

Bukhara Road Network Improvement Project, Phase 2

*Environmental and Social Impact
Assessment and Paris Alignment and
Climate Finance Assessment for Bukhara
Road Network Improvement Project,
Phase 2: M37 Corridor Improvement
Project – Phase I*



Draft Report

PART II

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Acronyms

AIIB	Asian Infrastructure Investment Bank
AoI	Area of Influence
BBs	Building Blocks
EHS	Environmental, Health, and Safety
ESIA	Environmental and Social Impact Assessment
ESF	Environmental and Social Framework
ESMP	Environmental and Social Management Plan
ESP	Environmental and Social Policy
ESS	Environmental and Social Standards
FGD	Focus Group Discussion
GHG	Greenhouse Gases
ILO	International Labor Organization
IUCN	International Union for Conservation of Nature
KII	Key Informant Interview
MDB	Multilateral Development Bank
NDCs	Nationally Determined Contributions
OHS	Occupational health and safety
PAPs	Project-affected persons
PMO	Project Management Office
RAP	Resettlement Action Plan



Appendices



Appendix 1. Project Design

1. Design Standards and Criteria

The engineering design of the M37 road rehabilitation and upgrading project is based on applicable national road design standards of Uzbekistan, supplemented by international good practice where relevant.

- SHNK 2.05.02-07: Motorways
- SHNK 3.06.03-08: Motorways
- KMK 3.06.01-19: Railways. Organization, Execution, and Acceptance of Work
- SHNK 3.06.04-14: Bridges and Pipes
- SHNK 2.05.11-19: Internal Farm Roads.
- SHNK 4.02.27-05: Collections of Estimated Resource Standards (Collection No. 27: Motorways)
- Law on Motorways, No. ZRU-117, 02.10.2007
- Resolution of the President of the Republic of Uzbekistan on Measures for Further Improvement of the Road Sector, No. PP-330, 10.10.2023
- KMK 2.05.05-96, Railway and Road Tunnels
- SHNK 3.01.03-19: Geodetic Work in Construction
- SHNK 3.01.01-22: Production Organization in Construction
- SHNK 3.01.04-19: Acceptance of Finished Facilities for Operation. Basic Conditions
- KMK 3.01.05-99: Rules for Performance and Acceptance of Work. Landscaping
- KMK 3.06.05-98: Railway, Highway, and Hydraulic Tunnels. Subways. Performance and Acceptance of Work
- SHNK 3.06.07-23: Bridges and Pipelines. Inspection, Testing, and Diagnostic Rules
- SHNK 4.02.01-04: Earthworks
- SHNK 4.02.27-05: Highways
- SHNK 4.02.28-04: Railways.



2. Project Design Key Parameters

Table 1: Project Design – Key Parameters

#	Design Element	Unit	Total / General	Lot 1 km 207–249	Lot 2 km 249–276	Lot 3 km 276–311	Lot 4 km 311–346	Lot 5 km 346–365
I Basic Design Parameters								
1	Project scope	-	Rehabilitation of existing M37 corridor with localized greenfield construction	Rehabilitation	Rehabilitation + greenfield construction, including ~7.5 km bypass and ~4.5 km ring road connection	Rehabilitation	Rehabilitation	Rehabilitation
2	Road classification	-	IB	IB	IB	IB	IB	IB
3	Design speed	km/h	120	120	120	120	120	120
4	Project road length	km	~158	42	31.5 (27+4.5) km	35	35	19
5	Main carriageway configuration	no.	2x2 lanes	2x2	2x2	2x2	2x2	2x2
6	Lane width	m	3.75	3.75	3.75	3.75	3.75	3.75
7	Typical road width outside settlements	m	25.1–25.25	25.25	25.25	25.1	25.1	25.1
8	Typical road width in settlements	m	34.51	34.51	34.51	34.51	34.51	34.51
9	Service roads	km	To be confirmed during detailed design	TBD	TBD	TBD	TBD	TBD
10	Local/access roads	km	To be confirmed during detailed design	TBD	TBD	TBD	TBD	TBD
II Subgrade, Pavement and Roadside Elements								
11	Subgrade width	m	Preliminary data available for Lots 1–2	22.05	22.05	TBD	TBD	TBD



#	Design Element	Unit	Total / General	Lot 1 km 207–249	Lot 2 km 249–276	Lot 3 km 276–311	Lot 4 km 311–346	Lot 5 km 346–365
12	Main carriageway width	m	15.0 m in rural sections 22.5 m in settlement sections	15.0 / 22.5	15.0 / 22.5	15.0 / 22.5	15.0 / 22.5	15.0 / 22.5
13	Rural carriageway lanes	no. / m	4 lanes x 3.75 m	4x3.75	4x3.75	4x3.75	4x3.75	4x3.75
14	Settlement carriageway lanes	no. / m	6 lanes x 3.75 m where settlement cross-section applies	6x3.75	6x3.75	6x3.75	6x3.75	6x3.75
15	Median / central reserve	m	~2.6–2.75	2.75	2.75	TBD	TBD	TBD
16	Shoulders / edge strips	m	Up to 3.75 per side based on typical section	3.75	3.75	TBD	TBD	TBD
17	Embankment side slope	ratio	01:01.5	01:01.5	01:01.5	01:01.5	01:01.5	01:01.5
18	Pavement type, main road	-	Cement concrete	Cement concrete	Cement concrete	Cement concrete	Cement concrete	Cement concrete
19	Cement concrete pavement, rural sections	m ²	Preliminary quantities available for Lots 1–2	373,034	412,272.50	TBD	TBD	TBD
20	Cement concrete pavement, settlement sections	m ²	Preliminary quantities available for Lots 1–2	583,050	265,590	TBD	TBD	TBD
21	Asphalt pavement	m ²	Preliminary quantities available for Lots 1–2	103,633.50	53,058	TBD	TBD	TBD
22	Asphalt pavement, shoulders	m ²	Preliminary quantities available for Lots 1–2	158,370	153,213	TBD	TBD	TBD
23	Service road pavement	m ²	To be confirmed during detailed design	TBD	TBD	TBD	TBD	TBD
24	Local/access road pavement	m ²	To be confirmed during detailed design	TBD	TBD	TBD	TBD	TBD
25	Sidewalk paving	m ²	Included in settlement sections; preliminary quantities available for Lots 1–2	696,631.25	29,948.75	TBD	TBD	TBD



#	Design Element	Unit	Total / General	Lot 1 km 207–249	Lot 2 km 249–276	Lot 3 km 276–311	Lot 4 km 311–346	Lot 5 km 346–365
26	Drainage protection / masonry works	m / m³	Included; quantities to be confirmed during detailed design	TBD	TBD	TBD	TBD	TBD
27	Poor ground treatment	m / m³	To be confirmed during detailed design, where required	TBD	TBD	TBD	TBD	TBD
28	Earthworks	m³	Preliminary quantities available for Lots 1–2	1,507,727.35	1,015,926.70	TBD	TBD	TBD
III Bridges, Culverts and Cross-Drainage Structures								
29	Bridges	no.	Preliminary quantities available for Lots 1–2	8	4	TBD	TBD	TBD
30	Large bridges	no.	To be confirmed during detailed design	TBD	TBD	TBD	TBD	TBD
31	Minor bridges	no.	To be confirmed during detailed design	TBD	TBD	TBD	TBD	TBD
32	Culverts	no.	Included; quantity to be confirmed during detailed design	TBD	TBD	TBD	TBD	TBD
33	Bridge length as proportion of route	%	To be confirmed during detailed design	TBD	TBD	TBD	TBD	TBD
IV Road Junctions and Access Structures								
34	Interchanges / traffic junctions	no.	Included along the corridor; final number to be confirmed	Approx. 6 based on preliminary drawings	Approx. 5 based on preliminary drawings	TBD	TBD	TBD
35	Grade-separated road crossings / overpasses	no.	Preliminary quantities available for Lots 1–2	8	2	TBD	TBD	TBD
36	At-grade intersections	no.	Included where local access is retained	4	TBD	TBD	TBD	TBD
37	U-turns	no.	Included where required for traffic	TBD	TBD	TBD	TBD	TBD



#	Design Element	Unit	Total / General	Lot 1 km 207–249	Lot 2 km 249–276	Lot 3 km 276–311	Lot 4 km 311–346	Lot 5 km 346–365
			circulation; to be confirmed					
38	Underpasses	no.	Preliminary quantities available for Lots 1–2	26	9	TBD	TBD	TBD
39	Overhead passes / flyovers	no.	To be confirmed during detailed design	TBD	TBD	TBD	TBD	TBD
V Railway Crossings								
40	Railway crossings	no.	Existing railway crossings are shown on preliminary maps; details to be confirmed during detailed design	Present on maps (Section 2.3.4)	Present on maps (Section 2.3.4)	Present on maps (Section 2.3.4)	TBD	TBD
VI Traffic Safety and Roadside Facilities								
41	Traffic safety facilities	-	Guardrails, barriers, signage, lane markings, lighting, pedestrian facilities, and fencing included as part of road safety design	Included	Included	Included	Included	Included
42	Guardrails	km	Preliminary quantities available for Lots 1–2	41.589	31.5	TBD	TBD	TBD
43	Road signs	-	Included; quantities to be confirmed during detailed design	Included	Included	Included	Included	Included
44	Road markings	-	Included; quantities to be confirmed during detailed design	Included	Included	Included	Included	Included
45	Median / roadside barriers	-	Included, including median concrete barriers where required	Included	Included	Included	Included	Included
46	Road lighting	km	Preliminary quantities available for Lots 1–2	21.425	9.215	TBD	TBD	TBD



#	Design Element	Unit	Total / General	Lot 1 km 207–249	Lot 2 km 249–276	Lot 3 km 276–311	Lot 4 km 311–346	Lot 5 km 346–365
47	Road lighting in median	km	Preliminary quantities available for Lots 1–2	21.425	9.215	TBD	TBD	TBD
48	Road lighting along roadside	km	Included in settlement areas and selected junctions; quantities to be confirmed	TBD	TBD	TBD	TBD	TBD
49	Pedestrian crossings	no.	35 for Lots 1–2 only	4	1	TBD	TBD	TBD
50	Livestock crossings	no.	9 confirmed across Lots 1–4; none identified for Lot 5	3	2	2	2	0
51	Bus stops	no.	Preliminary quantities available for Lots 1–2	30	8	TBD	TBD	TBD
52	WIM stations / mobile or automatic control	no.	Preliminary data available for Lot 2	0	1	TBD	TBD	TBD
53	Noise barriers	m	To be determined based on detailed design and sensitive receptor assessment	TBD	TBD	TBD	TBD	TBD
54	Fencing	m	Included in selected locations; quantities to be confirmed during detailed design	TBD	TBD	TBD	TBD	TBD
55	Landscaping / green zone	ha	Included in settlement sections, median areas, and selected roadside areas; quantities to be confirmed	TBD	TBD	TBD	TBD	TBD

TBD = to be determined during detailed design; WIM station = Weigh-in-Motion station; no. = number; km = kilometer; m = meter; h = hour;
(Source: Project Design)

3. Project Corridor by Lots

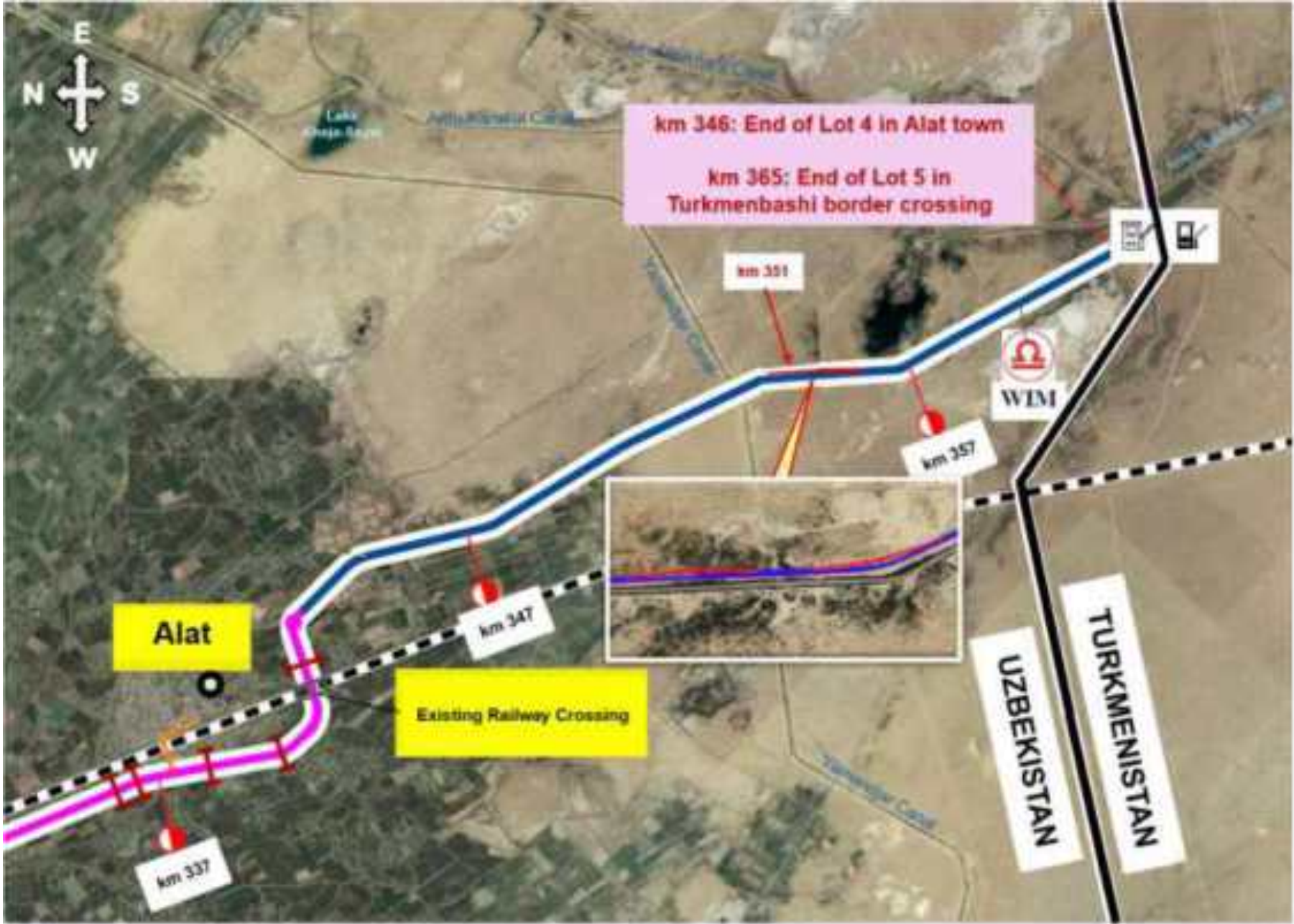
Table 2: Project Corridor Lots with Map

Lot	Chainage	Section Length	Brief Description	Lot Illustration on Map
Lot 1	km 207 – 249	42 km	▪ The section extends from km 207 to km 249, starting at the Kyzyltepa interchange near the Bukhara–Navoi provincial boundary and continuing southwest toward Bukhara district. ▪ The alignment follows the existing M37 corridor and passes through predominantly agricultural areas within Gijduvon and Vobkent districts. ▪ The alignment for this lot consists of a four-lane road, except for localized six-lane urban/settlement cross-sections in heavily populated areas like Gijduvon and Vobkent district centers. ▪ The section includes multiple at-grade road junctions and several grade-separated interchanges, as well as railway at-grade crossings. ▪ The settlement interface refers to the transition from rural areas to peri-urban and urban environments. ▪ This section primarily involves rehabilitation and capacity upgrading of the existing roadway.	Figure 1: Design of Lot 1 Alignment: blue line = M37 (Lot 1); green line = M37 (Lot 2); Road Infrastructure: red clover = designed junction/interchange; blue clover = existing junction; red cross = road picket (chainage marker) Other Features: orange line = secondary/local roads; black-white dashed line = railway; dark blue line = canals; black boundary = administrative/city boundary

Lot	Chainage	Section Length	Brief Description	Lot Illustration on Map
Lot 2	km 249 – 276	31.5 km (27 km + 4.5 km)	▪ The section extends from km 249 to km 276 and connects the end of Lot 1 to the western periphery of Bukhara city. ▪ The route passes through Bukhara district; after Galaosiyo the project corridor interfaces with the A-380b highway via grade-separated interchanges. ▪ The alignment of this lot is a four-lane road, except for a localized six-lane urban/settlement cross-sections in the densely populated city of Galaosiyo. ▪ This lot includes several junctions and represents a transition from rural to peri-urban and urban environments. ▪ The alignment includes both rehabilitation of the existing M37 corridor and a new greenfield bypass section (approximately 7.5 km) designed to divert transit traffic from urban areas. ▪ Additional connections are provided to the Bukhara ring road through a greenfield 4.5 km link section. ▪ The settlement interface refers to the transition from rural areas to peri-urban and urban environments. ▪ Lot 2 involves significant new alignment (greenfield bypass and junctions), resulting in extensive land acquisition and tree removal along the corridor. ▪ This section is classified as high-impact due to the greenfield bypass and connection, which will require permanent withdrawal of productive agricultural land and removal of roadside plantations.	 Figure 2: Design of Lot 2 Alignment: blue line = M37 (Lot 1); green line = M37 (Lot 2); Road Infrastructure: red clover = designed junction/interchange; blue clover = existing junction; red cross = road picket (chainage marker) Other Features: orange line = secondary/local roads; black-white dashed line = railway; dark blue line = canals; black boundary = administrative/city boundary

Lot	Chainage	Section Length	Brief Description	Lot Illustration on Map
Lot 3	km 276 – 311	35 km	▪ The section extends from km 276 to km 311, beginning at the eastern boundary of Bukhara city and continuing toward Jondor district. ▪ The alignment follows the existing M37 corridor and is characterized by predominantly rural and agricultural land use. ▪ The section includes multiple at-grade intersections and several grade-separated crossings. ▪ The section has an existing at-grade railway crossing with M37 road. ▪ The alignment runs parallel to irrigation infrastructure, including the Central Bukhara Drainage Canal. ▪ Settlements along the corridor are limited and discontinuous, with most of the alignment located in rural areas. ▪ Works in this section are limited to rehabilitation and upgrading of the existing road.	 Figure 3: Design of Lot 3 Alignment: green line = M37 (Lot 2); brown line = M37 (Lot 3); purple line = M37 (Lot 4) Road Infrastructure: red clover = designed junction/interchange; blue clover = existing junction; red cross = road picket (chainage marker) Other Features: orange line = secondary/local roads; black-white dashed line = railway; dark blue line = canals; black boundary = administrative/city boundary

Lot	Chainage	Section Length	Brief Description	Lot Illustration on Map
Lot 4	km 311 – 346	35 km	▪ The section extends from km 311 to km 346, connecting Jondor district to Alat district. ▪ The alignment follows the existing M37 corridor through sparsely populated semi-desert and agricultural areas. ▪ The alignment of this lot is a four-lane road, except for a localized six-lane urban/settlement cross-sections in the densely populated Karakul and Alat towns. ▪ The section includes several road junctions and crossings with local roads. ▪ The section has one crossing with railway infrastructure. ▪ Settlement interaction is limited, with only sparse rural communities located along the corridor in a semi-arid landscape. ▪ The scope consists of rehabilitation and upgrading of the existing roadway.	Figure 4: Design of Lot 4 Alignment: brown line = M37 (Lot 3); purple line = M37 (Lot 4); dark blue line = M37 (Lot 5) Road Infrastructure: red clover = designed junction/interchange; blue clover = existing junction; red cross = road picket (chainage marker) Other Features: orange line = secondary/local roads; black-white dashed line = railway; dark blue line = canals; black boundary = administrative/city boundary

