Environmental Monitoring Report

Bi-Annual Report
June 2016

AZE: Second Road Network Development Investment Program – Project 2

Prepared by Azeravtoyol OJSC of the Republic of Azerbaijan for the Asian Development Bank.

Bi-annual Environmental Monitoring Report

Project Number: 45389-004

Loan: 3144-AZE

Republic of Azerbaijan:
Road Network Development Program, Project: Tranche 2
Construction Supervision of the Alat-Astara Highway
Jalilabad Intersection to Shorsulu Intersection

(Financed by the Asian Development Bank)

Report 1: January to 30 June 2016

Loan 3144-AZE

Prepared by Azeravtoyol OJC for the Asian Development Bank (ADB).

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Abbreviations

ADB	Asian Development Bank	The Funding Agency
AQP	Air Quality Plan	
ARS	Azeravtoyol Open Joint Stock Company	The Executing Agency
CCP	Plan for Construction Camps	
EIA	Environmental Impact Assessment	
EIS	Environmental Impact Statement	
EMP	Environmental management plan	
EO	Environmental Officer	
ERP	Emergency Response Plan	
HDDV	Heavy Duty Diesel Vehicles	
HSP	Health and Safety Plan	
Kolin	Kolin Construction Tourism Industry & Trade Co. Inc.	The Contractor
MENR	Ministry of Ecology and Natural Resources	
PAH	Polycyclic aromatic hydrocarbons	
SEMP	Site Specific Environmental Management Plan	Contractor Generated Document
TERA	TERA International Group. Inc	The Supervising Consultant
WMP	Waste Management Plan	

A. Introduction

i. Introduction to Project

1. The Contract, which comprises sections of the Alat-Astara Motorway (M3), commences at the Bilasuvar Interchange (Km80+600) and runs in a generally south westerly direction ending at the Jalilabad Interchange (Km 110+700). It forms part of the road connection from Baku to the Iranian border (at Astara). The road alignment passes through the Mahmudchala and Akchala wetlands. A schematic arrangement of the project is presented in the Attachment B Figure 1.

2. The Executing Agency for the project is the Azeravtoyol Open Joint Stock Company.

3. An Environmental Impact Assessment (EIA) was carried out for the project in 2007 and included an Environmental Management Plan (EMP) that set out the environmental requirements for the project. The EIA report was approved by Azeravtoyol and Asian Development Bank (ADB) in 2012[1], and has served as a basis for the development of the specification and contract documents, and for the preparation of the Contractor's Site Specific Environmental Management Plan (SEMP).The SEMP includes a set of 4 main plans (Camp, Workshop, Plant Operation and Road Construction) and 8 sub plans (Water, Air Pollution, Noise, Waste, Soil, Site Drainage, Borrow Pit, Flora & Fauna and Cultural and Archaeological Find and Grievance Redress Mechanism).

4. The Site Supervision Consultant appointed by Azeravtoyol is TERA International Group. Inc. (TERA). The Contract is Design and Build (DB)[2] and the Contractor is Kolin Construction Tourism Industry and Trade Co. Inc. (Kolin).

5. The organization structure is shown in the Attachment B Figure 2.

ii. Objectives of Biannual Environmental Reporting

6. The purpose of the Bi-annual Environmental Monitoring Reports is to provide a summary of the key issues relating to environmental management over the past six months. The summary includes an update on overall project progress, the status of Site Environmental Management Plan (SEMP) implementation, any progress made with environmental management, environmental monitoring results, and other relevant issues such as non-compliance and corrective actions, and monitoring of the Grievance Redress Mechanism (GRM).

[1] ADB project 45389-001 in Azerbaijan. Second Road Network Development Investment Program: Masalli (Sarcuvar) Interchange to Shorsulu (Bilasuvar) Interchange. http://www.adb.org/projects/documents/second-road-network-development-investment-program-masalli-to-shorsulu-interchange-eia

[2] Design and Build is a method to deliver a project in which the design and construction services are contracted by a single entity (the Design and Build Contractor – in this case Kolin).

7. The Reports are prepared by Azeravtoyol and are intended to inform ADB and any other interested parties on the status of environmental management of the project. The Reports are summaries; more detailed information is included in the monthly and quarterly reports prepared by the Kolin and TERA.

iii. Methodology

8. The Biannual Environmental Monitoring Reports are prepared by reviewing and extracting information from sources including:
   - Kolin's Monthly and Quarterly and TERA Monthly Reports;
   - Kolin's Grievance Registers;
   - TERA's Environmental Field Reports;
   - Instrumented monitoring results;
   - Reports from TERA and Kolin on training and public consultation; and
   - Site inspections made by TERA.

iv. Construction Activities and Project Progress during reporting period

9. Kolin has acquired a lease on land at km 110 +700 and has established a construction camp and manufacturing area.

10. During the last six months the Contractor has transported material from Lenkeran Borrow pit, Yardimli Borrow Pit , Jalilabad Quarry, Sabirabad Quarry ,Ashurlu quarry, Yusuflu Quarry and Behramtepe Quarry On road construction, Kolin has started to form base layers of the road between Km 104 + 000 - 108+290 in rock fill sourced from the Yardimli Borrow Pit
11. The Contractor has started filling works between km 110 + 700 and 110 + 000
12. The Contractor has started installation of Pipe Culverts at Site. Pipe Culvert Construction works are in progress at km 109+931,km 109+767,km 109+671 and km108+563
13. The Contractor has started removal of Topsoil according to Environmental Procedures.

Monthly Progress of the Contractor during the last Six Months

Year	Month	Programmed	Progress	Time Elapsed
2016	Jan	2.24%	2.12%	1.70%
	Feb	2.70%	2.75%	4.48%
	Mar	3.40%	3.38%	7.26%
	Apr	5.29%	5.39%	10.04%
	May	9.19%	10.26%	12.81%
	Jun	15.17%	16.79%	15.59%

v. Project organization and environmental management team

14. TERA personnel · Mr. Alizamin Mustafayev, the approved National Environmental Monitoring Specialist, has been based employed on the project since 11 Feb 2016. Mr. Andrew Taylor the TERA International Environmental Monitoring Specialist was based on site from 31st March 2016 to 28th April 2016. Mr. Luca Luiselli (Ecologist – Turtle Specialist) was based on site from 25th April to 7th May2016.

15. The KOLIN environmental team is resident on site, led by Hafiz Abilhasanov (Environmental Manager) assisted by Elchin Kerimov (Health and Safety Officer) and the Environmental Protection Team (comprising a dedicated environmental technician) as presented in the Site Specific Environmental Management Plan (April 2016).

vi. Construction Camp

16. The Contractor has acquired a lease on land at km110 +700 to accommodate labor, Consultant and Contractor's technical staff, as well as offices, storage and manufacturing areas. The offices and accommodation were occupied during the reporting period and manufacturing activities are in progress including: stockpiling of construction stone from

the Lenkeran, Behramtepe and Yardimli borrow pits; crushing and grading of aggregate; concrete batching; and precast concrete manufacture. The contractor has covered vehicle running areas within the compound in gravel to reduce incidence of standing water and silt runoff and has initiated an extensive landscaping programme including tree planting and grassed areas. Schematic of the Construction Camp is given in Attachment B, Figure 3.

17. Septic Tanks have been installed for domestic and kitchen waste and solid waste bins are provided within the compound and removed for disposal by a licensed contractor. Fuel tanks and chemicals on site are stored within bounded areas. The vehicle washing area and concrete batching area have dedicated concrete lined sediment ponds.

vii. Relationships between project stakeholders.

18. The relationships between Funding Agency (ADB), Implementing Agency (Azeravtoyol), Supervision Consultant (TERA) and Contractor (Kolin) are considered to be normal working relationships.

19. At the working level, communication with regards to environmental issues remains good and interaction with the public is good.

B. ENVIRONMENTAL MONITORING

i. Status

20. Preconstruction monitoring of Air Quality, Water Quality, Noise and Vibration took place on 7th February 2016. The monitoring comprised six air quality, noise and vibration monitoring locations and one water quality site at Muganxolu channel (upstream and downstream from Bridge No1 Km 99+000). The six air, noise and vibration monitoring points are at three locations in Uzuntepe Village (immediately east of the camp), the sand borrow pit (located north of Uzuntepe Village) and two locations at the Vilash rock borrow pit (south of Bambashi Village). The first round of construction phase monitoring was carried out on May 21, 2016.

21. In addition to daily informal monitoring by the TERA and KOLIN environmental teams there is a joint weekly inspection by TERA and KOLIN at the camp and working sites. Observations in March are that work was being carried out in accordance with the environmental requirements of the EIA its EMP and the SSEMP. There were no environmental non-conformities recorded in the reporting period.

ii. Results

a) All water quality monitoring results for all determinants and all monitoring stations were below Azeri national standards during the present reporting period.

b) All air quality monitoring results for all determinants and all monitoring stations were below Azeri national standards during the present reporting period. Particulate, NO2 and

CO readings were generally lower than in previous monitoring periods and they even showed a further lowering trend towards the end of the reporting period. The reductions could be due to a combination of factors, such as higher rainfall, reduced earthworks and also a reduction in activity at the municipal crushing facility.

c) Noise monitoring results were all below the permitted limits during the reporting period.

d) Vibration monitoring results were all below the permitted limits during the reporting period.

22. The tables 1,2, 3 and 4 of Attachment A and Kolin's report in Attachment H set out the results of the pre-construction environmental monitoring programme.

iii. Action

23. No action is required as a result of the pre-construction monitoring. The Monitoring was carried out on May 21,2016

24. The tables 5, 6, 7 and 8 of Attachment A and Kolin's report in Attachment H set out the results of the May, 2016 environmental monitoring programme

Results :

a) All water quality monitoring results for all determinants and all monitoring stations were below Azeri national standards during the present reporting period.

No work, so no monitoring carried out in May 2016

b) All air quality monitoring results for all determinants and all monitoring stations were below Azeri national standards during the present reporting period. Particulate, NO2 and CO readings were generally lower than in previous monitoring periods and they even showed a further lowering trend towards the end of the reporting period. The reductions could be due to a combination of factors, such as higher rainfall, reduced earthworks and also a reduction in activity at the municipal crushing facility.

c) Noise monitoring results were all below the permitted limits during the reporting period.

d) Vibration monitoring results were all below the permitted limits during the reporting period.

C. ENVIRONMENTAL MANAGEMENT

i. Status

24. The project is in its first year and in terms of environmental management the key issue is to ensure that the Contractor (Kolin) understands the environmental requirements of the project and that these requirements are being met, and that the necessary environmental documentation and licenses are in place.

ii. Documents

25. Guiding environmental documentation used on the project given in Table 9, Attachment A.

iii. Inspections and Audits

26. Kolin and TERA carry out weekly site audits covering all operational sites and the camp compound. Kolin use a checklist identified in the SEMP comprising a single document that covers all work aspects. Kolin have developed this document over a number of years and projects and they find that it provides the detail that they need to monitor environmental performance of the works. TERA use a modified document comprising a series of one page sheets covering specific aspects of the work.

27. The TERA checklists feed from the Contractor generated SMP. The Table 10, Attachment A illustrates the relationship.

28. The sheets cover:

Camp (including the offices, canteen, recreation areas and accommodation units)
Crushing plant (including the pre-processing and post-processing stockpiles
Concrete Plant (Including the batching plant stockpiles and settlement tanks);
Workshop Area (including bounded storage of liquids, wash down & settlement tanks); Borrow Pits (Operation activities including dust & noise control, and runoff control)
Wetland (activities within the wetland)
Management and Community (Environmental document control, Grievance Redress)

29. The TERA sheets also include options for recording three level of impact:

Observation – a potential for localized environmental impact but none has occurred;
Opportunity for Improvement – a recurrent "observation" requiring action but again no incident has occurred.
Non Conformity recurrent OFI or an incident has occurred and a Corrective Action Plan (CAP) and staff retraining / education may be required (Refer to Table 11, Attachment A).

Non-Compliance and Corrective Actions

30. The Contractor, Kolin, has registered minor deviations from the Environmental Management Plan in the project EIA. These deviations are considered to be in the lowest

level of the "non conformity" and have been rectified promptly without significant impact on the environment.

31. TERA performs audit using a three tier level of "non conformity.

Observation – a potential for localized environmental impact but none has occurred; Opportunity for Improvement – a recurrent "observation" requiring action but again no incident has occurred.

Non Conformity – recurrent OFI or an incident has occurred and a Corrective Action Plan (CAP) and staff retraining / education may be required.

v. Consultations and Complaints

a. Public Consultations

32. In the SEMP Kolin identifies public meetings at six monthly to inform the local community of project activities. The first public consultation was on 5th February 2016 in the Kolin Camp for the villagers of Uzuntepe, immediately east of the camp. The next meeting has been rescheduled from 15th June 2016 to a date to be confirmed in August. Refer to Table 12, Attachment A.

b. Grievance Redress Mechanism

33. The Grievance Redress Mechanism (GRM) is included in the EMP and has been developed in the Kolin SEMP. A Grievance Focal Point has been established for the Uzuntepe – Jalilabad Area with two hotlines. Two minor complaints were registered in the complaints log in the first six monthly reporting period but have been promptly addressed. The Grievance Redress Committee has not had course to convene in January to June 2016. Information about Complaints and Compliments are given in Table 13, Attachment A.

c. Staff Training and Education

34. Environmental Training – TERA presented a training workshop on the SEMP for the environmental team of Kolin on Thursday 14thApil 2016 in the TERA offices at the Kolin Construction camp. The workshop covered lines of communication, SEMP documentation and potential environmental impacts of the project.

35. Water Quality – Due to the presence of valuable wetlands that the project will cross, TERA organized a training workshop on the ways that construction activity can affect the water environment and the precautions needed to prevent runoff. The workshop was held in the TERA offices on 25 May 2016

36. Turtle Management Plan –Mr. Luca Luiselli (Ecologist – Turtle Specialist) presented the Turtle Management Plan to members of the KOLIN site team on 05 May 016. The main items covered were how to protect turtles from construction impacts. Both direct impact

from construction activity (e.g. siltation, fatalities due to turtle plant interaction) and indirect actions (e.g. disruption of breeding activities).

37. The PowerPoint presentations used in the training are included as an Appendix C to the document. Information about training also given in Attachment A -Table 14 and Attachment D.

d. HIV / AIDS

38. Kolin presented the first HIV / AIDS briefing for site staff on 11th April 2016. The presentation was made by Mr. Murselov (Camp Doctor of Kolin) and was attended by 33 members of the construction team. Table 15, Attachment A illustrates information about briefing.

vi. Emerging Issues

39. No specific emerging environmental issues have been identified but with work in and close to wetlands continuing Kolin must be vigilant on the potential for adverse impact and continue implementing the mitigation measures identified in the Contractor Site Specific Environmental Management Plan (SEMP)

vii. Conclusions

40. The Contractor, Kolin, has prepared and is following the environmental requirements of the EIA and its Environmental Management Plan (EMP) through its Site specific Environmental Management Plan(SEMP). Environmental performance is being audited on a weekly basis by Kolin and TERA, using checklists based on the SEMP and has only yielded minor environmental incidents that have been promptly rectified.

41. The TERA ecological specialist visited the site in April 2016. He visited the wetlands and based on these experiences prepared a "Turtle Management Plan" (Refer to Appendix C) that has been incorporated into the Kolin Wetland Management Plan.

