau runs from a junction with the main east–west corridor linking Almaty and Astana with the Russian border at Aksarayaska at Makat station and is single track for the entire distance. A map of the rail connections is shown in Figure 4.

FIGURE 4: KTZ Routes in the Mangystau Region



Until Beyneu the line is relatively flat, and the maximum permitted load for a freight train is 6,000 tonnes. Between Makat and the Mangistau region station at Mangyshlak the line climbs over high ground, and the severity of the gradient restricts the maximum permitted loads. Until recently the maximum permitted load on the Beyneu – Mangyshlak section was 3,200 tonnes. KTZ is now re-engining its main line locomotive fleet with General Electric power units, which increase the hauling power of the 2TE10 double locomotives used on freight traffic, and this has increased the permitted load by 20% to 3,800 tonnes. The gradients in the return (northbound) direction are even greater, but as the northbound traffic predominantly consists of empty wagons the impact of this has been ignored in this report.

Standard crude oil block trains (trains comprising wagons of one type and commodity for one customer) from TCO and Kashagan to Beyneu consist of 60 loaded RTCs, each RTC containing up to 65 tonnes of crude oil. Because of the load constraints, at Beyneu these trains have to be split into sections, as the maximum forward load to Mangyshlak/Mangistau is 42 wagons.

At Mangyshlak railway station, KTZ operates a large 12-road gravity yard which sorts freight traffic bound for Aktau Port and other destinations. Substantial expansion works have been undertaken at this yard over the last 3 years. From Mangyshlak wagons are worked forward to Aktau Port station (approximately 3.5 km distant) where traffic is handed over to Kaz Trans Service (KTS), the local port and industrial area railway operator.

Trains between Mangyshlak and Aktau Port run with a maximum of 35 wagons, and therefore remarshalling of all incoming trains is required at Mangyshlak station.

Rail Access - KTS

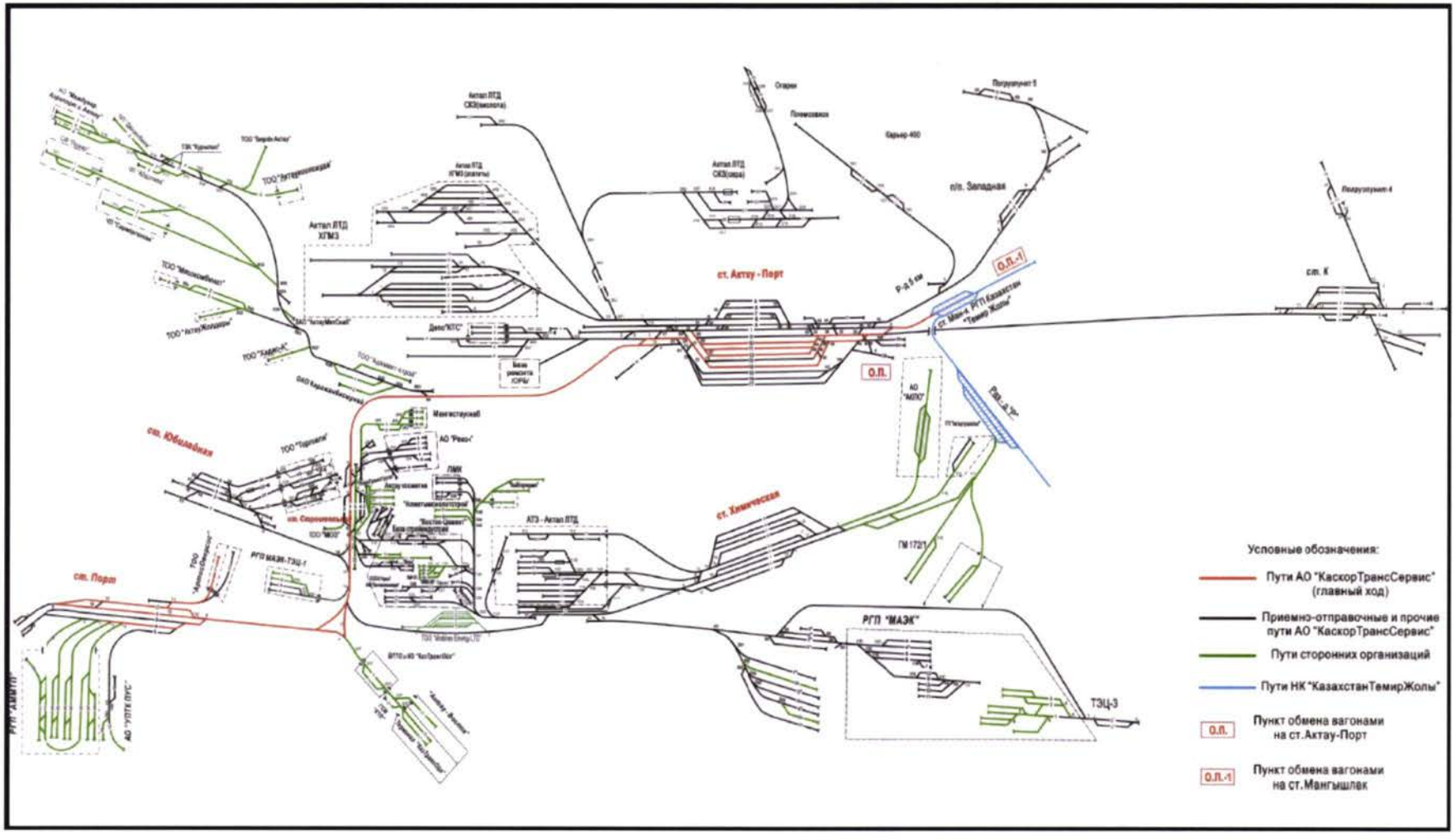
KTS is an independent railway JSC, privatised as part of the government process. Exact details of share ownership are not known, but a number of the key port operators (including KTO, Terminalex and Artis Overseas), are shareholders.

The KTS track layout is shown on the following page. KTS owns and operates a 160 track mile rail network. From Aktau Port station onwards, KTS takes wagons direct to the receiving oil terminal/tank farms, port and other different destinations. The maximum train size is 35 wagons; though many terminals are configured only to be able to receive smaller trains. There is therefore a need to remarshal trains once again at Aktau Port station. At Aktau port KTS has a marshalling yard and storage sidings (and is planning to expand these sidings to provide even more holding capacity).

The distance between Aktau Port Station and the port is 15 km.

A track diagram of the KTS system is reproduced in Figure 5.

FIGURE 5: KTS Network



KTS has wagon turnaround agreements with the terminals that it serves, and generally there are penalty charges for late handback of wagons berthed for unloading. However there appear to be no penalties paid by KTS for wagons delayed en route and 'on face value' the arrangement appears to be somewhat one sided.

Aktau Port station is congested with wagons awaiting discharge. At the time of the visit in October 2007 Aktau Port had approximately 1,300 wagons on hand awaiting discharge (1,000 oil RTCs and 300 other cargo wagons – mainly steel products). Even at maximum discharge rates, this equates to approximately 4 days worth of traffic awaiting unloading. The reasons for the backlog of wagons are complex and different parties have offered different explanations. KTZ and customers appear to generally believe that it is due to the inefficiency of KTS, while KTS believes that it is due to customers being highly selective as to the wagons they call forward (especially for oil traffic where terminals blend different oil from different customers to achieve a uniform quality grade). Whatever the reason, there is a considerable backlog of wagons awaiting discharge and this inevitably has an impact on the commercial attractiveness of transport via the Port of Aktau.

KTS charges tariffs independently of KTZ, and is a commercially independent organisation. In Europe, it would be normal for KTS to act as a subcontractor to KTZ and for KTZ to charge inclusive tariffs direct to destination terminal with the rate incorporating the subcontract charge. This does not happen in Kazakhstan, with the result that forwarders have to have two separate contracts, one for KTZ and one for KTS. This makes the rail offer more complicated and generally explains why most traffic to Aktau port is controlled by freight forwarders, rather than by freight customers themselves.

The tariff charged by KTS is currently 36,000 tenge per wagon, which appears high for the short route section of 15 km. It is generally felt by customers at Aktau that this acts as a major commercial disincentive, and that KTS is a generally uncommercial organisation that has a monopoly due to its control of all rail traffic currently accessing the port.

However, it is considered that KTS's costs per route km will inevitably be considerably higher than those required for normal main line operations, due to the amount of shunting and marshalling that is required to service the multiplicity of sites, while the track diagram demonstrates that the amount of infrastructure per route km is also extremely high.

KTS capacity

KTS has reported that it has a system capacity capability of between 8 and 9 million tonnes of traffic per annum. At an average load of 55 tonnes per wagon this would equate to 450 wagons per day handed over between KTZ and KTS.

Currently KTS has agreements in place that commit it to be able to handle a maximum of 420 wagons per day. It is therefore fair to assume that KTS believes that it is operating near to its fullest capacity.

At the moment KTS suffers from congestion on the system at a number of key points. The sidings accommodation at Aktau Port station is full, with many wagons on hand awaiting orders or terminal call off. At the last time of visit (and consistent with previous visits) Aktau port had 1,200 wagons on hand. Even at maximum discharge rates this equates to at least 3 days' traffic for all the terminals and port combined.

The second key area is the port reception sidings, a fan of 4 sidings that handle traffic onto and off the port, traffic for Artis Overseas, and some if not all of the oil traffic for the KTO terminal. These sidings are said to be a key constraint to increasing capacity, and indeed Artis reported that it experiences delays between the removal of empty wagons and berthing of the next set of loaded ones.

It is understood that KTS believes that to increase capacity across the system will require a significant capital expenditure, possibly as much as $300 million. While undoubtedly major expenditure would result in much greater capacity, the project team believes that there are a number of key initiatives that could be employed to increase the capacity of the system.

The system is characterized by a large number of siding connections that are now redundant, the industries served by them having closed, and infrastructure that in many cases is inappropriate for the current traffic. Therefore long-term remodeling is inevitably required, though as in all rail systems this will be a gradual and continuous process. However reconfiguration of the network to handle the traffic has already taken place, and KTS operates with Service Level Agreements (SLAs) to most of its key customers, which indicates that it has already adopted a planned and disciplined approach to the traffic needs of the terminals it serves.

The key issue at the moment appears to be the extent to which trains are broken at both Mangyshlak (KTZ) and Aktau Port (KTS) stations, which involves a large amount of shunting time, only for the RTCs to then be called forward by the terminals in quality order. A key objective of both TCO and Agip is to move as far as possible to block train movement where intermediate marshalling requirements are minimized. This in turn will increase both the throughput and speed of traffic at key locations, and it is recommended that KTS and AISCP consider the extent to which this strategy can be used to meet the anticipated throughput increase due in 2008.

Each of the 3 oil terminals has servicing agreements in place with KTS, which provide for 3 shunts per day. In total this provides for the terminals to receive and unload approximately 500 wagons per day, producing an annual offloading

capacity (assuming a load per crude oil RTC of 65 tonnes per wagon) of 11.7 mtpa. Strategies to maximize this capacity would therefore provide an increase of 3 mtpa in system capacity, while the use of block trains would make this perfectly possible.

The maximum train length within the KTZ and KTS systems is 42 wagons, which equates to the maximum train length which KTO can handle, and if Artis is going to invest in capacity for their terminal then it should be encouraged to standardize at this length also to maximize capacity. Terminalex is located on a different part of the KTS system with a separate rail interface with KTZ, and is capable of handling trains of 60 RTC length. Even with reassembling of trains from Beyneu at Mangyshlak, it should be possible to move trains of that length from there to the Terminalex reception sidings in a continuous movement (possibly with through working of KTZ or KTS locomotives).

Investment in reconfiguring sidings areas at the port entrance and adjacent to each of the 3 terminals would therefore result in increases in system capacity. Some of these sidings are controlled by power signalling, which necessitates more complex upgrades, and it may be prudent to consider when the current KTS signalling control system needs replacement, and to time capacity upgrades to coincide with this. However, even if this is not possible, reconfiguring of the track layout at key areas to reflect current and future operations rather than the traditional system uses should be an urgent priority.

At this stage detailed discussions with KTS on capacity enhancements have not been held, but we assess that the works required are relatively low scale siding and track alterations. It is debatable where funding for such upgrades should be sourced from. KTS is an independent profitable company, with a shareholding including some of the key port users. Additional traffic will provide higher revenues and to some extent this will fund the capital cost of any capacity increases (providing the longevity of traffic moved can be guaranteed or assured).

However, given that the port is largely dependent on the capacity of the rail network to support the projected traffic volumes, it would be prudent to include an element of capital cost for siding alterations in the project within the port upgrade capital budget.

Service Level Agreement with KTS underwriting the benefits gained from expenditure must of course accompany any contribution. At this stage we would suggest that a budget figure of $2 million should be allocated for siding and terminal servicing capacity upgrades, to be paid as a contribution to KTS for defined capacity works.

Main line KTS system capacity is dependent on both the amount of signalled track capacity available and the locomotive and driver fleet available. KTS

currently operates 6 locomotives of varying type (TEM2 and M62), all of which are capable of moving the maximum trainloads on the system (42 wagons) and capable of shunting into terminals. Normally KTS operates 5 locomotive duties from its total fleet. Increases in the locomotive fleet would be easy to arrange on a temporary or permanent basis, either by short-term hire from KTZ or locomotive JSCs, or by procuring additional serviceable locomotives (a TEM2 shunting locomotive can be procured in fully refurbished condition for approximately $500,000). Given that locomotive costs are directly linked to traffic levels, any additional procurement is therefore a matter for KTS alone and easily solved.

A move to concentrate on trainload movements wherever possible will maximize system capacity. Given the relatively small size of the system and the short journeys, a disproportionate portion of the total train time is inevitably occupied by shunting activities, but it is fair to assume that the maximum out and back time from Aktau Port station to any terminal should be 2 hours. On this basis, and assuming that 3 of the duties are available for running 'main line' services (the other 2 being occupied with shunting duties at the port, Aktau Port and tripping to KTZ), it ought to be possible to run 8 'trains' per day with one locomotive. This produces a servicing capacity of 24 'trains' per day or a maximum servicing capability of 1,000 wagons per day, far in excess of the maximum target throughput.

The remaining capacity issue is the volume capability of the single line from Aktau Port station to the port reception sidings. Colour light signalling controls this line and by observation has sufficient capacity for the traffic movements. Even on the basis that it was restricted to occupation by one train at any time, and given a maximum occupation time of 30 minutes, this would produce a maximum train capacity of 48 trains per day, again far in excess of what is required.

4.3 New Port Access

Both KTZ and the Port of Aktau have stated that a scheme is being developed to create a new independent main line rail access (approximately 14 km length) to the Port of Aktau. The scheme involves the construction of a new route to the port, linking to the KTS network close to the KTO terminal. KTZ stated in a meeting that the budget cost for the scheme is $ 4-5 million ($300k x 14 km). However, it is not clear who will fund the construction costs, though there are suggestions from the port that the funder may be KMG, or possibly KTZ.

The advantage of this scheme is that it will create a new KTZ-controlled access to the port that will act as a competitor to KTS, and will provide a considerably reduced tariff that could reduce overall transit charges to the port. KTZ estimated that the tariff charge would be 20% of that charged by KTS, and will produce

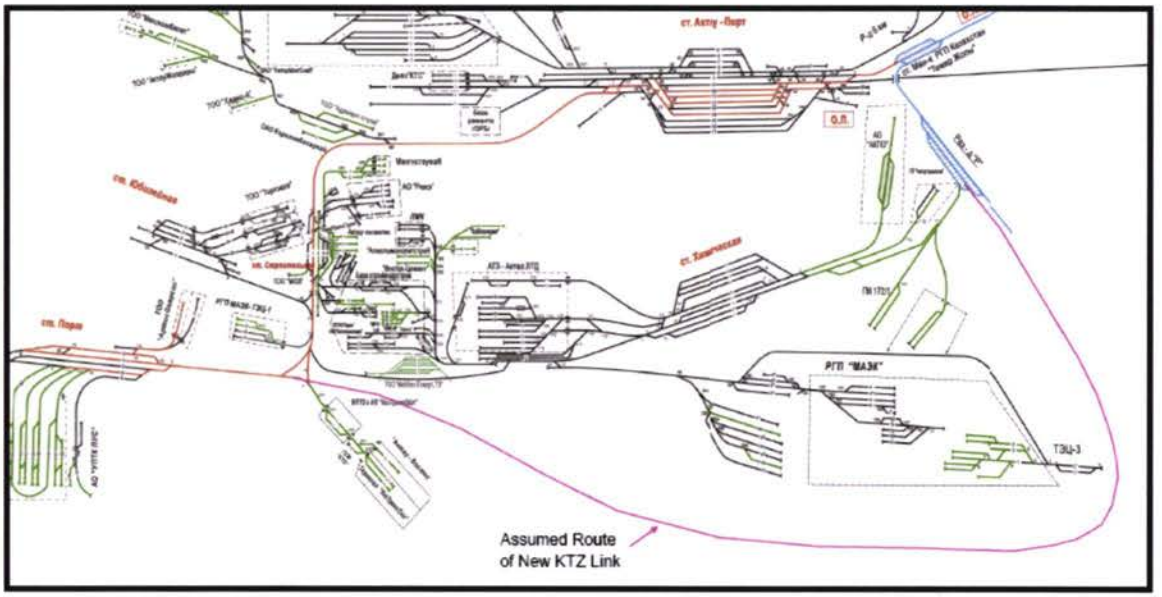
savings of 29,000 tenge ($240) per wagon. This would equate to a saving of $4 per tonne. The other advantage of the scheme is that KTZ will be able to offer a tariff direct to the port or terminal, thus simplifying commercial arrangements.