Lot	Chainage	Section Length	Brief Description	Lot Illustration on Map
Lot 5	km 346 – 365	19 km	▪ The section extends from km 346 to km 365, from the outskirts of Alat town to the Uzbekistan–Turkmenbashi border at the Turkmenbashi checkpoint. ▪ The alignment follows the existing M37 corridor and passes through semi-urban areas near Alat before transitioning into sparsely populated desert terrain. ▪ The alignment of this lot is a four-lane road. ▪ The settlement interaction is characterized as semi-urban, specifically in Alat town, and is transitioning to a sparsely populated desert area. ▪ This lot represents the international connectivity segment of the project, terminating at the border crossing infrastructure. ▪ Works are confined to rehabilitation and upgrading of the existing road.	 Figure 5: Design of Lot 5 Alignment: purple line = M37 (Lot 4); dark blue line = M37 (Lot 5) Road Infrastructure: red clover = designed junction/interchange; blue clover = existing junction; red cross = road picket (chainage marker) Other Features: orange line = secondary/local roads; black–white dashed line = railway; dark blue line = canals; black boundary = administrative/city boundary

4. Typical Road Cross-Sections for Project Corridor

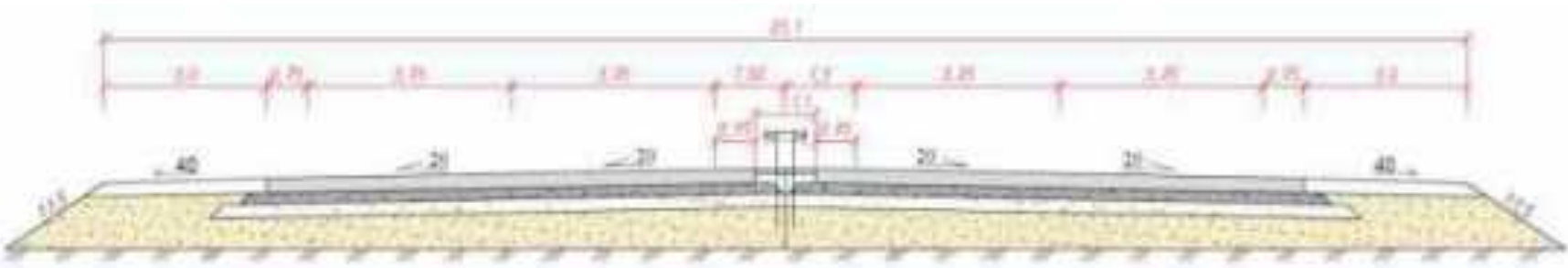


Figure 6: Typical Cross-Section – Rural Section (Outside Settlements)
(Source: Project Design)

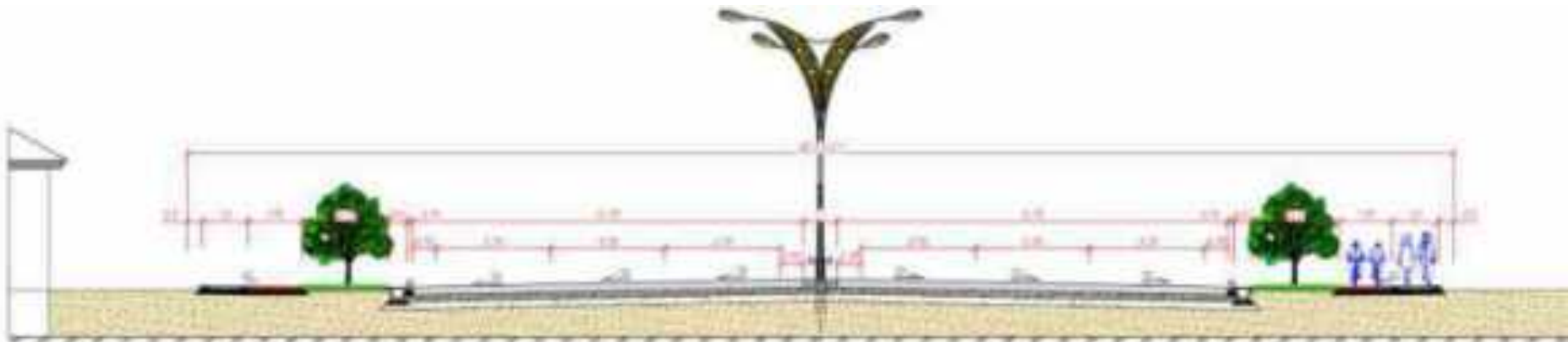


Figure 7: Typical Cross-Section – Settlement / Urban Section
(Source: Project Design)



5. Road Intersections and Crossings by Lot

Table 3: Road Intersections and Crossings by Lot and Needed Land Take

Lot	Alignment Type	Designed Grade-Separated Interchanges	Indicative Interchange Envelope /Land Take	At-Grade Road Intersections	Railway Crossings
Lot 1	Existing (rehabilitation)	(1) km 210.9 (Gijduvon district): Parclo A2 / folded diamond with loops – partial cloverleaf interchange with two loop ramps	3.45	Present as local access roads	---
		(2) km 214.1 (Gijduvon district): Modified Parclo (A2/B2 variant) – partial cloverleaf interchange with single-loop configuration	4.06		
		(3) km 220 (Gijduvon district): Hybrid Parclo / directional T-interchange – modified partial cloverleaf interchange with directional ramp configuration	3.91		
		(4) km 225.5 (Gijduvon district): Modified Parclo (A2/B2 variant) – partial cloverleaf interchange with single-loop configuration	4.13		
		(5) km 232 (Vobkent district): Modified Parclo (A2/B2 variant) – partial cloverleaf interchange with single-loop configuration	3.05		
		(6) km 235.1 (Vobkent district): Modified Parclo (A2/B2 variant) – partial cloverleaf interchange with single-loop configuration	3.63		
		(7) km 242 (Vobkent district): Modified partial cloverleaf (Parclo A/B variant) with one loop ramp and two directional ramps	7.12		
		(8) km 246.1 (Vobkent district): Parclo A2 / folded diamond with loops – partial cloverleaf interchange with two loop ramps	2.98		
Lot 2	Mixed (rehabilitation + greenfield bypass)	(1) km 251 (Bukhara district): Modified partial cloverleaf (Parclo A/B variant) with one loop ramp and two directional ramps	5.42	Present as local access roads	---
		(2) km 253 (Bukhara district): Hybrid Parclo / directional T-interchange – modified partial cloverleaf interchange with directional ramp configuration	5.16		
		(3) km 255 (Bukhara district): Modified partial cloverleaf (Parclo A/B variant)	5.86		



Lot	Alignment Type	Designed Grade-Separated Interchanges	Indicative Interchange Envelope /Land Take	At-Grade Road Intersections	Railway Crossings
		with one loop ramp and two directional ramps			
		(4) km 262 (Bukhara district): Modified Parclo (A2/B2 variant) – partial cloverleaf interchange with single-loop configuration	4.55		
		(5) km 267 (Bypass section): Partial cloverleaf interchange (Parclo) – two-quadrant (2Q) Parclo configuration	5.02		
Lot 3	Existing (rehabilitation)	(1) km 278 (Bukhara district): Hybrid Parclo / directional T-interchange – modified partial cloverleaf interchange with directional ramp configuration (2) km 283 (Bukhara district): Modified partial cloverleaf (Parclo A/B variant) with one loop ramp and two directional ramps (3) km 295 (Jondor district): Modified partial cloverleaf (Parclo A/B variant) with one loop ramp and two directional ramps (4) km 300 (Jondor district): Modified Parclo (A2/B2 variant) – partial cloverleaf interchange with single-loop configuration (5) km 306 (Jondor district): Modified Parclo (A2/B2 variant) – partial cloverleaf interchange with single-loop configuration	~3–5 ha per interchange	Present as rural junctions and	km 276: At-grade railway crossing on the boundaries of Bukhara and Jondor districts
Lot 4	Existing (rehabilitation)	(1) km 314 (Karakul district): Hybrid Parclo / directional T-interchange – modified partial cloverleaf interchange with directional ramp configuration (2) km 321 (Karakul district): Modified partial cloverleaf (Parclo A/B variant) with one loop ramp and two directional ramps	~3–5 ha per interchange	Present as rural junctions	- km 311: At-grade railway crossing on the boundaries of Jondor and Karakul districts - km 342: At-grade railway crossing on the exit of Alat town
Lot 5	Existing (rehabilitation)	---	---	Present as rural junctions	---

(Source: Project Design)



6. Indicative Equipment and Vehicle Estimate During Construction

Table 4: Indicative Equipment and Vehicle Estimate During Construction

#	Equipment / Vehicle Type	Indicative Quantity per Lot	Indicative Total for 5 Lots	Key Specifications	Relevance to Impact Assessment
1.	Excavator	3–5	15–25	20–30 ton; bucket capacity 0.8–1.5 m³; diesel engine, approx. 120–180 kW	Noise, exhaust emissions, dust generation, dust from excavation, vibration near settlements
2.	Bulldozer	1–2	5–10	160–220 hp crawler dozer; diesel engine	Noise, exhaust emissions, dust generation, soil disturbance, dust generation
3.	Motor grader	2–3	10–15	140–180 hp; blade width approx. 3.7 m	Noise, exhaust emissions, dust generation during subgrade and shoulder formation
4.	Wheel loader	2–3	10–15	Bucket capacity 2–3 m³; diesel engine, approx. 120–170 kW	Noise, exhaust emissions, dust generation, material handling dust
5.	Dump trucks / haulage trucks	15–25	75–125	15–25 m³ capacity or 20–30-ton payload; diesel	Main source of traffic, dust, exhaust emissions, road safety risks, noise
6.	Low-bed trailers / heavy transporters	1–2	5–10	30–60-ton load capacity for moving heavy machinery	Traffic safety, temporary access disruption, noise
7.	Asphalt paver	1–2	5–10	Paving width 6–9 m; diesel; capacity approx. 300–600 t/hour	Noise, exhaust emissions, dust generation, asphalt fumes, worker exposure
8.	Concrete slipform paver / concrete paving equipment	1	5	Minimum paving width 7–9 m; diesel/electric support systems	Noise, exhaust emissions, dust generation, concrete washout risk
9.	Concrete mixer trucks	4–8	20–40	6–10 m³ drum capacity	Traffic, noise, emissions, concrete washout risk
10.	Concrete pump truck	1–2	5–10	Boom length 24–36 m; pumping capacity 60–100 m³/hour	Noise, exhaust emissions, dust generation, localized concrete handling impacts
11.	Vibratory rollers	3–5	15–25	10–15 ton single/double drum; vibration frequency approx. 25–35 Hz	Ground vibration, noise, compaction impacts near structures
12.	Pneumatic tire rollers	1–2	5–10	20–30-ton operating weight	Noise, exhaust emissions, dust generation, compaction activity

#	Equipment / Vehicle Type	Indicative Quantity per Lot	Indicative Total for 5 Lots	Key Specifications	Relevance to Impact Assessment
13.	Plate compactors	4–8	20–40	0.5–1.5 ton; petrol/diesel	Localized noise and vibration near pedestrian areas/utility works
14.	Mobile crane/ truck crane	1–2	5–10	25–50 ton lifting capacity	Noise, exhaust emissions, dust generation, safety risks during bridge, culvert, or signage works
15.	Larger cranes where required for major structures (e.g., interchanges and bridges)	0–1	2–5	80–150 ton lifting capacity, depending on structures	Significant localized noise, traffic disruption, lifting safety
16.	Water tanker	3–5	15–25	8–15 m³ tank capacity	Dust suppression, water demand, traffic movements
17.	Fuel tanker / service vehicle	1	5	5–10 m³ fuel capacity or mobile refueling unit	Spill risk, fire risk, hazardous materials management
18.	Mobile generator	2–4	10–20	50–250 kVA diesel generator	Noise, exhaust emissions, dust generation, fuel storage/spill risk
19.	Bitumen distributor / sprayer	1	5	Spray bar width 2.5–4 m; heated bitumen tank	Bitumen fumes, odor, spill risk, worker exposure
20.	Road marking machine	1	5	Thermoplastic or cold paint system	VOCs/odor, worker exposure, traffic management
21.	Service pickups/ light vehicles	8–15	40–75	4×4 pickups, vans, minibuses	Traffic, community safety, minor emissions

(Source: ESIA's estimate)



Appendix 2. Regulation and Policies

1. National Regulatory Framework Analysis

Table 5: National Regulations and their Applicability to the Project

#	Policy/Acts/Rules	Key provisions and purpose	Applicability to the Project
I.	Constitutional and Overarching Legal Framework		
1.	Constitution of the Republic of Uzbekistan (as amended 2023)	- Establishes the constitutional basis for environmental protection, sustainable development, protection of property, equality of men and women, labor rights, and the right to submit appeals and complaints to state bodies. - It also recognizes the duty of citizens to protect the environment and the obligation of the state to safeguard natural and cultural heritage.	Provides the overarching legal foundation for environmental rights, property rights, labor standards, gender equality, grievance handling, and heritage protection relevant to the ESIA.
II.	Environmental Assessment and Permitting Framework		
2.	Law on Environmental Expertise, Environmental Impact Assessment, and Strategic Environmental Assessment, No. LRU-1036 (2025)	- Establishes the modern national legal framework for environmental expertise, and EIA. - Requires environmental assessment documentation, public hearings, disclosure of consultation results, and submission of project materials for State Environmental Expertise. - It is now the principal law for EIA procedure and public participation.	This is the primary national legal basis for preparation, disclosure, consultation, and approval of the EIA for the project. Details of screening and categorization under the Uzbek law is provided in Section 3.12.
3.	Law on Nature Protection, No. 754-XII (1992)	Umbrella environmental law establishing legal, economic, and organizational foundations for environmental protection and rational use of natural resources. It underpins environmental rights, pollution prevention, environmental control, and state environmental review.	Applies across all project phases, especially pollution prevention, natural resource management, and environmental compliance.
4.	Law on Environmental Control, No. ZRU-363 (2013)	- Defines state, departmental, industrial, and public environmental control. - Covers land, water, air, flora, fauna, natural and anthropogenic impact sources, and activities that may create environmental risks.	Relevant to construction and operation monitoring, inspection, and compliance.
5.	Decree of the Cabinet of Ministers No. 541 (2020), on further improvement of the environmental impact assessment mechanism	- Provides detailed procedural rules for State Environmental Expertise, project categorization, and consultation requirements. - It remains useful for understanding implementation detail and categorization logic but should no longer be presented as the primary legal anchor.	Applicable for categorization and procedural interpretation under the national EIA process. Details of screening and categorization under the Uzbek law is provided in Section 3.12.
III.	Natural Resources, Biodiversity, and Environmental Protection		



#	Policy/Acts/Rules	Key provisions and purpose	Applicability to the Project
6.	Law on Protected Natural Areas, No. 710-II (2004)	- Establishes legal regimes for protected areas, reserves, parks, and buffer zones. - Restricts activities that could damage ecological functions or conservation values. - Supports permitting and control within protected-area regimes.	Relevant to biodiversity screening, critical habitat analysis, and assessment of impacts on sensitive areas near the bypass or associated ecological receptors.
7.	Law on Protection and Use of Flora (new edition), No. LRU-409 (2016)	- Regulates protection, restoration, use, and state accounting of flora, including wild flora, protected species, and use permits. - Supports Red Book conservation, public oversight, and restrictions on special use.	Directly relevant to vegetation clearance, tree removal, shelterbelts, roadside planting, and biodiversity mitigation.
8.	Law on Protection and Use of Fauna (new edition), No. LRU-408 (2016)	Regulates protection and use of wildlife, including general and special use, permitting, conservation obligations, and protection of wildlife habitats.	Relevant to fauna disturbance, habitat fragmentation, wildlife movement, and biodiversity mitigation for the greenfield bypass.
9.	Water Code of Uzbekistan, effective 31.10.2025	Establishes the legal framework for rational use and protection of water resources, abstraction, discharge, water monitoring, quotas, special permits, and protection of water bodies and ecosystems.	Relevant to canal crossings, drainage, runoff control, stormwater management, erosion/sediment control, and prevention of water pollution during construction and operation.
10.	Law on waste, No. 362-II (2002, as amended)	- Regulates waste generation, collection, transport, storage, treatment, disposal, and responsibilities of waste generators. - Supports control of hazardous and non-hazardous waste streams.	Applies to spoil, demolition debris, asphalt waste, municipal waste, used oils, and hazardous materials generated during the project construction, rehabilitation, and operation activities.
11.	Law on Protection of Atmospheric Air	Establishes air protection requirements, emission control obligations, and state regulation of air quality.	Relevant to dust, vehicle emissions, asphalt works, construction plant emissions, and operational air-quality effects from traffic.
12.	Presidential Decree on measures for efficient use of land and water resources in agriculture, No. UP-5742 (2019)	- Establishes national policy for rational use of irrigated land and water resources, including improvement of irrigation efficiency, soil fertility, land productivity, and introduction of water-saving technologies. - Promotes protection and sustainable use of agricultural land and irrigation systems.	Relevant to the project due to construction of the greenfield bypass across irrigated agricultural areas. Applicable to assessment of impacts on irrigation infrastructure, agricultural productivity, soil conditions, and water management, as well as development of mitigation measures to maintain irrigation functionality and land productivity.
IV.	Land Acquisition, Property Rights, and Resettlement		
13.	Land Code of Uzbekistan	- Defines land categories, tenure rights, land use principles, withdrawal of land, compensation concepts, land protection obligations, and state control over land use. - It remains the basic framework law for land relations.	Directly relevant to land acquisition, temporary occupation, right-of-way, servitudes, agricultural land conversion, and restoration obligations.
14.	Law on procedures for withdrawal of land	Establishes the current modern legal framework for public-needs land acquisition, including grounds for	This is the primary national law for permanent and temporary land acquisition and compensation



#	Policy/Acts/Rules	Key provisions and purpose	Applicability to the Project
	plots for public needs with compensation, No. LRU-781 (2022)	acquisition, communication with PAPs, compensation, demolition, and procedural safeguards.	under the bypass and any other affected sections.
15.	Civil Code of Uzbekistan	Regulates property rights, contractual relations, obligations, easements, and civil remedies, and other property relations.	Relevant to land agreements, right-of-way arrangements, servitudes, and private-law aspects of compensation.
16.	Housing Code of Uzbekistan	- Establishes legal framework for housing rights, residential premises, and protection against unlawful eviction. - Defines rights of occupants and conditions under which relocation or loss of housing may occur.	Relevant to physical displacement under the Project, including protection of affected households, relocation procedures, and housing-related compensation under RAP.
17.	Cabinet of Ministers Resolution on compensation of losses to individuals and legal entities due to land acquisition, No. 97 (2006)	- Establishes procedures for compensation of losses associated with land acquisition, including valuation of buildings, structures, crops, and other assets, as well as losses incurred by land users and businesses. - Defines compensation principles and administrative procedures.	Directly applicable to compensation of affected persons, including valuation of assets, loss of income, and damages under RAP preparation and implementation.
18.	Cabinet of Ministers Resolution on additional measures for enhancing modalities of compensation on withdrawal and allocation of land plots and safeguarding property rights, No. 911 (2019)	Establishes detailed procedures and institutional mechanisms for compensation connected with land withdrawal, including buildings, structures, plantings, and associated property losses.	Relevant to RAP preparation, compensation methodology, and valuation/administrative procedures.
19.	Cabinet of Ministers Resolution on procedures for granting land plots for urban development and other non-agricultural purposes, No. 146 (2011, as amended)	Contains procedural and compensation-related provisions, including assessment of losses of landowners, users, lessees, and agricultural/forestry production losses.	Relevant as a supporting instrument for land compensation and land conversion matters, especially where agricultural land is affected.
20.	Law on protection of private property and guarantees of owners' rights, No. ZRU-336 (2012)	- Establishes legal guarantees for protection of private property rights, including protection against unlawful seizure, demolition, or interference. - Defines rights of owners to compensation, legal remedies, and judicial protection. - Strengthens security of ownership and limits arbitrary actions by state authorities.	Directly applicable to land acquisition and resettlement under the project, ensuring protection of affected persons' property rights, entitlement to compensation, and access to legal remedies in case of disputes.
21.	Presidential Decree on	Establishes principles of transparency, fairness, and protection of land rights.	Directly applicable to land acquisition processes under the