42. Environmental performance for the first sixth months of the project is considered satisfactory.

APPENDIX A

TABLES

Table 1: Water Quality Monitoring Results (at Muganxolu channel)

Parameter	Units	Upstream	Downstream	Allowable
pH		**6.8**	**7.0**	**6.0 – 9.0**
Conductivity	$X10^{-3}$ cm/cm	0.180	0.182	-
Limpidity	cm	16.7	16.8	>30
Turbidity	mg/l	18.4	18.6	>30
Dissolved Oxygen O_2	mg/l	4.1	4.2	4.6 – 6.0
BOD	mg/l	2.3	2.4	3
Roughness		5.1	5.2	7.0
Calcium Ca^{2+}	mg/l	128.1	129.0	180
Magnesium Mg^{2+}	mg/l	43.2	43.4	200
Chloride Cl^-	mg/l	144.8	145.0	350
SulphateSO_4^{2-}	mg/l	221.3	221.4	500
BicarbonateHCO_3^-	mg/l	198.2	198.4	-
Na^+ & K^+	mg/l	168.4	167.8	-
Sum of Ions	mg/l	904.0	905.1	1000
Ammonium NH_4^+	mg/l	**0.434**	**0.435**	0.39
Nitrite NO_2^-	mg/l	0.012	0.012	0.02
Nitrate NO_3^-	mg/l	6.4	6.6	9.0
Oil & grease	mg/l	0.002	0.002	0.05
E-coli	Per liter	837	840	1000
Total SS	mg/l	0.238	0.240	0.25
SSAM	mg/l	0.03	0.04	0.1
Phenol	mg/l	0.0001	0.0001	0.001

Table 2: Air Quality Monitoring Results

	Close to the Camp (Uzuntepe village)												**Vilash Borrow (Bambashi Village)**					
	N of camp			**E of Camp**			**SE of camp**			**S of sand borrow**			**N of Borrow**			**NE of Borrow**		
Units (mg/m^3)	***Dust***	***NO_2***	***CO***	***Dust***	***NO_2***	***CO***	***Dust***	***NO_2***	***CO***	***Dust***	***NO_2***	***CO***	***Dust***	***NO_2***	***CO***	***Dust***	***NO_2***	***CO***
Allowable	*0.5*	*0.085*	*5*	*0.5*	*0.085*	*5*	*0.5*	*0.085*	*5*	*0.5*	*0.085*	*5*	*0.5*	*0.085*	*5*	*0.5*	*0.085*	*5*
09:00 7 Feb 16	*0.1*	***0.32***	*1*	*0.1*	*0.034*	*1*	*0.1*	*0.035*	*1*	*0.2*	*0.038*	*2*	*0.2*	*0.039*	*2*	*0.2*	*0.036*	*2*

Table 3: Noise Monitoring Results

	Close to the Camp (Uzuntepe village)				Vilash Borrow (Bambashi Village)	
Units (dB)	N of camp	E of Camp	SE of camp	S of sand borrow	N of Borrow	NE of Borrow
Allowable	70	70	70	70	70	70
09:00 7 Feb 16	59.4	50.0	56.7	59.4	52.2	57.5

Table 4: Vibration Monitoring Results

	Close to the Camp (Uzuntepe village)				Vilash Borrow (Bambashi Village)	
Units (dB)	N of camp	E of Camp	SE of camp	S of sand borrow	N of Borrow	NE of Borrow
Allowable	77	77	77	77	77	77
09:00 7 Feb 16	65	56	63	65	57	64

Table 5: Water Quality Monitoring Results (at Muganxolu channel)

No work, so no monitoring carried out in May 2016

Table 6: Air Quality Monitoring Results

	Close to the Camp (Uzuntepe village)											
	N of camp			E of Camp			SE of camp			S of sand borrow		
Units (mg/m^3)	*Dust*	*NO_2*	*CO*	*Dust*	*NO_2*	*CO*	*Dust*	*NO_2*	*CO*	*Dust*	*NO_2*	*CO*
Allowable	*0.5*	*0.085*	*5*	*0.5*	*0.085*	*5*	*0.5*	*0.085*	*5*	*0.5*	*0.085*	*5*
21,May 2016	*0.3*	***0.45***	*2*	*0.3*	*0.042*	*3*	*0.2*	*0.040*	*2*	*0.3*	*0.048*	*3*

Table 7: Noise Monitoring Results

	Close to the Camp (Uzuntepe village)					
Units (dB)	N of camp	E of Camp	SE of camp	S of sand borrow		
Allowable	70	70	70	70		
21 May 2016	57.2	51.9	49.0	45.6		

Table 8: Vibration Monitoring Results

	Close to the Camp (Uzuntepe village)					
Units (dB)	N of camp	E of Camp	SE of camp	S of sand borrow		
Allowable	77	77	77	77		
21 May 2016	64	58	47	52		

Table 9: Environmental documentation used on the project

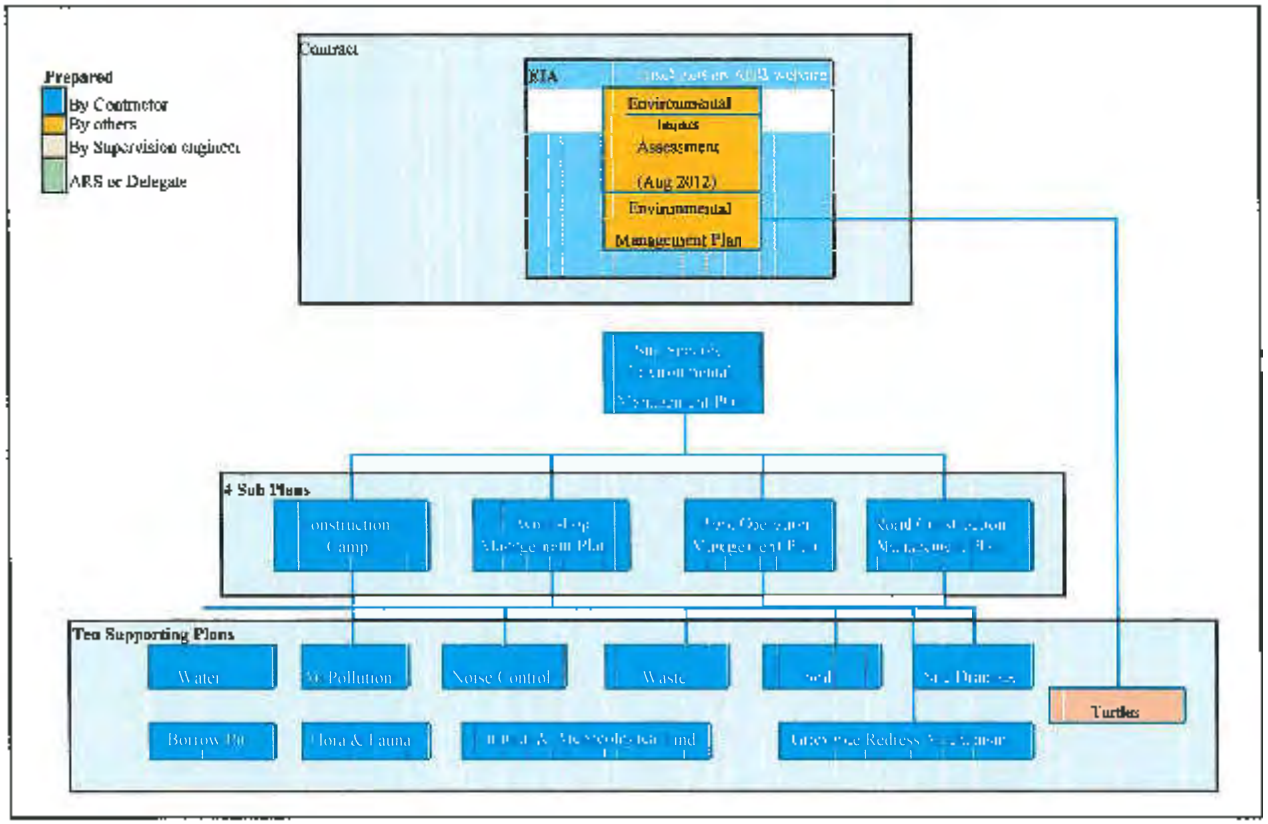


Table 10: TERA checklist concept – Feeding from Contractor SEMP

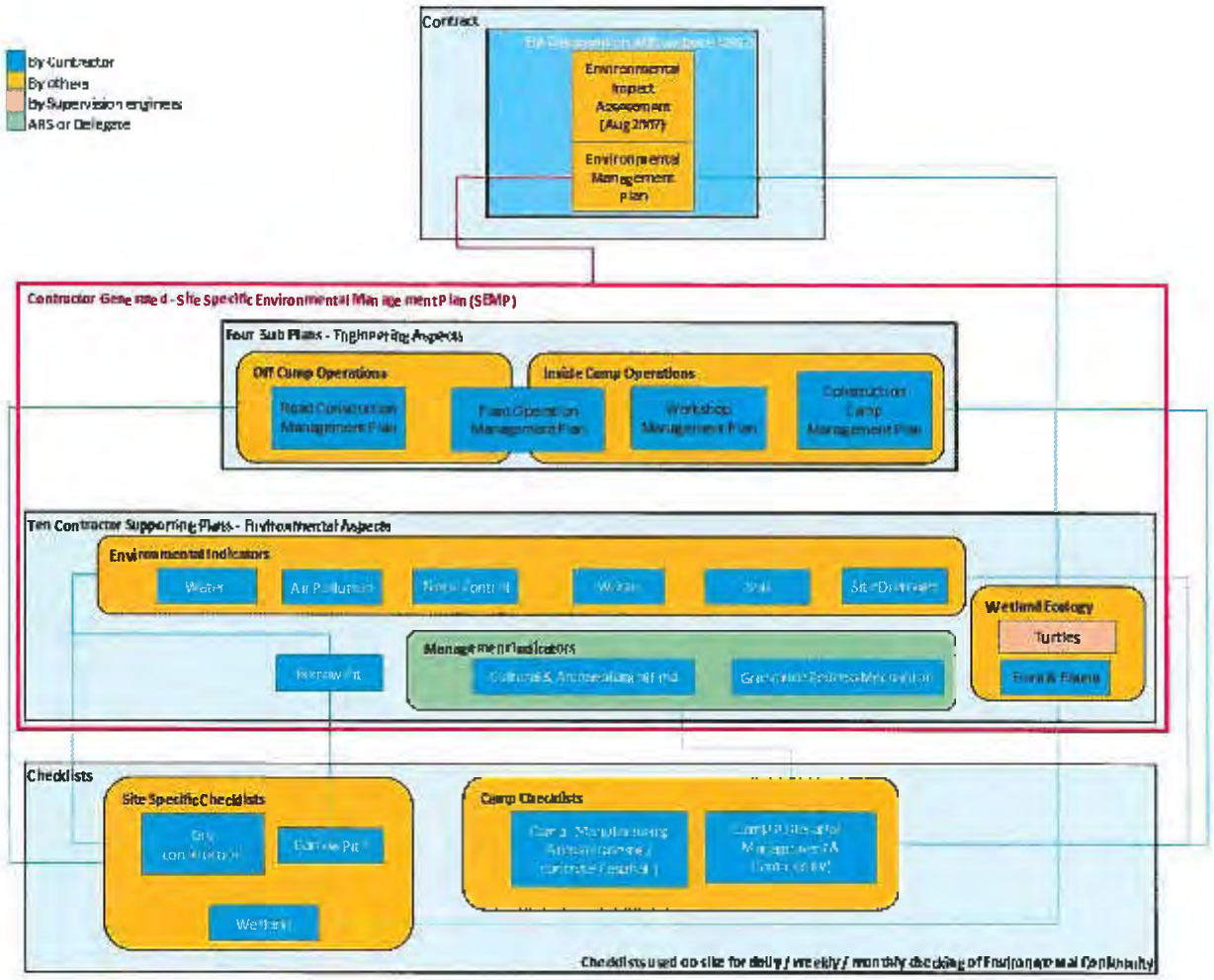


Table 11: Log of Audits carried out

	Weekly Joint monitoring		Monthly TERA	Non-conformity
Date	Kolin	TERA	Audit by::	
05 Jan 16	☑	☑		
12 jan 16	☑	☑		
19 Jan 16	☑	☑		
26 Jan 16	☑	☑		
03 Feb 16	☑	☑		
10 Feb 16	☑	☑		
16 Feb 16	☑	☑		
22 Feb 16	☑	☑		
06 Mar 16	☑	☑		
14 Mar 16	☑	☑		
23 Mar 16	☑	☑		
01 Apr 16	☑	☑		
07 Apr 16	☑	☑		
11 Apr 16	☑	☑		
24 Apr 16	☑	☑		
07 May 16	☑	☑		
14 May 16	☑	☑		Observation – 4 oil drums outside fuel bund. Rectified
21 May 16	☑	☑	Alizamin	
26 May 16	☑	☑		Observation – Concrete Plant open drainage line filled with

				sediment. Rectified
04 Jun 16	☑	☑		
11 Jun 16	☑	☑		Observation – sedimentation tank needs sediment removed. Rectified
18 Jun 16	☑	☑		
25 Jun 16	☑	☑	Alizamin	

Table 12: Schedule of Public Consultations

Scheduled	Actual	Venue	Discussion Items	Attendees
20 Dec15	5 Feb 16	Kolin Camp	Construction schedule& Grievance Redress Mechanism	21 -- No comments from attendees.
15 Jun 16	In August		-will be carried out in August	
10 Dec 16				
5 Jun 17				
10 Dec 17				
15 Jun 18				
20 Dec 18				

Table 13: Complaints and Compliments

Date	Number	Description	Resolved
Jan 2016	Nil	-	-
Feb 2016	1	Damage to property-	Repaired to satisfaction of complainant-
Mar 2016	Nil		-
April	Nil	-	-
May	2	Household lands were occupied more than agreed	PIU have been informed and the problem has been solved
Jun	Nil	-	-

Table 14: *Staff training*

Date	Subject	Venue	Presenter	Attendees
14 April 2016	Site Specific Environmental Management Plan (SEMP)	TERA office, Kolin Camp at Km110	A Taylor – International Monitoring Specialist (TERA)	7
05 May.2016	Turtle Management Plan	TERA office, Kolin Camp at Km110	Mr. Luca Luiselli- Ecologist – Turtle Specialist (TERA)	5
25 May 2016	Water Pollution	TERA office, Kolin Camp at Km110	Alizamin Mustafayev – Environment/Safeguard specialist (TERA)	4

Table 15: *HIV / AIDS briefing*

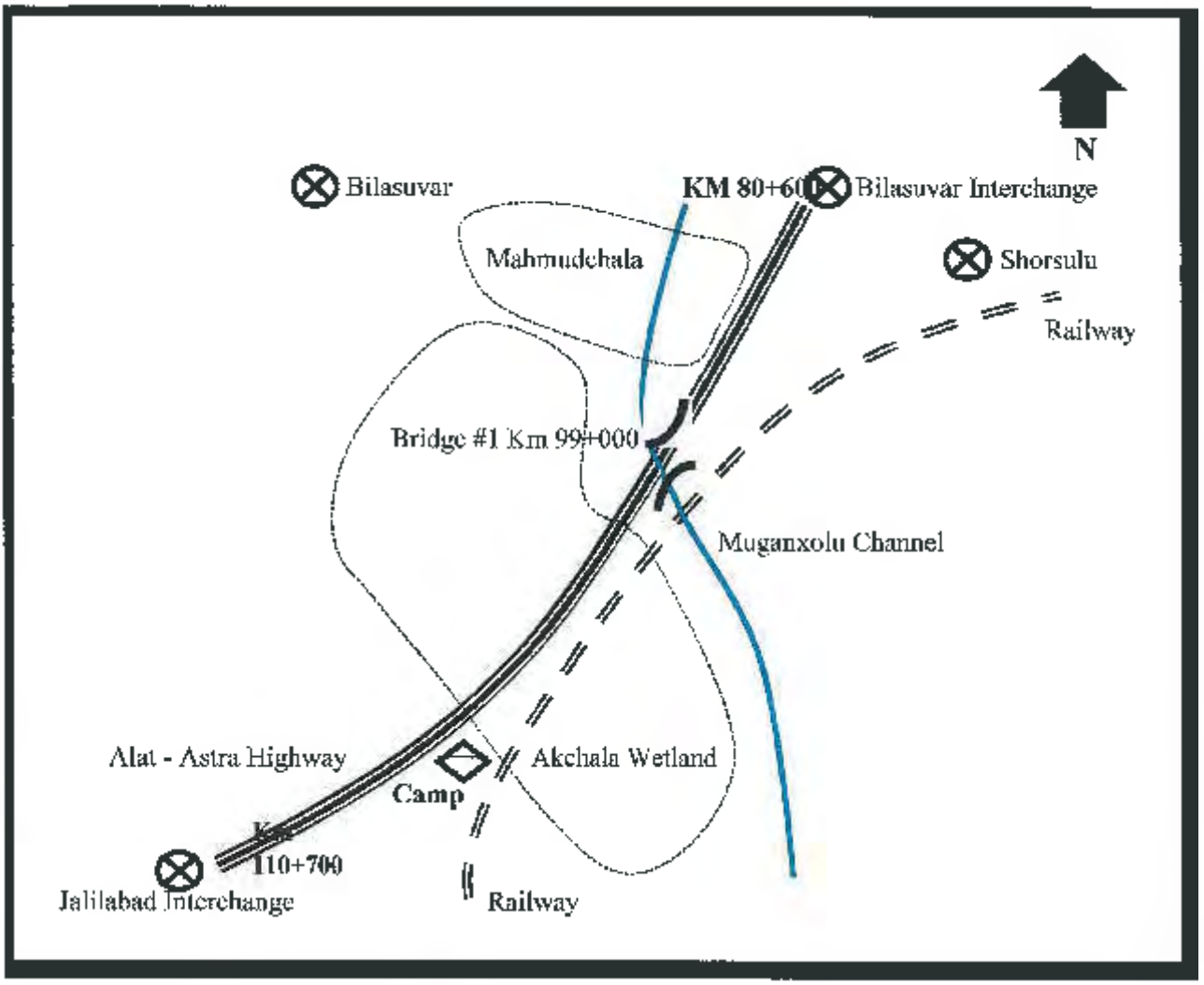
Scheduled	Actual	Venue	Presenter	Attendees
20 Apr 16	11 Apr 16	Kolin Camp at Km 110	Dr. Murselov (Camp Doctor of Kolin)	33
20 Jul 16				
20 Oct 16				
20 Jan 17				
20 Apr 17				
20 Jul 17				
20 Oct 17				