The route of the new link is on land within the Special Economic Zone of the port, but land ownership is not clear. The final 2km of the route to the port are on KTS owned track, and either this part of the route will be transferred to KTZ, or some form of track sharing will be required. It is not clear at this stage which operator will own this joint section, or indeed who will operate services over it.

Crucially, the only terminal served appears to be KTO, which would be logical if the funder is indeed KMG. It is unclear whether KTO's competitor, Artis Overseas, would be able use the link, and if it would be able to obtain the lower rates, as its terminals would not be directly serviced by the KTZ operated link. However, they are not far from the link and the same track sharing options may apply. It is recommended that AISCP should develop a commercial relationship with the scheme promoter, as it will have a substantial commercial and logistical impact on the port traffic prospects.

The probable route of the new link is shown in sketch form marked in pink on Figure 6.

FIGURE 6: Potential New KTZ Port Access Route



4.4 Main Line Capacity

KTZ, in common with other CIS systems, calculates track capacity in terms of the number of train pairs (one train in each direction) permitted per route section. Capacity is then stated as the number of pairs used. In terms of route capacity, the constraining factor between Makat and Mangyshlak is the final steeply graded section between Sai Utes and Mangyshlak. Data provided by KTZ states that the maximum permitted number of pairs per day on this section is 16, with 3 of these paths being dedicated to the daily passenger services (two for Mangistau and one for Uzen). This leaves 13 train pairs available for freight traffic.

Trains on this section running at maximum permitted load comprises 42 wagons. If an average payload per wagon of 60 tonnes is assumed this produces a payload per loaded train (Sai Utes to Mangyshlak) of 2,500 tonnes. Given that standard KTZ practice is to run the maximum number of wagons on every train run, this is a valid calculation assumption for the Beyneu to Mangyshlak route (oil trains will run with a maximum of 66 tonnes per wagon while general cargo trains will run with an average payload of between 40 and 60 tonnes per wagon).

At an average of 360 days of operation per annum and with trains carrying a load in the Aktau direction only, this means that every train pair conveys 900,000 tonnes per annum. Given KTZ's stated capacity of 13 pairs per day, this means that the total capacity per annum on the route to Mangyshlak is currently 11.7 m tonnes per annum.

However, TCO has invested a capital sum to upgrade the railway line to provide additional capacity, both for oversized loads of plant and machinery and in providing an additional two passing loops to create additional route capacity. In interviews KTZ at Mangyshlak stated that total route capacity is now 17 pairs, producing a maximum freight capacity of 14 pairs or 12.6 m tonnes per annum (mtpa).

Route capacity on the rest of the route is 26.7 m tonnes per annum achieved through the regular capacity of 19 full sized pairs (60 wagon trains) per day carrying a load only in the Aktau direction. The only realistic way in which capacity on the Sai Utes – Mangyshlak section could be substantially increased and could match this capacity would be to double track the 225 km section throughout (a rough budget estimate for this would be $68 million, based on a notional total construction cost of $300 per metre of doubled track).

4.5 Terminals

Visits have been made to each of the principal terminals on the KTS system, to understand the traffic that they currently handle and future prospects. This section sets out the findings and draws conclusions as to the total volume being handled now and the potential volume that could be handled in the future.

Oil Terminals

There are 3 terminals in the port area, all served by both rail and pipeline from the Busachi field, linked to Aktau by a 20" pipeline with 160,000 bpd (4 – 4.2 mtpa) capacity.

Artis Overseas

Artis Overseas operates the oldest of the tank farms with relatively poor facilities. Artis is a British Virgin Islands registered company, believed ultimately to be of Turkish ownership. However, according to the trade press Artis purchased Mobilex in September 2007 and therefore took control of the Mobilex (Terminalex) terminal as well.

Artis currently handles 1.8 mtpa of oil from a variety of markets, principally Vitoil, all bound for the Iranian swap market. The maximum volume the site could handle is 2.1 m tpa and therefore the site is operating near to its maximum capacity. The site can unload 38 RTCs at one time on a single siding, and generally handles 4 trains per day. The site has 55,000 m^3 storage capacity.

However it is understood that Artis has held discussions with TCO in 2007 and would be prepared to carry out substantial investment to increase its rail discharge capability by adding a second track and increasing unloading capability to 4.8 mm tpa by 2008.

Terminalex (Mobilex)

Terminalex (the new name for Mobilex) opened the terminal in 2005. It is now understood that Artis Overseas has purchased the site (see above).

Terminalex has the most modern and best equipped of all the terminals. Unloading facilities consist of 4 x 30 RTC parallel unloading racks, and 120 RTCs can be unloaded at the same time. KTS provides a maximum of 3 shunts a day. Terminalex has a storage capacity of 60,000 m^3. Maximum capacity of the site is 3.6 mtpa, though at the moment tonnage handled is approximately 1.5 mtpa. It appears that Terminalex is having difficulty gaining sufficient berth access and that its operations are being severely restricted, as in normal conditions it would be expected to be handling more traffic than it currently does.

Terminalex has held discussions with TCO, and expects to handle 3 mtpa from early 2008, though contracts have not yet been signed.

Overall Terminalex has plans to increase site capacity by adding 2 x 45 unloading lines and upgrading tank farm capacity to 160,000 m^3. The ambition is to increase total handling capability to 12 – 17 mtpa. However this appears to be totally dependent on an expansion of the port to provide additional 12,000 dwt loading berths, as this is the current constraining factor.

KTO

Kaz Trans Oil (KTO) is a state owned company responsible for oil terminals across Kazakhstan. The Aktau site has unloading facilities for 2 x 42 RTCs and 140,000 m^3 storage capacity. Currently the site handles 700,000 – 850,000 tonnes per month (8.5 – 10 mtpa), including 4 mtpa of oil from the Busachi field. KTO estimates that the maximum capacity of the site is 15 mtpa, and that storage capacity can be increased to 100,000 m^3 by doubling the size of the 20 5,000 m^3 tanks. At the moment KTO appears to have no plan to increase the capacity of the site, and indeed is concerned that in the medium term it may have to adapt the terminal to handle other traffic (such as LPG) if the KCTS pipeline abstracts a substantial amount of traffic. The terminal has already lost traffic following the diversion of Kumkol traffic that it used to handle to China (via Atasu).

4.6 Aktau Port

Aktau Port is served by rail directly serviced by KTS shunting locomotives. The port does not have its own shunting locomotives or staff. Principal traffics handled by rail are:

- Train ferry traffic – the train ferry runs to and from Baku and also handles ro-ro lorry traffic. The ferry has limited capacity - a maximum of 28 freight wagons - and sails infrequently (at the moment it appears to operate approximately 4 times per month). The train ferry berth is normally used for oil tanker loading for both Artis and KTO.
- Steel traffic – the port is currently handing approximately 1 mtpa of steel – a combination of hot rolled and cold reduced coil and flat sheet. Maximum lifts are 25 tonnes. As is usual in Kazakhstan, general wagon types (principally flats and gondolas) are used to carry the traffic. Though these are not customised for the traffic and make terminal handling difficult, they are in generally good supply. It is apparent that the steel is stored for extended lengths of time on the port.

4.7 Future development

There are a number of planned developments that will affect the future volume of oil traffic handled via Aktau port. These developments have been detailed in the time sequence in which they are likely to occur.

TCO Oil

TCO currently produces 13 mtpa (300,000 bopd) of crude oil from its onshore field at Tengiz, all of which moves via the CPC pipeline to Novorosiyssk for export shipment. TCO is about to double the oil it produces to 26 mpta (600,000 bopd) as part of its phase 2 development, which will come on stream in 2008. As there is no spare pipeline capacity available to carry this traffic, most will be moved by rail to a number of destinations. It is understood that TCO's plan is that they will move most of this volume (8 mtpa) to Odessa on the Black Sea and transfer it to ship there, but that they will move 5 mtpa via Aktau – the likely maximum that Aktau can handle from both a rail and port capacity point of view.

All three oil terminal operators that we contacted during the site visit confirmed that they are in discussion with TCO about handling oil traffic and all confirmed that TCO have nominated a total tonnage of 5 m tpa through Aktau. However it is understood that the tonnage on offer is only quoted until 2012. This is almost certainly because of the likely construction of the KCTS pipeline (see below). TCO will know that terminal operators will be looking to invest to create extra capacity to handle their traffic (at present there is only just enough spare capacity to handle the volume and then possibly at the expense of other traffic). Therefore they can be expected to offer as long a period of contractual security as they can.

Four years is considered too short to realistically underwrite investment, and therefore it is concluded that TCO have very little intention at the moment of using terminals in Aktau if an alternative pipeline route via Kuryk is likely to become available. This would explain why the company is only prepared to offer traffic guarantees up until 2012 at the moment.

The conclusion therefore is that the 5 mtpa of TCO traffic is a short-term opportunity only, and that after 2012 there is no certainty that the traffic will be continue.

KCTS

KCTS (Kazakhstan Caspian Transport System) is a joint project between KMG, TCO and Agip KCO to build a pipeline from Eskene and Tengiz to a new site at Kuryk, south east of Aktau. The parties signed an MOU in January 2007 for the $3 bn project, which is scheduled for completion in 2011 –12. Nominal capacity is 25 mtpa. The pipeline would feed an oil-loading terminal at Kuryk based on single point moorings (SPM) and possibly involving larger tankers than can

currently operate via Aktau or Baku ports. It is reasonable to assume (in view of the inherent economics of pipeline transport and the need for the partners to recoup their investment) that once this pipeline is open, all oil from Tengiz and Kashagan routed into the BTC pipeline at Baku will be routed via this pipeline and rail traffic will cease.

Though there is a possibility that a branch of this pipeline would be constructed to Aktau, both for regular shipment and to provide standby capacity in the event of serious plant failure or bad weather closing the Kuryk terminal, it is understood that no firm decision has yet been taken by the consortium.

At the moment there appears to be considerable doubt as to when KCTS would actually be completed. At worst, political and environmental issues could delay the project until at least 2020. However, it is concluded that there is sufficient likelihood that the pipeline will be constructed to make it impossible to place any reliance on substantial rail movement of oil beyond 2012 from either Kashagan or Tengiz.

Kashagan

The Kashagan oil field currently being developed by Agip KCO on behalf of a consortium of partners is due now to produce its first oil at the end of 2010. The project has already suffered a number of production delays and the first oil date has already slipped from initial estimates by 2 years. Kashagan is the largest oil field outside the Middle East, with proven recoverable reserves of 10 bn barrels. As with Tengiz, the key issue for Kashagan is that there is insufficient pipeline capacity available to move the production volume, and rail will be required to move initial production. Agip KCO expects to produce about 350,000 barrels per day, and until pipeline capacity is available up to 300,000 barrels per day (14 mtpa) will move by rail. As with TCO therefore, there should be an expectation that some of this volume would move via Aktau.

Agip KCO is known to have conducted exploratory meetings with terminal operators at Aktau. However, use of the rail line to Aktau and terminals will only be possible if there is sufficient spare capacity in both, and at the moment it appears that capacity will be taken up by TCO traffic. Furthermore, as Agip KCO is a partner in the KCTS project, it can be assumed that if this pipeline opens then all Kashagan output for Baku will switch immediately to the pipeline and will cease to move by rail.

There is further uncertainty about the first oil date that Agip KCO is likely to achieve. There has already been a succession of delays to the project and at the moment there is no certainty that the declared first oil date will be achieved. At the time of writing this report the ROK Government has suspended exploration operations for 3 months to conduct a full cost review of the project and is claiming several billion dollars damages for environmental impact. Whatever the outcome of this, further project delays seem very likely.

There is therefore a very small time window in which oil may be transported by rail via Aktau Port before KCTS opens, and in any event this time window will be smaller than that for the TCO traffic. It is therefore impossible to base any recommendations on upgrading port facilities or rail and terminal capacity on Kashagan traffic.

4.8 Conclusions

Rail Access

KTZ rail access to the Aktau Port is constrained in terms of capacity by the last section of route between Sai Utes and Mangyshlak. At the moment rail does not seem able to deliver more than 12.6 million tonnes of traffic per annum. Of this approximately 2.5 m tonnes are non-oil cargo. This means that the maximum oil capacity on this stretch of line is approximately 10.1 million tonnes. The existing pipeline brings in another 4 million tonnes of traffic per annum, and it therefore appears that the total transport capacity (ignoring road) to Aktau produces a total throughput capacity of around 14.1 million tonnes of oil traffic per annum. These figures indicate that KTZ capacity is a concern when overall traffic to the port exceeds 15 million in total.

It is considered that to increase capacity beyond this level KTZ would need to either double the track section or to investigate provision of additional locomotive power for trains using this section of route. Track capacity cannot be increased quickly, even if funding were available, and a lead-time of at least 24 months from the date of authority should be assumed to be the minimum achievable.

Given that track capacity plays a major part in the port's economic and logistical capabilities, it would be sensible for the port management team to actively pursue the issue of capacity with KTZ in Astana and Mangyshlak to ensure that its development plans are well understood and that KTZ's regional investment policy correctly reflects the port's needs.

KTS Capacity

KTS currently controls rail access to the port and its key customers. KTS is often quoted as the major constraint to volume increases, but this disguises some of the more systemic logistical problems in providing rail access to terminals that in some cases lack the total capacity to efficiently handle maximum volumes.

Current system capacity is assessed by KTS themselves at 8-9 million tonnes/year. However the system is configured to serve former industry rather than being totally appropriate for the needs of the current terminals and the port.

Some reconfiguration of the network would therefore be appropriate to assist in increasing volumes.

It is suggested that some money be budgeted within the port development plan to contribute to the resolution of immediate bottlenecks to capacity. An initial figure of $2 million is suggested.

The key action which would improve system throughput would be to encourage terminals and KTS to co-operate in basing as much traffic movement as possible on trainload (block) working rather than staging trains at Aktau port station. This would cut down the amount of shunting and remarshallings required, and simplify wagon handover between KTZ and KTS.

Given current resources and track capacity on the KTS network it appears that there is capacity within the system to increase traffic by up to 50% given reasonable modifications to the track layout, methods of working and concentration on trainload traffic movements. This will require co-operation between KTS, terminals and the port, but should be achievable to match projected traffic build up. KTS has already indicated that it is able to handle the projected additional TCO traffic forecast for 2008.

New KTZ Rail Access to the Port

KTZ has prepared plans to construct an independent rail access on its own network infrastructure to serve both the port and some or all of the oil terminals. Details are still provisional, but this access would further boost the rail capacity of the port and surrounding industry, while KTZ can offer lower tariffs and a competitive force to ensure that rail servicing of terminals is the most efficient and economic possible. It is recommended that AISCP should participate as fully as possible in the development of this project in order to ensure that the maximum benefits for the port estate are secured, even if this means consideration of capital participation.

5 Comparison of Capacity and Demand

In this section the capacity of the existing port is compared with the forecasts contained in the Feasibility Report.

5.1 Oil Cargo

Table 9 summarises the maximum oil traffic forecast in the Feasibility Report under Scenario A, year by year until 2020. By comparing this with the throughputs in Table 8 in Chapter 3, it can be seen that there is a potential shortfall in berth capacity in 2008 of 1.0 MT/YR rising to a maximum of 13.0 MT/YR in 2012 and levelling off to 6.0 MT/YR thereafter.

