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APPENDIX 2

CALCULATION OF PAYMENT FOR DAMAGE TO ENVIRONMENT DURING IMPLEMENTATION OF "ATASH" MARINE BASE PROJECT

1 CALCULATION OF PAYMENT FOR DISCHARGES

According to the technical decisions made in the marine base construction project, no discharges into the sea will take place.

At the construction phase sewage from the camp and the office will be discharged into an underground sewage holding tank that will be regularly emptied by a tank truck. Sewage will be taken to the Fort Shevchenko sewage treatment facility.

At the operation phase hazard liquid waste (oily water) will be collected to intercepting wells and holding tank at diesel fuel storage site, pass the passive stage of gravity separation and removed in by the waste management contractor to Koshkar-Ata liquid waste disposal lake at Aktau in a tank trucks. At the jetty head this water will be captured by the jetty head drainage system into a holding tank and then either removed directly by a tank truck or temporary transferred to the site interceptor well. Oily water collected from the vessels at 2 berthing points will be sucked directly into a tank truck and delivered to the same waste disposal lake. Non-hazardous liquid waste (Sewerage from buildings, vessels and surface runoff water) will be collected into two 1000м^3 underground tanks and then transferred by the municipal services tank trucks to the Municipal Sewage Treatment Plant (STP).

It should be emphasized that the Base serves as a transiting point for this waste and the Base Operator has no legal responsibility for its safe disposal. Hence, disposal of these volumes is not accounted during the impact assessment.

2 CALCULATION OF PAYMENT FOR AIR EMISSIONS

Calculation of payment for air emissions during the “Atash” marine base construction and operation in Bautino base, north-eastern part of Caspian Sea, was implemented on the basis of air emission estimation, prepared for this project. Tab. A.2.1 and Tab.A.2.2 show detailed estimation of payment by substances and in total for the project, taking into account the type of sources (mobile and stationary).

Calculation of payment was performed on the basis of “Methodology on the calculation of payment for environmental contamination”, Almaty, 1994, «Methodology on the calculation of payment for air emissions from mobile sources”, Almaty, 1996 and payment rates, specified annually by the regional authorities.

2.1 STATIONARY SOURCES

Payment for normative air emissions was estimated according to the following formula:

$$\mathbf{P_N = R * M_{Ni}}, \text{ where}$$

P_N – payment for normative air emissions, tenge

R – payment rate for emissions, tenge/nominal ton

M_{Ni} – reduced annual normative volume of emissions (nominal ton)

Reduced volume is estimated according to the following formula:

$$M_{Ni} = \sum_{i=1}^{n} M_{Ni} * K_i, \text{ where}$$

M_{Ni} – normative of "i" pollutant in natural units, ton

n – amount of pollutants

i – type of pollutant

Ki – reduction factor, taking into account the relative hazard of "i" pollutant, estimated according to the following formula:

$$K_i = 1/MPCi, \text{ where}$$

MPCi – maximally permitted concentration of "i" pollutant (mg/m^3, g/m^3)

Payment rate in Mangistau region for 2005 for air emissions from stationary sources is 1291 tenge per nominal ton.

2.2 MOBILE SOURCES

$$Pf = Vf * R_N, \text{ where}$$

Pf – payment for estimation period, tenge

Vf – volume of car engine fuel, ton

R_N – payment rate for air emissions from mobile sources, tenge/physical ton, annually specified by the regional authorities.

Payment rates in Mangistau region for 2005 for air emissions from mobile sources are the following (tenge/physical ton):

- Nonleaded gasoline 443
- Leaded gasoline 532
- Diesel fuel 356
- Oil liquefied gas 297