Meeting schedule from SEMP (April 2016, Pg 198)

APPENDIX B

FIGURES

Figure 1: Schematic arrangement of the alignment



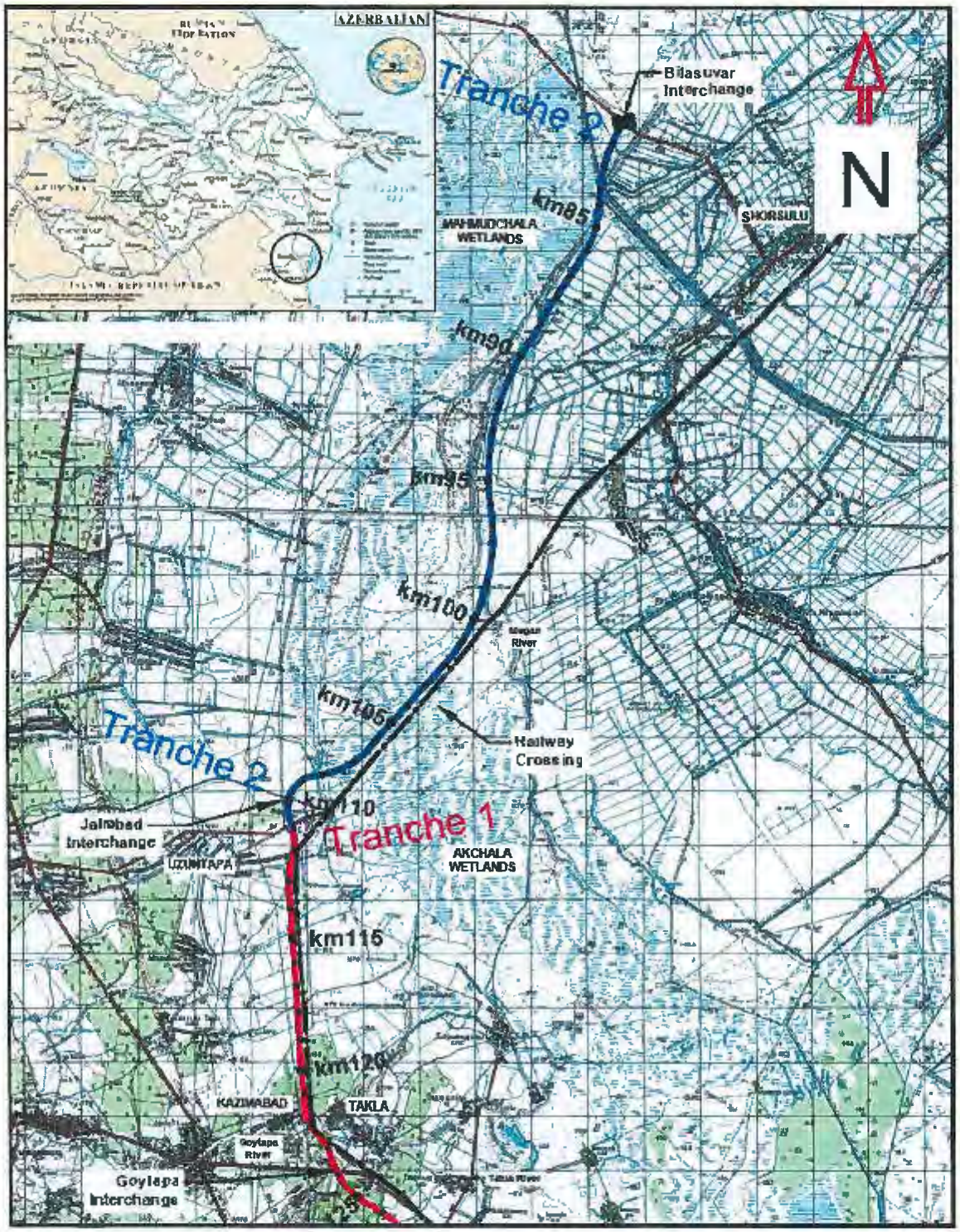

AZERBAIJAN
Tranche 2
Bilasuvar Interchange
N
km85
MAHMUDCHALA WETLANDS
SHORSULU
km90
km95
km100
Railway Crossing
km105
Tranche 2
km110
Tranche 1
Jalilabad Interchange
UZUNYAPA
AKCHALA WETLANDS
km115
km120
KAZIMABAD
TAKLA
Goytapa River
Goytapa Interchange

Figure 2: Organization Structure for the Project

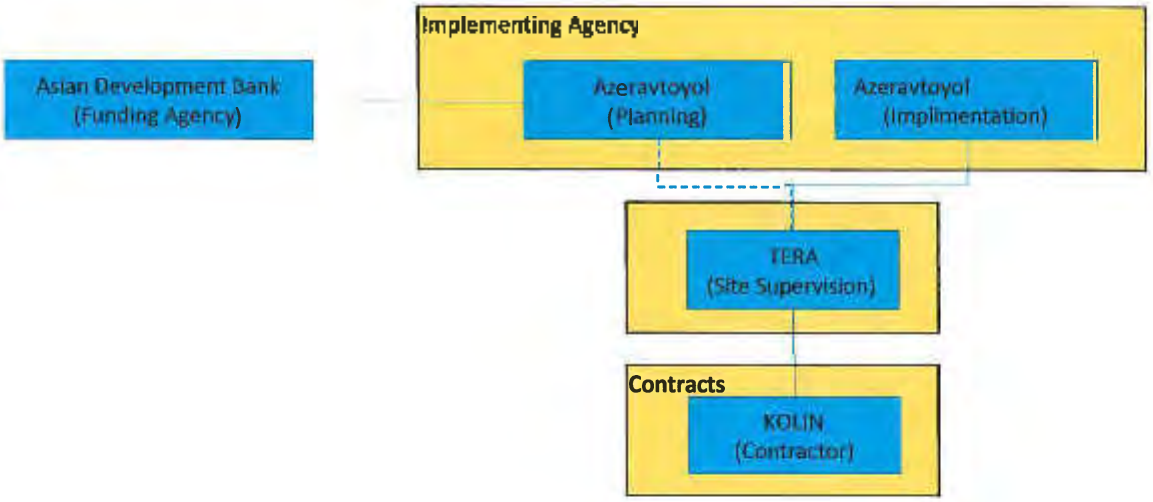


Figure 3: Schematic of the Construction Camp at Km 110+600

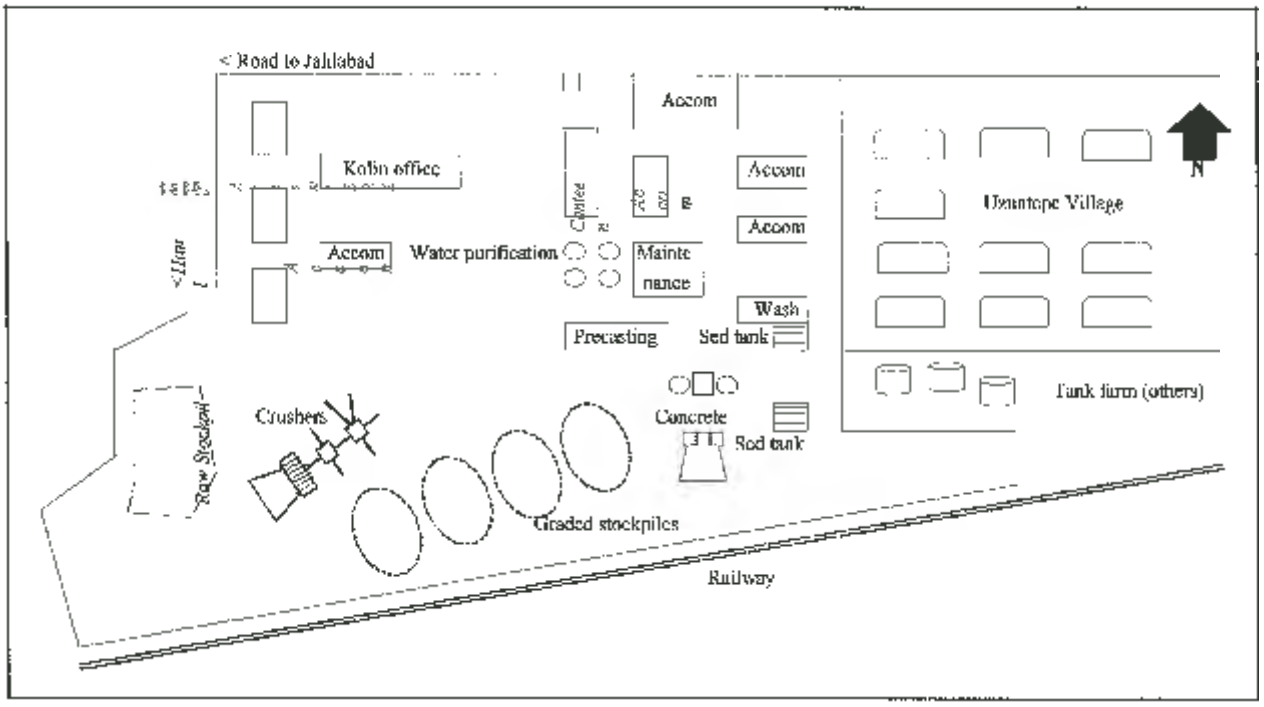


Figure 4. Bounded Fuel Tank inside Construction Camp

Figure 5 Concrete batching plant inside Camp

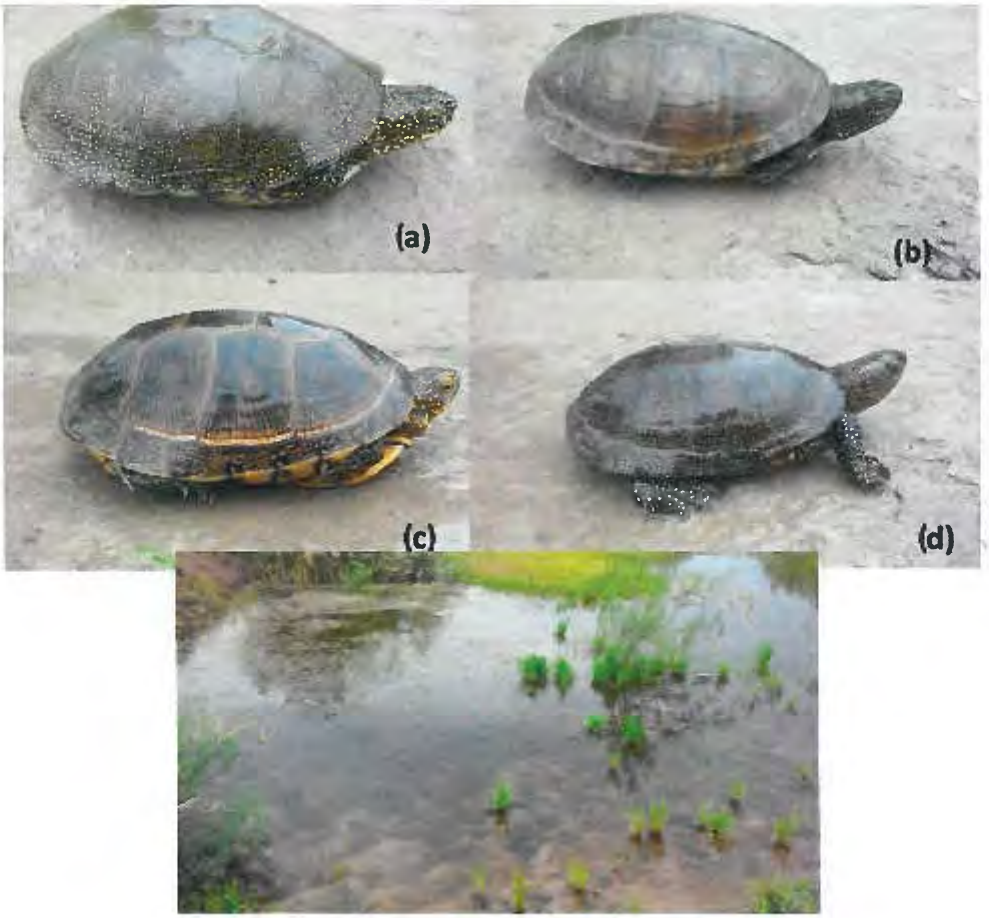
APPENDIX C

TURTLE ACTION PLAN

"AZERAVTOYOL" OJCS,

REPUBLIC OF AZERBAIJAN

ADB LOAN: 3144-AZE: CONSTRUCTION SUPERVISION OF ALAT-ASTARA HIGHWAY FROM JALILABAD INTERSECTION TO SHORSULU INTERSECTION (KM 110+700 to 80+600)



TURTLE ACTION PLAN

MAY 2016

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DRAFT TURTLE ACTION PLAN

Rev. #	Date	Revision description	Written by	Verified by	Reviewed by	Approved by
0	14 May 2016	Draft	Prof. Luca M. Luiselli, Ecologist*	A. J. Taylor, Environmental Specialist	J. J. Bentley, Team Leader	A. Gezen, President

* IUCN/SSC Tortoises and Freshwater Turtles Specialist Group, Steering Committee Member

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1. BACKGROUND

1. According to IUCN (2016), two species of freshwater turtles do occur in Azerbaijan, and both also should occur at the study area, i.e. the European pond turtle (*Emys orbicularis*) and the Caspian turtle (*Mauremys caspica*). The former species is globally listed as LC/NT (Near Threatened) by IUCN (www.iucnredlist.org; last accessed on 26 April 2016), whereas the latteris not listed as threatened in the IUCN red list. Concerning *Emys orbicularis*, it should be noted that it is also listed in the Bern Convention (Annex II) and in the Red Data Books of many CIS states (e.g. Lithuania, Latvia, Belarus and Moldova) and was recently proposed also for inclusion in the Red Data Book of Azerbaijan.

2. During our investigations, however, we were able to directly observe only *Emys orbicularis*, for which also a rough estimation of abundance and population size for the site Akchala was obtained by field surveys (see below).

3. *Emys orbicularis* is widespread in Azerbaijan, where it may be found in almost all freshwater bodies excluding high mountain regions (IUCN, 2016). Virtually there is no published data on the ecology and natural history of this species in Azerbaijan, and even its distribution in the country is not appropriately known. Therefore, the baseline survey done in this study would probably provide the first quantitative data on the species' abundance in the country, other than at the Project site.

4. While fragmentary notes are available for Azerbaijan populations of *Emys orbicularis*, this species has been widely and intensely studied in other countries (especially in Italy and France). Thus, we can use a comparative approach to establish basic ecological characteristics for this species in Azerbaijan. It can be assumed that the hibernation period lasts from October/November to March-April. *E. orbicularis* is active during diurnal hours at springtime, and essentially during the evenings and at night time during the summertime. Usually turtles can be observed in groups taking sun baths on embankmentsor while foraging below water or on the banks (Figure 1), but during the present investigations we were able also to find mating specimens (see below for details). These turtles hibernate in the muddy bottom of their aquatic habitat for hibernation. These turtles may also aestivate below ground during drought periods, although they may also decide to emigrate to search for an appropriate alternative habitat.

5. Reproductive activity is seasonal: mating starts from late April and continues to mid June at higher elevations. Starting from late May females lay 5–10 eggs three times at certain intervals. Females move to the embankments where they dig a 100 mm deep hole with their back feet, lay their eggs and cover them with soil. Depending on temperatures, incubation of the eggs takes 2 to 3 months. Sexual maturity is reached after 5 to 7 years, depending on the external climatic conditions.

6. Turtle specimens observed at all habitat types in both Akchala and Mahmudchala wetlands clearly belong to *Emys orbicularis persica* EICHWALD 1831, that has a wide distribution in Northern Iran to Turkmenistan, Azerbaijan, Georgia, Iran, Russia (Dagestan)

Figure 1. *Emys orbicularis* searching for food on the water-body banks. Photo by Luca Luiselli

2. STUDY AREA AND METHODS

2.1. Reed-Bed Habitat Type

7. Transects surveys were carried out in the reed-bed vegetation habitat type at Akchala (Figures 2 and 3). These transects consisted in slow-walking throughout the habitat, in order to directly observe turtles and eventual other aquatic fauna randomly encountered. When a given turtle individual was observed, its behavior, data and hour of observation, and precise site of observation were recorded. Total surface of this area was 15,000 ha.