TABLE 9: Maximum Oil Traffic Forecast for Aktau Port (based on Scenario A) (mtpa)

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Oil Traffic MT/YR	11.0	15.0	14.0	20.0	23.0	21.0	14.0	15.0	16.0	16.0	16.0	16.0	17.0

Existing Oil Handling Issues

A recent development at the Port has been the introduction of 12000 DWT oil tankers – and it is envisaged that substantial numbers of these 12000 DWT tankers will be brought into operation over the next few years. These tankers are capable of being loaded at a flow rate of up to 2000 TPH.

The 12000 DWT tankers can be berthed at berths 4, 5 and 10 without berth modification – and at berth 9 provided that additional dredging is carried out.

In order to take advantage of the 12000 DWT tankers, the loading rate of berths 4, 5, 9 and 10 must be increased from the existing flow rate of 1000/1200 TPH up to an upgraded flow rate of 2000 TPH.

The Deputy Director of the Port advised that pumping trials are currently being carried out by the Port and Kaztransoil Terminal to determine how the existing pumps and pipelines can best be used to achieve this aim.

The Chief Engineer of Kaztransoil Terminal advised that he considered that it would be possible to provide 2000 TPH at either berths 4, 5, 9 or 10 by using 2 No. lines and 2 No. marine arms at each berth.

He advised that this would be possible without additional pumps or marine arms – apart from replacing the missing marine arm at berth 9.

The Chief Engineer of Terminalex Terminal also advised that it would be possible to provide 2000 TPH at berth 11 using 2 No. lines and 2 No. marine arms at berth 11, without additional pumps or marine arms being required.

The Chief Engineer of Artis Terminal advised that, in order to increase flowrate at berths 4 and 5, it would be necessary for them to install 5 No. new pumps and 2 No. new lines.

Given the complexity of the pumping systems from the terminals to the oil berths, it is important that carefully supervised pumping trails are carried out as quickly as possible before making a final decision on the need for additional pumps and loading lines.

It is also suggested that the allocation of berths to terminals should be reconsidered in order to maximize throughput.

From comments of two of the three Terminal Engineers, the loading flow rate can be increased to 2000 TPH using 2 No. marine arms per berth. If the trials prove uccessful then the existing marine arms will be sufficient for the upgrade.

However, it is important that the operating envelopes of the existing marine arms are carefully checked for the new tanker manifolds.

All the existing marine arms at the oil berths are 250 dia. manually operated arms of Russian manufacture. In view of their comparative low capital cost and for the standardization of spare parts, it is recommended that any additional marine arms should be similar to those existing.

Capacities of Upgraded Oil Berths in Existing Port

For the 12000 DWT tankers it is proposed to use an assumed loading rate of 2000 TPH. However, for safety reasons, a slow flow start-up rate of 500 TPH is required for 30 mins and a slow flow close down rate of 500 TPH is also required for 30 mins. The proposed revised throughput values using 12000 and 5000 DWT tankers are calculated as follows:

The pumping time for 12000 DWT tankers at the

upgraded oil berths = 0.5 + 0.5 + 11,500/2,000 Hrs

= 6.75 Hrs

Say – pumping time = 7 Hrs

paperwork time = 8 hours

Hence total loading time = 15 hours.

Assuming berth occupancy remains at 53% the annual throughput for an oil berth using 12000 T tankers at the upgraded flow rate is:

12,000 x 295 x 24/15 x 53% T = 3.00 MT

The annual throughput for an oil berth using 5000 T tankers is assumed to remain at 1.10 MT.

It is assumed that additional dredging can be carried out at berth 9 in order to allow 12000 DWT tankers to use this berth. This would then allow 12000 T tankers to use berths 4, 5, 9 and 10. It is assumed that 5000 T tankers will continue to use berth 8 and will start using berth 11.

Table 10 shows the possible throughput that could be achieved at the existing berths following the improvements described above. It is estimated that the upgrading of the oil berths could be completed by the end of 2008.

It should be noted that these improvements would be further increased if the paperwork time is reduced from 8 hours to the typical 2-4 hours found in most oil ports world wide. The greatest benefit would be achieved if improvement efforts concentrated on the 12000 DWT ships. If the paperwork is reduced to 4 hours the throughput for 12000 DWT berths would increase to 4.0 MT/yr.

TABLE 10: Possible Throughput of Upgraded Oil Berths

Berth No.	Max. Tanker Capacity	Upgraded Annual Throughput	Upgraded Annual Throughput PLUS paperwork for 12000 DWT ships reduced to 4 hrs
4	12000 T	3.0 MT	4.0 MT
5	12000 T	3.0 MT	4.0 MT
8	5000 T	1.1 MT	1.1 MT
9	12000 T	3.0 MT	4.0 MT
10	12000 T	3.0 MT	4.0 MT
11	5000 T	1.1 MT	1.1 MT
All berths		14.2 MT	16.2 MT

Capacities of Oil Berths in North Port

Table 11 shows the possible throughputs in the North Port assuming the North Port is managed in the same way as the existing port. As shown, these figures could also be improved if the paper work time could be reduced.

TABLE 11: Possible Throughput from Oil Berths in North Port

Berth No.	Max. Tanker Capacity	New Berth Annual Throughput	New Berth Annual Throughput PLUS paperwork for 12000 DWT ships reduced to 4 hrs
14	12000 T	3.0 MT	4.0 MT
15	12000 T	3.0 MT	4.0 MT
16	12000 T	3.0 MT	4.0 MT
17	12000 T	3.0 MT	4.0 MT
Total		12.0 MT	16.0 MT

Comparison of Upgrading and New Oil Berth Outputs against Oil Traffic Forecast

Table 12 shows the comparison between possible berth throughputs and the Scenario A oil traffic forecasts. These require the upgrades to the existing port and the construction of the new berths in the North Port, together with the necessary improvements to the rail and pipeline system bringing oil into Aktau, to be completed in time to handle the forecast volumes. The berth capacities do not include increases resulting from improved documentation procedures, since these are largely outside the port's influence.

TABLE 12: Comparison between Berth Throughputs and Oil Traffic Forecast (mtpa)

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Existing	10.0												
Upgraded existing berths	-	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2
New berths in North Port	-	-	-	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
Total throughput capacity	10.0	14.2	14.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2
Traffic Forecast	11.0	15.0	14.0	20.0	23.0	21.0	14.0	15.0	16.0	16.0	16.0	16.0	17.0

5.2 Dry Cargo

Berths

The capacity of the 3 general cargo berths is provisionally estimated at around 1.6 million tonnes per annum. This would be sufficient to handle the forecast dry cargo up (steel, scrap, containers etc, but excluding grain) up to 2013.

The volumes forecast for 2015 and 2020 are 1.9 milion tonnes and 2.5 million tonnes. This suggests that the existing facilities should be sufficient to handle the projected traffic levels for approximately the next 6-8 years.

However, the key capacity issue is the growth of container or construction traffic because of its impact both on berths and especially on the storage space (see next section). The growth in the existing traffic should not cause a problem, but when the projects relating to the New Aktau City generate either containers or loose cargo then capacity problems would arise because of the reduced

availability of berths to handle the main cargo – steel – and the slower discharging rate.

Given the profile of the steel traffic, it is essential that the steel cargoes are stored in one common area. Thus, even if new general cargo berths are developed in the North Port the steel operations should remain in the existing port. Split stock would cause major problems and loss of operational performance. This suggests that the timing of North Port developments is likely to be determined by the growth in container or construction cargo.

One potential option could be to develop berth 12 as a specialised berth to handle general cargo and containers, thus leaving the other three berths to concentrate on steel and metals cargo. This would have to be undertaken in combination with infilling the adjacent land area to form a supporting storage facility. It is understood that currently this land (around 20,000 sq metres) is leased to TNT and therefore such an option would be dependent on their agreement or renegotiating the lease. The effect of such a development would not necessarily increase the overall tonnage that could be handled but would enable the port to handle a wider mix of traffic, and delay the need to build new berths.

However, if the cargo mix handled at Berths 1-3 remains unchanged, Berth 12 would provide additional capacity. Based on the following assumptions:

- Berth occupancy: 50% (lower than for the metal cargoes to reflect the smaller number of vessels and the disruption caused by railway operations along the curved track behind the berth);
- Total time for vessel to enter and exit the port: 3 hours;
- Delay due to customs procedures: 3 hours;
- Working hours/day: 20;
- Working days/year: 365;
- Average number of TEU exchanged per vessel: 200;
- Number of cranes: 1;
- Average lifts per hour per crane: 12 (allowing for re-stowing containers on board, delays waiting for trailers and inefficiency due to wave-induced vessel motion); and
- Split of 20':40' containers: 60:40

The estimated annual capacity of the berth handling only containers would be approximately 40,000 TEU. If the weight of cargo carried in each container is 10 tonnes (allowing for a proportion of empty units), this amounts to 400,000 tonnes per annum of cargo.

Storage Area

One of the key concerns has been the shortage of storage area for the projected growth of steel volumes. However, this does not pay due regard to the nature of the storage activity. Since it is stock storage, rather than transit storage, there is no evidence that the storage requirements would actually increase in line with higher loaded tonnages. In practice, the turnover cycle of the existing stock would merely increase proportionately, i.e. the average dwell time would decrease. Thus, it is not considered that additional storage areas are required for steel shipments.

The major storage concern is likely to be the potential growth in container traffic. It is clear that it already takes a disproportionate area in relation to throughput. This is a common problem with low throughputs, whereby only single stacking is used and levels of handling equipment are low. While increases in traffic will result in more economic use of space, it is clear that the existing open storage area has limited capacity given the high stocks of steel. This suggests that additional storage will be required if the container traffic increases significantly, unless the steel stock can be reduced.

The same applies to construction materials. The port is indicating that it is rejecting offers of such traffic because of inadequate storage capacity. Clearly, there is a concern by the port that this traffic could incur high port dwell times and thus constrain the steel storage capability.

Since storage is a low revenue earning activity, lack of storage capacity should not be considered as a 'trigger' to invest in berths. There are several options available to alleviate storage constraints in the existing port before additional cargo berths are needed in the North Port, as follows:

- The first option could be to develop the TNT leased land (irrespective of the construction of berth 12). This would enable a container terminal to be developed outside the main steel storage area.

- A second option could be to extend the existing storage area into the 18 hectares of storage area south east of the port that is owned by AISCP. The north-eastern part is allocated as a perishable cargo site. The recent storage extension including paving cost $2.5 million and a similar sized development may be required prior to development in the North Port.

- In the case of container cargo another alternative would be to transfer all landed cargo to an Inland Container Depot / Container Freight Station, possibly in the free zone including the land designated for new port. This is a standard international application and such a requirement is covered in the recently modernized Customs Act.

6 Master Plan for Expansion of Port Capacity to Match Demand

This chapter presents the master plan options for expanding the capacity of the port to match the different levels of demand over the study period.

The layouts are shown on the drawings contained in Appendix 1.

6.1 Berth Options

The main factors which affect the choice of master plan development options for Aktau port are:

- The volume of oil to be exported. The projected future volumes of oil and the timing of demand for additional facilities have been shown to cover a significant range (Scenarios A, B and C as discussed in Section 4 of the Feasibility Report); and

- The ability of the rail and pipeline systems to deliver oil to the port for export. As discussed in Section 11 of the Feasibility Report the existing capacity of the rail system is insufficient to meet the requirements of Scenarios A, B or C and without expansion of the systems the North Port expansion would not be justified; and

- The time frame to be covered by the development options.

The development options available are:

- Upgrade the existing port immediately to the limit of its capacity, at which point the port and rail and pipeline capacities are approximately equal, and then cease expansion works until the rail and pipeline capacity into Aktau has been increased to match potential oil and dry cargo traffic projections;

- Upgrade the existing port immediately to the limit of its capacity and in parallel carry out a phased development of the North Port to match the oil and dry cargo traffic projections on the assumption that the rail and pipeline infrastructure is upgraded in parallel with port development.

The upgrades to the existing port are highlighted on Drawing No. 2.

The nature of the phased development of the North Port will depend to some extent on whether the growth in oil volumes follows Scenario A, B or C. In the case of Scenario A the cost estimates and the corresponding estimated improvement in port throughput, as discussed in Section 8 of the Feasibility Report, are summarised in the following tables.

The layout for the North Port that has been approved by AISCP and Government is shown on Drawing No. 1. It should be noted that it only has sufficient space for 7 new berths: 4 oil berths and 3 dry cargo berths. The consequence of the limited space for berths is that beyond 2020 further new options will be required.

Drawing No. 4 shows the layout of the marine works required for the approved North Port development, which has been titled Option 1.

In the case of Scenarios B and C, only 2 oil berths are required, which should be berths 14 and 15. The space designated for berths 16 and 17 could then be used to develop three dry cargo berths (here numbered 16, 17 and 17A) to meet any longer term demand (e.g. beyond 2020). Two alternative development options have been prepared for the period up to 2020 to match these scenarios, as follows:

- Option 2 (Drawing No. 5). Berths 14 and 15 are built immediately as oil berths, and general cargo berths 21 and 22 are commissioned by 2017.
- Option 3 (Drawing No. 6). Berths 21 and 22 are built immediately as oil berths, and are converted to general cargo operation in 2017. The need for new oil berths at that time would depend on the actual throughput of oil traffic: if the upgraded oil handling facilities in the existing port have sufficient capacity, no additional berths are required; otherwise, new oil berths 14 and 15 are constructed.

In all three options, grain berth 23 would be commissioned in 2014, although in Option 3 an alternative would be to relocate this facility at one of the berths 16, 17 and 17A, which may be more suitable owing to their narrower back up area.

It should also be noted that unless the projected oil volumes exceed the capacity of the existing port (10-14MT/yr depending on the extent of upgrading) AND the rail/pipeline system is expanded to match this demand, any further development of the North Port would not be advisable and steps should be taken to terminate the current construction contracts to avoid a significant wasted investment.

The proposed master plan development options are grouped below in terms of the time scale in which these options should be developed.

6.2 2008-2010: Development of the Existing Port

TABLE 13: Master Plan for Existing Port: 2008-2010

Location	Year required	Berth no.	Proposed improvement	Reference drawing no.	Estimated improvement in capacity Tonnes/yr	Cost US$ million (ex. equi-pment)
Existing Port	2008	1, 2, 3	Improve customs and immigration procedures; improve/increase cargo storage area.	N/A	400,000	0.5
	2010	12	Extend existing berth face southwards; extend crane rails; extend port paving and reclamation; localised dredging	2	400,000	10.0
	2010	9	Increase water depth and mooring facilities to allow 12000 T tankers to use berth. Increase pumping rate to 2000 TPH using existing pumps and lines. Use 2 No. existing marine arms together.	2	1,900,000	5.0
	2010	10	Increase pumping rate to 2000 TPH using existing pumps and lines. Use 2 No. existing marine arms together.	2	750,000	1.0
	2010	8	Add additional loading arm and pumping	2	150,000	0.5
	2010	11	Use of this berth is subject to resolution of safety issues by AISCP and has not been included at this stage	2		
	2008	4, 5	Add additional loading arms and pumps. Increase pumping rate to 2000 TPH using existing pumps and lines. Use 2 No.	2	1,500,000	1.0

			existing marine arms together.			
					Oil 4,300,000 Dry (non grain & ferry) 800,000	18

6.3 2008-2020: Development of the North Port

TABLE 14: Master Plan for North Port: 2008-2020

Location	Year required	Berth no.	Proposed improvement	Reference drawing no.	Estimated improvement in capacity Tonnes/yr	Cost US$ million (incl. equipment)
North Port	2010	No berths	Construct mole and breakwater, complete reclamation and protect with revetment	4	0	107.0
	2010	14, 15	Construct 2 oil berths only and carry out dredging of North Port Basin and access channels, remainder of North Port to remain as for "no berth" case 4 No. 250 dia. marine arms 2 No. 500 dia. loading lines 3 No. 500 TPH loading pumps Fire fighting Electrical Controls Assuming connection to Artis Terminal only	4	6,000,000	30.0 (including equipment) Plus 30.0 for dredging
	2010 or 2015	16, 17	Construct 2 oil berths either at the same time as 14&15 or later if oil volumes are uncertain 4 No. 250 dia. marine arms 2 No. 500 dia. loading lines 3 No. 500 TPH	4	6,000,000	30.0 (including equipment)

			loading pumps Fire fighting Electrical Controls Assuming connection to Artis Terminal only			
	2017	21&22	Construct 2 general cargo berths. Complete reclamation & full development of North Port	4	850,000	60.0 (including equipment
	2014	23	Construct new grain berth	4	500,000	20.0
	2015		New roads, services, buildings to support new berths	4 & 8	Incl above	50.0
					Oil 12,000,000 Gen cargo 850,000 Grain 500,000	**327**

6.4 2008-2010: Development of North Port Reclamation Area

General

The approved development plan for the North Port (Drawing No. 1) includes a backup area totalling approximately 35 Ha behind the dry cargo berths. It includes various installations including a transit shed similar to the existing one, as well as facilities such water treatment, fire station, offices and maintenance. However, it is considered that the residual open area is generous for the throughputs of general or containerised cargo that may be handled across berths 21-23, and the space allocated for berth backup could be reduced.