#	Policy/Acts/Rules	Key provisions and purpose	Applicability to the Project
	ensuring transparency and protection of land rights, No. UP-6243 (2021)	Introduces allocation of land through open electronic auctions, strengthens legal safeguards for land users and owners, improves access to land information, and reduces discretionary decision-making by local authorities.	project, ensuring transparency, protection of affected persons' rights, and fair procedures in allocation and withdrawal of land for public needs.
22.	Law on subsidiary farming ("Tomorka"), No. LRU-681 (2021)	- Regulates household and subsidiary farming on small plots used by families to support subsistence and supplemental income. - Recognizes the importance of household land use for livelihoods and food security.	Relevant as a supporting ESS2/RAP instrument where project-affected households use small subsidiary plots for subsistence farming, even where losses may appear minor in cadastral terms but are material for livelihoods.
23.	Presidential Decree on ensuring transparency and protection of land rights, No. UP-6243 (2021)	- Introduces reforms to improve transparency, fairness, and protection of land rights. - Establishes allocation of land through open electronic auctions, strengthens legal safeguards for land users and owners, enhances public access to land information, and limits discretionary allocation of land by local authorities.	Relevant to land acquisition transparency, protection of affected persons' rights, and strengthening of due process in land allocation and acquisition procedures under the project.
24.	Cabinet of Ministers Resolution on formation and use of funds for compensation of property losses due to land acquisition, No. 1047 (26.12.2018)	- Establishes the mechanism for formation and use of centralized and territorial funds to compensate property losses of individuals and legal entities affected by land acquisition for state and public needs. - Defines sources of funding (including investor contributions and budget funds), procedures for allocation and disbursement of compensation, and institutional responsibilities.	Directly applicable to RAP implementation, ensuring availability and disbursement of compensation to affected persons for loss of land, structures, and assets under the Project.
25.	Presidential Resolution on additional measures to ensure guarantees of property rights, No. P-5491 (2019)	- Strengthens legal protection of property rights of individuals and businesses, including protection against unlawful seizure, demolition, or interference. - Establishes stricter requirements for state authorities in land acquisition processes, including safeguards for compensation and legal remedies.	Relevant to protection of affected persons' property rights, ensuring fair and lawful land acquisition, compensation, and prevention of unauthorized demolition or expropriation under the project.
26.	Law No 538 on pastures, pastureland regulation (as amended on 2022)	Regulates use rights, leasing, access, and protection of pasture lands, including termination of use rights and withdrawal for public needs.	Add only if the project footprint, temporary works, camps, haul roads, or borrow/storage areas affect pasture use or access. Otherwise, it is better kept in an annex or RAP legal due-diligence note.
27.	Tax Code of Uzbekistan, including 2024 and 2025 amendments	- Regulates taxation of individuals and legal entities, including income, property, land, and other taxes. - While it is not a compensation law, still it may affect the tax treatment of compensation, business activities, and restoration measures, especially for affected entrepreneurs and formal land users.	Relevant as a supporting legal instrument for RAP implementation where compensation, business interruption, livelihood restoration support, or tax treatment of payments may arise.



#	Policy/Acts/Rules	Key provisions and purpose	Applicability to the Project
28.	Law on valuation activities, No. 811-I (1999, as amended)	- Establishes the legal framework for professional valuation of property, assets, and property-related rights, including cases where valuation is mandatory and where valuation reports may be subject to review. - It is particularly relevant where state acquisition, compensation, or independent appraisal is required.	Relevant to RAP preparation, valuation of affected structures, trees, crops, business losses, and review of compensation calculations where independent valuation is required.
29.	Family Code of Uzbekistan, Law No. 607-I (1998)	Governs family and marital property relations, including joint ownership of spouses and legal protection of family rights. It is relevant to determining rights and interests in jointly used or jointly owned residential property and household assets.	Relevant to RAP and compensation where affected housing, residential assets, or jointly held household property may require verification of both spouses' rights and consent.
V.	Traffic, Transport, and Road Safety		
30.	Law on Traffic Safety, No. 818-I (1999)	Establishes the legal basis for road traffic safety, duties of road users and authorities, and requirements aimed at preventing accidents and protecting citizens on the road.	Core legal basis for road safety audit, traffic management, design of crossings/access, and operational road safety.
31.	Cabinet of Ministers Decree, Annex 2, on road safety during transportation of large and heavy loads, No. 342 (2011)	Regulates safety requirements for transport of oversized and heavy loads, including coordination, equipment condition, route safety, and operating precautions.	Relevant to contractor logistics, haulage routes, movement of heavy construction machinery, and oversized loads.
32.	Cabinet of Ministers Decree, guidelines for transportation of goods by road, No. 213 (2014)	Provides operational rules for road freight transport and transport organization.	Relevant to movement of materials, spoil, equipment, and contractor transport management.
VI.	Labor, Occupational Health and Safety, and Community Safety		
33.	Labor Code of Uzbekistan (adopted 28.10.2022, effective 30.04.2023, with later amendments)	- Articles 3 and 4 – Establish the fundamental principles of labor relations, including equality of labor rights, prohibition of discrimination in employment, and inadmissibility of forced labor. - Articles 118–121 – Regulate minimum age for employment, conditions for employing minors, restrictions on child labor, and prohibition of hazardous or harmful work for persons under 18 years of age. - Article 209 – Defines employer obligations for ensuring safe and healthy working conditions, including implementation of occupational safety and health measures and compliance with labor protection requirements. - Articles 302–311 – Regulate procedures for investigation, recording, reporting, and employer responsibility regarding occupational accidents, injuries, and work-related incidents.	Applies to all project workers and is the core national legal basis for the LMP.



#	Policy/Acts/Rules	Key provisions and purpose	Applicability to the Project
		- Articles 352–355 – Establish requirements for labor protection, including provision of safe working conditions, use of personal protective equipment (PPE), employer responsibility for occupational safety, and preventive safety measures. - Article 359 – Requires employers to organize safe work processes, develop safety instructions, and ensure compliance with occupational safety procedures. - Article 360 – Requires mandatory preliminary and periodic medical examinations for employees engaged in hazardous, harmful, or high-risk work. - Article 361 – Establishes requirements for occupational safety training, instruction, supervision, and ensuring workers are informed about workplace hazards and protection measures.	
34.	Law on occupational safety and health, No. № 839-XII (amended in 2016)	Establishes requirements to employer for safe working conditions, hazard communication, worker training, medical examinations, risk prevention, and worker protection, including use of PPE and employer responsibility for occupational safety.	Applicable to all construction and operation activities, construction compounds, work camps, and contractor OHS systems.
35.	Cabinet of Ministers Resolution on implementation of the occupational health and safety management system, No. 454 (2025)	Provides a current implementing framework for OHS management systems and strengthens practical OHS administration.	Applicable to contractor OHS systems, site management, monitoring, and compliance under the ESMP and LMP.
36.	Building Code No. KMK 3.01.02-00 "Safety in Construction"	- Establishes mandatory occupational health and safety requirements for construction and installation works. - Covers site organization, work permits, safety briefings, designation of responsible personnel, use of personal protective equipment (PPE), safe execution of works at height, excavation and earthworks, operation of machinery and cranes, electrical safety, fire safety, and worker training. - Requires proper site layout, fencing, lighting, and safe access routes.	Directly applicable to all construction activities under the Project, including road rehabilitation and greenfield bypass works. Forms the technical basis for contractor OHS procedures, method statements, and site safety management under the ESMP and LMP.
37.	Public Health Standard No. 0346-17, Sanitary rules on labour and working conditions	Establishes sanitary and hygienic requirements for working conditions and occupational exposure environments.	Applicable to worker welfare, noise, vibration, dust, sanitation, and camp/site conditions.
38.	Law on mandatory state social insurance against	Establishes a mandatory state insurance system providing compensation for harm to	Directly applicable to all project workers.



#	Policy/Acts/Rules	Key provisions and purpose	Applicability to the Project
	industrial accidents and occupational diseases, No. ZRU-174 (2008)	workers' health resulting from occupational accidents and diseases. - Defines employer obligations to insure workers, coverage of all employees under labor contracts, and entitlement to compensation in cases of temporary or permanent disability or death. - Establishes procedures for recognition of insurance events and compensation payments.	- Requires contractors to ensure insurance coverage, compensation mechanisms, and proper reporting of occupational accidents. - Supports compliance with OHS requirements under the LMP and ESS1.
39.	Law on fire safety, No. ZRU-226 (2009)	Define fire prevention measures, duties of responsible parties, emergency response requirements, and safe handling of flammable materials.	Applicable to construction camps, fuel storage, equipment operation, asphalt works, electrical equipment, machinery yards, and emergency preparedness.
40.	Regulation of the Cabinet of Ministers on investigation and registration of occupational accidents and other work-related injury to health, No. 286 (1997)	Establishes rules for recording, investigating, and reporting industrial accidents and work-related injuries.	Relevant to contractor incident reporting, investigation procedures, and ESMP/LMP compliance.
41.	Law on protection of population and territories from natural and technogenic emergencies, No. ZRU-790 (2022)	- Establishes the legal framework for prevention, preparedness, response, and recovery related to emergency situations in Uzbekistan. - Requires identification and assessment of natural and technological hazards, development of emergency preparedness and response plans, and implementation of preventive measures to reduce risks. - Requires ensuring emergency preparedness at workplaces, including evacuation procedures, first aid arrangements, fire safety measures, emergency communication, and coordination with relevant authorities. - Provides for protection of workers and the public through warning systems, evacuation procedures, use of protective equipment, rescue operations, and post-emergency recovery measures.	- Applicable to the project due to construction-related risks associated with road rehabilitation works, operation of heavy machinery, fuel and bitumen storage, asphalt plants, workers' camps, and traffic management along active transport corridors. - Relevant for contractor ESMPs, OHS management, emergency preparedness and response, including emergency evacuation planning, first-aid provision, coordination with local emergency services, and protection of nearby communities and road users during construction and operation.
VII.	Public Participation and Grievance Mechanism		
42.	Constitution of the Republic of Uzbekistan (as amended 2023)	Guarantees fundamental rights and freedoms, including the right to submit appeals, petitions, and complaints to state bodies, and to receive responses within established timeframes.	Provides constitutional basis for stakeholder engagement, access to information, and GRM.
43.	Law on appeals of individuals and legal entities, No. ZRU-378 (2014, new edition)	Establishes procedures for submission, registration, review, and response to appeals, including proposals, applications, and complaints. Defines timelines, responsibilities of authorities, and rights of applicants.	Core legal basis for the Project-level GRM and handling of stakeholder complaints during ESIA and implementation.



#	Policy/Acts/Rules	Key provisions and purpose	Applicability to the Project
44.	Law No. ZRU-445 (2017) amending the Law on appeals of individuals and legal entities	Strengthens accountability of state authorities and officials for violations of procedures related to handling appeals, including delays and improper responses.	Reinforces transparency, responsiveness, and accountability in grievance handling processes relevant to the project.
45.	Presidential Decree on improvement of the system for handling appeals of individuals and legal entities	Introduced institutional mechanisms for handling public appeals, including the Virtual Reception of the President and electronic complaint systems. Enhances accessibility, transparency, and efficiency of grievance mechanisms.	Supports integration of project-level GRM with national grievance systems and ensures accessibility for affected communities.
VIII.	Gender, Social Protection, Vulnerable Groups, and Inclusion		
46.	Law on protection of women from harassment and violence, No. LRU-561 (2019)	Provides legal protection against different forms of violence and establishes access to state support and remedies.	Applicable to GBV/SEA/SH prevention, worker codes of conduct, labor influx management, survivor-sensitive grievance pathways, and community safety.
47.	Law on social services for the elderly, people with disabilities and other socially vulnerable groups, No. ZRU-415 (2016)	- Establishes the legal framework for provision of social services to vulnerable populations, including elderly people, people with disabilities, and low-income households. - Defines eligibility criteria, types of services (social, medical, psychological), and institutional responsibilities for social support.	Relevant for identification and support of vulnerable groups affected by the project, particularly in socioeconomic surveys, RAP planning, and targeted mitigation measures.
48.	Law on the rights of people with disabilities, No. ZRU-641 (2020)	- Establishes rights of people with disabilities, including non-discrimination, equal access to infrastructure, services, employment, and social participation. - Requires accessibility standards in public infrastructure and promotes inclusive development.	Directly relevant to road design (safe crossings, accessibility), stakeholder engagement, and ensuring inclusive access to project benefits and infrastructure.
49.	Law on ratification of the UN Convention on the rights of persons with disabilities (2021)	Confirms Uzbekistan's international obligations to protect rights of persons with disabilities, including accessibility, inclusion, equality, and participation in public life.	Reinforces requirement for inclusive design, barrier-free access, and consideration of vulnerable groups in ESIA, RAP, and road safety measures.
50.	Presidential Decree on improving the system of social assistance, No. UP-82 (2023)	- Strengthens the national system of social protection, including targeted assistance to vulnerable populations and support mechanisms for women affected by violence. - Promotes institutional coordination and access to social services.	Relevant for GBV/SEA/SH risk mitigation, referral pathways, and integration of social protection mechanisms within project GRM and stakeholder engagement processes.
IX.	Waste Management and Sanitary Regulations		
51.	Law on Waste, No. 362-II (2002, as amended)	- Establishes legal framework for waste management, including classification, handling, recycling, and disposal. - Defines responsibilities of waste generators and operators.	Core regulation governing all waste generated during construction and operation, including excavation waste, asphalt, domestic waste, and hazardous materials (oils, fuels).



#	Policy/Acts/Rules	Key provisions and purpose	Applicability to the Project
		- Requires environmental and sanitary compliance in waste handling. - Introduces licensing and control mechanisms for hazardous waste.	
52.	Public Health Regulation SanPiN No. 0297-11 (2011) – Sanitary rules for cleaning populated areas from solid household waste	- Regulates collection, storage, transport, and disposal of municipal solid waste. - Establishes requirements for container sites, frequency of removal, and sanitation control. - Prohibits unauthorized dumping and burning of waste.	Applicable to management of domestic waste from worker camps, construction sites, and nearby settlements affected by the project.
53.	Public Health Regulation SanPiN No. 0068-96 (1996) – Collection, storage, transportation and disposal of solid waste in urban areas	- Defines technical and hygienic requirements for waste accumulation, transport, and disposal. - Requires use of designated disposal sites and controlled landfill practices. - Establishes minimum distances and sanitary conditions.	Relevant for temporary storage, transport logistics, and disposal arrangements of construction and domestic waste generated along the road corridor.
54.	Public Health Regulation SanPiN No. 0128-02 (2002) – Hygienic classification of toxic industrial waste	- Classifies industrial waste into hazard classes (I–IV). - Defines toxicity thresholds and handling requirements. - Establishes basis for waste risk assessment and management planning.	Critical for classification and management of hazardous waste (e.g., used oils, chemicals, bitumen residues) during project construction activities.
55.	Public Health Regulation SanPiN No. 0127-02 (2002) – Sanitary rules for inventory, classification, storage and disposal of industrial waste	- Establishes procedures for inventory and accounting of industrial waste. - Defines storage, containment, and disposal requirements based on hazard class. - Requires documentation and tracking of waste flows.	Applicable to contractor obligations for waste inventory, storage, documentation, and compliance with environmental permits.
56.	Decree of the Cabinet of Ministers on improvement of waste management system, No. 258 (2014)	- Introduces institutional arrangements for municipal waste management. - Defines roles of local authorities and service providers. - Supports development of waste infrastructure.	Relevant for coordination with local waste management services and disposal facilities in Navoi and Bukhara provinces.
57.	Decree of the Cabinet of Ministers on approval of the Regulation on the procedure for handling hazardous waste, No. 295 (2014)	- Establishes procedures for collection, storage, transport, neutralization, and disposal of hazardous waste. - Requires classification of hazardous waste and assignment of hazard categories. - Defines obligations of waste generators and licensed operators. - Requires use of specialized facilities and documentation (waste passports).	- Directly applicable to hazardous waste generated during construction (used oils, lubricants, fuel residues, contaminated soil, bitumen waste). - Requires contractors to engage licensed operators and maintain documentation.



#	Policy/Acts/Rules	Key provisions and purpose	Applicability to the Project
58.	Decree of the Cabinet of Ministers on measures to further improve the procedure for handling construction waste, No. 40 (28.01.2021)	- Establishes regulatory framework for management of construction and demolition waste. - Requires that construction waste (soil, debris, dismantled materials) is not treated as municipal waste. - Mandates disposal only through contracts with authorized/licensed operators. - Requires transport to designated disposal sites or recycling facilities. - Introduces accountability for waste tracking and proper disposal documentation.	- Directly applicable to road construction and rehabilitation works. - Requires contractors to segregate, store, transport, and dispose of construction waste through licensed entities and approved disposal sites. - Critical for management of excavation spoil, asphalt and concrete waste, and demolition materials along both the bypass and rehabilitation corridor.
59.	Decree of the Cabinet of Ministers on approval of Rules for provision of services for collection and removal of solid and liquid household waste, No. 95 (06.02.2019)	- Regulates collection, storage, transportation, and disposal of municipal (household) waste. - Defines responsibilities of service providers and waste generators. - Requires contracts with licensed waste collection operators. - Establishes requirements for waste containers, collection frequency, and designated disposal sites.	- Applicable to management of municipal waste generated by workers, camps, and project facilities. - Requires contractors to arrange waste collection through authorized service providers and ensure proper disposal at designated municipal landfills. - Not applicable to construction waste, which is regulated separately.
60.	Law on licensing, permitting and notification procedures, No. ZRU-701 (2021)	- Establishes unified framework for licensing environmentally hazardous activities. - Requires permits for hazardous waste collection, transport, treatment, and disposal. - Defines compliance and enforcement mechanisms.	Requires that all hazardous waste generated by the project be handled only by licensed entities, ensuring compliance with national environmental requirements.
X.	Cultural Heritage		
61.	Law on protection and use of cultural heritage, No. 269-II (2001)	Regulates protection, use, management, financing, and legal responsibility related to cultural heritage sites.	Directly applicable to ESIA requirements for cultural heritage screening, permitting, protection of known and undiscovered heritage resources, and implementation of chance finds procedures during construction in the wider Bukhara context.
62.	Decree of the Cabinet of Ministers of Uzbekistan on measures for further improvement of protection and use of cultural heritage objects, No. 269 (2002)	- Establishes institutional framework for protection, management, and use of cultural heritage sites. - Defines procedures for state registration, inventory, and classification of cultural heritage objects. - Sets requirements for permitting and supervision of works (including construction, excavation, and land use) within protected areas and buffer zones. - Introduces procedures for cultural heritage expertise and approvals prior to project implementation. - Strengthens responsibilities of state authorities for safeguarding heritage sites and preventing damage.	- Directly applicable to the Project, particularly for the greenfield bypass sections where new land disturbance may occur. - Requires cultural heritage screening, coordination with competent authorities, and obtaining approvals for any works near protected or potential heritage sites. - Supports implementation of chance finds procedures during construction.