Figure 2. Reed-bed habitat at Akchala. This is the microhabitat type typically used by *Emys orbicularis* at the study area. Photo by Luca Luiselli

Figure 3. Road construction at the reed-bed habitat type in Akchala. Photo by Luca Luiselli

8. At Akchala, the reed-bed vegetation is mainly constituted by *Phragmites australis, Phragmites communis, Scirpus lacustris* and *Typha angustifolia*. Such extensive areas of reed-bed are highly valued habitats in western Europe due to ongoing drainage but are more widespread and thus less valued in Eastern Europe and Central Asia. Despite an overall low botanical species diversity,this vegetation type houses a remarkable variety of animal species, including many mammals, birds, invertebrates, amphibians and reptiles. A preliminary list of species, encountered during the present surveys, is presented in Table 1.

Table 1. Preliminary list of animal species directly encountered during the present surveys in the aquatic ecosystem at Akchala and at Mahnudchala wetlands.

Class	Order	Family	Genus	Species
Reptilia	Squamata	Colubridae	*Natrix*	*natrix*
Reptilia	Squamata	Colubridae	*Natrix*	*tessellata*
Reptilia	Chelonia	Emydidae	*Emys*	*orbicularis*
Amphibia	Anura	Ranidae	*Pelophylax*	*ridibundus*
Insecta	Coleoptera	Dytiscidae	*Dytiscus*	*marginalis*
Insecta	Coleoptera	Dytiscidae	*Cybister*	*cf. lateralimarginalis*
Insecta	Coleoptera	Dytiscidae	*Agabus*	sp.
Insecta	Coleoptera	Hydophidae	*Hydrophilus*	*piceus*
Insecta	Coleoptera	Gyrinidae	*Gyrinus*	sp.
Insecta	Odonata		*Sympetrum*	sp.
Insecta	Odonata		*Anax*	sp.
Insecta	Odonata		*Lybellula*	sp.

2.2. Open Water Habitat Type

9. Open water habitat type, including both drainage channels(Figure 4) and a lake (Figure 5), was studied at Mahnudchala wetland. The vegetation at this site was similar to that at the reed-bed site, but with least vegetation density and with more current water. Overall surface of this wetland was 8,000 ha.

10. It should be noted that fishing nets have been observed in this habitat type, and that these fishing nets clearly represent a serious threat for the local turtle population (see below).

11. Apparently, the observed freshwater fauna is identical in the two study sites, with none of the species observed (see Table 1) that was recorded only from one of the two wetlands. Nonetheless, it can be assumed that the fish fauna is much higher at this latter site. Species of fish observed during the present surveys were *Esox lucius, Rutilus rutilus, Nemachilus angorae lenkoranensis* and *Tinca tinca*.

Figure 4. Water channel habitat type at Mahnudchala wetland. Photo by Luca Luiselli

Figure 5. Open water habitat type at Mahnudchala wetland. Photo by Luca Luiselli

3. STUDY OF TURTLE POPULATION SIZE (ABUNDANCE AND DENSITY)

12. In both the above-mentioned habitats, as well as in temporary ponds (used for comparisons) along the main road from Jalilabad to Baku, both line transects and time-constrained transects were carried out. Line transects were carried out from km 108+170 to km 103+900, whereas time-constrained random transects lasted 15 minutes and were performed at different times of the day. Transects were walked slowly, by maintaining a constant velocity in order to maximize the probability of spotting an individual (6.5 minutes per 100 m on average, range = 6-7 minutes).

13. Field transects were carried out also in significant areas surrounding the Alat-Astara highway in order to understand how the turtle population abundance may vary across the various sectors/habitat types, and therefore, in order to better understand where the highest probability of negative effects of the construction works on the turtle population should be. Two line transects in the seasonally inundated grassland habitat, at sites with coordinates E 5555721.539; N 4345881.771 and E 556342.178; N 4346129.903, were also performed in order to compare the density of turtles at these seasonally inundated sites with those in more stable wetland areas with constant water regime throughout the year.

14 Two main habitat types were observed along the highway course: (i) reed-bed and (ii) open water.

15. When it was possible, turtles were also captured (Figure 6) and carried to the laboratory in order to study their morphometric characteristics, their age (via count of the annual annuli growth on the dorsal shell), and in order to allow them to defecate. Feces do contain remains that may allow the turtle expert to analyze the dietary preferences of the population under study. Although these biological data are not directly relevant for the Turtle Action Plan, they are important from the purely scientific point of view and in any case may convey important data that can be useful for eventual future management/relocation programs.

Figure 6. Several live turtles, just captured and carried to the laboratory for further examination. Photo by Luca Luiselli

16. In each habitat type, estimated density of turtles (individuals per ha) was calculated on the basis of the field transects performed. Density estimates were generated by 'distance sampling analysis'. The data were elaborated with DISTANCE 6.2 (Buckland et al., 2001; Thomas et al., 2007), a dedicated software.

utilized with free-ranging animal populations (e.g., see Katsanevakis, 2006). DISTANCE produces a detection function $g(x)$ describing the probability of detecting an object (a turtle individual in our study case) located at distance x from the line transect under survey.

3.1. Reed-Bed Habitat

17. This habitat type appeared extremely good for turtles, and suitable for their reproductive activities. The highest turtle activity was observed between km 103.200 and 103.900, with two mating pairs observed on 26 April 2016 (Figure 7).

Figure 7. A mating pair of *Emys orbicularis* recorded in the wild, hour 1037 am, at site with coordinates 300366.630 N 4349930.574 E, about 3 meters aside the road construction operations. Photo by Luca Luiselli

3.2. Open Water Habitat

18. This habitat also appeared very good for turtles, with some individuals encountered alive during our field transects, and 7 specimens (3 males, 2 females and two broken shells of undetermined sex) were found dead in the vicinities of a fishing trap (Figure 8).

Figure 8. Shells of three dead *Emys orbicularis*, observed in the vicinities of a fishing net at the open water habitat. Photo: Luca Luiselli

19. The estimated population density of turtles in the reed-bed and open habitat types, calculated from line transects and using DISTANCE 6.2 software, is presented in Table 2. As it can be seen, the various transects in Table 2 have been divided based on the general features of the habitat.

20. With regard to Table 2, more specifically, reed-bed habitat type transects and seasonally inundated grassland habitat type are relative to Akchala, open habitat channel habitat and open habitat lake habitat are relative to Mahnudchala wetland, and pond habitat type is relative to the immediate surroundings of the works camp, with this latter habitat type just being used as an outgroup for comparisons.

21. It should be noted that in the Table 2, it is also presented the confidence intervals and the coefficient of variation of the density estimates for each transect, and also the likelihood of the model by using an AIC score. In this regard, it should be noted that low values of AIC should indicate, on a comparative way, that the estimate of density of turtles for that given transect is more adequate than when the AIC values is high. In other words, if we look at the data in Table 2, we can conclude that the density estimates are more reliable for transects located in reed-bed habitat type than in the two open water habitat types. In all cases, however, the values of AIC were not particularly high, thus showing that the estimates of density are accurate enough to draw conclusions as needed in the current work.

Table 2. Estimated population density of turtles in the reed-bed and open habitat types, calculated from line transects and using DISTANCE 6.2 software. Symbols: AIC = Akaike's Information Criterion - an index of the relative fit of competing statistical models. The lower the AIC, the more parsimonious the model,*ceteris paribus* (other things being equal) K = number of parameters of the model; ESW = effective strip width; EDR = effective detection radius.

Transect	Meters	No of turtles observed	Approx. distance from road (mean)	Standard Deviation	Estimated Density (specimens x ha)(D)	D (Lower confidence interval)	D (Upper confidence interval)	D (Coefficient of variation)	ESW/EDR	AIC	K
					Reed-bed habitat						
1	800	7	3	1.41	8.751	3.63	21.098	0.372	5	24.53	1
2	300	4	4.1	1.06	12.123	2.997	49.036	0.461	5.5	15.64	1
3	500	4	1.75	2.06	10.001	2.994	33.408	0.393	4	13.09	1
4	400	3	2.67	2.08	10.001	1.605	62.315	0.445	5	11.66	1
5	500	5	3.6	1.82	6.668	1.717	25.899	0.447	6	16.33	1
					Open water habitat channel						
6	500	7	4.86	3.01	7.435	3.067	18.027	0.374	9.41	34.22	1
7	500	5	5.8	5.26	4.167	1.674	10.375	0.338	12	26.85	1
8	500	3	5.33	7.5	2.143	0.393	11.697	0.41	14	17.83	1
					Open water habitat lake						
9	500	11	4.27	6.83	16.929	8.929	32.087	0.289	6.5	59.13	2
10	500	6	6.67	5.99	4.395	1.97	9.803	0.32	13.65	35.14	1
11	500	6	4.67	4.27	6.042	2.445	14.931	0.363	9.93	30.72	1
					Ponds						
12	350	0	0	0	0	0	0	0	0	0	0
13	450	0	0	0	0	0	0	0	0	0	0
					Seasonally inundated grassland						
14	400	1	1	0	12.5	0	0	0	0	0	0
15	300	1	3	0	5.556	0	0	0	0	0	0
16	350	0	0	0	0	0	0	0	0	0	0

22. Recalculating data from Table 2, and using the arithmetic means of either D or D (Lower confidence interval) and D (upper confidence intervals) for all transects inside a given habitat type, it can be concluded that (from Tables 3, 4, 5, 6):

Table 3. Summary statistics of the density of turtles in reed-bed habitat type.

	Mean D	D (lower confidence interval)	D (Upper confidence interval)
N transects	5	5	5
Min	6.668	1.605	21.098
Max	12.123	3.63	62.315
Sum	47.544	12.943	191.756
Mean	**9.5088**	**2.5886**	**38.3512**
Std. error	0.8933915	0.3964095	7.634114
Variance	3.990742	0.7857023	291.3985
Stand. dev	**1.997684**	**0.8863985**	**17.0704**
Median	10.001	2.994	33.408
25 prcntil	7.7095	1.661	23.4985
75 prcntil	11.062	3.3135	55.6755
Skewness	-0.2747454	-0.2091502	0.6528544
Kurtosis	0.812504	-2.443554	-1.28635
Geom. mean	9.33147	2.458205	35.42391

Table 4. Summary statistics of the density of turtles in open water habitat type (channel).

	Mean D	D (lower confidence interval)	D (Upper confidence interval)
N transects	3	3	3
Min	2.143	0.393	10.375
Max	7.435	3.067	18.027
Sum	13.745	5.134	40.099
Mean	**4.581667**	**1.711333**	**13.36633**
Std. error	1.541674	0.772143	2.361375
Variance	7.130277	1.788614	16.72828
Stand. dev	**2.670258**	**1.337391**	**4.090022**
Median	4.167	1.674	11.697
25 prcntil	2.143	0.393	10.375
75 prcntil	7.435	3.067	18.027
Skewness	0.6819569	0.1255198	1.530705
Kurtosis	-2.333333	-2.333333	-2.333333
Geom. mean	4.049259	1.263632	12.98161

Table 5. Summary statistics of the density of turtles in open water habitat type (lake).

	Mean D	D (lower confidence interval)	D (Upper confidence interval)
N transects	3	3	3
Min	4.395	1.97	9.803
Max	16.929	8.929	32.097
Sum	27.366	13.344	56.831
Mean	**9.122**	**4.448**	**18.94367**
Std. error	3.932348	2.244692	6.74121
Variance	46.39009	15.11593	136.3317
Stand. dev	**6.811027**	**3.887921**	**11.67612**
Median	6.042	2.445	14.931
25 prcntil	4.395	1.97	9.803
75 prcntil	16.929	8.929	32.097
Skewness	1.618807	1.703011	1.363841
Kurtosis	-2.333333	-2.333333	-2.333333
Geom. mean	7.660497	3.503612	16.7483

Table 6. Summary statistics of the density of turtles in seasonally inundated grasslands.

	Mean D	D (lower confidence interval)	D (Upper confidence interval)
N transects	3	3	3
Min	0	0	0
Max	12.5	0	0
Sum	18.056	0	0
Mean	**6.018667**	0	0
Std. error	3.615847	0	0
Variance	39.22305	0	0
Stand. dev	**6.26283**	0	0
Median	5.556	0	0
25 prcntil	0	0	0
75 prcntil	12.5	0	0
Skewness	0.3306233	0	0
Kurtosis	-2.333333	0	0
Geom. mean	0	0	0

23. It should be noted that, in pond habitat no turtle has been observed, thus suggesting that these reptiles are extremely rare if not already extirpated from this type of habitat.

24. Based on extrapolations at the landscape scale, and assuming a uniform density of turtles all throughout the area covered by the two habitat types (15,000 ha for the reed-bed habitat and 8,000 ha for the open water habitat), it can be determined that the total population size of *Emys orbicularis* should be:

- Total = 142,500 adult turtles (lower confidence interval = 38,829; upper confidence interval = 575,268) **at Akchala**
- Total = 72,976 adult turtles (lower confidence interval = 35,584; upper confidence interval = 93,408) **at Mahnudchala wetland**

25. Overall, the estimated total population size of turtles at the two sites should be:

Total = 235,908; Lower confidence interval = 74,413; Upper confidence interval = 688,676.

3.3. Estimates of Population Losses Due to Construction Works

26. Overall, about 60 ha of wetland will be directly impacted/destroyed during the construction works. Assuming that the use of culverts will keep the connectivity of the ecosystem at the two sides of the highway, it can be estimated that:

The total population loss for turtle is estimated at **615** adults (lower confidence interval: **194** adults; upper confidence interval: **1796** adults).

27. Taking the mean value of predicted turtle loss, and assuming and considering that each female deposit on average 10 eggs per year, that 1/10 of the hatchings become adult, that adult yearly mortality under natural conditions is about 3%, and that adult stage is reached at 6 years on average, it can be projected that at least 12-15 years are needed before the population will grow back to the current size.

4. OTHER BIOLOGICAL DATA

28. During the present surveys, we recorded also data on diet, and body size (shell length and width). These data are not directly relevant for the Turtle Action Plan, but in fact may highlight aspects of the ecology of these populations that are still completely unknown and that, therefore, may serve for a better planning of future management strategies at the study area and in other ecologically equivalent wetlands in Azerbaijan and in the Caucasus. That is why these data are shortly presented in this report.

29. From the point of view of the potential management implications for this turtle population, it is noteworthy that, at Akchala reed-bed habitat, the potential emerged basking spots are very few, and certainly a limited resource for the large number of turtles present in the area. During the present surveys, several individuals were observed while basking inside water, by resting motionless in sites with low water depth (< 20 cm), no vegetation, and very well exposed to sun. As is typical of these turtles, multiple individuals may occur nearby each other in these 'submerged basking spots'. On 1 May 2016, at hour 1058-1120, between km 104+480 and km 104 + 450, four turtles were seen while basking under the water, together.

30. Concerning the diet, Appendix 1, Table A4 presentsa more detailed dataset. In a sample of turtles that were directly observed in the wild while consuming/ingesting a meal (e.g. see Figure 1), and in another sample of prey remains that were recorded from feces of captured individuals (Figure 9), it was seen that an individual (Figure 1) was seen while trying to catch prey from the banks, but keeping its body inside the water. This turtle was seen to catch and ingest a tenebrionid beetle. Other three turtles were observed while eating two big larvae of *Hydrophilus piceus* (Coleoptera: Hydrophilidae) and one turtle ate a Hirudinea (unknown species).

31. The other identified prey remains, obtained from feces, were essentially larvae of *Hydrophilus piceus* (Coleoptera: Hydrophilidae), and, to a lesser extent, other larvae (for instance of Odonata: *Sympetrum* sp.), and beetles (see raw data in Appendix 1, Table A4).

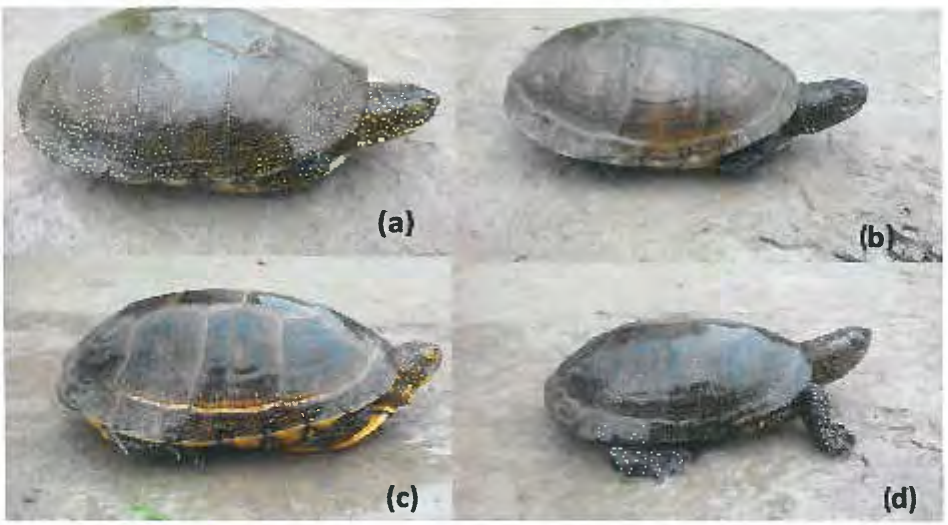
32. Overall, we can conclude that the diet of the local population of *Emys orbicularis* is based essentially on aquatic insect larvae of large size (especially of *Hydrophilus piceus*), and occasionally of terrestrial arthropods moving on the banks of the water bodies or nearby water. It should be remarked that, at the time of our surveys, frogs had not yet deposited their eggs and thus their tadpoles are not yet available. Turtles may possibly shift on foraging much on tadpoles later in the season, when this latter food resource would become readily available.