Drawing No. 8 shows a revised layout proposal for the North Port onshore area that incorporates the modifications proposed below.

Railways

The above layout shows railway tracks along the general cargo quay, which continue in a loop around the northern end and return along the eastern side of the area. We recommend that the rail tracks on the quay and the loop are omitted, for the following reasons:

- Direct loading / discharge of cargo between vessel and rail car is generally inefficient, both in terms of productivity and disruption caused to other berth operations by the trains, and it is generally more efficient to lift cargo on and off rail wagons at the rear of the storage area, and to transport it between the stack and the vessel to match the quay operations.

- Railways, and particularly the long curved sections required, break up storage areas and render them far less efficient both for the quantity of goods that can be stored and also because stacking and unstacking operations adjacent to the tracks conflicts with rail movements.

- Railways crossing roads tend to create difficulties both due to trains blocking road movements and because the crossings themselves generally require continual maintenance.

Therefore, we propose that the new rail tracks behind berths 21-23 are limited to the two pairs of sidings behind the transit shed.

The layout also shows rail-mounted quay cranes at berths 21-23. For the break bulk and container cargoes expected at these berths, we propose that mobile harbour cranes (MHCs), similar to the Liebherr models currently used in the port, would be both more versatile and productive.

Grain Silos

The proposed location for the new grain silos is to the south of berth 23, which minimises the loss of land area available for general cargo storage. This arrangement would enable railway tracks to be laid directly into the facility via a short spur from the existing tracks, and wagons to be discharged straight into the silos. A conveyor would be installed between the silos and a rail-mounted ship loader operating at berth 23.

This berth would be operated in the same way that berth 6 is now. For example, when not being used by grain ships it would handle cargoes such as vehicles that do not require large cranes.

Port Oil Depot

The 3 supply terminals have tankage sufficient only for between 3 days and 7 days of throughput, which is a very low figure. Additional tankage would balance out fluctuations in supply.

If new tankage were to be provided at the Port then this would allow the supply terminals to supply to the Port Oil Depot at the current flowrate of 1000 TPH over a 15 hour period and the Port Oil Depot would then supply to the tanker at a loading rate of 2000 TPH over a 7.5 hour period.

By using the Port Oil Depot as a buffer storage for all oil to be loaded, it should be possible to loading times.

The Port Oil Depot could be located behind the proposed new berths on the recently reclaimed area. Appropriate safety zones should be incorporated in the layout of the depot.

It is recommended that a study should be carried out – after the pumping trials have been completed – to establish the design and cost of the Depot and to consider possible methods of obtaining suitable investment in the Depot.

Ancillary Facilities

It is proposed that the requirements for the large numbers of new buildings and other installations that are shown on Drawing No. 1 are reviewed in detail. Where possible, existing facilities should be used and / or extended, to avoid duplication and unnecessary expenditure. Drawing No. 8 shows a Reserve Area along the rear of the new reclaimed land and across its northern end. We recommend that this area is used to accommodate the Port Oil Depot as well as those utilities installations that the detailed review recommended above shows to be necessary. The area will require detailed planning once the basic requirements have been decided.

Berth Backup Area

The berth backup area remaining between the quay wall and the Reserve Area is 375m deep and includes a 60m wide strip behind the landward pair of rail tracks for the intermediate storage of goods transported by rail and a perimeter road. The backup area provides ~23 ha of space, including the shed. This should be sufficient for the storage of the goods handled across berths 21 and 22 and the non-grain cargo moved at berth 23.

6.5 2020 onwards: Further Developments of Existing Port and North Port

Drawing No. 3 highlights the possible longer term marine developments that could be undertaken in the existing port, depending on traffic demands. These are:

- Construction of a new finger pier at the southern end of the harbour, located midway between the general cargo berths and oil berths 9 and 10. The pier would have two berths (here called A and B), which could either provide additional capacity or relieve berths 9 and 10 if it is decided to redevelop them.
- Reconstruction of the breakwater adjacent to berths 9 and 10. This work may be required to reduce the wave penetration in to the harbour due to transmission and overtopping and / or to provide additional land area to permit handling of dry cargoes, should this become more appropriate to the port's traffic in the future.

Drawing No. 7 (which is based on Development Option 1) highlights the possible longer term marine developments that could be undertaken in the North Port, depending on traffic demands. These are:

- Construction of a new finger pier at the southern side of the harbour, located to the north of berths 4 and 5. The pier would have two berths (here called C and D), which could provide additional capacity for either oil or dry cargoes.
- Provision of an SPM located in water depths sufficient to accommodate 60,000 DWT tankers. The SPM would be served by a pipeline laid along the mole and then subsea adjacent to the approach channel. This facility would enable Aktau to compete with facilities planned at Kuryk.

These developments are summarised in Table 15.

TABLE 15: Master Plan for Development of Existing and North Ports Beyond 2020

Location	Year required	Berth no.	Proposed improvement	Reference drawing no.	Estimated improvement in capacity Tonnes/yr	Cost US$ million (ex. equipment)
Existing Port	beyond 2020	A, B	New finger pier connected to south breakwater/mole to supplement other oil berths and/or replace berths 9 and 10 during possible redevelopment of breakwater berths.	3	6,000,000	40.0
	beyond 2020	9,10	Rebuild breakwater adjacent to berths 9 and 10 to improve wave protection and/or provide additional space for dry bulk berths.	3	TBD	TBD
North Port	beyond 2020	C, D	New finger pier to provide two additional oil berths or two dry bulk berths depending on demand.	7	TBD	TBD
	beyond 2020	SPM	SPM offshore from North Port breakwater in water depth suitable for 60,000 DWT tankers	7	TBD	TBD

7 Potential for Free Trade Zone

7.1 Special Economic Zone and Logistic Centres.

The "Morport Aktau" SEZ was established by Presidential Decree number 853 on 26th April 2002. The SEZ has been in operation since 1st January 2003. In accordance with the Decree, from 7th February 2007 the land area of the SEZ was increased from 227.1 to 982.3 hectares.

The SEZ is located in the industrial area of Aktau city, adjacent to the port, and is ideally located for a high degree of interaction between the port and the SEZ as shown on Drawing No. 9.

The main purposes of the SEZ are to facilitate development of the whole region, set up high-performance industries, and develop new businesses including those which produce advanced technology products and products for export.

The Government of Kazakhstan is also seeking to encourage other types of priority industries and activities such as:

- Subsidiary and additional transport activity;
- Production and distribution of electricity, gas and water;
- Trade, automobile maintenance, repair of domestic goods and items of personal use;
- Estate operations: lease and consumer service provision;
- Research and Development; and
- Provision of other consumer services.

In conjunction with the SEZ there are plans to develop a Transport and Logistic centre on 200 hectares of land adjacent to the SEZ and close to the port.

The Tax and Custom preferences that will be offered in the SEZ are:

- Corporate income-tax rate - 0 %
- Property-tax rate - 0 %
- Land-tax rate – 0 %
- VAT rate on imported goods for personal needs - 0 %
- Custom duties on goods imported for personal needs – 0 %.

Priority will be given in the SEZ to the following types of production companies:

- Chemical production
- Production of finished metal goods
- Production of plastic and elastic goods

- Metallurgical production
- Production of automobiles and equipment
- Production of other non metallic mineral products.

TABLE 16: List of Companies Registered in SEZ

№	Name	Investment	Registration	Operations	Workers
1	LTD «Hanwei Energy Services»	24 mln.$	2007 November	2009	200
2	LTD «Thyssen Krupp-Imstalcon»	8.5 mln. $	2008 January	2008 December	40
3	LTD «Cha-Kur»	12 mln.$	2007 December	2009	180
4	LTD «Silica Colar Aktau»	105 mln. Euro	2007 December	2009 December	100
5	LTD «Petrochem Kazakhstan»	5 mln.$	2008	2010	50
6	JSC «Caspian Pipe Industries»	200 mln. $	2007 December	2009 December	250
7	LTD «Fiber Glass Systems»	8.2 mln. $			150
8	LTD «Beles Service»	7.2 mln. $			200

7.2 Development Zones within the SEZ

The main zones currently being developed within, and adjacent to the SEZ are:

- The Industrial City, 195 Hectares, which will accommodate factories that produce export-orientated products for industrial and consumer products;
- The Caspian Shelf Infrastructure Development Centre, 225 Hectares, which is aimed at construction and maintenance industries related to the oil industry;
- The Transport and Logistics Centre, 200 Hectares;
- The Frontier Trade Centre, 100 Hectares; and
- The North Port expansion of AISCP.

Industries which reduce the country's dependence on imported goods will be given special preference by the SEZ management.

8 Master Plan for Utilisation of Land Adjacent to the Port

8.1 Land and facilities adjacent to Port

The potential for the port to obtain more land for expansion is limited:

- To the north, land is occupied by the Keppel Shipyard.
- To the east, land is occupied by Artis SA tank farms; the proposed transport-logistics area; railways; government buildings; contractor yards; and the SEZ.

There may be some scope for development to the south but there will be a need to investigate the possible environmental impacts that development may have on the water intake to the desalination plant, Aktau's main source of drinking water.

8.2 Zones for expansion in near term

At this stage the Port Authority, jointly with Akimat, are seeking potential investors to move the customs and border control and national security buildings, located right in front of the port administrative office, out of the port area. This move would require a large investment due to the rather specific communication networks used by national security, customs and border control bodies.

In 2002/3 18 Hectares of land to the south of the port was designated by Aktau city authorities for further expansion of the port. Half of this area has been incorporated into the port's open storage areas for steel and metal scrap and the remainder is intended to be used for covered storage facilities for fruits and vegetables as part of the SEZ, and the port and Akimat are currently holding negotiations with potential investors.

Land behind berth 12 has been leased to TNT on a 49 year lease and TNT are currently preparing a plan to use this area to handle steel and other general cargo.

8.3 Zones for expansion in long term

In the long term the only possible land for expansion of the port lies along the shoreline to the south but this land is largely owned by Government and is subject to the constraints caused by the intake to the desalination plant as mentioned above.

9 Conclusions

9.1 Options for Action

The forecasts of oil throughput at Aktau port, presented in Scenarios A, B and C in the Feasibility Study, are unusual from a port planning viewpoint. All three scenarios suggest the need to invest in new oil berths which will only be fully utilised from around 2010 for a very short number of years, after which time they will become under-utilised. In this situation it is questionable whether an investment bank will be attracted. There are a number of approaches which could be taken which can assist in proposing a strategy. These are described below.

1. As port owner, the Government of Kazakhstan might take the view that in any case the necessary infrastructure to respond to the short-term demand should be provided. In fact the economic rate of return is high because the new berths would avoid the extremely high costs of diversion to Odessa and Government could decide that it is in the best interest of the State to construct the berths. In this case Government should expect to have to proceed without the participation of development banks.
2. A contrasting approach would be to place the obligation to provide infrastructure for the short-term peak of oil traffic with the oil industry. The major oil operators of Tengiz field, who will be the main users of Aktau port, might be willing to provide their own berths and oil handling equipment in the North port after AISCP has completed the provision of the breakwater, mole and dredging. Temporary loading facilities, perhaps involving floating pontoons or jack-up platforms, could be a solution. In effect the oil companies would be offered a short-term lease, which would be negotiated on mutually agreeable terms. The oil companies would avoid incurring the high overland transport costs by rail from Tengiz to Odessa and this could be used as a negotiating point by AISCP. This is in line with common international practice whereby a port owner provides the essential but high-cost basic infrastructure (breakwaters and dredging), the harbour services such as towage, tugging and pilotage, fire fighting, safety and communications services, whilst the operators or cargo owners provide their own specific infrastructure, equipment and services under an operating agreement. Some international examples are provided below.
3. A third approach would be to seek from the oil companies an undertaking to continue to ship a certain minimum volume of oil across the Aktau berths after the critical date of 2013 for a minimum period (perhaps 10 years). In effect this would be a standard marketing task. AISCP would need to be able to offer enhanced service packages and financial concessions. To make the proposal potentially attractive to the oil companies, AISCP should be ready to discuss, or offer, at least the following:

- Tariffs below the general rate;
- Undertakings to maintain fixed tariffs for the medium term and a cap on increases in the long term;
- Certain minimum operational efficiency levels. These would include agreed benchmarks on berth availability, harbour services, berth service time and documentation time.

Some efficiency improvements are outside the control of the port company, for example reductions in time taken to process papers (customs, quality control etc).

4. One further option is that AISCP could seek an undertaking from Government to guarantee minimum oil volumes across the berths of Aktau port. It is felt that Government could prevail on the Kazakhstan partners of the oil industry (particularly Kazmunaigaz) to sustain the necessary volumes in the state interest.
5. Finally, it would be logical to consider a different phased development of the North Port involving phased usage of the new cargo berths. The general cargo berths in the North Port are not required until approximately 2014. It would be possible to construct the general cargo berths immediately and put them into use as oil berths, converting them to dry cargo use by 2014.

The Consultant's understanding is that the approved layout of the North Port is to be taken as Government strategy and that modification of the layout of the berths and the numbers of berths is not a matter for discussion. Therefore the recommendations made in Chapter 10 take account of this situation.

9.2 Efficiency Improvements to Current Cargo Operations

Thirty years ago ports were barriers to trade in many countries. They were often highly inefficient, expensive, and plagued with over-manning and restrictive labour practices.

These problems gave incentives for radical port reforms. The most common measures were the abolition of government monopolies and introduction of competition where possible. This generally entailed privatisation; deregulation of entry, investment and tariffs; and government measures to tackle labour problems, especially those of over-manning and restrictive practices. There is now a general consensus on the desirability of the ***withdrawal of port authorities to a landlord role***, with all operations carried out by private companies in a competitive environment.

These reforms have had been extremely successful in many countries. It is not uncommon for productivity to have reached levels three times as high as at the state-run ports; and tariffs have often fallen sharply at the private ports. In addition, employment has fallen to a small fraction of previous levels.

The greatest and most publicised impact of the port reforms has been in container terminals, which handle the majority of world trade in terms of value.

The situation in oil terminals has similarities and also differences.

First, most oil terminals have always been owned and operated by private companies - i.e. oil companies - independently of port authorities. This was the situation before the introduction of the port reforms described above.

This pattern has emerged because much of the oil is transported directly to refineries that are owned by oil companies from oil export terminals located near oil fields. Often the shipping requires berths with deeper drafts than in the established ports. It is often handled at single point moorings (SPMs) outside ports. For example, almost all the seaborne oil traffic in the UK is handled at terminals which are owned and operated by the oil companies (e.g. Esso at Fawley, Elf at Milford Haven, BP at Grangemouth and Phillips-Imperial at Tees).

There are also, however, many examples of private operators operating with the port boundaries, on facilities on long leases. For example, at Rotterdam, the largest oil port in the world, there are four refineries, 40 petrochemical companies and 13 major storage and distribution companies (e.g. Vopak), all operated by private companies within the port area, on long leases.

In the Caspian region, the dominant terminals of Dubendiy (Azerbaijan) and Batumi (Georgia) are also owned and operated by independent companies (Azpetrol and Greenoak).

At present, such arrangements would be ruled out in Aktau, by current law. This law, which is understood to have been partly the reason for terminating the Mobilex contract, is out of line with modern practice in ports elsewhere in the world.

An additional factor to consider is that the oil companies place a high priority on efficiency, safety and environmental / pollution controls, and they will require that operations at Aktau should meet internationally accepted levels of performance which at present they do not. The improvements necessary could be facilitated by the involvement of the companies in the port operations.