Tab. A.2.1 Payment for air emissions from stationary sources

Pollutant	MPCad, mg/m^3	MPCpeak, mg/m^3	SRLI	Emissions				Reduction factor	Payment rate, tenge	Payment for damage, tenge	
				Ton/year		Nominal ton/year					
				Construction	Operation	Construction	Operation			Construction	Operation
Manganese and its oxides	0.001	0.01		0.00138	0.00069	1.38	0.690	1 000.0	1291	1 781.58	890.790
Nitric dioxide	0.04	0.085		6.11004	3.78943	152.75	94.736	25.0	1291	197 201.54	122 304
Nitric oxide	0.06	0.4		0.10697	0.053487	1.78	0.891	16.7	1291	2 301.70	1 150.86
Sulfuric acid	0.1	0.3		-	0.00068	-	0.007	10.0	1291	-	9
Soot	0.05	0.15		0.30876	0.230208	6.175	4.604	20.0	1291	7 972.08	5943.971
Sulfur dioxide	0.05	0.5		0.76061	3.334056	15.21	66.681	20.0	1291	19 638.82	86 085
Carbon monoxide	3	5		3.97981	8.913934	1.33	2.971	0.33	1291	1 712.64	3 836
Hydrocarbons	1.5	5		0.00003	9.889024	0.00002	6.593	0.67	1291	0.02	0
Xylol	0.2	0.2		0.03200	0.32	0.16	1.600	5.00	1291	206.56	2 066
Benzpyrene	0.00001			0.000008	0.000003	0.80	0.300	100 000.0	1291	1082.6	387
Formaldehyde	0.003	0.035		0.07661	0.025476	25.54	8.492	333.33	1291	32 969	10 963
Kerosene			1.2	1.84101	0.611424	1.53	0.510	0.83	1291	1 980.6	658
White spirit			1	0.04800	0.48	0.05	0.480	1.00	1291	61.97	620
Aerosols of emulsol			0.05	-	0.001127	-	0.023	20.00	1291	-	29.099
Suspended solids	0.15	0.5		13.71686	0.0306	91.45	0.204	6.67	1291	118 056.48	263
Suspended solids	0.15	0.5		37.41169	-	249.41	-	6.67	1291	321 989.98	-
Welding aerosol	0.15	0.5		0.01200	0.006	0.08	0.040	6.67	1291	103.28	52
TOTAL Tenge				**64**	**28**	**548**	**189**			**707 059**	**235 257**
TOTAL, USD										**5 277**	**1 756**

Tab.A.2.2 Payments for air emissions from mobile sources

Pollutant	Emissions during combustion of diesel fuel, t/year		Payment rate, tenge/ton	Payment for damage, tenge	
	Construction	Operation		Construction	Operation
Carbon monoxide	24.8873	7.329	443	11025.094	3 247
Hydrocarbons	10.0608	8.027	443	4456.9534	3 556
Aldehydes	1.80036	0.2094	443	797.55992	93
Soot	4.87157	0.192	443	2158.1033	85
Benzpyrene	0.00007	0.00002	443	0.0328263	0.008
Nitric oxides	17.4741	4.7115	443	7741.0236	2 087
Sulfur dioxide	5.29518	0.349	443	2345.7647	154.607
Lead compounds	-	0.0646	443	-	28.602
TOTAL, tenge				**28 525**	**9 251**
TOTAL, USD				**213**	**69**

Data of Tab. A.2.1 and Tab.A.2.2 shows, that the payment for air emissions from stationary and mobile sources will be 942,316 and 37,775 tenge, correspondingly, and totally **980,092** tenge or **7,314** US dollars.

3 CALCULATION OF PAYMENT FOR WASTE DISPOSAL

Waste planned to be disposed at landfills, according to the project, includes the following:

1) Hazardous liquid waste (hazard class III)
2) Hazardous solid waste (hazard class III)
3) Non-hazardous combustible solid waste (hazard class IV)
4) Non-hazardous non-combustible solid waste (hazard class IV)

Non-hazardous liquid waste (hazard class IV) will processed at treatment plants with further disposal of cleaned liquid phase at evaporation ponds. Thus, payment for this type of waste was not calculated.

Calculation of payment for normative disposal of waste was performed according to the following formula:

$$\mathbf{P_j = R_j * M_{ijN} * Z_g * A_i}, \text{ where}$$

$\mathbf{P_j}$ – payment for normative disposal, tenge

$\mathbf{R_j}$ – payment rate, tenge/ton

$\mathbf{M_{ijN}}$ – normative volume of waste accumulation, ton

$\mathbf{Z_g}$ – divisible factor, taking into account the compliance of waste disposal facility with environmental requirements

$\mathbf{A_i}$ – hazard class of “i” type waste

Payment rate is specified annually by the regional authorities. It is necessary to note that these rates are specified, basing on the hazard class of the waste.