Figure 9. Feces of a wild-captured *Emys orbicularis* from Akchala wetland, with a *Hydrophilus piceus* larva clearly recognizable. Photo by Luca Luiselli

33. In addition, the turtle expert has been creating a detailed identification book for all the encountered/captured specimens of *Emys orbicularis*(Figure 10). Each individual is measured, photographed lateral, back and dorsal, in order to create a reference book for eventual management plans in the future. Since the field surveys of the turtle leader are short-time, it would be recommended that such a type of work for identification of turtle specimens in the area could be prolonged also by eventually purposely hired personnel.

34. It should be remarked that each individual turtle is easily identifiable via the patterns of yellow marks on the carapace, either visually or through dedicated image discriminations software that aid this kind of biological analyses on population demography of wild animals.

Figure 10. Example of the identification book for the turtles of Akchala wetland. All photos by Luca Luiselli.



5. TURTLE MANAGEMENT GUIDELINES AND ACTION PLAN

35. The purpose of these management guidelines is to provide advice to the Contractor on preventing or minimizing adverse effects on turtles during the implementation of the Alat-Astara highway Project, and also to appropriate government agencies after the works for the road construction are completed. Proper planning and implementation of recommended mitigation measures can result in:

i) Reduced risk or the elimination of harm to turtles during the execution of the highway project;

ii) Reduced risk or the elimination of harm to turtles for the years to come after completion of the Alat-Astara highway; and

iii) Demonstrating due diligence with respect to a species (*Emys orbicularis*) that is listed by IUCN (2016) as Near Threatened.

36. These guidelines can be used anywhere within the Alat-Astara highway project, because the wetland habitat is relatively homogeneous and turtles are supposed to occur with a relatively uniform distribution throughout the wetland areas.

5.1. Main Threats for Turtles at Alat-Astara Highway

37. Road mortality is a major threat to all reptiles, including turtles, as they are often attracted to the warm road surfaces and tend to be slow-moving across roads. Turtles will also often stop on the road and retract into their shells in response to traffic.

38. Road-killing has been already observed at the site (Figures 11and 12), and may become a serious issue in the next months if some management activities will not be implemented.

Figure 11. A female turtle squashed on the road, at the Akchala site. Photo by Luca Luiselli

Figure 12. A female turtle squashed on the road, at the Akchala site. Photo by Luca Luiselli

39. Female turtles are attracted to gravel shoulders during the nesting season, especially in sites where extended ponds/aquatic habitats reduce the potential availability of their oviposition sites. Since the habitat at the site is very extended but with scarce availability of nesting beaches, it is predicted that many female turtles may try to deposit their eggs in the rock-filled (up to 40 cm above water level) areas that are built during the execution of the works. If this will happen, it can be predicted that a high number of turtles and their eggs will be killed during the execution of the Project.

40. Another main threat is represented by fishing nets, that can kill a considerable number of individuals within short time intervals, in the open water habitat. For instance, 7 individuals were found killed at a fishing net station on 28 April 2016, at Mahnudchala (L. Luiselli and A. Taylor original observations).

5.2 Recommendationson Mitigation Measures

41. Four types of mitigation measures are recommended:

1) worker awareness,

2) timing of activities,

3) species exclusion,

4) rescuing and relocation of individuals.

42. Whereas for activities that are strictly limited to the existing paved lanes and paved shoulders (i.e. no change in footprint) worker awareness is sufficient. This is clearly not the case for the present highway Project, that requires all the above mentioned types of mitigation measures being implemented.

5.2.1. Worker awareness

43. It is highly recommended that worker awareness be implemented all along the highway Project.

44. Worker awareness can be as simple as a tailgate meeting conducted by someone knowledgeable about turtle ecology that informs site workers (including heavy equipment operators) about turtles and their protection. If a turtle is encountered on site, the construction activities that disturb or could harm the turtle must stop immediately. If the turtle appears to be simply moving through the area, a worker should carefully move the turtle out of the work site to a safe and suitable location nearby. It is essential that all these cases of turtle observations and small-scale relocations should be documented and reported to the turtle expert in due time. On some occasions, it is possible that the encountered turtle has already begun to nest. Nesting behavior is very easy to identify because the turtle will appear to be involved in digging and/or sitting in a nest pit. In these cases, construction activities must stop and the turtle be allowed to finish nesting and leave the area on its own.

45. At our site, it can be predicted that most observations of pond turtles (*Emys orbicularis*) will be made in April-May and in September-October, because the high temperatures and minimum levels of water availability will considerably depress the above-ground activity of turtles from June to August. Turtle hatchlings may be observed from late August to end of September. It is noteworthy that these turtles may also show a phase of autumn migrations (early to end of October) because these turtles may need to find suitable overwintering spots that are not in the vicinity of usual freshwater habitats. These autumnal migrations are not unusual in Mediterranean populations of *Emys orbicularis* from central Italy and southern France.It is totally unknown whether these autumnal migrations are also found in the population of *Emys orbicularis* inhabiting the highway site. Nonetheless, it is well possible that this migration may occur also at our site. Therefore, it is strongly advised that a second survey by the Turtle Expert should be done around mid-October to early November, in order to evaluate/monitor the population of *Emys orbicularis* just before its entering into hibernation, and also for individuating whether seasonal migrations, that may potentially adverse impact on the turtles if the highway will cut their home ranges, may occur.

5.2.2. Timing of activities

46. Conducting activities outside the active turtle nesting and incubation season is essential in order to avoid and mitigatethe potential negative impacts for *Emys orbicularis*. In Italy, female turtle nesting activity typically runs from the last week of May to the second week of June. It is likely that the same reproductive timing may occur also in *Emys orbicularis* populations in Azerbaijan, given the relatively similar bio-climate and also the similarities observed in other aspects of their ecology. Nests will hatch by mid-August to early September and the turtles will leave the nest and move to water. Assuming that the construction works of the highway cannot be stopped or completed before the nesting season begins or after incubation has ended, exclusion fencing is required to be in place prior to nesting season.

5.2.3. Exclusion fencing

47. Exclusion fencing has of course the aim to minimize any risk of harming to turtlenests and eggs, by physically preventing turtles from entering the work area at any time prior to and during construction, particularly during the nesting season.

48. It is essential that the fencing be installed before the starting of the nesting season (see above for timing). Given the ecological characteristics of the studied wetlands, the capture and rescuing of turtles eventually inhabiting the immediate surroundings of the operation works isadvisable (see Section5.2.5), but it is very much necessary that fencing will be appropriately installed (see below) and that a minimum staff of two people should be hired in order to monitor the situation. One local person should work on a daily basis at the site during the most important periods of turtle activity, and should record all data of turtles' nearby operation activities (see below for the protocol of data collection) and displace the eventual individuals at risk of being killed (capturing them by hand and by traps as explained below) and releasingin a nearby place of the same wetland (at least 200-300 m far away)where immediate construction activities are not ongoing. It can be predicted that the local turtle catcher should be present at site about 70 days between end of April and June, and about 30 days in October-November (total = 100 days per year). In addition, a scientific supervisor by a senior turtle ecologist should be hired in order to direct and manage the monitoring/conservation procedures that may need some adjustments/changes depending on how the highway works operations will go ahead and how the turtle population will fluctuate in the vicinity of the working operations. In this case, the senior turtle ecologist should monitor the operations at site twice per year, one in April-May, and another in October for about 30 days per year overall. Anyway, it is advised that quantitative data collected during the rescue operations should be made readily available to TERA.

49. It is also important that fencing should be placed strategically, i.e.in the areas of the Project where turtles are most likely to occur, so as to maximize effectiveness and potentially minimize costs and/or delays. Fencing is certainly not needed along the wholesegment of the highway. In our case, focus should be in areas between km 101 and km 105, because turtles: (i) were frequently observed at this area, and (ii) were observed even while mating at less than 5 m from the highway works, and therefore are predicted to use actively the gravel and the rocks filled for the works as nesting sites. Apparently, there is less need for such a fencing operation in the open water habitat, since turtles are less likely to use the construction works materials as nesting grounds. Indeed, the preferred habitats of turtles are those areas having standing water in April to June, and wherever such habitat areas are in proximity to a road, the risk of a turtle using the road as nesting ground becomes high.

50. As general guidance: Install exclusion fencing for a minimum distance of 10 meters beyond the actual footprint of work area. Exclusion fencing should be placed on both sides of the road and both sides of the culvert. It should be installed so that there are no gaps at the culvert and extend along the water's edge at right angles away from the culvert. Fencing should be angled 45 degrees up the bank, terminate before it becomes a safety risk to drivers, and then angled back down the bank at 90 degrees for an additional 1-2 meters (to direct turtles away from the road).

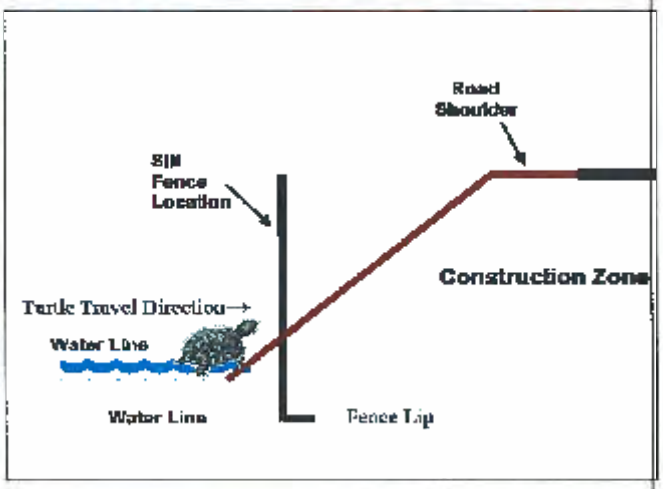
51. As an alternative, confinement fencing can be used, especially in the open water area. Confinement fencing approach is that, when the construction area is too large and extensive, it is more easy and less expensive to attempt to confine the turtles to the wetland.In this case, fencing should be installed on both sides of the road along areas where there is any open water habitat during May-June.

52. The primary difference with confinement fencing is that this fencing extends along the entire stretch of adjacent wetland habitat terminating a minimum of 10m past the extent of the habitat. Also, the terminating wing walls of the fencing angle back towards the wetland in order to encourage any turtles following the fencing to be redirected back to the wetland away.

53. Fencing should be installed a minimum of 10 meters beyond the extent of the turtle habitat feature. The ideal scheme for placing a fence for turtles at work is presented below (Figure 13).

54. In addition, it is recommended that a significant number of culverts, each at least 80-100 cm diameter, will be realized in both the Akchala and the Mahnudchala wetland sites, in order to maintain the connectivity of the wetlands at the two sides of the highway, and in order to mitigate the negative effects on turtle dispersal across the wetland area.

Figure 13. Location of exclusion fence should be placed near to the water to deter nesting



5.2.4. Inspections of fencing.

55. It is recommended that fences should be inspected daily or in alternate days for monitoring turtle activity and determine whether the installed mitigation operations have been successful. Daily inspections should occur to look for breaches in the fencing where turtles may be able to pass through. Any eventually occurring breaches should be repaired immediately. All turtles found during the daily inspections of the fences should be captured and relocated at least 200 to 300 m from the working activities.

56. There is no need to hire a qualified biologist to monitor exclusion fencing. A trained worker may be the ideal person to maintain and inspect the fencing and document any turtle observations.

5.2.5. Rescue and relocation of turtles

57. All turtles that have their home range at less than 8 m from the highway works-line are to be considered at immediate danger of life.

58. It is essential to try to capture as much as possible these turtles near the construction works, in order to minimize their probability of using the highway as a nesting ground, and thus in order to minimize their risk of mortality on road. This operation may be, however, difficult from the logistical point of view, and also relatively expensive, because of the conspicuous length of the tract of highway crossing the wetland area.

59. However, during the present research period, twelve sites with particularly high density of turtles in the immediate surroundings of the works operations have been observed and recorded. These twelve sites should be considered the areas at highest mortality risk for turtles, thus needing immediate rescue/relocation operations. Rescuing of turtles should be done with priority in these twelve sites, where their risk of mortality is exceptionally high.

60. These ***core turtle sites***, each of them 100 m in length, and at either sides of the highway, are:

1) km 82+650	**N 306588.453**	**E 4368948.578**
2) km 103 + 200	**N 300366.530**	**E 4349930.574**

3) km 103 + 400	**N 300237.355**	**E 4349777.873**
4) km 103 +800	**N 299979.006**	**E 4349472.470**
5) km 104 + 000	**N 299849.831**	**E 4349319.768**
6) km 104 + 280	**N 295668.985**	**E 4349105.985**
7) km 104 + 450	**N 299559.186**	**E 4348976.188**
8) km 104 + 700	**N 4348164.492**	**E 558235.030**
9) km 105 + 130	**N 4348046.824**	**E 557968.351**
10) km 105 + 250	**N 299042.484**	**E 4348365.378**
11) km 105 + 800	**N 306588.453**	**E 4368948.578**
12) km 106 + 300	**N 4346909.362**	**E 557242.736**

61. Other sites where turtles were observed at 1-2 m outside the road (and therefore, potentially at high risk of roadkilling) were: **km 109 + 700**; **km 108+560** and **km 108+170**. These three additional sites can be also considered for rescuing/relocation of turtles. At least 10 of the above-mentioned sites should be used for turtle relocation according to the project directives.

62. In all these sites, adult females and/or mating pairs were observed, thus showing that the potential risks of mortality on road is highest compared to other sites along the Project road alignment.

63. Rescue and relocation of turtles would require a minimum staff of 2 people (1 local field 'turtle hunter' and 1 international turtle expert for leading the operations), and make use of appropriately designed turtle traps (Figures 14 and 15).

64. A combination of two types of traps for turtles is suggested in this habitat type: basking traps (Figure 14) and baited hoop traps (Figure 15). It is strongly advised to use a combination of the two traps in order to maximize the success of capture for turtles residing in the surroundings of the construction works. Indeed, it should be noted that it is not possible to capture a reasonable number of individuals just by hand, because these animals escape quickly in the water and are also very cryptic, thus being difficult to spoteven by experienced turtle hunters.

65. The theoretical basis of basking traps is that they mimic a basking spot for turtles (Figure 14). The animals walk up on the emerged side of the trap thinking that it is a good basking place, but then the top surface collapses and the turtle falls into the net below. These types of traps were very effective at capturing Italian individuals of *Emys orbicularis* studied in Tolfa Mountains (Rome; Luca Luiselli and colleagues unpublished data). Indeed, between May and June 2013 (during a period of 22 field days), the team of turtle biologists was able to capture 113 turtles, 91 out of them being adults. On the other hand, it is nearly impossible to get similar capture rates by randomly searching turtles and capturing them by hand or with nets. In the same study case in Italy, during the same period as traps were set in, random catching by 4 people resulted in just 41 turtles, 38 of them being adults (Luca Luiselli and colleagues unpublished data). Therefore, it is strongly advised that basking traps should be used for rescuing turtles at the study site.

66. Hoop-styleturtle traps (Figure 15) are made of nylon #15 webbing, with 3 galvanized steel hoops. Each net is approximately 6' long and 30" in diameter. The traps are usually available for sale by specialized firms in 30" with 2" mesh, 30" with 3" mesh (made with #18 twine), and 30" with

4" mesh (made with #18 twine). The design of these nets is simple: the nets have a throat that turtles can easily get into, but are nearly impossible to escape. All nets are dipped in black asphalt treatment and are ready to go. Anyway, instructions and suggestions are sent with each trap when a commercial firm contacts. These traps should be baited with abundant pieces of fish, that represent a greatly attractive food for carnivorous freshwater turtles as *Emys orbicularis*. Fish bait should be changed every two days in order to maximize the probability of capture for turtles.

67. In terms of quantity, it is advised to place one basking trap every 50 m of highway, on either side of the road, and especially all throughout the twelve core turtle areas mentioned above. Thus, at least two basking traps should be placed, on each side of the highway, in each of the core sites. Overall, a total of 4 basking traps per core site, i.e. 40 basking traps should be placed at the site, and inspected every two days. Each captured turtle should be photographed and released at another safer place of the same wetland, but at least 200-300 m away from the highway path.

68. Hoop-style traps can be placed in number of one by side of highway in each of the above-mentioned 'core' sites. Thus, a total of 20 hoop traps should be necessary for all the rescuing operations.