#	Policy/Acts/Rules	Key provisions and purpose	Applicability to the Project
63.	Law on protection and use of archaeological heritage sites, No. ZRU-229 (updated version, 2022)	- Provides updated and consolidated legal framework for protection, conservation, and use of cultural heritage objects. - Defines categories of cultural heritage (archaeological, architectural, historical, cultural landscapes). - Establishes stricter requirements for impact assessment, permitting, and monitoring of activities affecting heritage sites. - Introduces enhanced protection regimes, including buffer zones and restrictions on construction and land use. - Strengthens enforcement mechanisms and penalties for damage or unauthorized works. - Requires integration of cultural heritage considerations into development planning and environmental assessment processes.	- Highly relevant to the Project, especially due to proximity to Bukhara (UNESCO World Heritage Site). - Requires integration of cultural heritage considerations into ESIA, pre-construction screening, and strict control of construction activities. - Applicable to both rehabilitation corridor (chance finds risk) and greenfield bypass (potential undiscovered sites).
XI.	Sanitary Protection Zones and Setback Requirements for Roads		
64.	Public Health Regulation SanPiN No. 0339-16 – Sanitary norms for protection of population from transport impacts	- Establishes sanitary buffer zones for transport infrastructure. - Defines minimum distances between roads and residential areas based on traffic intensity and noise/air pollution. - Requires mitigation measures where distances cannot be met (noise barriers, greening, etc.).	Directly applicable to design and assessment of impacts from the project road. For a Category IB road (2×2 lanes, 120 km/h), requires assessment of compliance with sanitary setback distances to nearby settlements and implementation of mitigation where exceedances occur.
65.	Building Code ShNK 3.06.03-08 Automobile Roads	- Defines technical standards for road design, including right-of-way (ROW), road categories, and safety buffers. - Specifies geometric design, alignment, and roadside safety requirements. - Establishes design parameters for high-speed roads (including Category I roads).	- Directly applicable to the design of the M37 road rehabilitation and bypass. - Determines ROW width, alignment constraints, and spatial separation from adjacent land uses.
66.	Building Code ShNK 2.07.01-03 Urban Planning. Planning and Development of Territories	- Regulates land use planning and development near infrastructure. - Defines zoning restrictions and compatible land uses adjacent to roads. - Supports establishment of buffer zones between transport infrastructure and residential areas.	- Applicable to assessment of land use compatibility along the road corridor and bypass alignment. - Ensures appropriate separation between the project road and residential or sensitive receptors.
67.	Public Health Regulation SanPiN No. 0350-17 – Sanitary norms for protection of atmospheric air in populated areas	- Establishes maximum permissible concentrations (MPCs) for air pollutants in residential areas. - Defines requirements for control of emissions from stationary and mobile sources. - Provides the basis for establishing sanitary protection zones to ensure compliance with air quality standards.	- Directly applicable to assessment of air quality impacts from road traffic. - Requires that pollutant concentrations at sensitive receptors along the road corridor and bypass do not exceed MPCs. - Determines sanitary buffer requirements indirectly through air dispersion modelling rather than fixed distances.

MPCs = maximum permissible concentrations; ROW = right-of-way; ESIA = Environmental and Social Impact Assessment; RAP = Resettlement Action Plan; GBV/SEA/SH = Gender-Based Violence/Sexual Exploitation and Abuse/Sexual Harassment; EIA = Environmental Impact Assessment; PAPs = project-affected persons;



ESS = Environmental and Social Standard; LMP = Labor Management Plan; PPE = personal protective equipment; OHS = Occupational Health and Safety; ESMP = Environmental and Social Management Plan

2. International Conventions, Treaties, and Protocols

#	Convention	Year	Ratified/ Acceded	Relevance to the Project
I.	Labour and Working Conditions (Binding Obligations)			
1.	C 29: Forced Labour Convention	1930	Ratified (2019)	- Prohibits forced and compulsory labour; requires free employment choice, prohibition of passport retention, debt bondage, and coercive labor practices. - Relevant to contractor labor management, migrant labor, and LMP implementation.
2.	C87: Freedom of Association and Protection of the Right to Organize Convention	1948	Ratified (2016)	- Protects workers' rights to establish and join organizations without interference; supports worker representation and access to grievance mechanisms. - Relevant to labor relations and worker GRM.
3.	C 98: Right to Organize and Collective Bargaining Convention	1949	Ratified (1997)	Protects workers from anti-union discrimination and promotes collective bargaining. Relevant for worker engagement and contractor compliance.
4.	C 100: Equal Remuneration Convention	1951	Ratified (1992)	- Requires equal pay for equal work regardless of gender. - Relevant to fair employment practices, payroll, gender equality in project workforce, and Gender Action Plan (GAP).
5.	C 111: Convention on Discrimination (Employment and Occupation)	1958	Ratified (1992)	- Prohibits discrimination in employment; relevant to inclusive hiring and . - Prohibits discrimination in employment and occupation. - Relevant to inclusive hiring practices, local employment, workforce management, and non-discrimination under the LMP.
6.	C 138: Minimum Age Convention	1973	Ratified (2008)	- Establishes minimum age for employment: the general minimum age for employment is set at 15 years, with exceptions for developing countries to initially set it at 14. Prohibits hazardous work for persons under 18. - Relevant to prevention of child labor in project activities.
II.	Labour and OHS (International Good Practice / Not Ratified but Highly Relevant)			
7.	C148: Working Environment: Air Pollution, Noise and Vibration	1977	Not Ratified	- Requires control of occupational exposure to dust, noise, and vibration through monitoring, engineering controls, and worker protection. - Highly relevant to road construction and asphalt operations.
8.	C155: Occupational Safety and Health	1981	Not Ratified	- Establishes general occupational health and safety framework, risk prevention, inspections, training, PPE, and emergency preparedness. - Core convention for construction site safety.
9.	C167: Safety and Health in Construction Convention	1988	Not Ratified	- Provides construction-specific OHS requirements including excavation safety, scaffolding, fall prevention, lifting operations, and contractor responsibilities. - Directly relevant to civil works.



#	Convention	Year	Ratified/ Acceded	Relevance to the Project
10.	C170: Chemicals Convention	1990	Not Ratified	- Covers classification, labeling, storage, transport, and safe handling of hazardous chemicals. - Relevant to fuels, bitumen, lubricants, solvents, and hazardous waste management.
11.	C174: Prevention of Major Industrial Accidents Convention	1993	Not Ratified	- Requires hazard identification, emergency preparedness, and accident prevention for hazardous installations. - Relevant for fuel depots, asphalt plants, and contractor storage facilities.
12.	C187: Promotional Framework for Occupational Safety and Health Convention	2006	Not Ratified	- Requires systematic national and project-level OHS improvement programs and continuous safety performance review. - Relevant to contractor OHS management systems.
13.	C190: Violence and Harassment Convention	2019	Not Ratified	- Requires prevention of workplace violence, harassment, and SEA/SH risks; supports confidential reporting and worker protection. - Relevant to labor influx and camp management.
III.	Biodiversity and Natural Resources			
14.	Convention on Biological Diversity (Rio de Janeiro Convention)	1992	Ratified (1995)	- Requires conservation of biodiversity, mitigation hierarchy, habitat protection, and ecosystem management. - Critical for bypass alignment and IFC PS6 compliance.
15.	Convention on Wetlands of International Importance (Ramsar Convention)	1971	Acceded (2001)	- Protection of wetlands. - Relevant to assessment of impacts on canals, drainage systems, and ecological connectivity.
16.	Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)	1979	Ratified (1998)	Protection of migratory species; relevant to habitat fragmentation and wildlife movement.
IV.	Climate Change and Atmospheric Protection			
17.	Vienna Convention for the Protection of the Ozone Layer	1985	Acceded (1993)	- Protects the ozone layer through management of ozone-depleting substances. - Relevant to refrigerants and equipment procurement.
18.	Montreal Protocol on Substances that Deplete the Ozone Layer	1987	Acceded (1993)	- Controls ozone-depleting substances. - Relevant to equipment and maintenance materials in construction.
19.	United Nations Framework Convention on Climate Change (UNFCCC)	1992	Ratified (1993)	- Framework for climate mitigation and adaptation. - Relevant to GHG emissions and climate resilience of road infrastructure.
20.	Kyoto Protocol to the UNFCCC	1997	Acceded (1999)	- Supports greenhouse gas reduction and emissions accounting. - Relevant to emissions from construction activities and long-term transport impacts.
21.	Paris Agreement	2015	Ratified (2018)	Requires alignment with climate resilience and national climate commitments (NDCs).



#	Convention	Year	Ratified/ Acceded	Relevance to the Project
				▪ Critical for Paris Alignment Assessment and climate finance evaluation.
22.	Convention on Persistent Organic Pollutants (Stockholm Convention)	2001	Acceded (2019)	▪ Regulates hazardous chemicals. ▪ Relevant to handling of fuels, lubricants, hazardous substances, and contaminated waste management.
23.	United Nations Convention to Combat Desertification	1994	Ratified (1995)	▪ Addresses land degradation, erosion, land disturbance, and desertification. ▪ Relevant to soil rehabilitation and erosion control along the project corridor.
V.	Cultural Heritage			
24.	Convention Concerning the Protection of the World Cultural and Natural Heritage (UNESCO)	1972	Ratified (1995)	▪ Protects cultural heritage sites; requires chance find procedures and heritage protection measures. ▪ Relevant due to proximity to Historic Centre of Bukhara and archaeological sensitivity (a UNESCO World Heritage area), and potential chance finds during construction.



Appendix 3. Cadastral Land Plots Intersected by the Project Bypass Section

Table 6: Cadastral Land Plots Intersected by the Greenfield Bypass and Missing Link Alignments

No.	Land's Cadaster No.	Community/ Makhalla	Land Type as Specified in the Cadaster System	Total Area of the Whole Land Plot, m2
1.	20:01:000009933	Shekhoncha	Agricultural Land	354,981.70
2.	20:01:000006809	Shekhoncha	Agricultural Land	18,235.50
3.	20:01:40:01:02:0745	Shekhoncha	Land Plot	67,000.00
4.	20:01:000009929	Shekhoncha	Agricultural Land	62,736.96
5.	20:01:000000059	Dekhcha	Agricultural Land	64,290.00
6.	20:01:000000060	Dekhcha	Agricultural Land	21,530.00
7.	20:01:000000061	Dekhcha	Agricultural Land	24,000.00
8.	20:01:000000062	Dekhcha	Agricultural Land	90,790.00
9.	20:01:40:01:02:0606	Dekhcha	Land Plot	40,438.00
10.	20:01:40:01:02:0620	Dekhcha	Land Plot	28,970.00
11.	20:01:40:01:02:0560	Dekhcha	Land Plot	153,730.00
12.	20:01:40:01:02:0564	Dekhcha	Land Plot	113,560.00
13.	20:01:40:01:02:0566	Dekhcha	Land Plot	79,660.00
14.	20:01:40:01:02:0561	Dekhcha	Land Plot	114,130.00
15.	20:01:000158151	Dekhcha	Agricultural Land	117,020.00
16.	20:01:000012056	Dekhcha	Agricultural Land	20,277.67
17.	20:01:000153806	Dekhcha	Agricultural Land	46,590.00
18.	20:01:000006507	Dekhcha	Agricultural Land	201,532.34
19.	20:01:000006505	Dekhcha	Agricultural Land	175,031.95
20.	20:01:41:01:01:0431	Dekhcha	Land Plot	32,327.00
21.	20:01:000087519	Dekhcha	Agricultural Land	830,005.60
22.	20:01:000019656	Dekhcha	Agricultural Land	9,985.55
23.	20:01:000011472	Dekhcha	Agricultural Land	73,146.50
24.	20:01:000011477	Shergiron	Agricultural Land	279,946.83
25.	20:01:000011471	Shergiron	Agricultural Land	25,807.20
26.	20:01:000011479	Shergiron	Agricultural Land	23,811.26
27.	20:01:000011469	Shergiron	Agricultural Land	35,124.61
28.	20:01:000011466	Shergiron	Agricultural Land	58,159.83
29.	20:01:000011475	Shergiron	Agricultural Land	37,647.89
30.	20:01:000017451	Shergiron	Agricultural Land	201,888.55
31.	20:01:000493640	Shergiron	Agricultural Land	616,245.10
32.	20:01:000493635	Shergiron	Agricultural Land	35,147.88
33.	20:01:000012735	Shergiron	Agricultural Land	7,257.10
34.	20:01:000016728	Shergiron	Agricultural Land	4,599.77
35.	20:01:000012737	Shergiron	Agricultural Land	42,489.99
36.	20:01:000493647	Shergiron	Agricultural Land	135,242.72
37.	20:01:000086962	Robotipoyon	Agricultural Land	100,620.00
38.	20:01:000011710	Shergiron	Agricultural Land	34,252.04
39.	20:01:000016780	Robotipoyon	Agricultural Land	2,006.83
40.	20:01:000017449	Robotipoyon	Agricultural Land	352,369.25
41.	20:01:000017417	Kulonkhona	Agricultural Land	391,074.97
42.	20:01:000120236	Kulonkhona	Agricultural Land	299,220.00
43.	20:01:41:01:02:0576	Kulonkhona	Land Plot	135,130.00
44.	20:01:000000411	Kulonkhona	Agricultural Land	11,822.72
45.	20:01:000450489	Kulonkhona	Agricultural Land	13,973.16
46.	20:01:000011342	Kulonkhona	Agricultural Land	33,477.10
47.	20:01:000450490	Kulonkhona	Agricultural Land	80,387.35



No.	Land's Cadaster No.	Community/ Makhalla	Land Type as Specified in the Cadaster System	Total Area of the Whole Land Plot, m2
48.	20:01:41:01:02:0438	Kulonkhona	Land Plot	61,053.00
49.	20:01:41:01:02:0436	Kulonkhona	Land Plot	56,674.00
50.	20:01:000493636	Kulonkhona	Agricultural Land	14,307.73
51.	20:01:000013811	Kulonkhona	Agricultural Land	36,200.86
52.	20:01:000492516	Zarmanok	Agricultural Land	20,440.70
53.	20:01:000492514	Zarmanok	Agricultural Land	129,892.96



Appendix 4. Inventory of Affected Trees and Structures

Table 7: Affected Asset Inventory under Lot 1

#	Chainage (PK)	Designed Infrastructure	Affected Asset					Total affected plants	Total affected structures	Note
			Orchard (Agricultural Asset)	Ornamental Tree	Commercial Structure	Residential Building	Auxiliary Structure			
1	PK 1+50	Linear Corridor	45	41				86	0	Affected trees near the trade school's fence
2	PK 6+75	Linear Corridor		23				23	0	
3	PK 11+50	Bus stop		2				2	0	
4	PK 12+00	Pedestrian Sidewalk		9				9	0	
5	PK 23+25	Bus stop		14				14	0	
6	PK 24+00	Pedestrian Sidewalk	48	32				80	0	
7	PK 27+50	Linear Corridor		2				2	0	
8	PK 28+50	Linear Corridor		3				3	0	
9	PK 30+50	Bus stop	29					29	0	
10	PK 31+25	Pedestrian Sidewalk	18	2				20	0	
11	PK 39+50	Junction	220	50				270	0	
12	PK 54+50	Linear Corridor	4	21				25	0	
13	PK 60+50	Pedestrian Sidewalk	2	25				27	0	
14	PK 66+25	Bus stop		17				17	0	
15	PK 72+50	Junction		220				220	0	apple trees plantation
16	PK 82+25	Bus stop	9					9	0	
17	PK 83+50	Pedestrian Sidewalk	15					15	0	
18	PK 93+50	Pedestrian Sidewalk		12				12	0	close to the house
19	PK 105+00	Pedestrian Sidewalk				1		0	1	a house
20	PK 119+00-128+00	Linear Corridor		600				600	0	



#	Chainage (PK)	Designed Infrastructure	Affected Asset					Total affected plants	Total affected structures	Note
			Orchard (Agricultural Asset)	Ornamental Tree	Commercial Structure	Residential Building	Auxiliary Structure			
21	PK 130+00	Junction	38				1	38	1	demolition of greenhouse
22	PK 130+50-144+00	Linear Corridor		500				500	0	
23	PK 147+00-158+00	Overpass		900				900	0	
24	PK 162+00	Pedestrian Sidewalk	16	4				20	0	
25	PK 185+00	Junction	100	40				140	0	vineyard plantation
26	PK 189+50	Linear Corridor		55				55	0	
27	PK247+00	Junction	280	118				398	0	vineyard plantation
28	PK 264+50	Pedestrian Sidewalk	7	18				25	0	
29	PK 281+25	Junction	55					55	0	
30	PK 286+50	Pedestrian Sidewalk	15	6				21	0	
31	PK 305+00-320+50	Overpass		1000				1000	0	
32	PK 324+75	Pedestrian Sidewalk	15	4				19	0	
33	PK 327+50-330+00	Linear Corridor	530	200				730	0	
34	PK 341+00	Pedestrian Sidewalk	38	19				57	0	
35	PK 349+25	Junction		405				405	0	
36	PK 372+50	Pedestrian Sidewalk	26	10				36	0	
37	PK 391+75	Junction		30				30	0	vineyard plantation
38	PK 396+75	Junction	12	16				28	0	vineyard plantation
Total:			1,522	4,398	-	1	1	5,920	2	



Table 8: Affected Asset Inventory under Lot 2

#	Chainage (PK)	Designed Infrastructure	Affected Asset					Total affected plants	Total affected structures	Note
			Orchard (Agricultural Asset)	Ornamental Tree	Commercial Structure	Residential Building	Auxiliary Structure			
1	PK 424+00	Pedestrian Sidewalk		8				8	0	
2	PK 433+50	Junction		120				120	0	
3	PK 435+50	Pedestrian Sidewalk		14				14	0	
4	PK 453+00	Junction	200					200	0	Mulberry Plantation
5	PK 455+40	Pedestrian Sidewalk	40	29				69	0	
6	PK 476+50	Junction	150	110				260	0	
7	PK 477+00	Pedestrian Sidewalk	30	9				39	0	Vineyard
8	PK 496+00	Pedestrian Sidewalk		20				20	0	
9	PK 523+60	Pedestrian Sidewalk	2	10	1			12	1	Demolition of one shop at the bus stop
10	PK 525+00-531+40	Overpass	30	340				370	0	
11	PK 532+80	Pedestrian Sidewalk	15	30				45	0	
12	PK 551+50	Junction		50				50	0	
13	PK 556+00-560+60	Linear Corridor	10	350				360	0	
14	PK580+00-583+00	Linear Corridor	60					60	0	
15	PK584+00-587+00	Linear Corridor	40	73				113	0	
16	PK 599+00	Linear Corridor	25	15				40	0	
17	PK 604+50	Overpass	110	1200				1310	0	
18	PK 605+00-609+60	Linear Corridor		85				85	0	
19	PK614+00	Linear Corridor		16			1	16	1	Demolition of a livestock shelter
20	PK 614+80	Linear Corridor	30					30	0	
21	PK619+00	Linear Corridor	24	30				54	0	
22	PK624+00-628+00	Linear Corridor	70	120				190	0	
23	PK636+00	Linear Corridor			1			0	1	Demolition of abandoned house
24	PK633+00-640+00	Linear Corridor	50	140				190	0	
25	PK642+40	Linear Corridor		40				40	0	
26	PK 653+00	Overpass	80	850				930	0	