Divisible factor is determined on the basis of «Methodology on the calculation of payment for environmental contamination», Almaty, 1994

Hazard class was also determined on the basis of «Methodology on the calculation of payment for environmental contamination», Almaty, 1994

Detailed description of waste generation process for the project is given in the main EIA report (Sections 7.2.14 and 7.3.12).

Payment for domestic and industrial waste disposal is shown in Tab.A.2.3.

Tab.A.2.3 Payment for industrial and domestic waste disposal

Type of waste	Hazard class	Volumes, ton		Payment rate, tenge/ton	Payment for construction phase, tenge	Payment for operation phase, tenge	Method of disposal/recycling
		Construction	Operation				
Oily water from site and slipway drainage, seawater fuel spills and drums and fuel tanks cleaning	3	-	176	1325	-	233 200	To drainage interception well or slipway drainage holding tank then by tank trucks to Koshkar-Ata liquid waste disposal lake at Aktau
Water from drums, cans and scrap metal cleaning	3	-	9	1325	-	11 925	To slipway drainage holding tank then by tank trucks to Koshkar-Ata liquid waste disposal lake at Aktau
Used oils at workshop and fuel at testing laboratory	3	-	0,8	1325	-	1 060	
Residual paints, thinners, solvents and coatings	3	0,6	87	1325	795	115 275	In sealed and labeled containers to Koshkar-Ata hazardous waste temporary storage site
Acids and alkali from laboratory and workshop	3	-	0,2	1325	-	265	Recovery, neutralizing in the lab then in sealed and labeled containers to Koshkar-Ata hazardous waste temporary storage site
Oiled rugs, spill cleanup absorbents, fuel tanks sludge, fuel filters	3	0,7	1	1325	928	1 325	Delivery to Koshkar-Ata hazardous waste temporary storage site
Fluorescent tubes	3	-	0,1	1325	-	133	Crush at site handle to Koshkar-Ata hazardous temporary waste storage site
Office dry waste and packaging paper and carton	3	0,7	2	1325	928	2 650	In enclosed containers to municipal landfill, burned in pits
Wood	3	0,5	1	1325	663	1 325	In enclosed containers to municipal landfill, utilized by local households
Construction inert waste	4	90	-	662	59 580	-	In dump trucks to municipal landfill
Plastic, glass	4	0,5	9	662	331	5 958	In enclosed containers to municipal landfill
Electric wire	4	0,5	3	662	331	1 986	
TOTAL, tenge					63 555	375 102	*Exchange rate for US dollar is assumed as 134 tenge
TOTAL, USD					474	2799	

4 CALCULATION OF DAMAGE FROM MARINE WILDLIFE AND VEGETATION LOSS

Payment for compensation of unavoidable damage was estimated according to “Temporary methodology on the fish damage assessment as a result of construction, reconstruction and extension of enterprises, facilities and other objects and performance of the various activities in fishery water bodies” approved by the principle Union Ministries in 1990.

Specific biomass of feed organisms (mg/m^3, g/m^3, g/m^2), specific composition of fish fauna, percent ratio of fish species were assumed on the basis of Agip KCO monitoring data in Tyub-Karagan bay (1998-2004). Coefficient of relative fish value was estimated according to the prices of “Atyrau Balyk” LLC for 2005.

According to the technical description of the project, Atash base construction includes the following activities in Tyub-Karagan bay water zone:

a) dredging;

b) additional land reclamation;

c) construction of jetty and wharf;

d) breakwater construction

Methodology of stated activities will not provide direct adverse effect for local fishes. In case of negative factors fish can freely leave the work zone. Calculation assumed the reduction of possible spawning areas due to the bottom covering during breakwater construction and land reclamation, as the worst case.

Damage for benthos was determined as follows: firstly, from the death of bottom fauna without rehabilitation possibility in land reclamation area and breakwater construction zone. This damage is assumed as permanent during the existence of the base.