Figure 14. Example of a 'basking trap' that can be used for sampling freshwater turtles. This type of trap has been used with good success in capture rate of *Emys orbicularis* in Italy. Photo by Luca Luiselli

Figure 15. Example of a baited hoop trap, that works very efficiently with carnivorous freshwater turtles such as *Emys orbicularis*. Photo by S. Hecnar

5.2.6. Monitoring protocol

69. As pointed out above, it is necessary that the data collected during monitoring activities of fencing spots, and of course of individuals that are captured during the rescue operations and in the traps, should be accurately recorded in order to allow a better interpretation of the information available by turtle expert in the next phase of the environmental works.

70. For each turtle observation the following data should be recorded (sheet should be filled):

TURTLE OBSERVATION REPORT FORM

This form is intended for feedback from the user on how the turtle mitigation toolkit has assisted them in helping to mitigate for turtles during the highway construction project.

Date When Work Was Conducted: _____
Location Description and Coordinates if available: _____
_____

Were there any turtles observed within and or near the worksite during your work or construction? check box: ☐ Yes or ☐ No

Certainty of Observation: (please choose one)
Please submit photographs whenever possible to verify species identification.
____ I am positive I've identified the species correctly
____ I am pretty confident I've identified the species correctly
____ I am unsure whether I've identified the species correctly

Date: _____ **Time of observation:** _____ AM/PM

Number of Turtles: _____

OBSERVATIONS / LOCATION DESCRIPTION
Please provide an accurate account of your sighting here - a detailed description of the species you observed (this is especially important if you are not including a photograph with your submission), and location details of where you made the observation.
Please provide the most specific information available about the location of your turtle sighting, including nearest named place or geographic coordinates if possible

_____
_____
_____
_____
_____

Latitude / Northing: _____ Longitude / Easting: _____
Estimated Accuracy of Location:
____within 5 m ____within 10 m ____within 50 m ____within 100 m ____within 500 m ____within 1 km
Turtle Behaviour: Please choose one
____Basking (sunning itself) ____Nesting
____Swimming ____Alive on Road
____Walking ____Dead on Road
____Other (please specify):_____
Nearest distance to water in meters: _____

Contact Information: Name or Company: _____
Telephone:_____ Email:_____

Please return this information to: Resident Engineer of Supervisory Consultant

5.3 Estimated Cost of Implementing the Action Plan

71. Summary cost estimate for implementation of the Action Plan is provided in the following table. BOQ 1.2.8 of the construction Contract provides for protection of environment for compliance with environmental mitigation measures pursuant to Clauses 123and 205.6 and Annex IV and IV-A of the Specifications. Protection of turtles is listed in Annex IV-A. The total funding for BOQ 1.2.8 under the Contract is AZN 220,944.

Summary table of mitigations and potential costs of the action plan for mitigation actions implementations

IMPACT	MITIGATION	ACTION	ACTION CODE
Roadkilling of adults and egg destruction	relocation of turtles in danger due to works to a secure site	placement of Hoop traps; their inspection and relocating captured turtles	A1
Roadkilling of adults and egg destruction	relocation of turtles in danger due to works to a secure site	placement of basking traps; their inspection and relocating captured turtles	A2
Roadkilling of adults and egg destruction	relocation of turtles in danger due to works to a secure site	analysis and supervision of the effectiveness of operations	A3
Roadkilling of adults and egg destruction	preventing turtles from entering the road area for migrations/oviposition	placement of exclusion fences at either sides of road in 10 core sites	A4
Roadkilling of adults and egg destruction	promoting appropriate behaviour by road workers when a turtle is met on road	awareness campaign to workers	A5

Action Code	No. Items	Cost Per Item (USD)	Total Cost of Materials (USD)	Personne Hired For The Task	Salary Per Day (USD)	Number of Days at Site (Per Year)	No Years	Total Salary Costs	Responsibility
A1	2 traps for 10 core sites, one in each side of the road	50	1,000	1 local worker	40	30	2	2,400	Contractor
A2	4 traps for 10 core sites, 2 on each side of the road	50	2,000	1 local worker	40	30	2	2,400	Contractor
A3				1 turtle expert	400	15	2	12,000	Contractor
A4	1000 m of exclusion fences overall (50 m per side and per site; 500 m on each side of the road)		50,000	highway workers					Contractor
A5				1 local worker	40	1	1	40	Contractor
TOTAL			53,000					16,840	GRAND TOTAL = 69,840

Note: BOQ 1.2.8 in the Contract provides payment of AZN220,944 for protection of environment for compliance with environmental mitigation measures pursuant to Clauses 123and 205.6 and Annex IV and IV-A of the Specifications. Protection of turtles is listed in Annex IV-A.

6. COMMENTS ON THE TURTLE ACTION PLAN FROM THE EARLIER ENVIRONMENTAL IMPACT ASSESSMENTS (2007 WORLD BANK AND 2012)

72. As a part of the investigations made by turtle expert, the sections of the EIA documents (2007 and 2012) concerning turtles have been critically reviewed.

73. The data concerning turtles, presented in the above-cited reports, are so scarce that there was virtually nothing of real utility to draw the present Action Plan. The present report, therefore, must be considered much updated and more scientifically sound if compared to the few statements available in the two EIA reports.

74. World Bank EIA (2007) simply provided a statement that *Emys orbicularis* is 'frequent to locally abundant in irrigation and drainage ditches around the wetland margins'. The present study has widely confirmed these anecdotal observations, but also provided a much sounder database concerning the true abundance and population density of these turtles in the overall area and by habitat type.

75. The 2012 EIA report stated that:

> 'the European Pond Turtle (*Emys orbicularis*) is a most typical species of the study area. It occurs in almost all irrigation channels, in some drainage channels and in the ponds on the Taxta River to the east of Chaxirli. *Emys orbicularis* is classified as LR (locally rare) in the IUCN Red List and was proposed for inclusion in the draft Red Book of Azerbaijan. During field studies conducted in mid-April 2007, an abundance of *Emys orbicularis* was noted. Numbers were particularly high in the irrigation channels crossed at ~ km 114.8, around the pond system on Taxta River (downstream of km 127.7), and in the irrigation channel at the end of the study section (~ km 143).'

76. Also in this case, it is evident that our investigations provided clearly more detailed and reliable data compared to these previous reports. Nonetheless, our investigations confirmed that the general approach suggested by earlier authorities for mitigating the effects of highway works on turtles was correct. Culverts are considered, also by TERA's turtle expert and in agreement with previous documents, very much effective and necessary to keep on with the connectivity of the wetland at the two sides of the highway.

77. Also, the results of our study would agree that rescuing turtles (via traps and by hand) is a very useful operation to mitigate the negative effects of the road construction activities on turtles. However, it is suggested that relocationshould be done preferably todifferent places of the same wetland instead of in different water bodies. The captured turtles should then be released inside the same wetland of capture, but in places where the works are not going on. It is recommended that a careful monitoring of the turtle fluctuations over time be conducted, in order to be efficient in adopting immediate mitigation measures when needed.

78. Finally, it is strongly recommended the placement of turtle fencing at either side of the road (see above) at a limited length of the road, in such a way to minimize the risks of being roadkilled for turtles, especially during the oviposition phase and the migrations from and to the hibernation points (*hibernacula*).

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APPENDIX 1. MORPHOMETRIC AND BIOLOGICAL ANALYSIS ON THE SAMPLES OF COLLECTED TURTLES

Table A1. Body measurements data taken from *Emys orbicularis*

No	Sex	Carapace length (mm)	Carapace width (mm)	Plastron length (mm)	Plastron width (mm)
1	m	191		183	
2	m	198	169	178	110
3	m	191	167	178	110
4	m	189	160	176	105
5	m	191	160	160	110
6	f	140	128	126	86
7	m	121	108	115	80
8	f	220	193	190	129
9	f	209	187	191	111
10	m	178	147	160	100
11	f	196	179	179	118
12	f	211	190	192	130

Figure A1 Linear correlation model between carapace length and plastron length in *Emys orbicularis*.

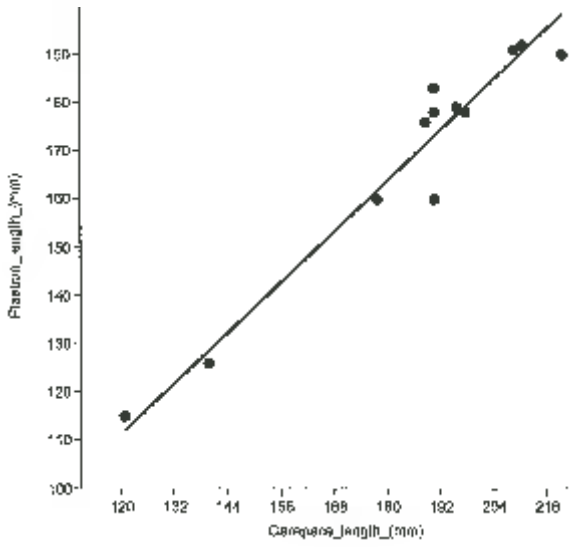


Table A2. Statistics relative to the graphic Figure A1

Slope a:	0.87279
Intercept b:	6.4434
Std. err. a:	0.067264
Std. err. b:	160.1
Chi squared:	0
r:	0.96985
r squared:	0.9406
t statistic:	12.584
p(uncorrel):	1.87E-07
Permutat. p:	0.0001
p(a=1):	0.087882
95% bootstrapped confidence intervals:	
a: [0.6923; 0.9739]	
b: [-13.06; 41.99]	

Figure A2 Linear correlation model between carapace length and plastron width in *Emys orbicularis*.

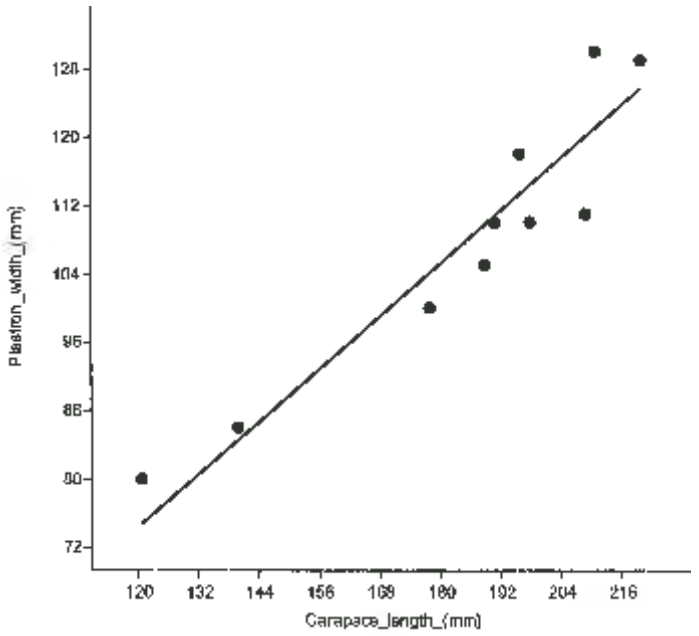


Table A3. Statistics relative to the graphic Figure A2

Slope a:	0.51448
Intercept b:	12.49
Std. err. a:	0.058191
Std. err. b:	119.49
Chi squared:	0
r:	0.94067
r squared:	0.88487
t statistic:	8.3168
p(uncorrel):	1.62E-05
Permutat. p:	0.0001
p(a=1):	1.58E-05
95% bootstrapped confidence intervals:	
a: [0.1782; 0.621]	
b: [-4.625; 78.58]	

Table A4. Summary of the diet (expressed in terms of number of turtle individuals having eaten a given food item) of *Emys orbicularis* at the study area.

	males	females
Hydrophilus piceus larva	5	9
Sympetrum larva	2	1
AdultTenebrionidae	1	0
Adult Dytiscidae	1	0
*Dytiscus*larva	0	2
Hirudinea	0	1

APPENDIX D

SEMP WORKSHOP - PRESENTATION MATERIAL

Azerbaijan Second Road Network Development Program
Tranche 2: Construction Supervision of the Alat-Astara Highway
Jalilabad Intersection - Shorsulu Intersection (km 110+700 to km 80+600)

Construction Safeguards
Environmental Protection

14 April 2016
KOLIN construction camp, Jalilabad, Azerbaijan

Andrew Taylor - Workshop Facilitator
Andrew@envision-2020.net

This Presentation

Four Modules

1) Module 1 - Outline of Workshop
2) Module 2 - Stakeholders – Key Players
3) Module 3 – Environmental Documentation
4) Module 4 – Impacts and Compliance

At the end of this presentation, you will understand

1) Groups and Individuals involved in the project and their role in the protection of the environment.

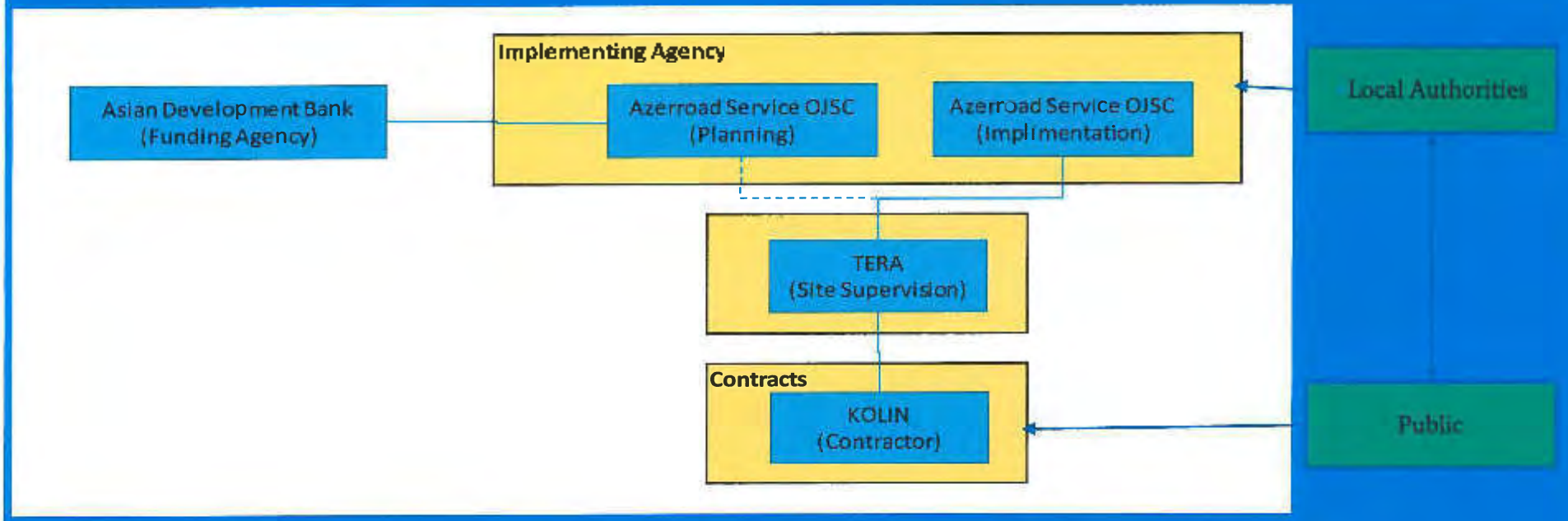
2) The environmnetal documentation prepared for the project .