27	PK653+00-658+00	Linear Corridor		50				50	0	
28	PK 656+00	Linear Corridor				1	1	0	2	Demolition of a livestock shelter and a frame of a residential building
29	PK660+80	Linear Corridor		30				30	0	
30	PK665+00	Linear Corridor	10	15				25	0	
31	PK669+00-670+00	Linear Corridor	50	75				125	0	
32	PK671+00-673+00	Linear Corridor	20					20	0	
33	PK676+00-678+00	Linear Corridor	10	30				40	0	
34	PK 680+00	Linear Corridor		20				20	0	
35	PK 692+00	Linear Corridor	10	6				16	0	
36	PK 696+00	Linear Corridor	260	220				480	0	
Total:			1,326	4,105	2	1	2	5,431	5	

Appendix 5. Geologic Map of the Project Area



Figure 8: Geologic Map of the Project Area

(Source: Excerpt from National Atlas of Uzbekistan)

Seismic Zoning Map of Uzbekistan

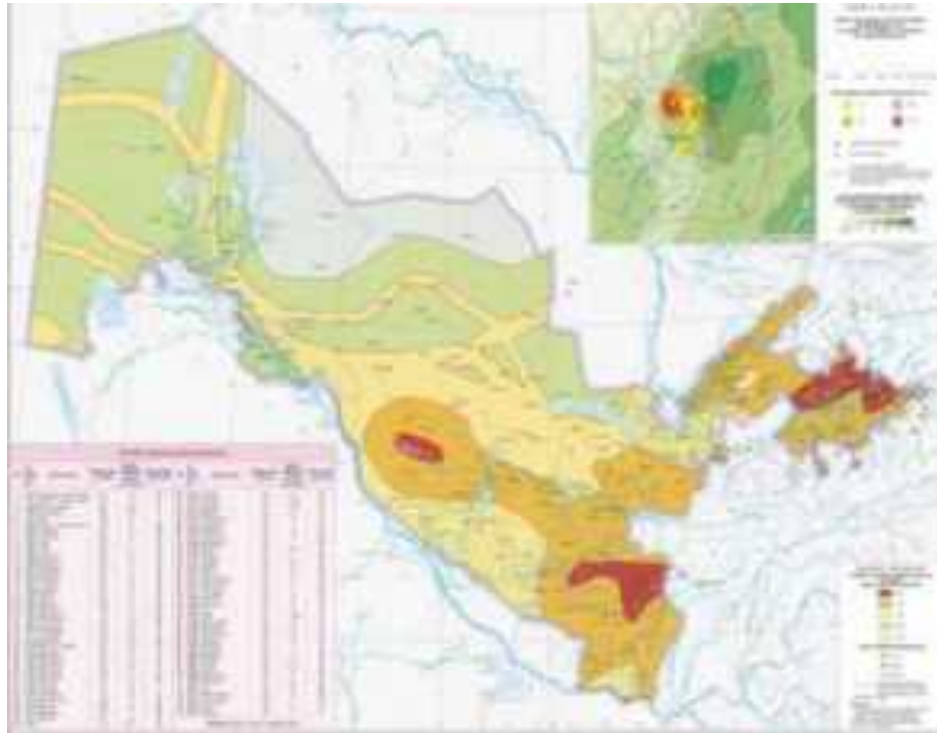


Figure 9: Seismic Zoning Map of Uzbekistan

■ = earthquakes of 9 MA; ■ = earthquakes of 8 MA; ■ = earthquakes of 7 MA; ■ = earthquakes of 6 MA; ■ = earthquakes of 5 MA
(Source: National Atlas of Uzbekistan, 2020)

QIYILDI DIZILGAN KATAGORI											
No	$\frac{M}{M_0}$	Shahar nomi	Magnituda (m. dav)	Yillar Mik. ad shaharlar to'rtboshi	Chiqarilgan dav. dav	No	$\frac{M}{M_0}$	Shahar nomi	Magnituda (m. dav)	Yillar Mik. ad shaharlar to'rtboshi	Chiqarilgan dav. dav
1	1.00	1940 Yangi yo'l atrofi shahari	6.2	17.4	40	40	1942	Yuzovskiy	6.2	9	29
2	1.00	1941 Yangi yo'l atrofi shahari	6.2	9	17	41	1943	Yuzovskiy	6.2	9	17
3	1.00	1942 Yuzovskiy	6.4	9	17	42	1944	Yuzovskiy	6.4	9	17
4	1.00	1943 Yuzovskiy	6.4	9	17	43	1945	Yuzovskiy	6.4	9	17
5	1.00	1944 Yuzovskiy	6.4	9	17	44	1946	Yuzovskiy	6.4	9	17
6	1.00	1945 Yuzovskiy	6.4	9	17	45	1947	Yuzovskiy	6.4	9	17
7	1.00	1946 Yuzovskiy	6.4	9	17	46	1948	Yuzovskiy	6.4	9	17
8	1.00	1947 Yuzovskiy	6.4	9	17	47	1949	Yuzovskiy	6.4	9	17
9	1.00	1948 Yuzovskiy	6.4	9	17	48	1950	Yuzovskiy	6.4	9	17
10	1.00	1949 Yuzovskiy	6.4	9	17	49	1951	Yuzovskiy	6.4	9	17
11	1.00	1950 Yuzovskiy	6.4	9	17	50	1952	Yuzovskiy	6.4	9	17
12	1.00	1951 Yuzovskiy	6.4	9	17	51	1953	Yuzovskiy	6.4	9	17
13	1.00	1952 Yuzovskiy	6.4	9	17	52	1954	Yuzovskiy	6.4	9	17
14	1.00	1953 Yuzovskiy	6.4	9	17	53	1955	Yuzovskiy	6.4	9	17
15	1.00	1954 Yuzovskiy	6.4	9	17	54	1956	Yuzovskiy	6.4	9	17
16	1.00	1955 Yuzovskiy	6.4	9	17	55	1957	Yuzovskiy	6.4	9	17
17	1.00	1956 Yuzovskiy	6.4	9	17	56	1958	Yuzovskiy	6.4	9	17
18	1.00	1957 Yuzovskiy	6.4	9	17	57	1959	Yuzovskiy	6.4	9	17
19	1.00	1958 Yuzovskiy	6.4	9	17	58	1960	Yuzovskiy	6.4	9	17
20	1.00	1959 Yuzovskiy	6.4	9	17	59	1961	Yuzovskiy	6.4	9	17
21	1.00	1960 Yuzovskiy	6.4	9	17	60	1962	Yuzovskiy	6.4	9	17
22	1.00	1961 Yuzovskiy	6.4	9	17	61	1963	Yuzovskiy	6.4	9	17
23	1.00	1962 Yuzovskiy	6.4	9	17	62	1964	Yuzovskiy	6.4	9	17
24	1.00	1963 Yuzovskiy	6.4	9	17	63	1965	Yuzovskiy	6.4	9	17
25	1.00	1964 Yuzovskiy	6.4	9	17	64	1966	Yuzovskiy	6.4	9	17
26	1.00	1965 Yuzovskiy	6.4	9	17	65	1967	Yuzovskiy	6.4	9	17
27	1.00	1966 Yuzovskiy	6.4	9	17	66	1968	Yuzovskiy	6.4	9	17
28	1.00	1967 Yuzovskiy	6.4	9	17	67	1969	Yuzovskiy	6.4	9	17
29	1.00	1968 Yuzovskiy	6.4	9	17	68	1970	Yuzovskiy	6.4	9	17
30	1.00	1969 Yuzovskiy	6.4	9	17	69	1971	Yuzovskiy	6.4	9	17
31	1.00	1970 Yuzovskiy	6.4	9	17	70	1972	Yuzovskiy	6.4	9	17
32	1.00	1971 Yuzovskiy	6.4	9	17	71	1973	Yuzovskiy	6.4	9	17
33	1.00	1972 Yuzovskiy	6.4	9	17	72	1974	Yuzovskiy	6.4	9	17
34	1.00	1973 Yuzovskiy	6.4	9	17	73	1975	Yuzovskiy	6.4	9	17
35	1.00	1974 Yuzovskiy	6.4	9	17	74	1976	Yuzovskiy	6.4	9	17
36	1.00	1975 Yuzovskiy	6.4	9	17	75	1977	Yuzovskiy	6.4	9	17
37	1.00	1976 Yuzovskiy	6.4	9	17	76	1978	Yuzovskiy	6.4	9	17
38	1.00	1977 Yuzovskiy	6.4	9	17	77	1979	Yuzovskiy	6.4	9	17
39	1.00	1978 Yuzovskiy	6.4	9	17	78	1980	Yuzovskiy	6.4	9	17
40	1.00	1979 Yuzovskiy	6.4	9	17	79	1981	Yuzovskiy	6.4	9	17
41	1.00	1980 Yuzovskiy	6.4	9	17	80	1982	Yuzovskiy	6.4	9	17
42	1.00	1981 Yuzovskiy	6.4	9	17	81	1983	Yuzovskiy	6.4	9	17
43	1.00	1982 Yuzovskiy	6.4	9	17	82	1984	Yuzovskiy	6.4	9	17
44	1.00	1983 Yuzovskiy	6.4	9	17	83	1985	Yuzovskiy	6.4	9	17
45	1.00	1984 Yuzovskiy	6.4	9	17	84	1986	Yuzovskiy	6.4	9	17
46	1.00	1985 Yuzovskiy	6.4	9	17	85	1987	Yuzovskiy	6.4	9	17
47	1.00	1986 Yuzovskiy	6.4	9	17	86	1988	Yuzovskiy	6.4	9	17
48	1.00	1987 Yuzovskiy	6.4	9	17	87	1989	Yuzovskiy	6.4	9	17
49	1.00	1988 Yuzovskiy	6.4	9	17	88	1990	Yuzovskiy	6.4	9	17
50	1.00	1989 Yuzovskiy	6.4	9	17	89	1991	Yuzovskiy	6.4	9	17
51	1.00	1990 Yuzovskiy	6.4	9	17	90	1992	Yuzovskiy	6.4	9	17
52	1.00	1991 Yuzovskiy	6.4	9	17	91	1993	Yuzovskiy	6.4	9	17
53	1.00	1992 Yuzovskiy	6.4	9	17	92	1994	Yuzovskiy	6.4	9	17
54	1.00	1993 Yuzovskiy	6.4	9	17	93	1995	Yuzovskiy	6.4	9	17
55	1.00	1994 Yuzovskiy	6.4	9	17	94	1996	Yuzovskiy	6.4	9	17
56	1.00	1995 Yuzovskiy	6.4	9	17	95	1997	Yuzovskiy	6.4	9	17
57	1.00	1996 Yuzovskiy	6.4	9	17	96	1998	Yuzovskiy	6.4	9	17
58	1.00	1997 Yuzovskiy	6.4	9	17	97	1999	Yuzovskiy	6.4	9	17
59	1.00	1998 Yuzovskiy	6.4	9	17	98	2000	Yuzovskiy	6.4	9	17
60	1.00	1999 Yuzovskiy	6.4	9	17	99	2001	Yuzovskiy	6.4	9	17
61	1.00	2000 Yuzovskiy	6.4	9	17	100	2002	Yuzovskiy	6.4	9	17
62	1.00	2001 Yuzovskiy	6.4	9	17	101	2003	Yuzovskiy	6.4	9	17
63	1.00	2002 Yuzovskiy	6.4	9	17	102	2004	Yuzovskiy	6.4	9	17
64	1.00	2003 Yuzovskiy	6.4	9	17	103	2005	Yuzovskiy	6.4	9	17
65	1.00	2004 Yuzovskiy	6.4	9	17	104	2006	Yuzovskiy	6.4	9	17
66	1.00	2005 Yuzovskiy	6.4	9	17	105	2007	Yuzovskiy	6.4	9	17
67	1.00	2006 Yuzovskiy	6.4	9	17	106	2008	Yuzovskiy	6.4	9	17
68	1.00	2007 Yuzovskiy	6.4	9	17	107	2009	Yuzovskiy	6.4	9	17
69	1.00	2008 Yuzovskiy	6.4	9	17	108	2010	Yuzovskiy	6.4	9	17
70	1.00	2009 Yuzovskiy	6.4	9	17	109	2011	Yuzovskiy	6.4	9	17
71	1.00	2010 Yuzovskiy	6.4	9	17	110	2012	Yuzovskiy	6.4	9	17
72	1.00	2011 Yuzovskiy	6.4	9	17	111	2013	Yuzovskiy	6.4	9	17
73	1.00	2012 Yuzovskiy	6.4	9	17	112	2014	Yuzovskiy	6.4	9	17
74	1.00	2013 Yuzovskiy	6.4	9	17	113	2015	Yuzovskiy	6.4	9	17
75	1.00	2014 Yuzovskiy	6.4	9	17	114	2016	Yuzovskiy	6.4	9	17
76	1.00	2015 Yuzovskiy	6.4	9	17	115	2017	Yuzovskiy	6.4	9	17
77	1.00	2016 Yuzovskiy	6.4	9	17	116	2018	Yuzovskiy	6.4	9	17
78	1.00	2017 Yuzovskiy	6.4	9	17	117	2019	Yuzovskiy	6.4	9	17
79	1.00	2018 Yuzovskiy	6.4	9	17	118	2020	Yuzovskiy	6.4	9	17
80	1.00	2019 Yuzovskiy	6.4	9	17	119	2021	Yuzovskiy	6.4	9	17
81	1.00	2020 Yuzovskiy	6.4	9	17	120	2022	Yuzovskiy	6.4	9	17
82	1.00	2021 Yuzovskiy	6.4	9	17	121	2023	Yuzovskiy	6.4	9	17
83	1.00	2022 Yuzovskiy	6.4	9	17	122	2024	Yuzovskiy	6.4	9	17
84	1.00	2023 Yuzovskiy	6.4	9	17	123	2025	Yuzovskiy	6.4	9	17
85	1.00	2024 Yuzovskiy	6.4	9	17	124	2026	Yuzovskiy	6.4	9	17
86	1.00	2025 Yuzovskiy	6.4	9	17	125	2027	Yuzovskiy	6.4	9	17
87	1.00	2026 Yuzovskiy	6.4	9	17	126	2028	Yuzovskiy	6.4	9	17
88	1.00	2027 Yuzovskiy	6.4	9	17	127	2029	Yuzovskiy	6.4	9	17
89	1.00	2028 Yuzovskiy	6.4	9	17	128	2030	Yuzovskiy	6.4	9	17
90	1.00	2029 Yuzovskiy	6.4	9	17	129	2031	Yuzovskiy	6.4	9	17
91	1.00	2030 Yuzovskiy	6.4	9	17	130	2032	Yuzovskiy	6.4	9	17
92	1.00	2031 Yuzovskiy	6.4	9	17	131	2033	Yuzovskiy	6.4	9	17
93	1.00	2032 Yuzovskiy	6.4	9	17	132	2034	Yuzovskiy	6.4	9	17
94	1.00	2033 Yuzovskiy	6.4	9	17	133	2035	Yuzovskiy	6.4	9	17
95	1.00	2034 Yuzovskiy	6.4	9	17	134	2036	Yuzovskiy	6.4	9	17
96	1.00	2035 Yuzovskiy	6.4	9	17	135	2037	Yuzovskiy	6.4	9	17
97	1.00	2036 Yuzovskiy	6.4	9	17	136	2038	Yuzovskiy	6.4	9	17
98	1.00	2037 Yuzovskiy	6.4	9	17	137	2039	Yuzovskiy	6.4	9	17
99	1.00	2038 Yuzovskiy	6.4	9	17	138	2040	Yuzovskiy	6.4	9	17
100	1.00	2039 Yuzovskiy	6.4	9	17	139	2041	Yuzovskiy	6.4	9	17
101	1.00	2040 Yuzovskiy	6.4	9	17	140	2042	Yuzovskiy	6.4	9	17
102	1.00	2041 Yuzovskiy	6.4	9	17	141	2043	Yuzovskiy	6.4	9	17
103	1.00	2042 Yuzovskiy	6.4	9	17	142	2044	Yuzovskiy	6.4	9	17
104	1.00	2043 Yuzovskiy	6.4	9	17	143	2045	Yuzovskiy	6.4	9	17
105	1.00	2044 Yuzovskiy	6.4	9	17	144	2046	Yuzovskiy	6.4	9	17
106	1.00	2045 Yuzovskiy	6.4	9	17	145	2047	Yuzovskiy	6.4	9	17
107	1.00	2046 Yuzovskiy	6.4	9	17	146	2048	Yuzovskiy	6.4	9	17
108	1.00	2047 Yuzovskiy	6.4	9	17	147	2049	Yuzovskiy	6.4	9	17
109	1.00	2048 Yuzovskiy	6.4	9	17	148	2050	Yuzovskiy	6.4	9	17
110	1.00	2049 Yuzovskiy	6.4	9	17	149	2051	Yuzovskiy	6.4	9	17
111	1.00	2050 Yuzovskiy	6.4	9	17	150	2052	Yuzovskiy	6.4	9	17
112	1.00	2051 Yuzovskiy	6.4	9	17	151	2053	Yuzovskiy	6.4	9	17
113	1.00	2052 Yuzovskiy	6.4	9	17	152	2054	Yuzovskiy	6.4	9	17
114	1.00	2053 Yuzovskiy	6.4	9	17	153					



Appendix 6. Soil Survey Campaign Results

This appendix presents the methodology, classification criteria, and station-by-station laboratory results supporting the soil baseline.

1. Laboratory Methodology

Soil sampling and laboratory analysis for both the greenfield bypass and rehabilitation corridor sections were undertaken by the Bukhara Regional Agrochemical Analysis Centre, in accordance with applicable national standards, as summarized in Table 13.

Table 9: Methods of Soil Analysis

Parameter	Method of Analysis
Humus (organic matter)	Tyurin method (wet oxidation by potassium dichromate, titrimetric/photometric determination), GOST 26213-91, clause 1.4
Mobile Phosphorus	Machigin extraction, spectrophotometric determination (GOST 26205-91, clause 4)
Exchangeable Potassium	Flame photometric determination after Machigin extraction (GOST 26205-91, clause 4)
Chloride Salinity	Argentometric titration and conductivity measurement (GOST 26425-85)
Total Nitrogen	Kjeldahl digestion method (GOST 26107-84)
pH	Potentiometric method in aqueous suspension (GOST 26423-85, clause 4)

(Source: Laboratory Report of Bukhara Regional Agrochemical Analysis Centre)

2. Salinity Classification System

The chloride-based salinity classification applied in this section follows the national standard GOST 26425-85, which defines salinity classes based on chloride content as a percentage of oven-dried soil weight. The thresholds applied are summarized in Table 14.