Area of bottom withdrawn with non-recoverable death of benthos and spawning area loss, m^2 (long-year damage)

Breakwater construction area	11 570
Area of the piling for jetty	1 500
Area of land reclamation	60 000
Total	73 070

Secondly, from temporary death of benthos in dredging area, including 15m zone of suspended solids deposition, which can cover bottom feed organisms. Benthos in this area will rehabilitate over three years.

Area of bottom loss with three-year rehabilitation of benthos, m^2 (three-year damage)

Dredging area	311 500
Additional area of suspended solids deposition	37050

Total	348 550

Volume of zooplankton and phytoplankton impacted, m^3 (one-year damage)

Volume of turbidity at dredging machine pump head	1 401 750
Volume of water pumped	1 440 000
Volume of turbidity at pulp discharge	180 000
Total	3 021 750

This estimation assumes 100% death of feed organisms, as the worst case, regardless to their taxonomy at all areas of unfavorable impact.

Expected loss of fish food reserve in conversion to the biomass of fish products, tons

	Over 1 year	Over 3 years	Long-term
Phytoplankton	4,533	0	0
Zooplankton	0,535	0	0
Benthos	0	6,110	1,912
Fish	0	0	0,029
Total	5,068	6,110	1,941

It should be noted that such estimations assess only proposed damage, because all factors and values of unfavorable damage cannot be assessed in advance. Thus, the monitoring in work zone is necessary to be continued in order to specify the damage value.

4.1 ESTIMATION OF COMPENSATION MEASURES COST

Estimation of damage compensation measures in money terms was performed according to the "Temporary methodology on the fish damage assessment as a result of construction, reconstruction and extension of enterprises, facilities and other objects and performance of the various activities in fishery water bodies":

As the area of Northern Caspi is unique place of sturgeon reproduction and feeding, the compensation measures usually suggest the equity participation in construction and operation of sturgeon plant. Sturgeon plant with capacity of 3,000,000 tiny fishes per year was assumed as analog. Capital costs for construction of sturgeon plant are $5,394,000. Capacity of the plant for sturgeons, taking into account the production recovery, is 538.8 tons per year. Specific investments into the sturgeon plant are $10,011 per one ton of production recovery.

Obtained damage values, converted to the fish products, were distributed by species, which can be registered in Tyub-Karagan bay, pro rata to their quantitative ratio and converted to sturgeons according to the relative value coefficient.

Total damage from the activity performed	**Over 1 year**	**Over 3 years**	**Long-term**
in conversion to the sturgeons, ton	0.487	0.587	0.187

Cost of compensation to mitigation the possible damage provided in Tyub-Karagan bay due to the project activity in case of equity participation in construction and operation of surgeon plant will be the following:

Compensation	US dollars	Tenge	Payment mode
One-year damage	**$ 592**	**79 330**	One-time payment
Three-years damage	**$ 2 141**	**286 922**	One-time payment
Long-term damage[1]	**$ 1 882**	**252 179**	Annually, all period of the Base existence

5 SUMMARY OF PAYMENTS FOR ENVIRONMENTAL CONTAMINATION

Tab. A.2.4 shows the summary values of payment for environmental contamination

Tab. A.2.4 Summary table of payment for environmental contamination during the Atash marine base construction and operation

Type of payment	Sum, tenge	Sum, dollars
Payment for air emissions, including	735 584	5 489
For emissions from mobile sources	*28 525*	213
For emissions from stationary sources	*707 059*	5 277
Payment for waste disposal	438 656	3 274
Payment for damage to the fish resources	618 431	4 615
For 1-year damage (one-time payment)	*79 330*	592
For 3-years damage (one-time payment)	*286 922*	2 141
For long-term damage (annual payment)	*252 179*	1 882
TOTAL	**1 792 671**	**13 378**

Thus, general payments for the environmental damage due to the Atash marine base construction and operation will be **1 792 671** tenge or **13 378** USD.

[1] Long-term damage here means irretrievable loss of marine fauna as a result of the construction of components, which will permanently or durably occupy marine space, where vegetation and animals would inhabit (piles, breakwater)