9.3 Rail and Pipeline Access into Aktau

The current rail and pipeline systems transporting cargo into the port, particularly oil, do not have sufficient capacity to carry the projected volumes which have been the basis for proceeding with the North Port. Therefore future expansion in the North Port should not proceed without parallel investment in the railway and pipeline systems.

9.4 Institutional Reform and Efficiency Improvements within other Port Agencies

It is proposed that the Consultant prepares terms of reference for a technical assistance programme which will reach those agencies providing Customs clearance, immigration, security and quality testing.

10 Recommendations

The study has shown that there are several actions that need to be taken immediately to meet the projected demand to handle future cargo volumes. To assist AISCP with identifying these actions, the following recommendations are made for the key development areas.

General Recommendations on actions to be taken before implementation of the Master Plans

1. AISCP seek meetings with Ministry of Transport, Ministry of Energy and Ministry of Economy to clarify the inconsistencies in State forecasts of oil volumes and to seek guaranteeing of oil volumes or underwriting the repayments of the loan if the volumes do not materialize.
2. AISCP should seek meetings with the oil companies, notably Tengiz Chevroil, to discuss sharing the costs of investment in the oil berths as is common in many oil terminals worldwide.
3. AISCP should build on existing arrangements and work more closely with the oil companies to determine the optimum procurement strategy and port tariffs for the new oil berths, given the possible short term requirement for these berths.
4. To compete with alternative transport routes AISCP should establish a forum for working with the oil, rail, pipeline and tank storage companies to ensure that oil exporting facilities and procedures at Aktau are as attractive as the alternative transport routes that are available and that the capacity of the railway and pipeline are increased so that they can handle the projected future volumes.
5. AISCP should source as much funding as possible through an increase in equity/capital, but be prepared to provide sovereign guarantees to attract external funding institutions.
6. The management of the SEZ falls under the jurisdiction of the City Administration of Aktau City. To ensure the correct level of synergy is formed between the development of the Port and the SEZ it is essential that the existing links between the port and the city are used to their fullest extent in the future planning of the port and the surrounding areas.

Existing Port Recommendations

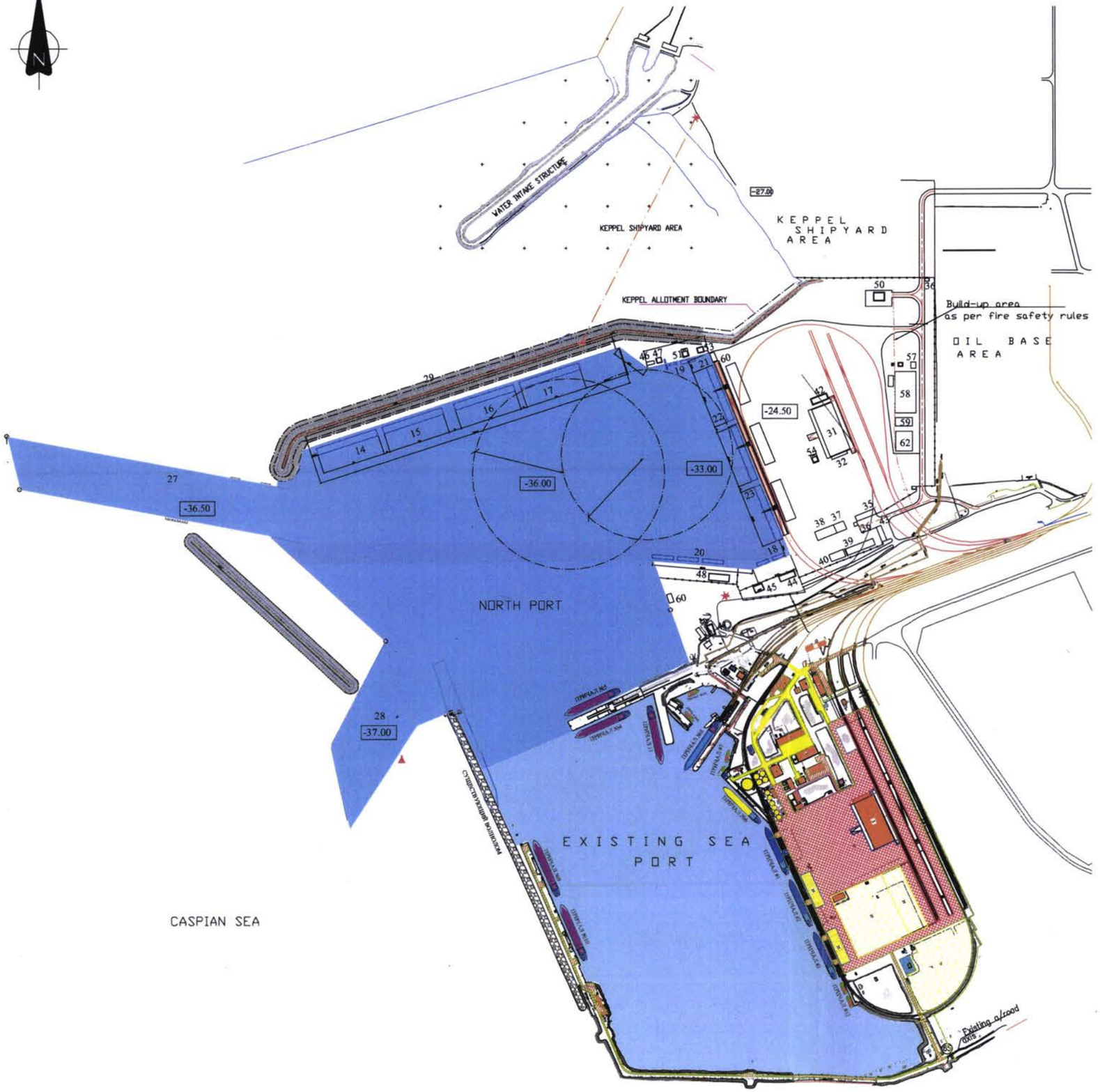
1. Upgrading work should be carried out immediately in the existing port to meet immediate projected increases in traffic volumes.
2. AISCP should put in hand efficiency improvements to the existing cargo operations.
3. As part of the next stage of this study, AISCP and the Consultants should initiate an institutional reform review amongst the agencies involved in customs clearance, immigration, security and quality testing to improve oil berth productivity. A large proportion of the tanker loading time is taken up by procedures required to complete the loading schedule. The times allowed by the Port, 8 hours per tanker, is twice the time found in comparable oil ports elsewhere. In particular the Consultants should consider if international procedures such as "International Safety Guide for Oil Tankers & Terminals", known as "ISGOTT", would be beneficial to AISCP.
4. AISCP should complete as soon as possible their investigations which are currently in hand, to confirm the practicality of increasing oil volumes through the Existing Port; this involves:
   - Re-evaluation of the allocation of berths to terminals;
   - Carry out pumping trials at berths 4, 5, 9 and 10 from Kaztransoil, Terminalex and Artis Terminals as appropriate;
   - Check operating envelope of marine arms at berths 4, 5, 9 and 10; and establish requirements to provide 2000 TPH at berths 4, 5, 9 and 10;
   - Establish dredging requirements for berth 9;
   - Commission berth 11.
5. Examine the need for additional tankage: the 3 supply terminals have tankage sufficient only for between 3 days and 7 days of throughput, which is a very low figure: additional tankage would balance out fluctuations in supply. If new tankage were provided at the Port then this would allow the supply terminals to supply to the Port Depot at the current flowrate of 1000 TPH over a 15 hour period, and the Port Depot would then supply to the tanker at a loading rate of 2000 TPH over a 7.5 hour period.
6. Consider that all port oil loading operations should be carried out from a central location. A Port Oil Depot could be located adjacent to the proposed new berths on the recently reclaimed area.

North Port Recommendations

1. To maintain AISCPs role as a key player in the export of Kazak crude oil at least two new oil berths should be operational in the North Port by 2010.
2. AISCP should plan to construct a new grain terminal in the North Port by 2014 and two new dry cargo berths in the North Port by 2017.
3. AISCP should consider finding additional/alternative use for the large reclamation in the North Port, such as tank farms or industrial development, both for the temporary condition until the new dry cargo berths are required and for the permanent condition where a significant proportion of the reclamation is unlikely to be needed for port operations.
4. Following the Second Steering Committee Meeting held in Astana on 27th March 2008 the Consultant should proceed with designs and tender documents based on FIDIC conditions of contract for new oil berths in the North Port. Designs will be prepared for four berths. It is expected that by the time the designs are completed, the forecasts of demand for oil shipment will have been clarified through the AISCP activities listed under points 1, 2 and 3 of the General Recommendations on Actions to be taken before implementation of the Master Plan". It will then be possible to firm up the scope and financing of the oil berth procurement package.

APPENDIX 1 - DRAWINGS

Drawing Number	Drawing Title
1	Existing Development Plan for North Port
2	Proposed Improvements to Existing Port 2008-2010
3	Proposed Improvements to Existing Port 2020 onwards
4	Proposed Development of North Port 2010-2020-Option 1
5	Proposed Development of North Port 2010-2020-Option 2
6	Proposed Development of North Port 2010-2020-Option 3
7	Proposed Development of North Port 2020 onwards
8	Proposed Development of North Port Reclamation
9	Relationship Between SEZ and Port



LEGEND
NORTH HARBOR FACILITIES

LEGEND

14,15,16,17 - Oil Terminals
18 - Fleet vessels
19 - Ecological Terminal
20 - Naval Forces Terminal
21,22 - Main Cargos Terminals
23 - Multiple Terminal
27,28 - Approach channels
29 - Breakwater
30 - Breakwall
31 - Inside storage
32 - Operating Services Office (OSO-1)
35 - Administrative building - 5 fl.
36 - Ledges of the port (3ea)
37 - Domestic compartments
38 - Automobile repair shops
39 - Material and technical warehouse and repair shop
40 - Automobile box
41 - Coastal Radar (CR)
42 - Operating Services Office (OSO-2)
43 - Customs Service building
44 - Frontier service building
45 - Quarantine Service building
46 - Tank for washing the floating booms
47 - Ecological post
48 - Naval Forces Platform
49 - Check point
50 - Fire station for 2 fire trucks
51 - Foam fire-fighting station #1 with operator's room
53 - Fire pump station (sea water)
54 - Fire pump station of closed type warehouse
55 - Water tower with pump station
56 - Intake tank of oily wastes
57 - Sewage treatment facility
58 - Treated water evaporator
59 - Rainwater storage
60 - Filling station of the fire truck with sea water (2)
62 - Reserve tank for ballast water

0 80 160 240 320 400 480
SCALE METERS

The project is funded by the European Union

The project is implemented by Scott Wilson & Proektirovshik

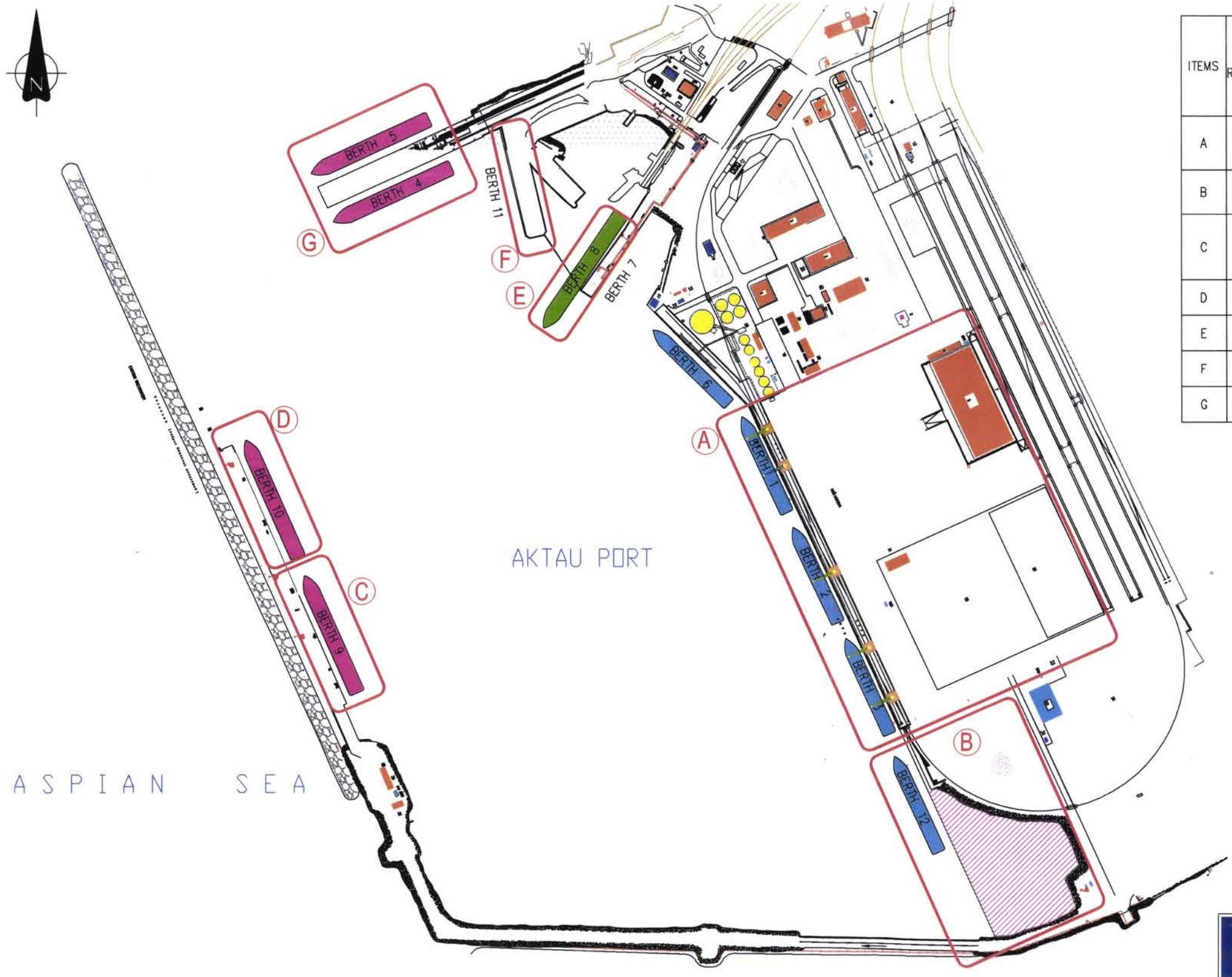
Aktau Port Development, Kazakhstan
Master Plan for the Port of Aktau

Project title

EXISTING DEVELOPMENT PLAN FOR NORTH PORT

Drawing title

Sheet#	Date
1	25/02/08



ITEMS	YEAR REQUIRED	BERTH NUMBER	PROPOSED IMPROVEMENT	ESTIMATED IMPROVEMENT IN CAPACITY TONNES/YR
A	2008	1;2;3	IMPROVE CUSTOMS/IMMIGRATION PROCEDURES; IMPROVE/INCREASE CARGO STORAGE AREA.	400,000
B	2010	12	EXTENSION OF BERTH 12 INCLUDING DREDGING AND FILLING.	400,000
C	2010	9	INCREASE WATER DEPTH AND MOORING FACILITIES TO ALLOW 12000 DWT SHIPS USE BERTH 9, ADDITIONAL LOADING ARM AND INCREASED PUMPING CAPACITY.	1,900,000
D	2010	10	ADDITIONAL LOADING ARM AND PUMPING FOR BERTH 10.	750,000
E	2010	8	ADDITIONAL LOADING ARM AND PUMPING FOR BERTH 8.	150,000
F	2010	11	USE OF BERTH 11 BY RESOLVING SAFETY ISSUES.	
G	2008	4;5	ADDITIONAL LOADING ARMS AND PUMPING FOR BERTHS 4 & 5.	1,500,000

NOTES:

1. LEVELS ARE IN METRES BELOW BALTIC DATUM.
2. SURVEY DATA SOURCE: MEASUREMENTS "CASPMORPUT", AZERBAJAN 2000 И 2005 Y.Y.

0 40 80 120 160 200 240
SCALE METERS

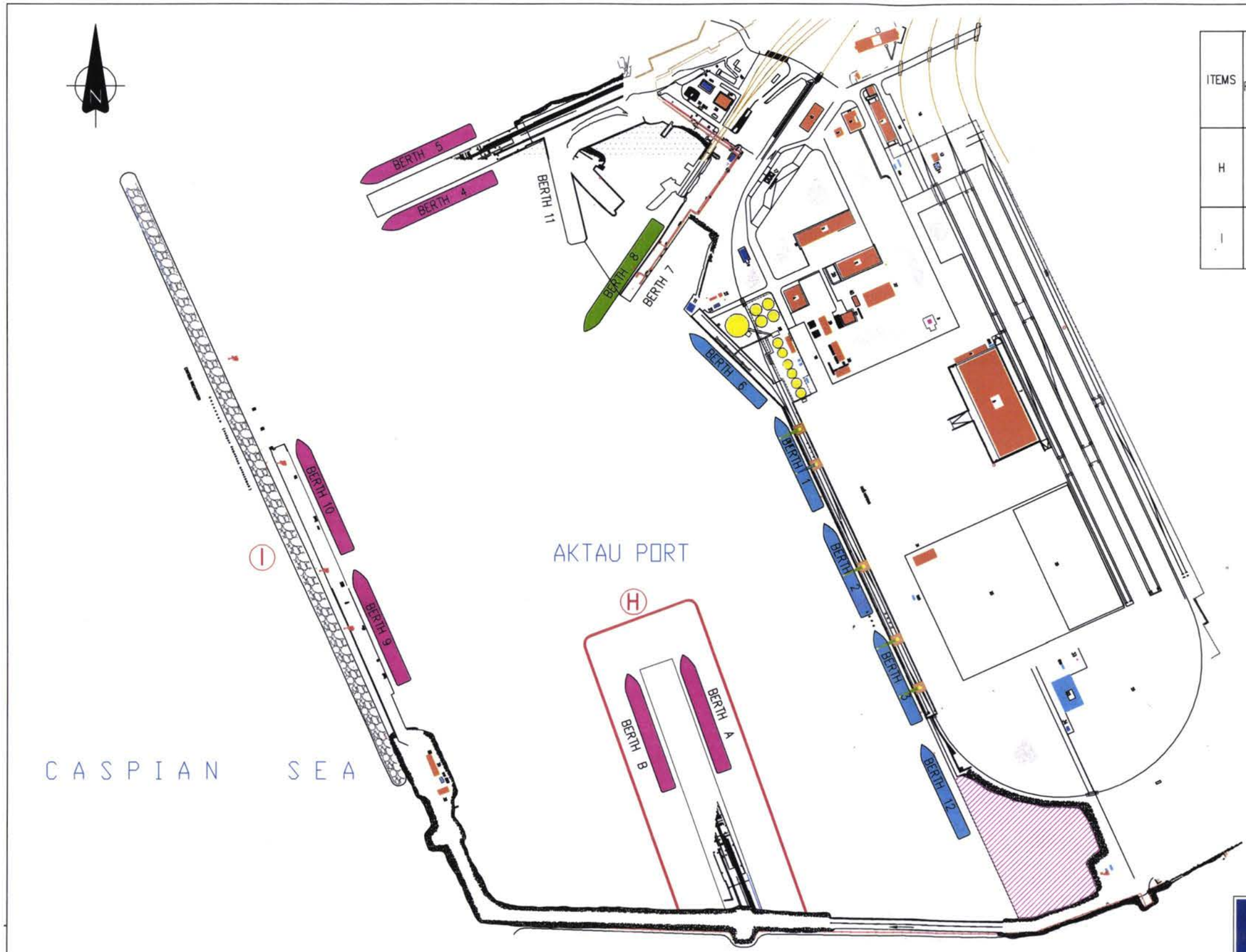
The project is funded by the European Union

The project is implemented by Scott Wilson & Proektirovshik

Aktau Port Development, Kazakhstan
Master Plan for the Port of Aktau

PROPOSED IMPROVEMENTS TO EXISTING PORT
2008-2010

Sheet	Date
2	25/02/08



ITEMS	YEAR REQUIRED	BERTH NUMBER	PROPOSED IMPROVEMENT	ESTIMATED IMPROVEMENT IN CAPACITY TONNES/YR
H	BEYOND 2020	A;B	NEW FINGER PIER CONNECTED TO SOUTH BREAKWATER/MOLE TO SUPPLEMENT OTHER OIL BERTHS AND/OR REPLACE BERTHS 9 AND 10 DURING POSSIBLE REDEVELOPMENT OF BREAKWATER BERTHS	6,000,000
I	BEYOND 2020	9;10	REBUILT BREAKWATER ADJACENT TO BERTHS 9 AND 10 TO REDUCE WAVE DISTURBANCE AND/OR PROVIDE SPACE FOR DRY BULK BERTHS	TBD

NOTES:

1. LEVELS ARE IN METRES BELOW BALTIC DATUM.
2. SURVEY DATA SOURCE: MEASUREMENTS "CASPMORPUT" , AZERBAJAN 2000 И 2005 Y.Y.

0 40 80 120 160 200 240
SCALE METERS

The project is funded by the European Union

The project is implemented by Scott Wilson & Proektirovshik

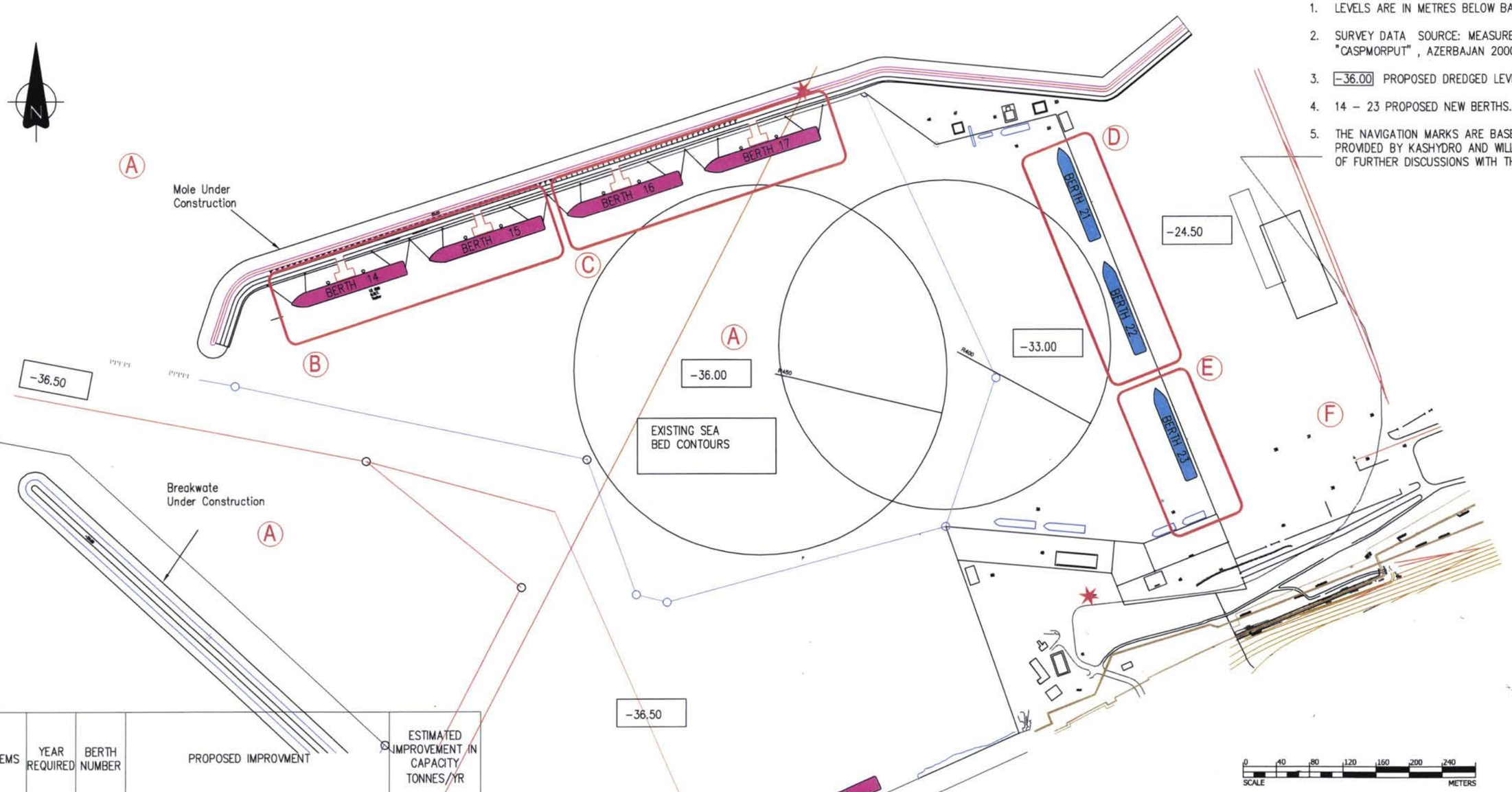
Aktau Port Development, Kazakhstan
Master Plan for the Port of Aktau

PROPOSED IMPROVEMENTS TO EXISTING PORT 2020-ONWARDS

Sheet	Date
3	25/02/08

NOTES:

1. LEVELS ARE IN METRES BELOW BALTIC DATUM.
2. SURVEY DATA SOURCE: MEASUREMENTS "CASPMORPUT", AZERBAJAN 2000 И 2005 Y.Y.
3. -36.00 PROPOSED DREDGED LEVEL.
4. 14 – 23 PROPOSED NEW BERTHS.
5. THE NAVIGATION MARKS ARE BASED ON INFORMATION PROVIDED BY KASHYDRO AND WILL BE THE SUBJECT OF FURTHER DISCUSSIONS WITH THE PORT.



ITEMS	YEAR REQUIRED	BERTH NUMBER	PROPOSED IMPROVMENT	ESTIMATED IMPROVEMENT IN CAPACITY TONNES/YR
A	2010	NO BERTHS	COMPLETE MOLE,BREAKWATER AND RECLAMATION	0
B	2010	14,15	CONSTRUCT 2 OIL BERTHS ONLY AND DREDGE NORTH PORT BASIN AND ACCESS CHANNELS;INSTALL OIL HANDLING/FIRE FIGHTING EQUIPMENT	6,000,000
C	2010 OR 2015	16,17	CONSTRUCT OIL BERTHS EITHER AT THE SAME TIME AS 14/15 OR LATER IF OIL VOLUMES ARE UNCERTAIN;INSTALL OIL HANDLING / FIRE FIGHTING EQUIPMENT	6,000,000
D	2017	21,22	CONSTRUCT 2 GENERAL CARGO BERTHS&FULL DEVELOPMENT OF NORTH PORT	850,000
E	2014	23	CONSTRUCT NEW GRAIN BERTH	500,000
F	2015		NEW ROADS, SERVICES, BUILDINGS TO SUPPORT NEW BERTHS	INCL ABOVE

The project is funded by the European Union

The project is implemented by Scott Wilson & Proektirovshik

Aktau Port Development, Kazakhstan
Master Plan for the Port of Aktau

Project title

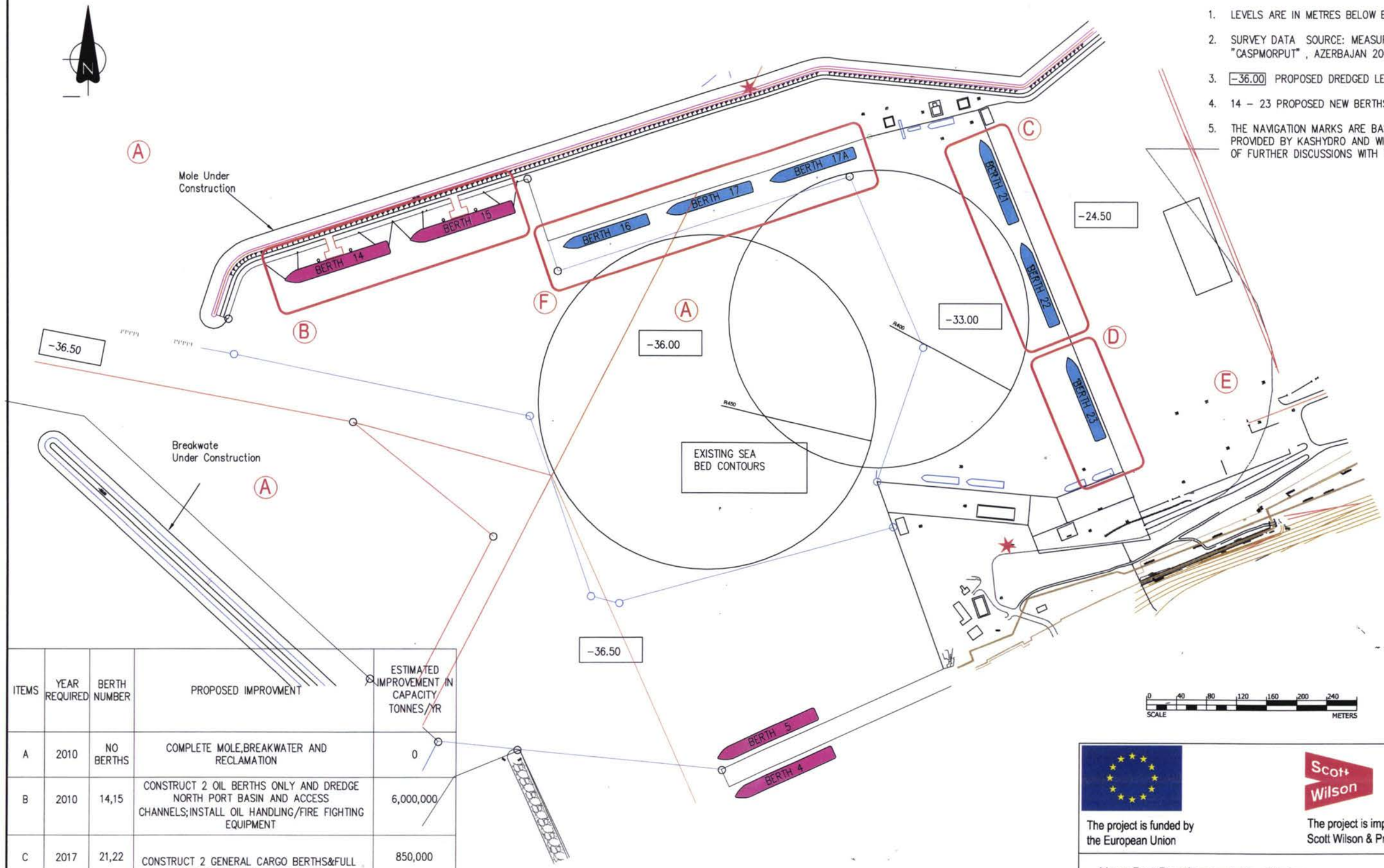
PROPOSED DEVELOPMENT OF NORTH PORT 2010-2020
OPTION 1

Drowing title

Sheet#	Date
4	25/02/08

NOTES:

1. LEVELS ARE IN METRES BELOW BALTIC DATUM.
2. SURVEY DATA SOURCE: MEASUREMENTS "CASPMORPUT", AZERBAJAN 2000 И 2005 Y.Y.
3. -36.00 PROPOSED DREDGED LEVEL.
4. 14 – 23 PROPOSED NEW BERTHS.
5. THE NAVIGATION MARKS ARE BASED ON INFORMATION PROVIDED BY KASHYDRO AND WILL BE THE SUBJECT OF FURTHER DISCUSSIONS WITH THE PORT.