3) Methods to ensure good social and environmental performance

For coverage today

- Todays focus
  - Roles and Responsibilities of Parties
  - Inspection and Monitoring Processes
  - Communication and Reporting Processes
  - To come once QA Plan adopted

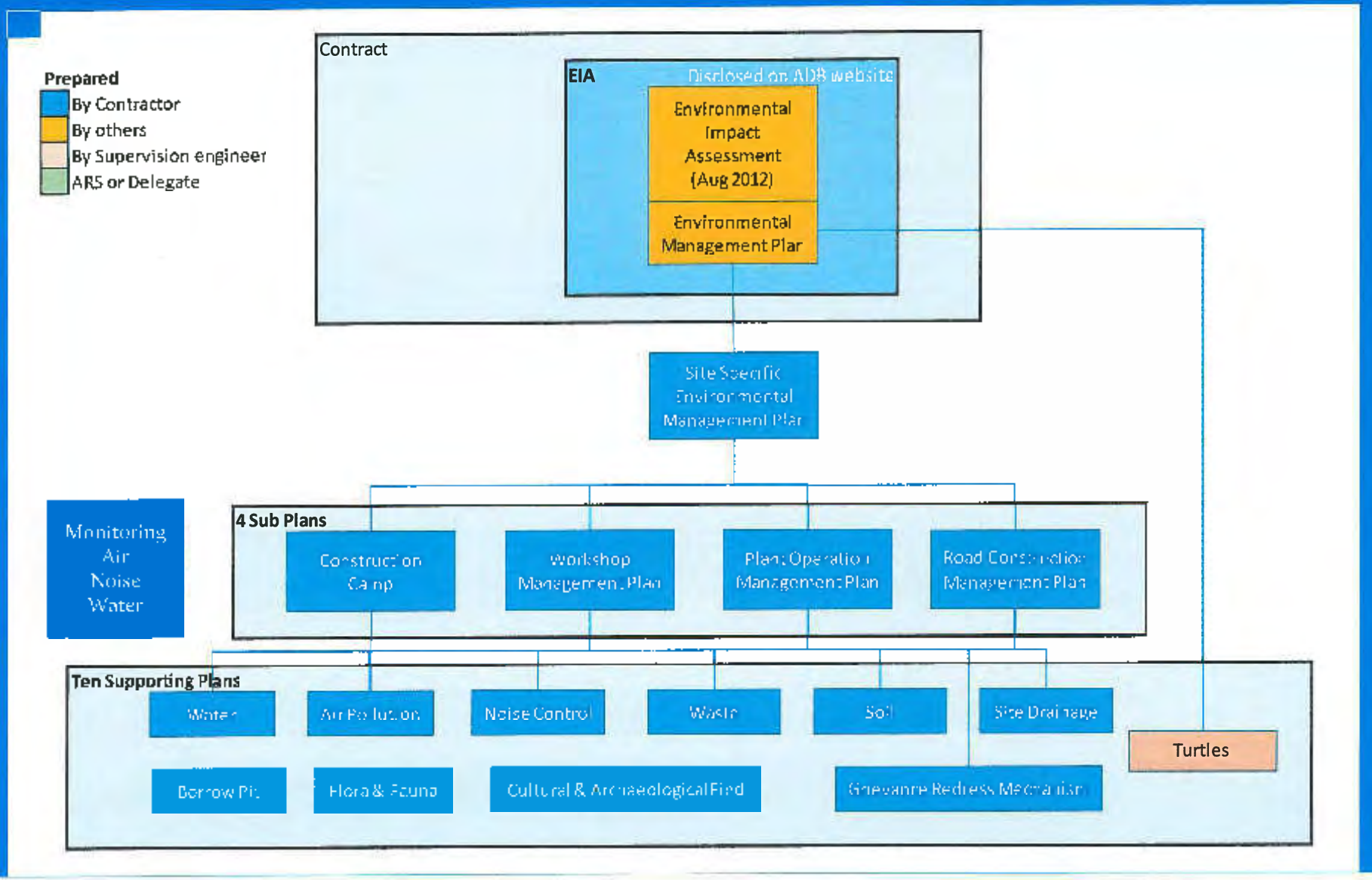
Organisation



Funding Agency observations

- Concern Areas identified from other project experience:
  - Infrequent supervision;
  - confusion of roles and responsibilities
  - lack of monitoring
  - slow responses to incidents and corrective actions
  - poor record keeping, inadequate reporting and communications
- Increase the likelihood of:
  - environmental problems;
  - health and safety incidents and community unrest.
- Outcomes:
  - cost lives;
  - increase budgets;
  - delay the construction program, and
  - lead to breaches of Azerbaijan laws and Asian Development Bank policies.

Key Environmental Documents



Why do we need an SSEMP?

Contractors SSEMP is a powerful tool when properly developed to ensure the smooth and sustainable implementation of the construction works.

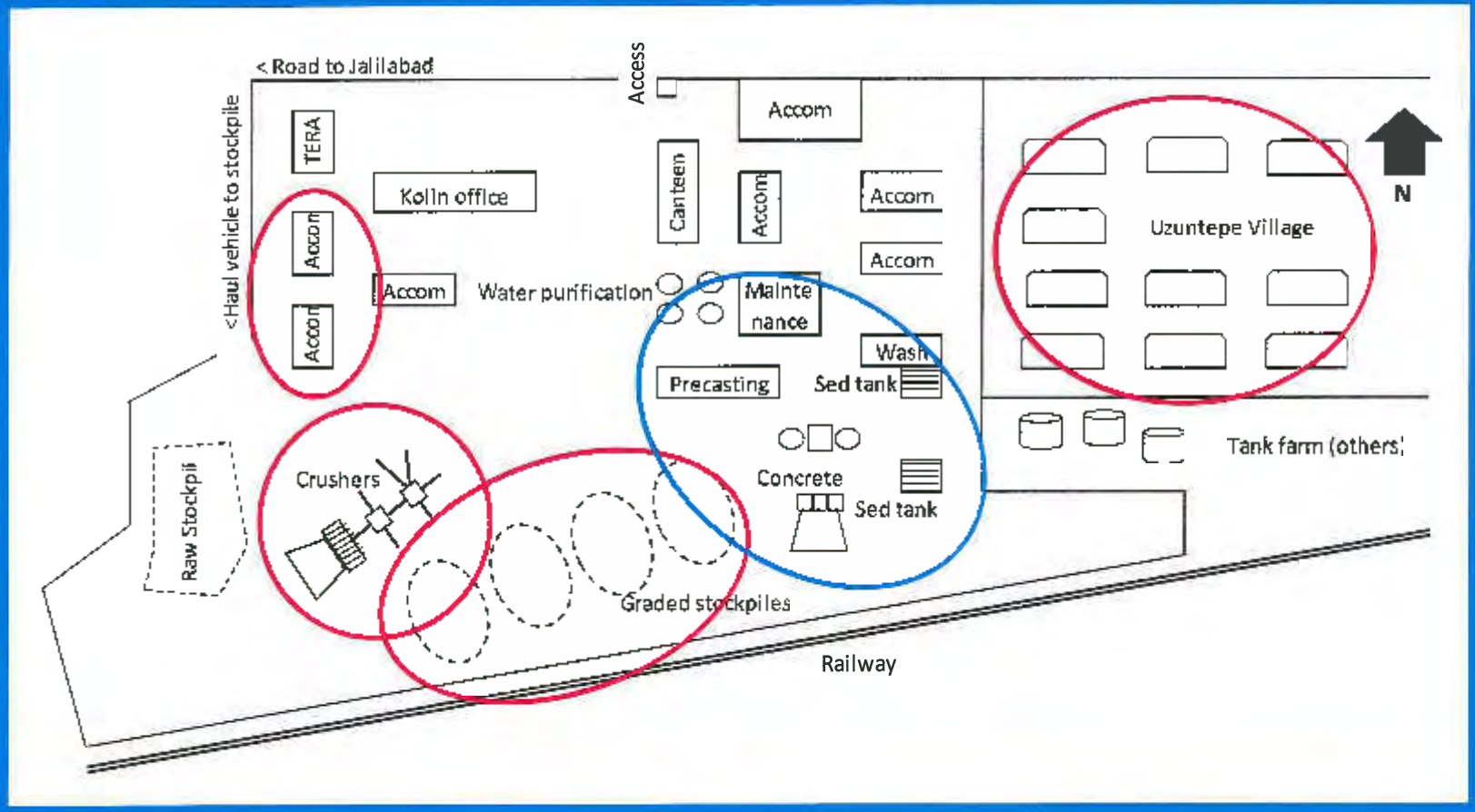
One of the biggest threats are the workforce - lack of clarity in communication, roles and responsibilities, training and procedures.

There are prior experiences when projects had to shutdown work camps due to disease, social tensions, etc.

Compliance – Good Neighbour

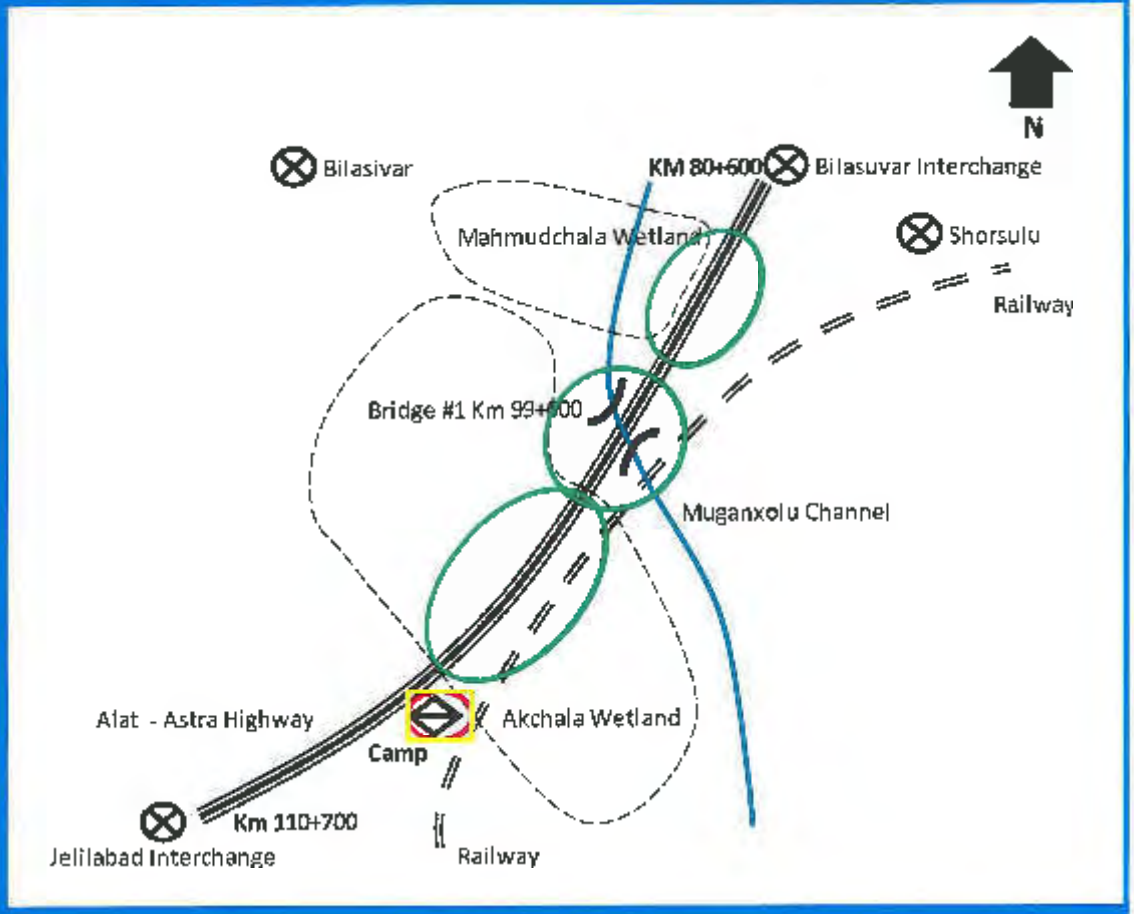
- **Camp**: Near existing communities:
  - health (i) noise and dust, (ii) public health
  - pressure on resources
    - Electricity
    - Water supply
    - Solid and liquid waste disposal
- **Increased traffic** on existing network:
  - Pedestrian safety
  - Severance either side of haul route
  - Increased dust & noise
  - Damage to existing road surface
- **Protection of wetlands**:
  - Protect livelihood of local community
  - Water pollution: Silt runoff, oil & chemical spills
  - Protecting flora and fauna (bird , turtle and amphibian communities)

Camp Impacts



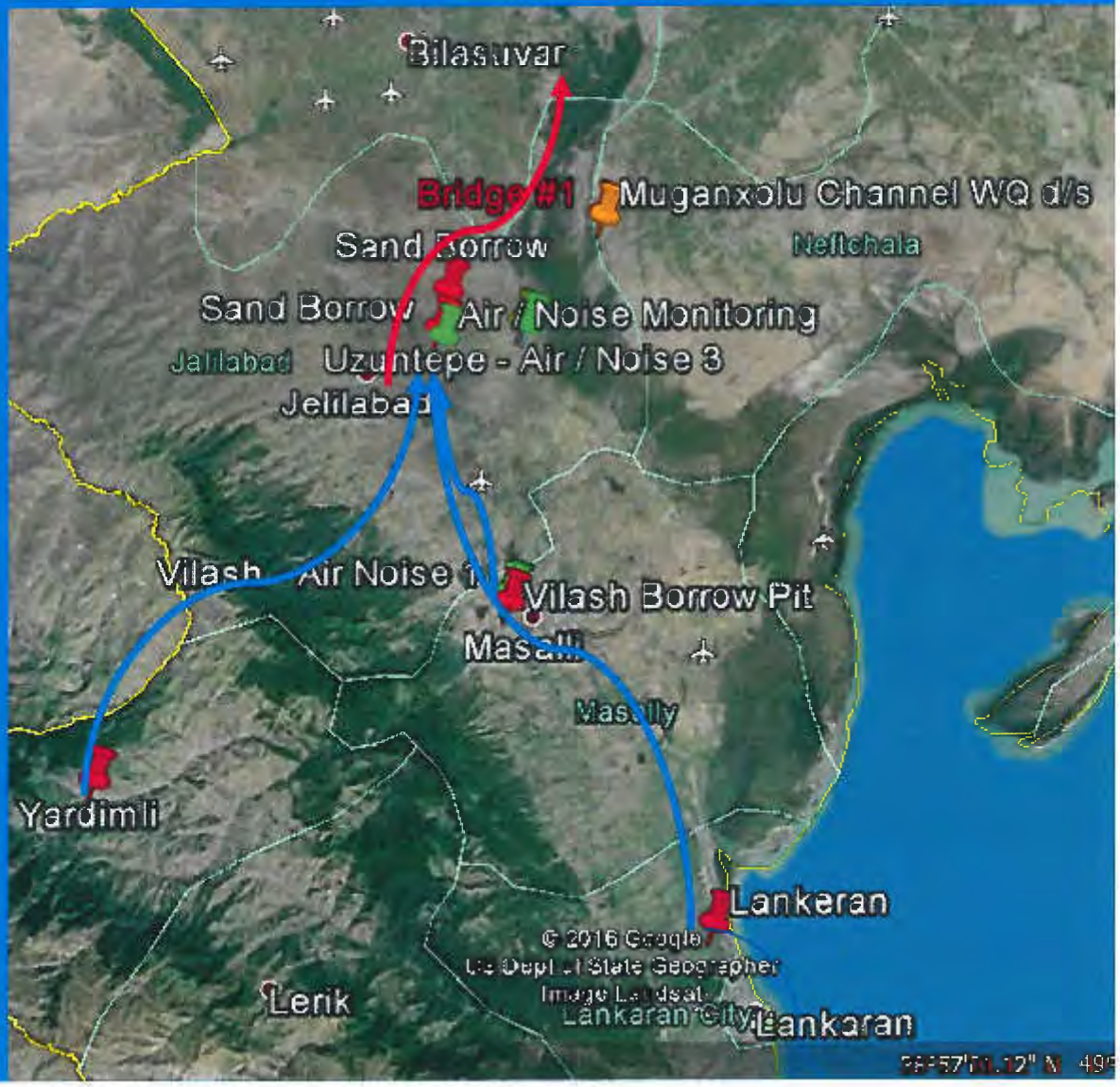
Alignment Impacts

- Noise
  - Camp
    - Haul vehicles
    - Crushers
    - Maintenance Area
    - Visual
- Air Quality (Dust)
  - Haul vehicles
  - Crushers
  - Asphalt
- Water Quality (runoff)
- Ecology



Wider impacts

- Haul Routes
  - Noise
  - Dust
  - Running surface
- Quarry sites
  - Dust
  - Noise
  - Water
- Bridges
  - Water



Supervision and Reporting

APPENDIX E

AIDS / HIV - PRESENTATION MATERIAL

Protocol N 1

Subject. Training on enlighten of workers about the AIDS/HIV and its harmful results

1) *Speeches: Mr.Alizamin – Environmental Specialist of TERA firstly welcomed all participants and briefly emphasized the importance of such trainings.*

2) *Mr.Mursalov Camp doctor spoke about the symptoms of AIDS/HIV.He said that many people don't develop symptoms after getting infected with HIV.Others have a flu-like illness within several days to weeks after exposure to the virus. They complain of fever, headache, tiredness and enlarged lymph glands in the neck. These symptoms usually disappear on their own within a few weeks.*

Following initial infection, you may have no infection. The progression of disease varies widely among individuals. This state may last from a few months to more than 10 years. During this period, the virus continues to multiply actively and infects and kills the cells of the immune system. The immune system allows us to fight against the bacteria viruses and other infectious causes.

The virus destroys the cells that are the primary infection fighters. called CD4+ or T4 cells. Once the immune system weakens, a person infected with HIV can develop the following symptoms:

- *Lack of energy*
- *Weight loss*
- *Frequent fevers and sweats*
- *Persistent or frequent yeast infections*
- *Persistent skin rashes or flaky skin*
- *Short-term memory loss*
- *Mouth, genital or sores from herpes infections.*

AIDS is the most advanced stage of HIV infection. The definition of AIDS includes all HIV-infected people who have fewer than 200 CD+ cells per micro liter of blood.The definition also includes 26 conditions that are common in advanced HIV disease but that rarely occur in healthy people.Most of these conditions are infections caused by bacteria,viruses,fungi,parasites,and other organisms.Opportunitic infections are common in people with AIDS. Nearly every organ system is affected. Some of the common symptoms include the following:

- *Cough and shortness of breath*
- *Seizures and lack of coordination*
- *Difficult of painful swallowing*
- *Mental symptoms such as confusion and forgetfulness*
- *Severe and persistent diarrhea*
- *Fever*
- *Vision loss*
- *Nausea, abdominal cramps and vomiting*
- *Weight loss and extreme fatigue*
- *Severe headaches with neck stiffness*
- *Coma*

People with AIDS are prone to develop various cancers such as Kaposi sarcoma, cervical cancer, and cancers of the immune of the immune system known as lymphomas. Kaposi sarcoma causes round, brown, reddish or purple spots that develop in the skin or in the mouth. After the diagnosis of AIDS is made, the average survival time has been estimated to be 2-3 years.