Table 10: Salinity Classification Thresholds

Salinity Class	Chloride Content (% of dry soil)	Agricultural Impact
Non-saline	< 0.02%	No saline constraint
Weakly saline	0.02–0.06%	Slight yield reduction for sensitive crops
Moderately saline	0.06–0.12%	Significant yield reduction; management required
Strongly saline	> 0.12%	Severe constraint; most crops affected

(Source: GOST 26425-85, Soils – Methods for determination of chloride-ion content in water extract)



3. Bypass Sections: Sampling and Results

1.1. Sampling

Twelve sampling stations were established along the proposed bypass alignment and associated junction areas (laboratory certificate dated 27 April 2026), selected to represent principal landforms, soil types, and areas of anticipated earthwork intensity, with particular attention to proximity to irrigation infrastructure. Sampling locations are shown in Figure 11. All samples were collected from the 0–30 cm surface horizon.



Figure 11: Soil Sampling Locations within Bypass Sections
(Source: ESIA)

Table 11: Baseline Soil Quality Survey Results – Greenfield Bypass and Missing Link Sections

Sampling Location	GPS Coordinates	Depth (cm)	Humus (%)	Mobile P (mg/kg)	Exch. K (mg/kg)	Chloride Salinity	Total N (%)	pH	Notes
SS 1	39.805811, 64.375658	0–30	0.83	13.94	348	Weakly saline (0.03%)	0.043	8.1	Low fertility; alkaline
SS 2	39.811458, 64.375775	0–30	1.25	47.92	216	Weakly saline (0.025%)	0.27	7.3	Moderate fertility; low alkalinity
SS 3	39.803178, 64.364308	0–30	0.86	36.69	204	Weakly saline (0.05%)	0.19	7.6	Moderate fertility; alkaline



Sampling Location	GPS Coordinates	Depth (cm)	Humus (%)	Mobile P (mg/kg)	Exch. K (mg/kg)	Chloride Salinity	Total N (%)	pH	Notes
SS 4	39.796522, 64.371383	0–30	0.93	16.02	316	Weakly saline (0.04%)	0.047	7.5	Low fertility; low alkalinity
SS 5	39.788772, 64.348464	0–30	0.85	16.06	245	Weakly saline (0.037%)	0.054	7.8	Low fertility; alkaline
SS 6	39.776061, 64.372169	0–30	0.78	15.90	234	Weakly saline (0.06%)	0.051	7.3	Very low humus; low alkalinity
SS 7	39.775419, 64.362072	0–30	0.82	34.04	208	Weakly saline (0.055%)	0.11	7.6	Moderate phosphorus; alkaline
SS 8	39.769722, 64.360803	0–30	0.85	44.80	236	Weakly saline (0.04%)	0.15	7.5	Moderate fertility; low alkalinity
SS 9	39.762267, 64.366000	0–30	0.83	16.55	322	Weakly saline (0.037%)	0.025	7.1	Very low nitrogen; low alkalinity
SS 10	39.755067, 64.365978	0–30	1.18	53.20	186	Weakly saline (0.048%)	0.22	7.4	Elevated phosphorus; low alkalinity
SS 11	39.747414, 64.368253	0–30	0.87	34.36	204	Weakly saline (0.033%)	0.17	7.5	Moderate fertility; low alkalinity
SS 12	39.742094, 64.376225	0–30	1.22	57.76	282	Weakly saline (0.028%)	0.28	7.7	Relatively higher fertility; alkaline

(Source: Bukhara Regional Agrochemical Analysis Center)

1.2. Soil Survey Results

The laboratory results for the bypass sections are summarized in Table 15. All samples were collected from the 0–30 cm surface horizon, which is the most relevant layer for agricultural productivity assessment, topsoil stripping and reinstatement planning, and vegetation restoration management.

The bypass survey results indicate the following principal soil characteristics:

- **Humus (organic matter) content** ranges from 0.78% (SS 6) to 1.25% (SS 2), indicating uniformly low to moderate organic matter accumulation consistent with intensively cultivated irrigated soils under arid conditions. No station exceeds the 2% threshold considered indicative of moderate fertility under regional agrochemical standards;



- **Mobile phosphorus** varies between 13.94 mg/kg (SS 1) and 57.76 mg/kg (SS 12), indicating variable nutrient availability. Stations SS 1, SS 4, SS 5, SS 6, and SS 9 record low phosphorus values that may constrain vegetation establishment during reinstatement;
- **Exchangeable potassium** ranges from 186 mg/kg (SS 10) to 348 mg/kg (SS 1), with generally moderate to high values across the bypass alignment, indicating comparatively favorable potassium availability;
- **Total nitrogen** is low to very low at most stations (0.025%–0.28%), with particularly low values at SS 9 (0.025%) and SS 1 (0.043%), which may limit natural revegetation capacity and require supplementary fertilization during reinstatement.
- **pH** values range from 7.1 (SS 9) to 8.1 (SS 1), indicating neutral to moderately alkaline conditions throughout the bypass alignment.

All twelve bypass stations were classified as weakly saline based on measured chloride content (0.025%–0.06%), indicating no severe salinity constraint for construction or agricultural use. However, the surface productive soil layer is nevertheless vulnerable to disturbance, compaction, erosion, and fertility loss during bypass construction activities, and requires systematic topsoil management.

4. Rehabilitation Sections: Sampling and Results

1.3. Sampling

Sampling locations were distributed across the project districts (Kyzyltepa, Gijduvon, Vobkent, Bukhara), focused on areas of anticipated substantial ground disturbance, interchanges, junction reconstruction, underpasses, U-turn facilities, access modifications, and widening sections (samples submitted 15–18 May 2026; laboratory analysis completed 21 May 2026). All samples were collected from the 0–30 cm surface horizon.

1.4. Soil Quality Survey Results

The rehabilitation corridor generally traverses long-established transport and agricultural landscapes characterized by anthropogenically modified soils affected by previous road construction, maintenance activities, traffic-related deposition, cultivation, and irrigation practices. As a result, soil conditions within the rehabilitation sections are expected to exhibit varying degrees of compaction, disturbance, reduced organic content, and localized salinity. Soil quality test results are summarized in Table 16.



Table 12: Baseline Soil Quality Survey Results – Rehabilitation Sections

Sampling Location	District	GPS Coordinates	Depth (cm)	Humus (%)	Mobile P (mg/kg)	Exch. K (mg/kg)	Chloride Salinity	Total N (%)	pH	Notes
SS-1	Kyzyltepa	40.058533, 64.788400	0–30	1.19	34.28	182	Non-saline (0.01%)	0.07	7.1	Low fertility; slightly alkaline
SS-2	Gijduvon	40.066061, 64.752581	0–30	1.22	38.63	206	Weakly saline (0.036%)	0.09	7.4	Moderate fertility; slightly alkaline
SS-3	Gijduvon	40.085500, 64.693333	0–30	0.75	12.00	318	Moderately saline (0.05%)	0.03	7.6	Very low humus; alkaline
SS-4	Gijduvon	40.092036, 64.629908	0–30	1.16	31.89	242	Weakly saline (0.03%)	0.047	7.5	Low fertility; slightly alkaline
SS-5	Gijduvon	40.071272, 64.561992	0–30	1.34	37.89	316	Weakly saline (0.039%)	0.11	6.8	Moderate fertility; neutral
SS-6	Vobkent	40.047478, 64.537619	0–30	1.12	27.84	240	Weakly saline (0.035%)	0.07	7.4	Low fertility; slightly alkaline
SS-7	Vobkent	39.995314, 64.511075	0–30	0.86	19.63	318	Moderately saline (0.053%)	0.13	7.9	Low fertility; alkaline, elevated salinity
SS-8	Vobkent	39.957867, 64.495494	0–30	0.93	20.09	164	Weakly saline (0.02%)	0.03	7.1	Low fertility; slightly alkaline
SS-9	Bukhara District	39.919169, 64.481594	0–30	1.26	34.56	182	Weakly saline (0.41%)	0.11	7.4	Moderate fertility; slightly alkaline
SS-10	Bukhara District	39.902711, 64.473533	0–30	1.18	27.86	208	Weakly saline (0.02%)	0.13	6.8	Low fertility; neutral
SS-11	Bukhara District	39.882217, 64.462158	0–30	1.07	33.42	262	Non-saline (0.01%)	0.08	7.1	Low fertility; slightly alkaline
SS-12	Bukhara District	39.836903, 64.410931	0–30	1.23	38.62	160	Weakly saline (0.029%)	0.15	6.9	Moderate fertility; neutral
SS-13	Bukhara District	39.767006, 64.343856	0–30	1.16	34.53	204	Weakly saline (0.03%)	0.11	7.0	Low fertility; neutral
SS-14	Bukhara District	39.763397, 64.303697	0–30	1.34	39.63	186	Non-saline (0.01%)	0.18	6.9	Moderate fertility; neutral

(Source: Bukhara Regional Agrochemical Analysis Center);

SS = soil sampling location; cm = centimeter; kg = kilogram; mg = milligram; % = percentage; pH = hydrogen indicator



5. Soil Sampling and Laboratory Testing Photographs

(a) Bypass Soil Sampling Campaign

	
Soil Sampling in Section 1	
	
Soil Sampling in Section 2	
	
Soil Sampling in Section 3	
	
Soil Sampling in Section 4	
	
Soil Sampling in Section 5	



	
Soil Sampling in Section 6	
	
Soil Sampling in Section 7	
	
Soil Sampling in Section 8	
	
Soil Sampling in Section 9	
	
Soil Sampling in Section 10	



(b) Rehabilitation Corridor Soil Sampling Campaign

	
Soil Sampling in Kyzyltepa District, Navoi	
	
Soil Sampling in Gijduvon District, Bukhara	
	
Soil Sampling in Vobkent District, Bukhara	
	
Soil Sampling in Bukhara District, Bukhara	
	
Soil Sampling in Jondor District, Bukhara	



	
Soil Sampling in Karakul District, Bukhara	
	
Soil Sampling in Alat District, Bukhara	

(c) Soil Quality Laboratory Testing



(d) Bypass Soil Quality Laboratory Test Report

[illegible]

(e) Rehabilitation Corridor Soil Quality Laboratory Test Report

[illegible]



Appendix 7. Surface Water Quality Campaign Results

1. Sampling Stations, GPS Coordinates, and Environmental Conditions

A baseline surface water quality monitoring campaign was conducted between 20 May and 1 June 2026 by the Public Health and Wellbeing Service, which operates a licensed environmental and sanitary laboratory accredited under the Ministry of Health of Uzbekistan. All sampling, analysis, and reporting were carried out in accordance with procedures and protocols approved by Order No. 399 of the Minister of Health dated 26 December 2025, entitled Protocol on Inspection of Open Water Bodies and Wastewater.

The monitoring campaign was designed to characterize the physicochemical baseline conditions of surface water bodies crossed by or located adjacent to the M37 project corridor, covering both the rehabilitation section and the greenfield bypass and missing link components. A total of 12 water samples were collected from irrigation canals, rivers, reservoirs, and drainage channels distributed across the project-affected districts of Kyzyltepa (Navoi Province) and Gijduvon, Vobkent, and Bukhara districts (Bukhara Province). Sampling stations were assigned reference codes WA1 through WA6 in rehabilitation corridor and BWA1-BWA6 in bypass and geo-referenced by GPS coordinates.

The campaign was carried out across three field missions:

- 20–21 May 2026 – Stations WA1–WA6 (Kyzyltepa, Gijduvon, and Vobkent districts, with air temperatures of 29–30 °C and water temperatures of 8–9 °C.
- 1 June 2026 – Stations BWA1–BWA6 (Bukhara district bypass cluster; Figure 14), with air temperatures of 33 °C and water temperatures of 8–9 °C.

The elevated air temperatures during the June sampling round (33 °C) confirm that samples were collected during a seasonally critical period for irrigation water demand and water quality stress. Water temperatures remained stable across all rounds (8–9 °C). The GPS-referenced sampling stations and associated environmental conditions are summarized in the table below.

Table 13: Surface Water Sampling Stations, GPS Coordinates, and Environmental Conditions

Station ID	Water Body / Location	GPS Coordinates	Sample Date	Air Temperature (°C)	Water Temperature (°C)
WA1	Zarafshan River (Saidkent community, Kyzyltepa District)	40°3'41.07"N 64°46'28.10"E	20.05.2026	29	8
WA2	Mazragan Canal (Mazragan community, Gijduvon District)	40°5'8.96"N 64°41'31.59"E	20.05.2026	29	8
WA3	Kalkanrud Canal (Y. Hamadoniy St., Gijduvon District)	40°5'8.96"N 64°40'41.74"E	20.05.2026	29	8



Station ID	Water Body / Location	GPS Coordinates	Sample Date	Air Temperature (°C)	Water Temperature (°C)
WA4	Vabkentdarya Canal (Vobkent District)	40°0'56.01"N 64°31'36.06"E	21.05.2026	30	9
WA5	Bukhara Central Collector (Vobkent District)	39°57'39.72"N 64°29'51.14"E	21.05.2026	30	9
WA6	Jaykhun Collector (Galaosiyo, Bukhara District)	39°51'6.55"N 64°26'31.60"E	21.05.2026	30	9
BWA1	Dekhcha Canal (Dekhcha MFY, Bukhara District)	39°48'17.78"N 64°22'12.93"E	01.06.2026	33	9
BWA2	Dekhcha Zahkash I (Dekhcha community, Bukhara District)	39°47'48.87"N 64°21'40.21"E	01.06.2026	33	8
BWA3	Dekhcha Zahkash II (Dekhcha community, Bukhara District)	39°47'22.45"N 64°21'11.57"E	01.06.2026	33	9
BWA4	Canal I – Shergiron community (Bukhara District)	39°46'51.38"N 64°20'38.08"E	01.06.2026	33	8
BWA5	Canal II – Shergiron community (Bukhara District)	39°45'57.14"N 64°20'48.26"E	01.06.2026	33	8
BWA6	Collector – Kulonkhona community (Bukhara District)	39°45'25.82"N 64°21'24.46"E	01.06.2026	33	8

(Source: Laboratory Report of Bukhara Province Public Health and Wellbeing Service, 03 June 2026)

2. Analytical Parameters and Methods

Each water sample was analyzed for a standard suite of physicochemical and chemical parameters in accordance with applicable Uzbekistan standards. The following parameters were determined:

- **Physical parameters:** odour intensity (ball scale), colour degree (°), turbidity / suspended sediment (mg/dm³), transparency (cm), and floating matter; pH
- **Nitrogen compounds:** ammonia nitrogen (GOST 4192-82), nitrite nitrogen (GOST 4192-82), nitrate nitrogen (GOST 18826-73)
- **Mineralization indicators:** total hardness (mg-ekv/dm³), dry residue / total dissolved solids – TDS (mg/dm³), chlorides (mg/dm³), and sulfates (mg/dm³)
- **Additional indicators:** calcium, magnesium, total iron, fluoride, and petroleum products (recorded where detected).

Analyses were performed under the supervision of accredited laboratory specialists and countersigned by the head of the communal hygiene division. Laboratory conclusions were prepared for each protocol in accordance with regulatory requirements.

3. Baseline Water Quality Results

The geo-referenced physicochemical monitoring results for all 12 sampling stations are presented in Table 14.



Table 14: Baseline Surface Water Quality Monitoring Results

Station ID	Location	pH	Nitrate (mg/dm ³)	Hardness (mg-ekv/dm ³)	Dry Residue (mg/dm ³)	Chlorides (mg/dm ³)	Sulfates (mg/dm ³)	Ammonia	Nitrite
WA1	Zarafshan River (Kyzyltepa District)	7.0	14.5	14.0	1'004	109.9	216	Trace	Trace
WA2	Mazragan Canal (Gijduvon District)	7.0	16.2	15.5	1'056	119.7	225	Trace	Trace
WA3	Kalkanrud Canal (Gijduvon District)	7.0	16.9	17.0	1'088	128.1	229	Trace	Trace
WA4	Vabkentdarya Canal (Vobkent District)	7.0	14.9	14.0	1'016	111.3	218	Trace	Trace
WA5	Bukhara Central Collector (Vobkent District)	7.0	17.7	23.0	1'104	152.6	221	Trace	Trace
WA6	Jaykhun Collector (Galaosiyo)	7.0	16.8	17.0	1'096	129.5	230	Trace	Trace
BWA1	Dekhcha Canal (Bukhara District)	6.0	15.5	9.5	1'004	56.0	227	Trace	Trace
BWA2	Dekhcha Zahkash I (Bukhara District)	6.0	14.7	14.0	1'036	161.0	218	Trace	Trace
BWA3	Dekhcha Zahkash II (Bukhara District)	7.0	12.2	32.0	1'216	175.0	252	Trace	Trace
BWA4	Canal I – Shergiron MFY (Bukhara District)	6.0	15.2	15.0	1'056	140.0	225	Trace	Trace
BWA5	Canal II – Shergiron MFY (Bukhara District)	5.5	14.9	14.0	1'032	98.0	217	Trace	Trace
BWA6	Collector – Kulonkhona MFY (Bukhara District)	6.0	15.3	16.0	1'056	147.0	224	Trace	Trace

(Source: Laboratory Report of Bukhara Province Public Health and Wellbeing Service, 03 June 2026)



4. Conclusion

The baseline monitoring results characterize the surface water bodies along the M37 project corridor as moderately to highly mineralized, turbid, agriculturally influenced waters consistent with the arid irrigated environment of the Bukhara oasis. The following principal conclusions are drawn:

- Elevated mineralization (TDS >1,000 mg/dm³ at all stations), hardness, chloride, and sulfate concentrations across the full corridor reflect the cumulative influence of Amudarya source water salinity, arid evaporative concentration, irrigation return flows, and gypsum-bearing regional geology. These represent pre-existing baseline conditions not attributable to the project.
- The absence of detectable ammonia and nitrite nitrogen at all 12 stations across the complete corridor extent confirms no acute organic pollution at baseline, providing a clear reference condition for construction-phase impact detection.
- A spatially coherent north-to-south pH gradient, from 7.0 at WA1–WA6 in the northern rehabilitation corridor to 5.5–6.0 at BWA1–BWA6 in the Bukhara bypass cluster, is consistent with increasing distance from Amudarya headworks and cumulative agricultural drainage influence and should be incorporated into the construction monitoring design.
- Station BWA3 (Dekhcha Zahkash II, Bukhara District) is the most mineralized water body in the network (TDS 1,216 mg/dm³; hardness 32.0 mg-ekv/dm³; Cl 175 mg/dm³; SO₄ 252 mg/dm³) and should be designated a priority monitoring station during construction, given its location within the active bypass and missing link construction zone.
- The satellite imagery visually demonstrates the critical role of the irrigated corridor as the only productive landscape in an otherwise arid environment, reinforcing the high environmental and economic sensitivity of the canal systems intersected by the project as receptors during construction.
- The concentration of six stations in the Bukhara bypass cluster reflects the highest infrastructure density along the corridor and, in combination with the most consistently acidic pH and elevated mineralization recorded at these stations, confirms that this section presents the greatest pre-existing water quality challenge and requires the most rigorous construction-phase canal protection, spill prevention, and sediment control measures.
- All 12 GPS-referenced stations were assessed by the accredited laboratory as not meeting applicable sanitary norms for open water bodies.