ITEMS	YEAR REQUIRED	BERTH NUMBER	PROPOSED IMPROVMENT	ESTIMATED IMPROVEMENT IN CAPACITY TONNES/YR
A	2010	NO BERTHS	COMPLETE MOLE,BREAKWATER AND RECLAMATION	0
B	2010	14,15	CONSTRUCT 2 OIL BERTHS ONLY AND DREDGE NORTH PORT BASIN AND ACCESS CHANNELS;INSTALL OIL HANDLING/FIRE FIGHTING EQUIPMENT	6,000,000
C	2017	21,22	CONSTRUCT 2 GENERAL CARGO BERTHS&FULL DEVELOPMENT OF NORTH PORT	850,000
D	2014	23	CONSTRUCT NEW GRAIN BERTH	500,000
E	2015		NEW ROADS, SERVICES, BUILDINGS TO SUPPORT NEW BERTHS	INCL ABOVE
F	2020 ONWARDS	16,17, 17A	CONSTRUCT 3 GENERAL CARGO BERTHS&BACK-UP AREA	1,000,000

The project is funded by the European Union

Scott Wilson

The project is implemented by Scott Wilson & Proektirovshik

Aktau Port Development, Kazakhstan
Master Plan for the Port of Aktau

Project title

PROPOSED DEVELOPMENT OF NORTH PORT 2010-2020
OPTION 2

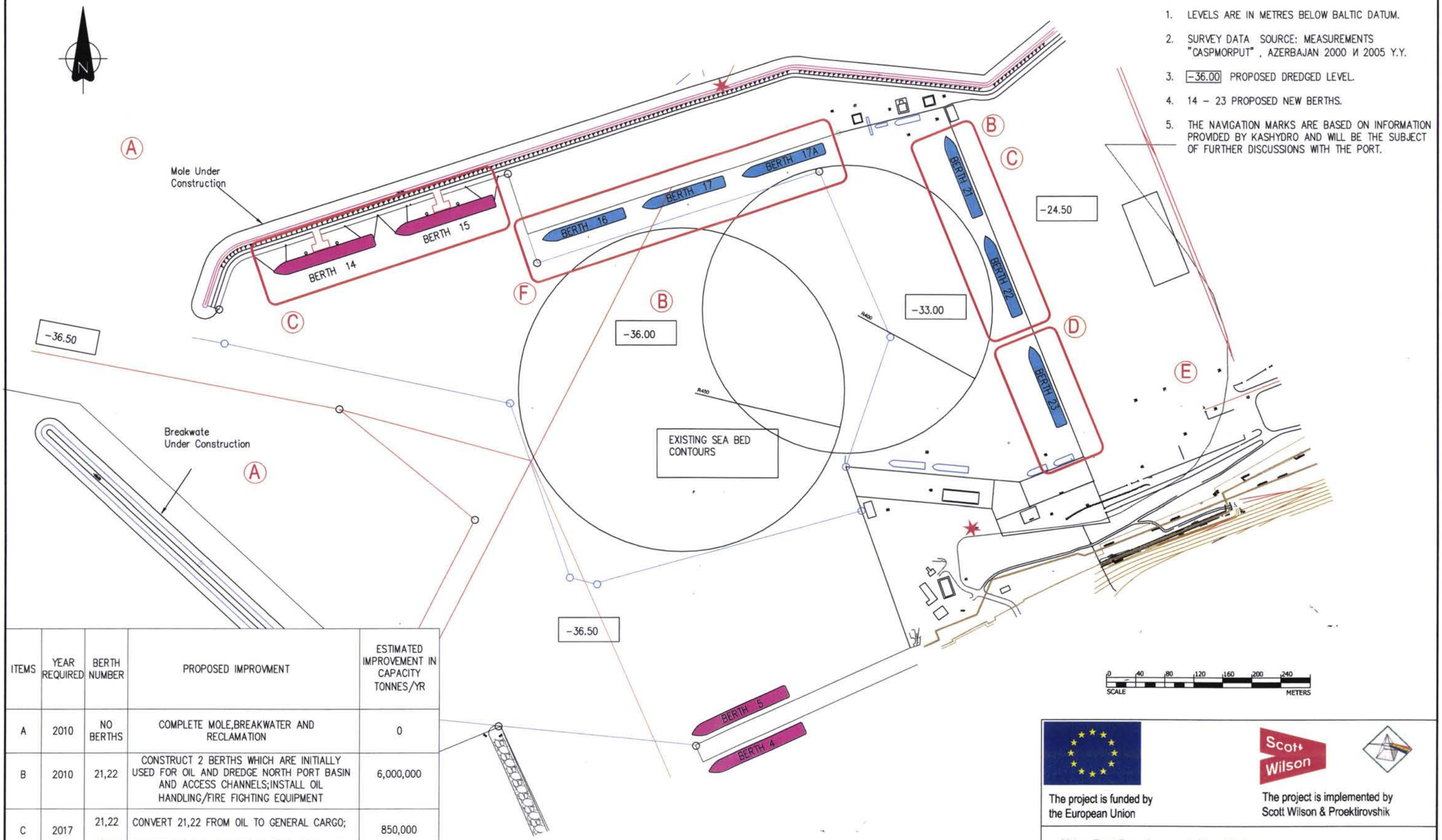
Drowing title

Sheet#	Date
5	25/02/08

format A3

NOTES:

1. LEVELS ARE IN METRES BELOW BALTIC DATUM.
2. SURVEY DATA SOURCE: MEASUREMENTS "CASPMORPUT", AZERBAJAN 2000 И 2005 Y.Y.
3. −36.00 PROPOSED DREDGED LEVEL.
4. 14 – 23 PROPOSED NEW BERTHS.
5. THE NAVIGATION MARKS ARE BASED ON INFORMATION PROVIDED BY KASHYDRO AND WILL BE THE SUBJECT OF FURTHER DISCUSSIONS WITH THE PORT.



ITEMS	YEAR REQUIRED	BERTH NUMBER	PROPOSED IMPROVMENT	ESTIMATED IMPROVEMENT IN CAPACITY TONNES/YR
A	2010	NO BERTHS	COMPLETE MOLE,BREAKWATER AND RECLAMATION	0
B	2010	21,22	CONSTRUCT 2 BERTHS WHICH ARE INITIALLY USED FOR OIL AND DREDGE NORTH PORT BASIN AND ACCESS CHANNELS;INSTALL OIL HANDLING/FIRE FIGHTING EQUIPMENT	6,000,000
C	2017	21,22 14,15	CONVERT 21,22 FROM OIL TO GENERAL CARGO; CONSTRUCT 2 OIL BERTHS TO REPLACE 21&22 OIL CAPACITY	850,000
D	2014	23	CONSTRUCT NEW GRAIN BERTH	500,000
E	2015		NEW ROADS, SERVICES, BUILDING TO SUPPORT NEW DRY CARGO BERTHS 21,22&23	INCL ABOVE
F	2020 ONWARDS	16,17, 17A	CONSTRUCT 3 GENERAL CARGO BERTHS&BACK-UP AREA	1,000,000

The project is funded by the European Union

The project is implemented by Scott Wilson & Proektirovshik

Aktau Port Development, Kazakhstan
Master Plan for the Port of Aktau

Project title

PROPOSED DEVELOPMENT OF NORTH PORT 2010-2020 OPTION 3

Drawing title

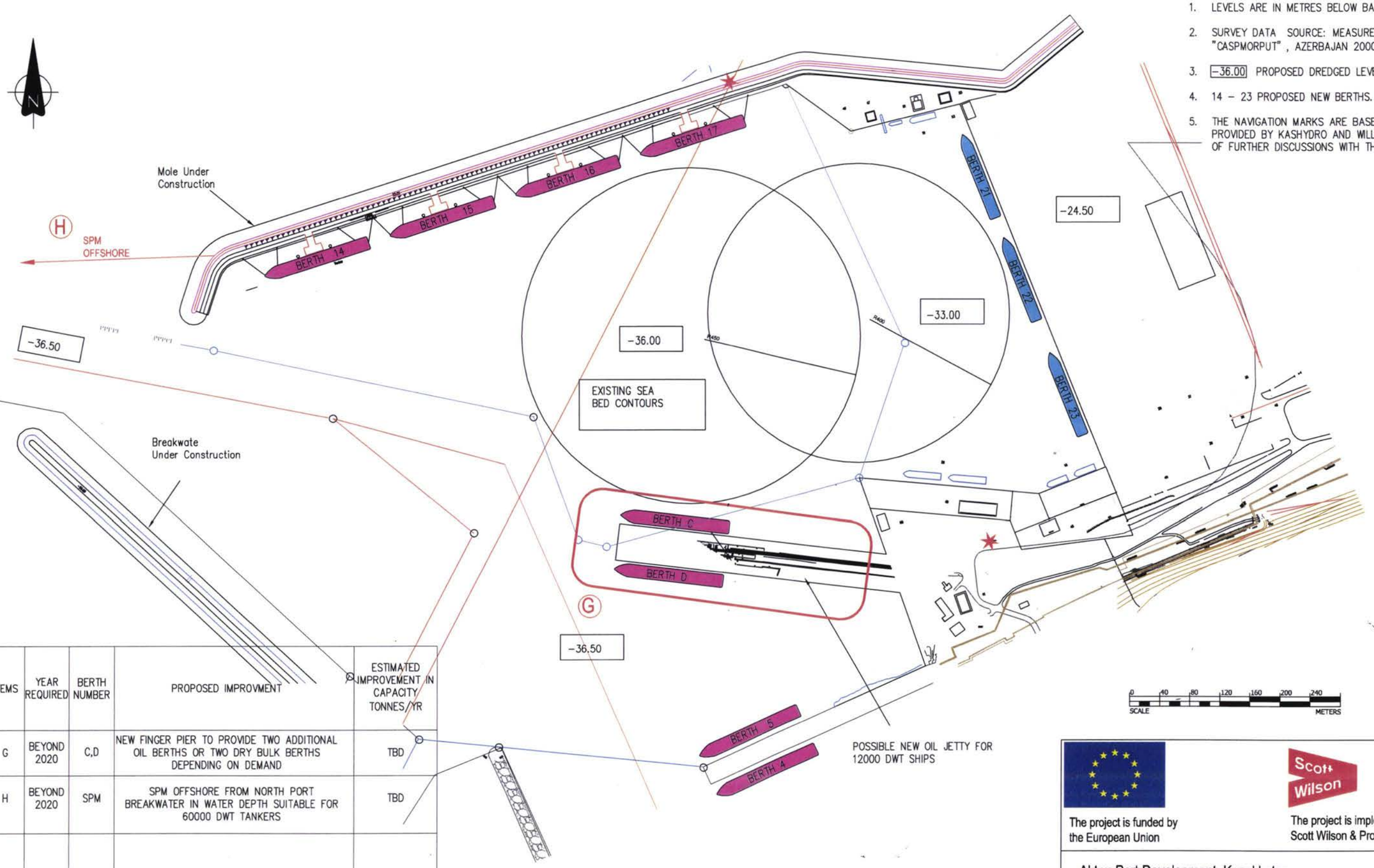
Sheet# 6

Date 25/02/08

format A2

NOTES:

1. LEVELS ARE IN METRES BELOW BALTIC DATUM.
2. SURVEY DATA SOURCE: MEASUREMENTS "CASPMORPUT", AZERBAJAN 2000 И 2005 Y.Y.
3. [-36.00] PROPOSED DREDGED LEVEL.
4. 14 – 23 PROPOSED NEW BERTHS.
5. THE NAVIGATION MARKS ARE BASED ON INFORMATION PROVIDED BY KASHYDRO AND WILL BE THE SUBJECT OF FURTHER DISCUSSIONS WITH THE PORT.



ITEMS	YEAR REQUIRED	BERTH NUMBER	PROPOSED IMPROVMENT	ESTIMATED IMPROVEMENT IN CAPACITY TONNES/YR
G	BEYOND 2020	C,D	NEW FINGER PIER TO PROVIDE TWO ADDITIONAL OIL BERTHS OR TWO DRY BULK BERTHS DEPENDING ON DEMAND	TBD
H	BEYOND 2020	SPM	SPM OFFSHORE FROM NORTH PORT BREAKWATER IN WATER DEPTH SUITABLE FOR 60000 DWT TANKERS	TBD

The project is funded by the European Union

The project is implemented by Scott Wilson & Proektirovshik

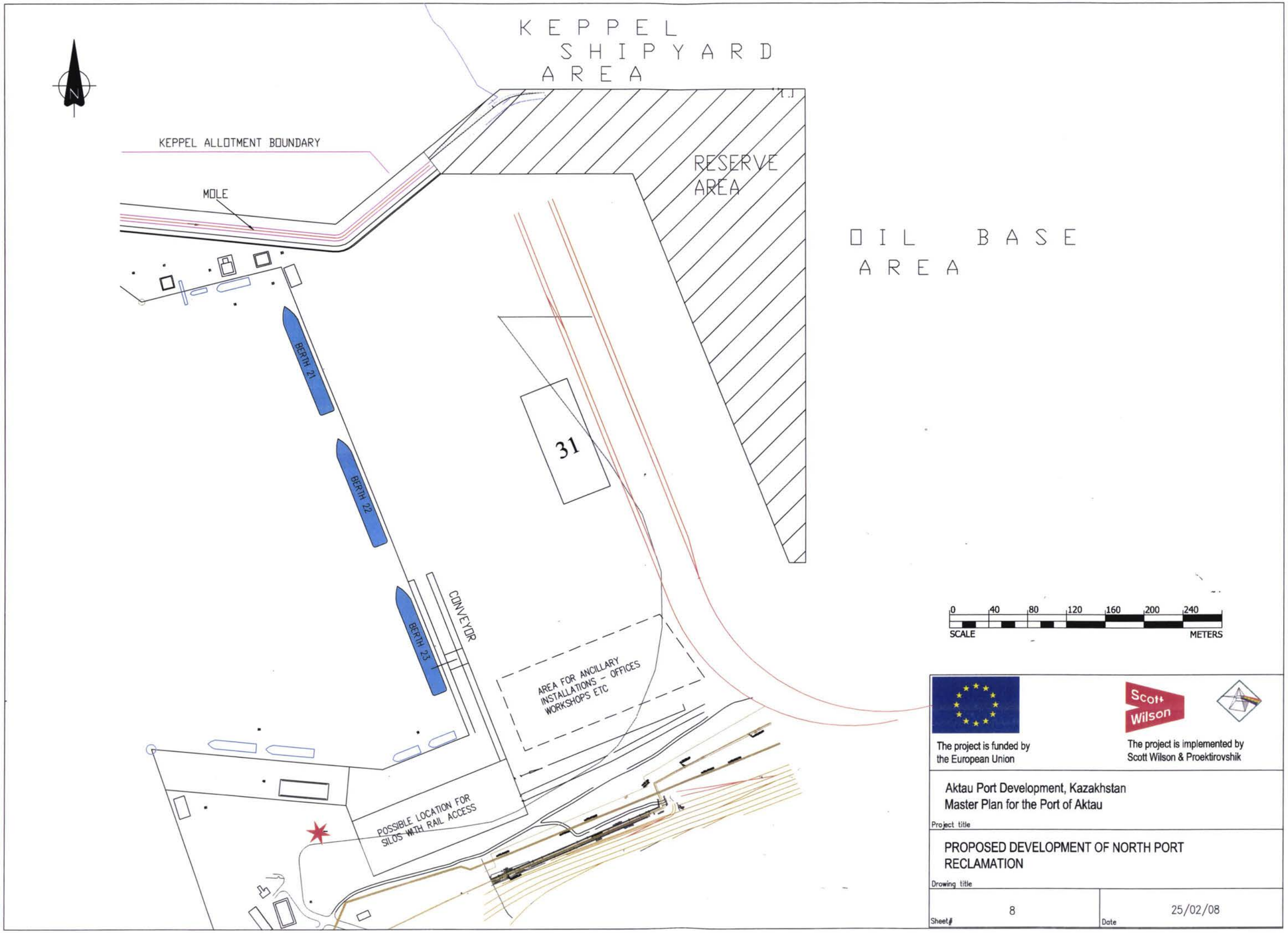
Aktau Port Development, Kazakhstan
Master Plan for the Port of Aktau