Even though the doctor informed about the negative aspects of AIDS and necessary measures of protecting from this danger. He said that everybody must enlighten and fight against this misfortune. Worker in construction areas and other sections must pay special attention to this disease, be careful and try to avoid from accidental sex.

Finally all participants were provided with information leaflets about AIDS and its harmful results

APPENDIX F

WATER QUALITY AND WATER POLLUTION - PRESENTATION MATERIAL

Azerbaijan Second Road Network Development Program

Tranche 2: Construction Supervision of the Alat-Astara Highway

Jalilabad Intersection - Shorsulu Intersection (km 110+700 to km 80+600)Construction Safeguard Environmental Protection

Consultant's camp, Jalilabad, Azerbaijan

14 April 2016

Alizamin Mustafayev – Health&Safety, Environmental Engineer

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PRESENTATION

What is Water Pollution?

- **Water Pollution** is the contamination of water bodies(e.g.lakes,rivers,oceans,aquifers and Groundwater) very often by human activities.

- **Water pollution affects** – water pollution affects not only individual living species but also populations and entire functioning ecosystems that exist in the waters.
  Human have now realized the importance of clean water as a foundation for life. In recent time, more and more organization councils are working hard to educate, protect, restore waterways and encourage practices that help keep waters from contamination, and also to preserve water ecosystems from destruction.

- **Water Pollution** occurs when pollutants (particles, chemicals or substances that make water contaminated) are discharged directly or indirectly into water bodies without enough treatment to get rid of harmful compounds. Pollutants get into water mainly by human causes or human factors.
  Any change or modification in the physical, chemical and biological properties of water that will have a detrimental consequence on living things is water pollution.

- **Water Pollution problem** - Water covers over 70% of The Earth`s surface. It is a very important resource for people and the environment. Water pollution affects drinking water, rivers, lakes and oceans all over the world. In many developing countries, it is usually a leading cause of death, by people drinking from polluted water sources.

Types of Water pollution

- **1. Nutrients Pollution** – Some wastewater, fertilizers and sewage contain high levels of nutrients. If they end up in water bodies, they encourage algae and weed growth in the water. This will make the water undrinkable, and even clog filters. Too much algae will also use up all the oxygen in the water, and other water organisms in the water will die out of oxygen starvation.

- **2.Surface water pollution**-Surface water includes natural water found on the earth`s surface ,like rivers,lakes,lagoons and oceans.Hazarous substances coming into contact with this surface water, dissolving or mixing physically with the water can be called surface water pollutions

- **3. Oxygen depleting**-Water bodies have micro-organisms. These include aerobic and anaerobic organisms. When too much biodegradable matter (things that easily decay) end up in water, it encourages more microorganism growth, and they use up more oxygen in the water. If oxygen is depleted, aerobic organisms die, and anaerobic organisms grow more to produce harmful toxins such as ammonia and sulfides.

- **4. Microbiological-**In many communities in the world, people drink untreated water (straight from a river or stream).sometimes there is natural pollution caused by microorganisms like viruses, bacteria and protozoa. This natural pollution can cause fishes and other water life to die. They can also cause serious illness to humans who drink from such waters.
- **5. Oil spillage-**Oil spills usually have only a localized effect on wildlife but can soared for miles. The oil can cause the death to many fish and get stuck to the feathers of seabirds causing them to lose their ability to fly.
- **6. Chemical Water Pollution**-Many industries and farmers work with chemicals that end up in water. These include chemicals that are used to control weeds, insects and pests. Metals and solvents from industries can pollute water bodies. These are poisonous to many forms of aquatic life and may slow their development, make them infertile and kill them.

Industrial Causes

- **Industrial waste-**Industrial cause huge water pollution with their activities. These come mainly from
- **Sulphur**-This is a non-metallic substance that is harmful to marine life.
- **Asbestos-This pollution has cancer-causing properties. When inhaled, it can cause illness such as asbestosis and some types of cancer.**

Septic tanks – Every domestic (home) toilet is connected to septic tank usually located outside the house. Each time poop is flushed down the toilet, it goes into this tank, where the solid part is separated from the liquid part. Biological processes are used to break down the solids and the liquid is usually drained out into a land drainage system. From this stage, it can escape into the soil and nearby water bodies:

Septic effluent percolates to the water table

Effects of Water Pollution

Important facts of Water pollution

- You will notice in the previous pages that water pollution is very harmful to humans, animals and water life. The effects can be catastrophic, depending on the kind of chemicals, concentrations of the pollutants and where there are polluted.

a) 40% of America`s rivers and 46% of America`s lakes are too polluted for fishing, swimming, or aquatic life.

b) 1.2 trillion gallons of untreated sewage, storm water, and industrial waste are discharged into US waters annually.

c) Polluted drinking waters are a problem for about half of the world`s population. Each year there are about 250 million cases of water-based diseases, resulting in roughly 5 to 10 million deaths.

d) In 2010, there was a huge oil spill in America by BP. Of the 400 miles of Louisiana coast, approximately 125 miles have been polluted by the oil spill over 1,000 animals (birds,turtles,mammals)have been reported dead, including many already on the endarged species list. Of the animals affected by the spill that are still alive only about 6% have been reported cleaned, but many biologists and other scientists predict they will die too. In November 2012,BP agreed on a settlement with the US government worth $4.5bn,including a $1.26bn criminal fine.

Prevention of Water Pollution

- Dealing with water pollution is something that everyone(including governments and local Councils) needs to get involved with. Here are a few things you can do to help. Learning about the issue(like you are doing) is the greatest and most important step to take:

We can help:

Never throw rubbish away anyhow. Always look for the correct waste bin. If there is none around, please take it home and put it in your trash can. This includes places like the beach, riverside and water bodies:

Don't forget!!!

Millions of people are in need of water!!!

If you Live close to a water body, try to plant lots of trees and flowers around your home, so that when it rains, chemicals from your home doesn't easily drain into the water:

APPENDIX G

MAHMUDCHALA AND AKCHALA WETLANDS

Akchala and Mahmudchala Wetland

Introduction

a) The northern section of the alignment (Tranche 2) passes across the Akchala Wetlands for about 7 km,before continuing for a further 20 km immediately to the east of the Mahmudchala wetlands. The Mahmudchala wetland is located 10 km north of the Akchala Wetlands. The two wetlands areas are essentially contiguous and drain into the Gryzyl-Agach Bay Strict Nature reserve(and designated Ramsar site) located 20 km southeast of where the proposed alignment traverses the Akchala Wetlands.

b) The Mahmudchala wetlands were formed in 1896 as a result of overflow from the Araz river. According the hydrological study that was carried out as apart of the EA/EMP studies(2007), the main source oof water is overspill from the Mugan-Salyan Canal.The wetland area extends north ,north - east and south of the Shorsulu - Bilasuvar section of the existing road. The total area of the wetland is about 8,000 ha.

c) There are two wetland-Important Bird Areas(IBAs)within the areas of Mahmudchala and Akchala. They are Lake Mahmudchala(IBA AZ045) and Akchala (Novologolovka-chala)(IBA AZ047).The total area of both IBAs is approximately 6.500 ha.The area is highly populated by species of birds that access the area all year round for breeding ,wintering and migration. Many of these species are included on the IUCN Red List and /or Azerbaijan Red Data book. It is therefore regarded by the Government of Azerbaijan, the the Asian Development Bank and the World Wide Fund for Nature(WWF) as being of maximum conservation priority.

Action

There has been no work carried out in the Mahmudchala wetlands area in the reported time.

APPENDIX H

CONTRACTORS MONITORING REPORTS

1. Introduction

The AKO GROUP LLC of Azerbaijan have been carried out pre-construction monitoring for water quality, air quality, noise and vibration at the area of Alat – Astara Highway, Jalilabad Intersection to Shorsuolu Intersection of "Kolin" on February 07, 2016 according to the regulation on "rules for conducting state monitoring of environment and national resources" confirmed under the decision No 90 dated July 01, 2004 of the Cabinet of Ministers of Azerbaijan Republic. The samples are taken and laboratory analyses are carried out to monitor ecological condition of such territories. The analyses are executed at the laboratoryusing by extraction, colorimetric, conductimetric and titration methods.

Samples are taken from the following stations provided below:

Table 1. Water Quality Samples Information

Sample ID	Sample name/location	Sampling date	Sampling time	Arrival date	Arrival time
1011-1	Muganxolu channel	07.02.2016	10:30	07.02.2016	09:00

Table 2. Air Quality Samples Information

Sample ID	Sample name/location	Sampling date	Sampling time	Arrival date	Arrival time
1111-1	Sensitive Receptor 1	07.02.2016	11:30	07.02.2016	09:00
1111-2	Sensitive Receptor 2		11:30		
1111-3	Sensitive Receptor 3		11:30		
1111-4	Saud borrow pit, station 1		11:30		
1111-5	Vilash borrow pit, station 1		14:30		
1111-6	Vilash borrow pit, station 2		14:30		

Table 3. Noise and Vibration measurement locations

Sample No	Sample description/location	Sampling date	Sampling time	Arrival date	Arrival time
1211-1	Sensitive Receptor 1	07.02.2016	11:30	07.02.2016	09:00
1211-2	Sensitive Receptor 2		11:30		
1211-3	Sensitive Receptor 3		11:30		
1211-4	Sand borrow pit - station 1		11:30		
1211-5	Vilash borrow pit - station 1		14:30		
1211-6	Vilash borrow pir - station 2		14:30		

2. Results and National Standards

Water sample for physical and chemical analysis were taken from Muganaxlu channel, air quality, noise and vibration monitoring implemented at Sensitive Receptor 1, 2 and 3, at Sand borrow pit - station 1, Vilash borrow pit - station 1 and Vilash borrow pit - station 2 from the territory that subordinate to "Kolin". As it seen from the results of the water quality analysis, the density of dirty ingredients was above according to the standards.

Even though as it seen from the results of the air quality analysis, dirty ingredients of atmosphere air-dust, nitrogen 4-oxide and carbon monoxide did not overstep the limits and was in norm. Also as it seen from measure works, noise and vibration did not overstep the limits and was in norm.

All monitoring results were compared with local standards provided below:

- Maximum allowed noise levels, DÜST 17187 (State General Standards and Requirements), (presidential decree No 796 from 8th July, 2008)
- Maximum allowed vibration levels, DÜST 17187 (State General Standards and Requirements), (presidential decree No 796 from 8th July, 2008)
- Maximum allowed concentrations of toxic elements in the working area, GOST 12.1.005 88; Ministry of Ecology and National Resources, 2003.
- Maximum allowed concentrations of toxic elements in the surface water. Degree1, Monitoring Committee of Ecology and National Resources, 1994.

Results of Physical-Chemical Analysis carried out on Water Samples (mg/l)

Ingredients	Unit	Mugamo(e) channel		Allowed Concentration
		Up stream	Down stream	
pH		6.8	7.0	6.0-9.0
Electrical conductivity	X10^6 cm/cm	0.180	0.182	-
Limpidity	cm	16.7	16.8	>30
Turbidity	mg/l	18.4	18.6	>30
Dissolved O_2	mg/l	4.1	4.2	4.6-6.0
BOD	mg/l	2.3	2.4	3
Total toughness	mgekv/l	5.1	5.2	7.0
Calcium ion Ca^{2+}	mg/l	128.1	129.0	180.0
Magnesium ion Mg^{2+}	mg/l	43.2	43.4	200.0
Chloride ion Cl^-	mg/l	144.8	145.0	350.0
Sulphate SO_4^{2-}	mg/l	221.3	221.4	500.0
Bicarbonate ion, HCO_3^-	mg/l	198.2	198.4	-
Na^++K^+ ions	mg/l	168.4	167.9	
Sum of ions, $\sum$ 1	mg/l	904.0	905.1	1000.0
Ammonium ion, $NH4^+$	mg/l	0.434	0.435	0.39
Nitrite ion, NO2-	mg/l	0.012	0.012	0.02
Nitrite ion, NO3-	mg/l	6.4	6.6	9.0
Oil & grease	mg/l	0.002	0.002	0.05
E-coli	Per liter	837	840	1000
TSS	mg/l	0.238	0.240	0.25
SSAM	mg/l	0.03	0.04	0.1
Phenol	mg/l	0.0001	0.0001	0.001

Thickness of Pollution Ingredients in Atmosphere (mg/m³)

Monitoring locations	Ingredients	Components quantity	Allowed concentration
Sensitive Receptor 1	Dust	0.1	0.5
	NO2	0.32	0.085
	Carbon monoxide	1	5
Sensitive Receptor 2	Dust	0.1	0.5
	NO2	0.034	0.085
	Carbon monoxide	1	5
Sensitive Receptor 3	Dust	0.1	0.5
	NO2	0.035	0.085
	Carbon monoxide	2	5
Sand borrow pit, station 1	Dust	0.2	0.5
	NO2	0.038	0.085
	Carbon monoxide	2	5
Vilash borrow pit, station 1	Dust	0.2	0.5
	NO2	0.039	0.085
	Carbon monoxide	2	5
Vilash borrow pit, station 2	Dust	0.2	0.5
	NO2	0.036	0.085
	Carbon monoxide	2	5

Noise level (dB)

Monitoring locations	Parameters	Measuring results	Allowed
Sensitive Receptor 1	Noise	59.4	70
Sensitive Receptor 2	Noise	50.0	70
Sensitive Receptor 3	Noise	56.7	70
Sand borrow pit, station 1	Noise	59.4	70
Vilash borrow pit, station 1	Noise	52.2	70
Vilash borrow pit, station 2	Noise	57.5	70

Vibration level (dB)

Monitoring locations	Parameters	Measuring results	Allowed
Sensitive Receptor 1	Vibrasiya	65	77
Sensitive Receptor 2	Vibrasiya	36	77
Sensitive Receptor 3	Vibrasiya	63	77
Sand borrow pit, station 1	Vibrasiya	65	77
Vilash borrow pit, station 1	Vibrasiya	57	77
Vilash borrow pit, station 2	Vibrasiya	64	77

1. Introduction

The AKO GROUP LLC of Azerbaijan have been carried out monitoring for air quality, noise and vibration at the area of Alat – Astara Highway, Jalilabad Intersection to Shorsuulu Intersection of "Kolin" on May 21, 2016 according to the regulation on "rules for conducting state monitoring of environment and national resources" confirmed under the decision No 90 dated July 01, 2004 of the Cabinet of Ministers of Azerbaijan Republic. The samples are taken and laboratory analyses are carried out to monitor ecological condition of such territories. The analyses are executed at the laboratoryusing by extraction, colorimetric, conductimetric and titration methods.

Samples are taken from the following stations provided below:

Table 1. Air Quality Samples Information

Sample ID	Sample name/location	Sampling date	Sampling time	Arrival date	Arrival time
1255-1	Sensitive Receptor 1	21.05.2016	11:30	21.05.2016	09:00
1255-2	Sensitive Receptor 2		11:30		
1255-3	Sensitive Receptor 3		11:30		
1255-4	Sand borrow pit, station 1		11:30		

Table 2. Noise and Vibration measurement locations

Sample ID	Sample name/location	Sampling date	Sampling time	Arrival date	Arrival time
1256-1	Sensitive Receptor 1	21.05.2016	11:30	21.05.2016	09:00
1256-2	Sensitive Receptor 2		11:30		
1256-3	Sensitive Receptor 3		11:30		
1256-4	Sand borrow pit - station 1		11:30		

2. Results and National Standards

Air quality, noise and vibration monitoring implemented at Sensitive Receptor 1, 2 and 3, at Sand borrow pit - station 1.

As it seen from the results of the air quality analysis, dirty ingredients of atmosphere air-dust, nitrogen 4-oxide and carbon monoxide did not overstep the limits and was in norm. Also as it seen from measure works, noise and vibration did not overstep the limits and was in norm.

Note: The contractor have not started the bridge construction works at Muganxolu channel yet. For this reason a water quality monitoring was not carried out at Muganxolu channel on May 2016.

All monitoring results were compared with local standards provided below:

- Maximum allowed noise levels, DÜST 17187 (State General Standards and Requirements), (presidential decree No 796 from 8th July, 2008)
- Maximum allowed vibration levels, DÜST 17187 (State General Standards and Requirements), (ptesidential decree No 796 from 8th July, 2008)
- Maximum allowed concentrations of toxic elements in the working area, GOST 12.1.005-88; Ministry of Ecology and National Resources, 2003.

APPENDIX I

PROGRESS PHOTOS