5. Water Sampling and Laboratory Testing Photographs

(a) Bypass Water Sampling Campaign



	
Water Sampling in Section 4, Dehcha community, Bukhara District	
	
Water Sampling in Section 5, Dehcha community, Bukhara District	
	
Water Sampling in Section 6, Dehcha community, Bukhara District	
	
Water Sampling in Section 7, Shergiron community, Bukhara District	
	
Water Sampling in Section 9, Shergiron community, Bukhara District	



(b) Rehabilitation Corridor Water Sampling Campaign





	
Water Sampling in Bukhara Central Collector, Vobkent District, Bukhara Province	
	
Water Sampling in Jaykhun Canal, Bukhara District, Bukhara Province	

(c) Water Quality Laboratory Testing

	
	
	
Water quality laboratory testing of collected samples in Gijduvon District Public Health and Wellbeing Service Laboratory	

(d) Bypass Water Quality Laboratory Test Report

Section 1: Project Data	Section 2: Environmental Data
Project Name: <u>M37 Corridor Improvement Project</u>	Project Location: <u>...</u>
Project Description: <u>...</u>	Project Purpose: <u>...</u>
Project Start Date: <u>...</u>	Project End Date: <u>...</u>
Project Status: <u>...</u>	Project Phase: <u>...</u>
Project Manager: <u>...</u>	Project Engineer: <u>...</u>
Project Budget: <u>...</u>	Project Cost: <u>...</u>
Project Risk: <u>...</u>	Project Impact: <u>...</u>
Project Benefit: <u>...</u>	Project Outcome: <u>...</u>
Project Conclusion: <u>...</u>	Project Recommendation: <u>...</u>

Section 1: Project Data	Section 2: Environmental Data
Project Name: <u>M37 Corridor Improvement Project</u>	Project Location: <u>...</u>
Project Description: <u>...</u>	Project Purpose: <u>...</u>
Project Start Date: <u>...</u>	Project End Date: <u>...</u>
Project Status: <u>...</u>	Project Phase: <u>...</u>
Project Manager: <u>...</u>	Project Engineer: <u>...</u>
Project Budget: <u>...</u>	Project Cost: <u>...</u>
Project Risk: <u>...</u>	Project Impact: <u>...</u>
Project Benefit: <u>...</u>	Project Outcome: <u>...</u>
Project Conclusion: <u>...</u>	Project Recommendation: <u>...</u>

Section 1: Project Data	Section 2: Environmental Data
Project Name: <u>M37 Corridor Improvement Project</u>	Project Location: <u>...</u>
Project Description: <u>...</u>	Project Purpose: <u>...</u>
Project Start Date: <u>...</u>	Project End Date: <u>...</u>
Project Status: <u>...</u>	Project Phase: <u>...</u>
Project Manager: <u>...</u>	Project Engineer: <u>...</u>
Project Budget: <u>...</u>	Project Cost: <u>...</u>
Project Risk: <u>...</u>	Project Impact: <u>...</u>
Project Benefit: <u>...</u>	Project Outcome: <u>...</u>
Project Conclusion: <u>...</u>	Project Recommendation: <u>...</u>

Section 1: Project Data	Section 2: Environmental Data
Project Name: <u>M37 Corridor Improvement Project</u>	Project Location: <u>...</u>
Project Description: <u>...</u>	Project Purpose: <u>...</u>
Project Start Date: <u>...</u>	Project End Date: <u>...</u>
Project Status: <u>...</u>	Project Phase: <u>...</u>
Project Manager: <u>...</u>	Project Engineer: <u>...</u>
Project Budget: <u>...</u>	Project Cost: <u>...</u>
Project Risk: <u>...</u>	Project Impact: <u>...</u>
Project Benefit: <u>...</u>	Project Outcome: <u>...</u>
Project Conclusion: <u>...</u>	Project Recommendation: <u>...</u>

1. Name of the person: *John Doe*
 2. Date of birth: *12/12/1980*
 3. Address: *123 Main St, New York, NY 10001*
 4. Phone: *212-555-1234*
 5. Email: *john.doe@example.com*
 6. Occupation: *Software Engineer*
 7. Education: *B.S. in Computer Science, NYU*
 8. Marital Status: *Single*
 9. Number of children: *0*
 10. Current residence: *Apartment 5B, 123 Main St*
 11. Previous residences: *456 Park Ave, NYC*
 12. Vehicles: *2015 Ford Focus*
 13. Pets: *1 dog, 2 cats*
 14. Hobbies: *Reading, hiking, cooking*
 15. Languages: *English, Spanish*
 16. Travel history: *Europe, Asia, Africa*
 17. Current employer: *Google Inc.*
 18. Previous employers: *Facebook, Amazon*
 19. Current salary: *\$120,000*
 20. Previous salaries: *\$90,000, \$110,000*
 21. Bank accounts: *Chase, Wells Fargo*
 22. Credit cards: *Amex, Visa*
 23. Insurance: *Health, Life, Auto*
 24. Social media: *Facebook, Twitter, LinkedIn*
 25. Other notes: *Willing to relocate*

(e) Rehabilitation Corridor Water Quality Laboratory Test Report

[illegible]

[illegible][illegible]



Appendix 8. Air and Noise Sensitive Receptors

Table 15: Air Quality and Noise Sensitive Receptors Along the Project Corridor

#	Receptor	Receptor Type	District / Community	Approximate Distance to Project Corridor (m)
1	School No.7	human	Gumbaz community, Kyzyltepa district, Navoi	220
2	School No.4	human	Buston microdistrict, Kyzyltepa district, Navoi	29
3	Vocational college No. 2	human	Buston microdistrict, Kyzyltepa district, Navoi	54
4	Hospital	human	Buston microdistrict, Kyzyltepa district, Navoi	79
5	Impuls-med Private Hospital	human	Buston microdistrict, Kyzyltepa district, Navoi	206
6	Dono bolajon Pre-school	human	Bulakrabot community, Kyzyltepa district, Navoi	50
7	Zarafshan River	natural	Bulakrabot community, Kyzyltepa district, Navoi	1
8	Pre-school No.32	human	Goyibon community, Kyzyltepa district, Navoi	49
9	Greenhouse	natural	Havzak community, Gijduvon district, Bukhara	171
10	Vineyard, orchard	natural	Khatcha community, Gijduvon district, Bukhara	32
11	School No.29	human	Khatcha community, Gijduvon district, Bukhara	46
12	Hatcha cemetery	human	Khatcha community, Gijduvon district, Bukhara	10
13	Plant nursery	natural	Kulijabbor community, Gijduvon district, Bukhara	14
14	Sports school	human	Govshun community, Gijduvon district, Bukhara	26
15	School No.49	human	Govshun community, Gijduvon district, Bukhara	16
16	Pre-school No.18	human	Gajdumak community, Gijduvon district, Bukhara	103
17	Lyceum No.62	human	Gajdumak community, Gijduvon district, Bukhara	201
18	Cemetery	human	Abdulla Kahhor community, Gijduvon district, Bukhara	76
19	Cemetery	human	Mazoragasak community, Gijduvon district, Bukhara	179
20	Cemetery	human	Labirud community, Gijduvon district, Bukhara	51
21	Irrigation Canal	natural	Pomuzha community, Gijduvon district, Bukhara	5
22	Kalkanrud Canal	natural	Shark community, Gijduvon district, Bukhara	1
23	Agricultural farmstead	natural	Ponob community, Vobkent district, Bukhara	35
24	Pre-school No.8	human	Panob community, Vobkent district, Bukhara	209
25	Sports school	human	Rabotokhun community, Vobkent district, Bukhara	112
26	Orchard	natural	Muminobod community, Vobkent district, Bukhara	18
27	Cemetery	human	Shifokor community, Vobkent district, Bukhara	69



#	Receptor	Receptor Type	District / Community	Approximate Distance to Project Corridor (m)
28	Cemetery	human	Rabotokhun community, Vobkent district, Bukhara	30
29	Vabkentdarya Canal	natural	Rabotokhun community, Vabkent district, Bukhara	1
30	Northwest Branch Canal	natural	Arabkhona community, Vobkent district, Bukhara	1
31	Central Bukhara Collector	natural	Ponob community, Vobkent district, Bukhara	1
32	Irrigation Canal	natural	Khalach community, Vobkent district, Bukhara	1
33	Musical school No.7	human	Galaosiyo community, Bukhara district, Bukhara	114
34	Cemetery	human	Sahovat community, Bukhara district, Bukhara	73
35	Cemetery	human	Shaykhon community, Bukhara district, Bukhara	75
36	Medical center	human	Dustlik community, Bukhara district, Bukhara	153
37	Bukhara District Medical Association	human	Rabotak community, Bukhara district, Bukhara	205
38	Irrigation Canal	natural	Dehcha community, Bukhara district, Bukhara	1
39	Irrigation Canal	natural	Shergiron community, Bukhara district, Bukhara	1
40	Irrigation Canal crossing Jondor Canal	natural	Kulonkhona community, Bukhara district, Bukhara	1
41	Sakovich Drainage Canal	natural	Zarmanok community, Bukhara district, Bukhara	1
42	Irrigation Canal	natural	Bogikalon community, Bukhara district, Bukhara	5
43	Jayhun Collector	natural	Oybek community, Bukhara district, Bukhara	1
44	Jondor Canal	natural	Shergiron community, Bukhara district, Bukhara	30
45	Greenhouse	natural	Amirobod-Guliston community, Bukhara district, Bukhara	138



Appendix 9. Air Quality Survey Campaign Results

This appendix presents the full monitoring station details, GPS coordinates, distances to the project corridor, and detailed station-by-station laboratory results for both the gaseous pollutant monitoring campaign (AAQ1–AAQ10) and the particulate matter monitoring campaign (PMM1–PMM12), supporting the baseline air quality.

1. Gaseous Pollutant Monitoring Stations (AAQ1–AAQ10)

A 24-hour ambient air quality monitoring program was undertaken to establish baseline ambient air quality conditions at representative sensitive locations along the rehabilitation sections of the M37 corridor and within the proposed Bukhara bypass area. The table below presents the selected ambient air quality monitoring locations.

Table 16: Selected Ambient Air Quality Monitoring Locations

No.	District / Area	Project Component	Monitoring Location	GPS-positioning	Distance to M37 Road
AAQ1	Kyzyltepa, Navoi Province	Rehabilitation Section	Pre-school "Dono Bolajon", Bulakrabot settlement	40°03'22.61"N, 64°47'54.34"E	50 m
AAQ2	Gijduvon, Bukhara Province	Rehabilitation Section	School No. 29, Khatcha town	40°04'19.17"N, 64°44'24.81"E	46 m
AAQ3	Vobkent, Bukhara Province	Rehabilitation Section	Vobkent District Sports School, Rabotokhun community	40°00'48.94"N, 64°31'29.67"E	112 m
AAQ4	Galaosiyo, Bukhara Province	Rehabilitation Section	Music and Art School No. 7, Galaosiyo community	39°51'38.71"N, 64°26'45.25"E	126 m
AAQ5	Bukhara Bypass	Bypass Section	Roadside section, Dekhcha community, Aminobod settlement	39°48'11.95"N, 64°22'9.04"E	13 m
AAQ6	Bukhara Bypass	Bypass Section	Cemetery, Dekhcha community, Rabot-Eshon settlement	39°47'44.50"N, 64°21'39.57"E	51 m
AAQ7	Bukhara Bypass	Bypass Section	Nearest household, residential area in Chor-Bakr settlement	39°46'25.59"N, 64°20'24.79"E	80 m
AAQ8	Bukhara Bypass	Bypass Section	Nearest household, residential area in Shergiron community	39°46'6.06"N, 64°20'36.80"E	40 m
AAQ9	Bukhara Bypass	Bypass Section	Near residential area in Shergiron community, Takhmach settlement	39°45'53.73"N, 64°20'46.53"E	85 m
AAQ10	Bukhara Bypass	Bypass Section	Near residential area in Kulonkhona community	39°45'4.91"N, 64°21'50.15"E	115 m

(Source: ESIA Field Monitoring Campaign, 2026)



The monitoring campaign was undertaken by the public health service laboratory following applicable national monitoring and analytical procedures on 10-17 May 2026. The air temperature during the monitoring ranged from 19°C to 30°C in clear weather.

The monitoring campaign included assessment of gaseous pollutants commonly associated with road transport, mixed urban-rural environments, and regional industrial and household emission sources. Ambient air quality analysis included carbon monoxide (CO), sulfur dioxide (SO₂), nitrogen oxide (NO), ozone (O₃), and benzene.

Dräger X-am 5600¹ gas analyzer was used for ambient air analysis. The gas analyzer is designed to simultaneously monitor up to six gases. An infrared and electrochemical Dräger XXS mini-sensors was used to detect the required five gases. Specifically, benzene was detected by an infrared sensor, while the remaining gases were detected by electrochemical sensors.

Results of the 24-hour ambient air quality monitoring campaign and comparison with applicable standards (Table 21), indicate the following:

- **Sulfur Dioxide (SO₂):** All 13 stations recorded 24-hour mean concentrations in the range 0.045–0.049 mg/m³, exceeding the applicable harmonized benchmark of 0.040 mg/m³ (WHO 24-hour guideline) at all locations. Concentrations remain below the national SanPiN 0053-23 24-hour MPC of 0.05 mg/m³. The exceedance of the WHO benchmark across the entire corridor may reflect combined influences from localized fuel combustion, domestic heating sources, local industrial activities, and prevailing atmospheric conditions.
- **Nitrogen Oxide (NO):** Measured concentrations were consistently low across all monitoring locations, ranging between 0.0014–0.0017 mg/m³, substantially below the applicable national standard of 0.25 mg/m³ (SanPiN 0053-23). This indicates relatively limited localized accumulation of combustion-related nitrogen compounds during the monitoring period.
- **Carbon Monoxide (CO):** All stations recorded 24-hour mean concentrations in the range 0.044–0.059 mg/m³, substantially below the harmonized benchmark of 3.0 mg/m³ (SanPiN 0053-23), indicating limited influence from traffic-related combustion emissions during the monitoring period. No exceedance recorded at any station.
- **Ozone (O₃):** Measured 24-hour mean concentrations (0.053–0.059 mg/m³) are below the applicable 24-hour standard of 0.1 mg/m³ (SanPiN 0053-23) at all monitoring locations. Spatial variability between monitoring sites was limited, indicating relatively homogeneous atmospheric conditions across the monitored corridor during the monitoring period.

¹ Dräger X-am 5600 Specifications, Dräger, https://www.draeger.com/en_sea/Products/X-am-5600 (accessed May 2026)



- **Benzene (C_6H_6):** Measured 24-hour mean concentrations (0.047–0.057 mg/m³) are below the applicable standard of 0.06 mg/m³ (SanPiN 0053-23) at all monitoring locations. Higher benzene concentrations were observed near certain rehabilitation and bypass monitoring sites, potentially reflecting localized traffic emissions and regional hydrocarbon-related industrial activities. Benzene has no safe threshold under WHO guidance (IARC Group 1 carcinogen); the national MPC constitutes the binding compliance limit. Given that motor vehicle exhaust on the M-37 corridor is the primary benzene source, concentrations approaching 80–95% of the MPC at several stations warrant attention in the health impact assessment.



Table 17: Results of Ambient Air Quality Monitoring (24-Hour Monitoring)

Monitoring Location	Parameter	24-Hour Average Monitoring Concentration			Harmonized Framework	Compliance Summary
		Daytime (07:00–23:00), mg/m³	Nighttime (23:00–07:00), mg/m³	24-Hour Average, mg/m³		
AAQ1	CO	0.0530	0.0530	0.0530	3.0 mg/m³ (24-hour) (SanPiN No. 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are well below the applicable standard (SanPiN No. 0053-23, 3.0 mg/m³), at <2% of the limit.
	SO ₂	0.0540	0.0350	0.0480	0.04 mg/m³ (24-hour) (WHO Global Air Quality Guidelines)	Daytime (0.054 mg/m³) and 24-hr average (0.048 mg/m³) exceed the WHO Global Air Quality Guideline of 0.04 mg/m³; nighttime (0.035 mg/m³) is compliant.
	NO _x	0.0020	0.0010	0.0015	0.25 mg/m³ (24-hour) (SanPiN No. 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are well below the applicable standard (SanPiN No. 0053-23, 0.25 mg/m³), at <1% of the limit.
	O ₃	0.0540	0.0530	0.0530	0.1 mg/m³ (24-hour) (SanPiN 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are approximately 53–54% of the applicable standard (SanPiN No. 0053-23, 0.1 mg/m³).
	C ₆ H ₆	0.0500	0.0480	0.0490	0.06 mg/m³ (24-hour) (SanPiN 0053-23)	Compliant under the applicable standard (SanPiN 0053-23, 0.06 mg/m³) for daytime, nighttime, and 24-hr average; however, concentrations reach ~82–83% of the limit. The WHO has classified benzene as a Group 1 carcinogen with no established safe threshold.
AAQ2	CO	0.0570	0.0580	0.0580	3.0 mg/m³ (24-hour) (SanPiN No. 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are well below the applicable standard (SanPiN No. 0053-23, 3.0 mg/m³), at <2% of the limit.
	SO ₂	0.0490	0.0360	0.0450	0.04 mg/m³ (24-hour) (WHO Global Air Quality Guidelines)	Daytime (0.049 mg/m³) and 24-hr average (0.045 mg/m³) exceed the WHO Global Air Quality Guideline of 0.04 mg/m³; nighttime (0.036 mg/m³) is compliant.
	NO _x	0.0020	0.0010	0.0014	0.25 mg/m³ (24-hour) (SanPiN No. 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are well below the applicable standard (SanPiN 0053-23, 0.25 mg/m³), at <1% of the limit.



Monitoring Location	Parameter	24-Hour Average Monitoring Concentration			Harmonized Framework	Compliance Summary
		Daytime (07:00–23:00), mg/m ³	Nighttime (23:00–07:00), mg/m ³	24-Hour Average, mg/m ³		
	O ₃	0.0560	0.0540	0.0550	0.1 mg/m ³ (24-hour) (SanPiN 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are approximately 54–56% of the applicable standard (SanPiN 0053-23, 0.1 mg/m ³).
	C ₆ H ₆	0.0570	0.0560	0.0570	0.06 mg/m ³ (24-hour) (SanPiN 0053-23)	Compliant under the applicable standard (SanPiN 0053-23, 0.06 mg/m ³) for daytime, nighttime, and 24-hr average; however, concentrations reach 93–95% of the limit – the highest proportion recorded across all monitoring stations. The WHO classification of benzene as a Group 1 carcinogen with no safe threshold warrants attention.
AAQ3	CO	0.0550	0.0580	0.0560	3.0 mg/m ³ (24-hour) (SanPiN No. 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are well below the applicable standard (SanPiN 0053-23, 3.0 mg/m ³), at <2% of the limit.
	SO ₂	0.0480	0.0440	0.0460	0.04 mg/m ³ (24-hour) (WHO Global Air Quality Guidelines)	Exceeds the WHO Global Air Quality Guideline of 0.04 mg/m ³ across all three periods – daytime (0.048), nighttime (0.044), and 24-hr average (0.046 mg/m ³).
	NO _x	0.0020	0.0020	0.0015	0.25 mg/m ³ (24-hour) (SanPiN No. 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are well below the applicable standard (SanPiN 0053-23, 0.25 mg/m ³), at <1% of the limit.
	O ₃	0.0560	0.0550	0.0550	0.1 mg/m ³ (24-hour) (SanPiN 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are approximately 55–56% of the applicable standard (SanPiN 0053-23, 0.1 mg/m ³).
	C ₆ H ₆	0.0570	0.0500	0.0550	0.06 mg/m ³ (24-hour) (SanPiN 0053-23)	Compliant under the applicable standard (SanPiN 0053-23, 0.06 mg/m ³) for daytime, nighttime, and 24-hr average; however, the daytime reading (0.057 mg/m ³) reaches 95% of the limit. The WHO classification of benzene as a Group 1 carcinogen with no safe threshold warrants attention.
AAQ4	CO	0.0530	0.0330	0.0460	3.0 mg/m ³ (24-hour) (SanPiN No. 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are well below the applicable standard (SanPiN 0053-23, 3.0 mg/m ³), at <2% of the limit.