Project title

PROPOSED DEVELOPMENT OF NORTH PORT
2020 ONWARDS

Drowing title

Sheet#	Date
7	25/02/08



The project is funded by the European Union

The project is implemented by Scott Wilson & Proektirovshik

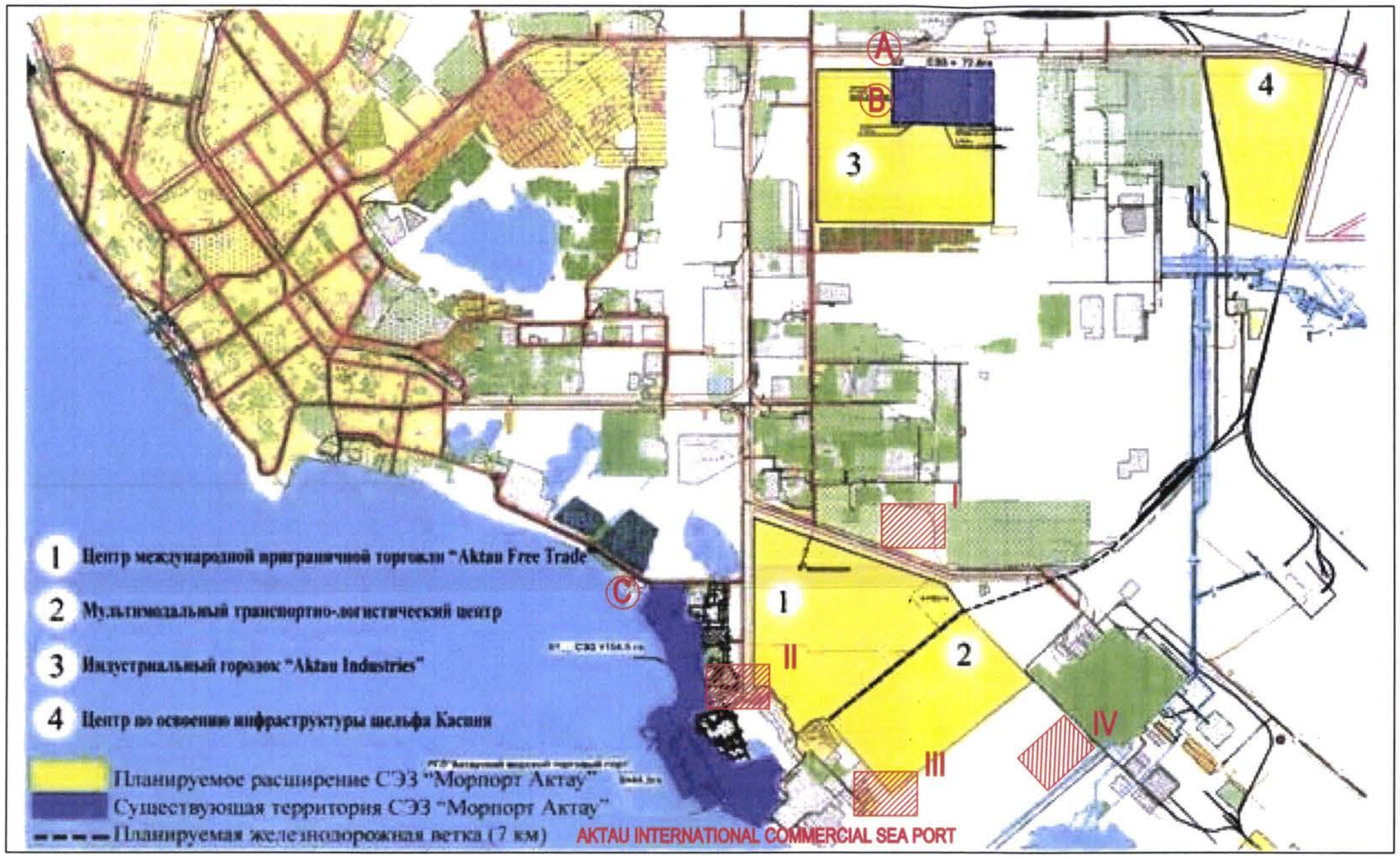
Aktau Port Development, Kazakhstan
Master Plan for the Port of Aktau

Project title

PROPOSED DEVELOPMENT OF NORTH PORT RECLAMATION

Drawing title

Sheet #	Date
8	25/02/08



OIL STORAGE DEPOTS:

(I) TERMINALEX

(II) ARTIS

(III) KAZTRANSOIL

(IV) PLANNED

DEVELOPMENT CENTRES:

1. AKTAU FRONTIER FREE TRADE CENTRE
2. TRANSPORT LOGISTIC CENTRE
3. INDUSTRIAL CITY CENTRE
4. CASPIAN SHELF INFRASTRUCTURE DEVELOPMENT CENTRE

EXISTING PROJECTS:

A. FIBREGLASS PIPE FACTORY

B. OIL PIPE FACTORY

C. MARINE FABRICATION YARD

The project is funded by the European Union

The project is implemented by Scott Wilson & Proektirovshik

Aktau Port Development, Kazakhstan
Master Plan for the Port of Aktau

Project title

RELATIONSHIP BETWEEN SEZ AND PORT

Drawing title

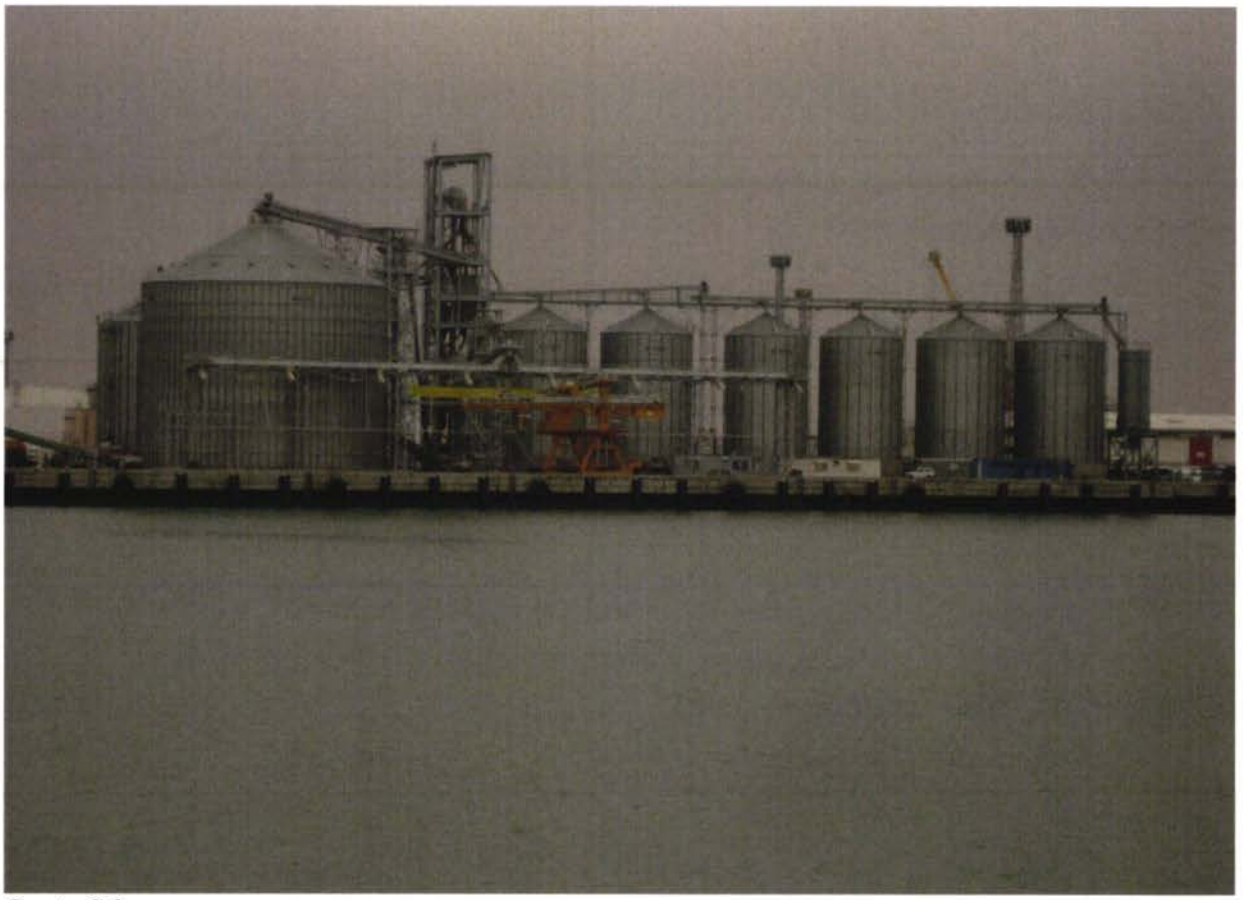
Sheet #	Date
9	25/02/08

format A3

APPENDIX 2 – PHOTOGRAPHS

Berths 4/5

Berth 11



Grain Silos

Berth 6 with the grain loader on the quay and the ecological vessel at the berth

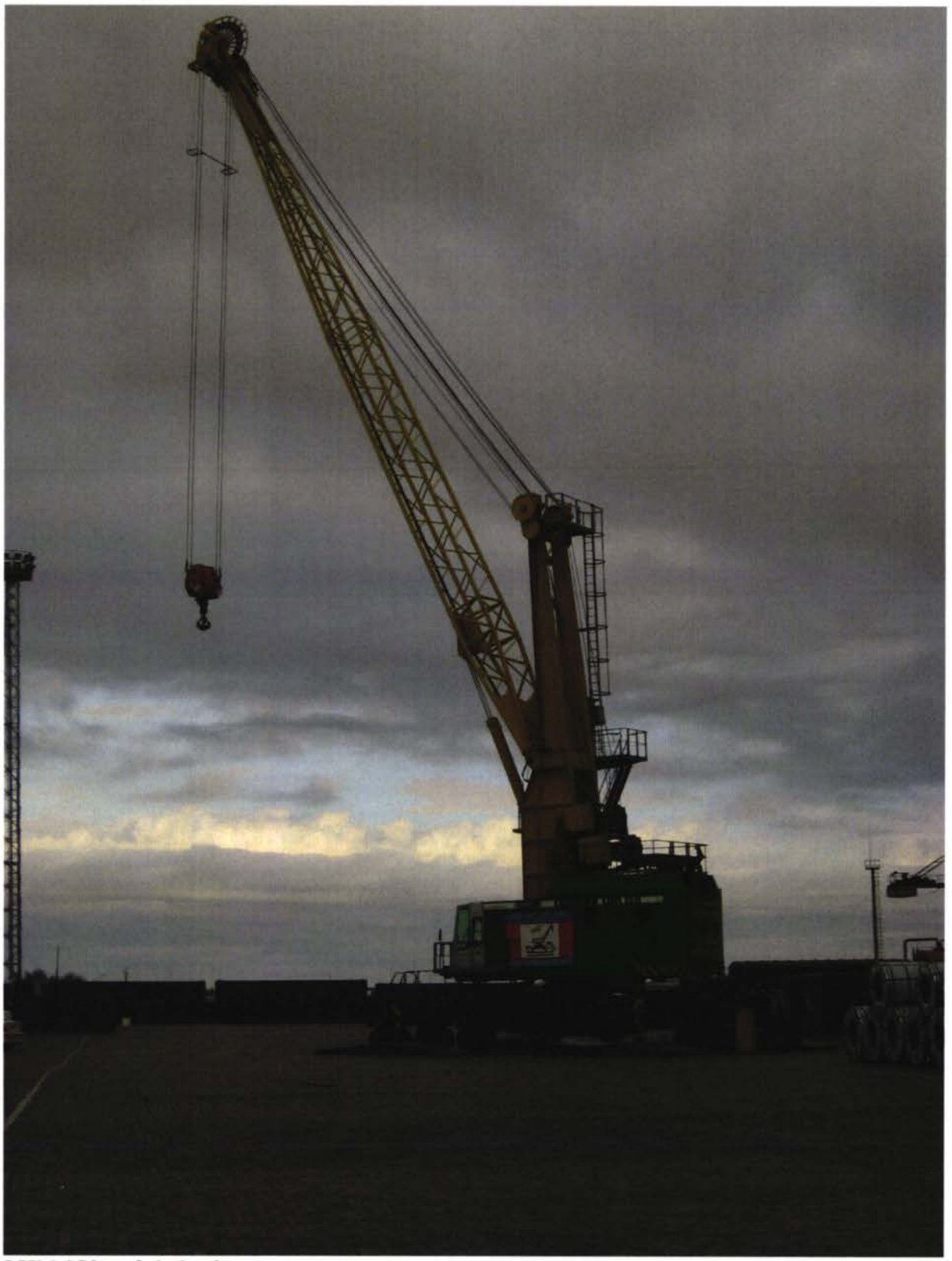
Railway at grain silos

Berth 8

Cranes at berths 1-3

Berths 1-3 quay apron

Handling scrap



LHM 150 mobile harbour crane

Berth 12

Containers stacked near berth 12

General cargo area

Silos & Steel stackyard behind berths 1-3

Steel stackyard behind berths 1-3

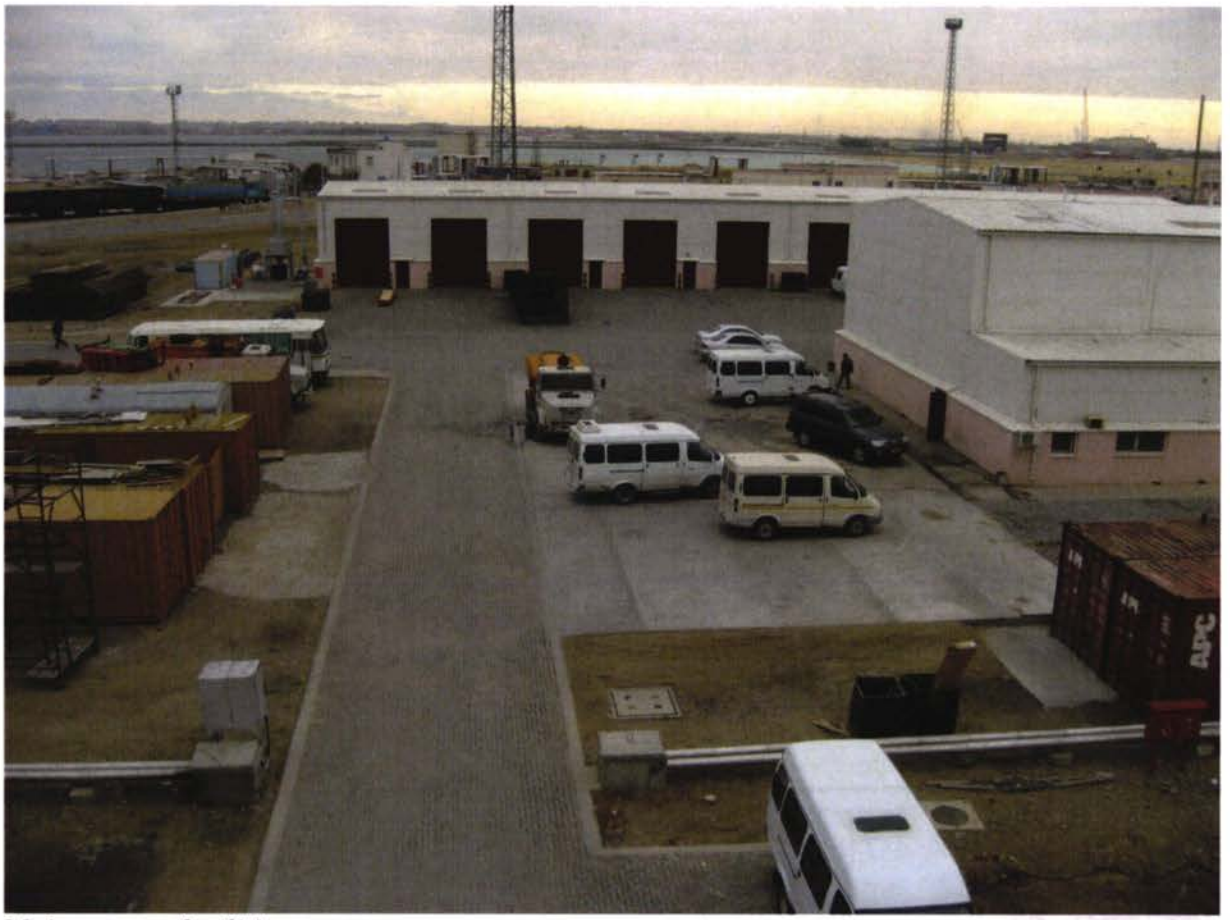
Steel stackyard behind berths 1-3 (shed at rear)

Transit Shed

Shed Interior

Rear railway and AISCP office

Railway behind shed



Maintenance facilities

Equipment Workshop

Breakwater

Tip of Breakwater

Berths 9 & 10 (from north)

Berths 9 & 10 (from south)

North port reclamation

North port breakwater

APPENDIX 3 - ACRONYMS AND INITIALISMS

AISCP	Aktau International Sea Commercial Port
CPC	Caspian Pipeline Consortium
DWT	deadweight
EBRD	European Bank for Reconstruction and Development
EIA	Environmental Impact Assessment
FTZ	Free Trade Zone
ISGOTT	International Safety Guide for Oil Tankers & Terminals
KCTS	Kazakhstan Caspian Transport System
KMG	KazmunaiGas
KTO	KazTransOil
KTS	Kaz Trans Service
KTZ	Kazakhstan Temir Zholy (Kazakhstan Railways)
MHC	Mobile Harbour Crane
MOU	Memorandum of Understanding
MT	million tons
Mtpa	million tons per annum
RTC	rail tank car
SEZ	Special Economic Zone
SLA	Service Level Agreement
SPM	Single Point Mooring
ToR	Terms of Reference
TPH	tons per hour