Monitoring Location	Parameter	24-Hour Average Monitoring Concentration			Harmonized Framework	Compliance Summary
		Daytime (07:00–23:00), mg/m ³	Nighttime (23:00–07:00), mg/m ³	24-Hour Average, mg/m ³		
	SO ₂	0.0490	0.0500	0.0490	0.04 mg/m ³ (24-hour) (WHO Global Air Quality Guidelines)	Exceeds the WHO Global Air Quality Guideline of 0.04 mg/m ³ across all three periods — daytime (0.049), nighttime (0.050), and 24-hr average (0.049 mg/m ³). Nighttime concentrations are notably elevated, slightly surpassing daytime levels.
	NO _x	0.0020	0.0020	0.0015	0.25 mg/m ³ (24-hour) (SanPiN No. 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are well below the applicable standard (SanPiN 0053-23, 0.25 mg/m ³), at <1% of the limit.
	O ₃	0.0570	0.0580	0.0570	0.1 mg/m ³ (24-hour) (SanPiN 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are approximately 57–58% of the applicable standard (SanPiN 0053-23, 0.1 mg/m ³).
	C ₆ H ₆	0.0500	0.0500	0.0500	0.06 mg/m ³ (24-hour) (SanPiN 0053-23)	Compliant under the applicable standard (SanPiN 0053-23, 0.06 mg/m ³) for daytime, nighttime, and 24-hr average (~83% of the limit). The WHO classification of benzene as a Group 1 carcinogen with no safe threshold warrants attention.
AAQ5	CO	0.0520	0.0390	0.0480	3.0 mg/m ³ (24-hour) (SanPiN No. 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are well below the applicable standard (SanPiN 0053-23, 3.0 mg/m ³), at ~1.6% of the limit.
	SO ₂	0.0490	0.0480	0.0490	0.04 mg/m ³ (24-hour) (WHO Global Air Quality Guidelines)	Exceeds the WHO Global Air Quality Guideline of 0.04 mg/m ³ across all three periods – daytime (0.049), nighttime (0.048), and 24-hr average (0.049 mg/m ³).
	NO _x	0.0020	0.0020	0.0016	0.25 mg/m ³ (24-hour) (SanPiN No. 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are well below the applicable standard (SanPiN 0053-23, 0.25 mg/m ³), at <1% of the limit.
	O ₃	0.0580	0.0510	0.0560	0.1 mg/m ³ (24-hour) (SanPiN 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are approximately 51–58% of the applicable standard (SanPiN 0053-23, 0.1 mg/m ³).
	C ₆ H ₆	0.0520	0.0500	0.0520	0.06 mg/m ³ (24-hour) (SanPiN 0053-23)	Compliant under the applicable standard (SanPiN 0053-23, 0.06 mg/m ³) for all periods (~83–87% of the limit). The WHO classification of benzene as a Group 1 carcinogen with no safe threshold warrants attention.



Monitoring Location	Parameter	24-Hour Average Monitoring Concentration			Harmonized Framework	Compliance Summary
		Daytime (07:00–23:00), mg/m ³	Nighttime (23:00–07:00), mg/m ³	24-Hour Average, mg/m ³		
AAQ6	CO	0.0510	0.0400	0.0450	3.0 mg/m ³ (24-hour) (SanPiN No. 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are well below the applicable standard (SanPiN 0053-23, 3.0 mg/m ³), at ~1.5% of the limit.
	SO ₂	0.0500	0.0350	0.0490	0.04 mg/m ³ (24-hour) (WHO Global Air Quality Guidelines)	Daytime (0.050 mg/m ³) and 24-hr average (0.049 mg/m ³) exceed the WHO Global Air Quality Guideline of 0.04 mg/m ³ ; nighttime (0.035 mg/m ³) is compliant, reflecting lower traffic or activity levels during night hours.
	NO _x	0.0020	0.0010	0.0016	0.25 mg/m ³ (24-hour) (SanPiN No. 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are well below the applicable standard (SanPiN 0053-23, 0.25 mg/m ³), at <1% of the limit.
	O ₃	0.0580	0.0550	0.0580	0.1 mg/m ³ (24-hour) (SanPiN 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are approximately 55–58% of the applicable standard (SanPiN 0053-23, 0.1 mg/m ³).
	C ₆ H ₆	0.0540	0.0490	0.0530	0.06 mg/m ³ (24-hour) (SanPiN 0053-23)	Compliant under the applicable standard (SanPiN 0053-23, 0.06 mg/m ³) for all periods; daytime concentration (0.054 mg/m ³) reaches 90% of the limit. The WHO classification of benzene as a Group 1 carcinogen with no safe threshold warrants attention.
AAQ7	CO	0.0510	0.0380	0.0470	3.0 mg/m ³ (24-hour) (SanPiN No. 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are well below the applicable standard (SanPiN 0053-23, 3.0 mg/m ³), at ~1.6% of the limit.
	SO ₂	0.0490	0.0450	0.0480	0.04 mg/m ³ (24-hour) (WHO Global Air Quality Guidelines)	Exceeds the WHO Global Air Quality Guideline of 0.04 mg/m ³ across all three periods – daytime (0.049), nighttime (0.045), and 24-hr average (0.048 mg/m ³).
	NO _x	0.0020	0.0020	0.0016	0.25 mg/m ³ (24-hour) (SanPiN No. 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are well below the applicable standard (SanPiN 0053-23, 0.25 mg/m ³), at <1% of the limit.
	O ₃	0.0580	0.0540	0.0560	0.1 mg/m ³ (24-hour) (SanPiN 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are approximately 54–58% of the applicable standard (SanPiN 0053-23, 0.1 mg/m ³).



Monitoring Location	Parameter	24-Hour Average Monitoring Concentration			Harmonized Framework	Compliance Summary
		Daytime (07:00–23:00), mg/m³	Nighttime (23:00–07:00), mg/m³	24-Hour Average, mg/m³		
	C ₆ H ₆	0.0510	0.0490	0.0510	0.06 mg/m³ (24-hour) (SanPiN 0053-23)	Compliant under the applicable standard (SanPiN 0053-23, 0.06 mg/m³) for all periods (~82–85% of the limit). The WHO classification of benzene as a Group 1 carcinogen with no safe threshold warrants attention.
AAQ8	CO	0.0580	0.0590	0.0580	3.0 mg/m³ (24-hour) (SanPiN No. 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are well below the applicable standard (SanPiN 0053-23, 3.0 mg/m³), at ~1.9% of the limit.
	SO ₂	0.0490	0.0480	0.0490	0.04 mg/m³ (24-hour) (WHO Global Air Quality Guidelines)	Exceeds the WHO Global Air Quality Guideline of 0.04 mg/m³ across all three periods – daytime (0.049), nighttime (0.048), and 24-hr average (0.049 mg/m³).
	NO _x	0.0020	0.0020	0.0016	0.25 mg/m³ (24-hour) (SanPiN No. 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are well below the applicable standard (SanPiN 0053-23, 0.25 mg/m³), at <1% of the limit.
	O ₃	0.0580	0.0510	0.0560	0.1 mg/m³ (24-hour) (SanPiN 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are approximately 51–58% of the applicable standard (SanPiN 0053-23, 0.1 mg/m³).
	C ₆ H ₆	0.0500	0.0440	0.0480	0.06 mg/m³ (24-hour) (SanPiN 0053-23)	Compliant under the applicable standard (SanPiN 0053-23, 0.06 mg/m³) for all periods (~73–83% of the limit). The WHO classification of benzene as a Group 1 carcinogen with no safe threshold warrants attention.
AAQ9	CO	0.0580	0.0580	0.0580	3.0 mg/m³ (24-hour) (SanPiN No. 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are well below the applicable standard (3.0 mg/m³), at ~1.9% of the limit.
	SO ₂	0.0480	0.0480	0.0480	0.04 mg/m³ (24-hour) (WHO Global Air Quality Guidelines)	Exceeds the WHO Global Air Quality Guideline of 0.04 mg/m³ across all three periods – daytime (0.048), nighttime (0.048), and 24-hr average (0.048 mg/m³). Concentrations are uniform across monitoring periods, suggesting a consistent background emission level.



Monitoring Location	Parameter	24-Hour Average Monitoring Concentration			Harmonized Framework	Compliance Summary
		Daytime (07:00–23:00), mg/m ³	Nighttime (23:00–07:00), mg/m ³	24-Hour Average, mg/m ³		
	NO _x	0.0020	0.0020	0.0016	0.25 mg/m ³ (24-hour) (SanPiN No. 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are well below the applicable standard (SanPiN 0053-23, 0.25 mg/m ³), at <1% of the limit.
	O ₃	0.0580	0.0540	0.0570	0.1 mg/m ³ (24-hour) (SanPiN 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are approximately 54–58% of the applicable standard (SanPiN 0053-23, 0.1 mg/m ³).
	C ₆ H ₆	0.0500	0.0500	0.0500	0.06 mg/m ³ (24-hour) (SanPiN 0053-23)	Compliant under the applicable standard (SanPiN 0053-23, 0.06 mg/m ³) for all periods (~83% of the limit). The WHO classification of benzene as a Group 1 carcinogen with no safe threshold warrants attention.
AAQ10	CO	0.0590	0.0540	0.0580	3.0 mg/m ³ (24-hour) (SanPiN No. 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are well below the applicable standard (SanPiN 0053-23, 3.0 mg/m ³), at ~1.9% of the limit.
	SO ₂	0.0510	0.0400	0.0470	0.04 mg/m ³ (24-hour) (WHO Global Air Quality Guidelines)	Daytime (0.051 mg/m ³) and 24-hr average (0.047 mg/m ³) exceed the WHO Global Air Quality Guideline of 0.04 mg/m ³ ; nighttime (0.040 mg/m ³) is at exactly the guideline threshold. The daytime reading (0.051 mg/m ³) is the highest SO ₂ value recorded across all 13 monitoring stations.
	NO _x	0.0020	0.0020	0.0017	0.25 mg/m ³ (24-hour) (SanPiN No. 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are well below the applicable standard (SanPiN 0053-23, 0.25 mg/m ³), at <1% of the limit.
	O ₃	0.0580	0.0510	0.0550	0.1 mg/m ³ (24-hour) (SanPiN 0053-23)	Compliant for daytime, nighttime, and 24-hr average; concentrations are approximately 51–58% of the applicable standard (SanPiN 0053-23, 0.1 mg/m ³).
	C ₆ H ₆	0.0500	0.0400	0.0470	0.06 mg/m ³ (24-hour) (SanPiN 0053-23)	Compliant under the applicable standard (SanPiN 0053-23, 0.06 mg/m ³) for all periods (~67–83% of the limit). The WHO classification of benzene as a Group 1 carcinogen with no safe threshold warrants attention.

(Source: Laboratory analysis, 2026 and Harmonized Framework for Air Quality Monitoring, [Section 3.5.2.1](#))



2. Particulate Matter Monitoring (PM 2.5 and PM10)

Particulate matter baseline monitoring was undertaken by the laboratory of the Bukhara Department of the National Committee on Ecology and Climate Change. The monitoring campaign was conducted from 05 June to 08 June 2026 under ambient conditions of approximately 30°C and relative humidity of approximately 51%.

Measurements of the mass concentration of suspended particles, specifically PM2.5 and PM10, were conducted using EKOLAB² universal gas analyzers equipped with built-in optical aerosol modules, providing real-time continuous readings. To verify optical readings, a high-volume air sampler with a size-selective inlet was used in parallel, collecting particles within each target size fraction on a filter that was subsequently weighed gravimetrically. A correction factor was derived from this gravimetric verification and applied to the optical analyzer data.

Monitoring was conducted at 9 locations across the project corridor, covering Kyzyltepa and Gijduvon districts in Navoi Province, and Bukhara, Vobkent districts, together with Galaosiyo town, in Bukhara Province. Monitoring locations spanned both the rehabilitation and bypass sections of the M-37 corridor to ensure representative characterization of baseline conditions. To maximize coverage of sensitive receptors, PM monitoring sites were selected to differ from the gaseous pollutant monitoring stations used for SO₂, CO, NO, O₃, and benzene monitoring. Monitoring results are presented in Table 22.

Table 18: Particulate Matter Monitoring (PM 2.5 and PM10)

No.	Location	GPS Coordinates	Distance to M37 Road, meters	Parameter	24-hour Average Monitoring Concentration		Applicable Standard (Table 21)
					Day, mg/m ³	Night, mg/m ³	
1	Bukhara district, Aminobod settlement, next to the road	39°48'11.99"N 64°22'8.95"E	17	PM 2.5	0.001	0.002	0.015 mg/m ³ (24-hour) (WHO Global Air Quality Guidelines)
				PM 10	0.003	0.005	0.045 mg/m ³ (24-hour) (WHO Global Air Quality Guidelines)
2	Bukhara district, Rabot-Eshon settlement, next to the cemetery	39°47'44.56"N 64°21'39.57"E	45	PM 2.5	0.001	0.003	0.015 mg/m ³ (24-hour) (WHO Global Air Quality Guidelines)
				PM 10	0.012	0.013	0.045 mg/m ³ (24-hour) (WHO Global Air Quality Guidelines)
3	Bukhara district, Chor-Bakr settlement,	39°46'25.67"N 64°20'24.90"E	77	PM 2.5	0.003	0.002	0.015 mg/m ³ (24-hour) (WHO Global Air Quality Guidelines)

² ECOLAB Gaza Analyzer Specifications, NPP GazoAnalit LLC, Smolensk, Russia, <https://gazoanalit.ru/catalog/perenosnye/ekolab-plyus/> (Accessed May 2026)



No.	Location	GPS Coordinates	Distance to M37 Road, meters	Parameter	24-hour Average Monitoring Concentration		Applicable Standard (Table 21)
					Day, mg/m ³	Night, mg/m ³	
	nearest household			PM 10	0.002	0.004	0.045 mg/m ³ (24-hour) (WHO Global Air Quality Guidelines)
4	Bukhara district, Shergiron community, nearest household	39°46'6.13"N 64°20'36.72"E	42	PM 2.5	0.001	0.003	0.015 mg/m ³ (24-hour) (WHO Global Air Quality Guidelines)
				PM 10	0.004	0.005	0.045 mg/m ³ (24-hour) (WHO Global Air Quality Guidelines)
5	Bukhara district, Takhmach settlement, near a residential area	39°45'53.92"N 64°20'46.67"E	86	PM 2.5	0.005	0.003	0.015 mg/m ³ (24-hour) (WHO Global Air Quality Guidelines)
				PM 10	0.010	0.018	0.045 mg/m ³ (24-hour) (WHO Global Air Quality Guidelines)
6	Bukhara district, Kulonkhona community, near a residential area	39°45'4.83"N 64°21'50.31"E	106	PM 2.5	0.003	0.006	0.015 mg/m ³ (24-hour) (WHO Global Air Quality Guidelines)
				PM 10	0.011	0.014	0.045 mg/m ³ (24-hour) (WHO Global Air Quality Guidelines)
7	Kyzyltepa district, Buston microdistrict, Kyzyltepa District Technical School No.2	40° 3'12.51"N 64°49'30.85"E	42	PM 2.5	0.002	0.004	0.015 mg/m ³ (24-hour) (WHO Global Air Quality Guidelines)
				PM 10	0.005	0.008	0.045 mg/m ³ (24-hour) (WHO Global Air Quality Guidelines)
8	Gijduvon district, Gulistonobod community, residential area	40° 5'22.44"N 64°39'32.56"E	5	PM 2.5	0.010	0.013	0.015 mg/m ³ (24-hour) (WHO Global Air Quality Guidelines)
				PM 10	0.012	0.017	0.045 mg/m ³ (24-hour) (WHO Global Air Quality Guidelines)
9	Vobkent district, Shakarkent community, residential area	40° 1'19.05"N 64°31'53.03"E	6	PM 2.5	0.005	0.007	0.015 mg/m ³ (24-hour) (WHO Global Air Quality Guidelines)
				PM 10	0.013	0.018	0.045 mg/m ³ (24-hour) (WHO Global Air Quality Guidelines)

(Source: Laboratory analysis, 2026 and Harmonized Framework for Air Quality Monitoring, [Section 3.5.2.1](#))

All measured PM_{2.5} and PM₁₀ concentrations are below the applicable harmonized 24-hour benchmarks of 0.015 mg/m³ (PM_{2.5}) and 0.045 mg/m³ (PM₁₀) set under the WHO Global Air Quality Guidelines as adopted in the project's harmonized framework (Section 3.5.2.1, Table 22). No exceedance of either benchmark was recorded at any station during the monitoring period:



- For PM_{2.5}, measured daytime concentrations ranged from 0.001 to 0.010 mg/m³ and night-time concentrations from 0.002 to 0.013 mg/m³, both well within the WHO 24-hour guideline of 0.015 mg/m³. Station 8 (Gijduvon district, near the road) recorded the highest values across the survey for both the day period (0.010 mg/m³) and night period (0.013 mg/m³), approaching the WHO 24-hour benchmark. The elevated concentrations at Station 8 relative to other stations are consistent with its proximity to the M-37 carriageway and the higher traffic density characteristic of the Gijduvon section of the corridor. Station 12 (Alat district) recorded the next highest daytime PM_{2.5} value (0.008 mg/m³), also located immediately adjacent to the road.
- For PM₁₀, measured daytime concentrations ranged from 0.002 to 0.017 mg/m³ and night-time concentrations from 0.004 to 0.018 mg/m³, all significantly below the WHO 24-hour guideline of 0.045 mg/m³. The highest PM₁₀ values were recorded at Station 5 (Bukhara district, near a residential settlement, night: 0.018 mg/m³) and Station 9 (Vobkent district, near the road, night: 0.018 mg/m³), followed by Station 12 (Alat district, day: 0.017 mg/m³). These values remain at approximately 40% of the WHO 24-hour benchmark.
- A consistent pattern of higher night-time than daytime concentrations was observed at most stations for both PM_{2.5} and PM₁₀. This is attributable to reduced atmospheric mixing height and lower wind speeds during night-time hours, which limit the vertical and horizontal dispersion of particulate matter and allow concentrations to accumulate in the near-surface layer. This pattern is typical of arid, low-wind conditions characteristic of the desert region in early summer in Central Asian environments.
- The PM_{2.5} to PM₁₀ ratio across all stations and time periods is consistently low, with PM_{2.5} typically representing 15–60% of the PM₁₀ concentration. This indicates that the coarse fraction (PM_{2.5-10}, i.e., particles between 2.5 and 10 microns in diameter) dominates the particulate loading at baseline, which is characteristic of arid and semi-arid environments where wind-blown dust and road surface resuspension are primary contributors to ambient particulate matter rather than combustion-derived fine particles.
- The baseline results demonstrate that ambient particulate matter concentrations along the project corridor are generally low relative to the applicable harmonized benchmarks under current pre-construction conditions.

3. Summary of Baseline Air Quality Conditions

Baseline ambient air quality conditions along the M37 project corridor are influenced by a combination of arid desert climatic conditions, regional dust transport from the Kyzylkum desert environment, existing vehicular traffic on the M-37 highway, agricultural activities, and localized industrial and urban emission sources within Bukhara and Navoi provinces.

Project-specific monitoring conducted in May–June 2026 at 25 locations by two different state licensed laboratories across the rehabilitation and bypass sections of the



corridor, supplemented by regional data from Uzhydromet monitoring stations and the IQAir platform, indicates the following baseline air quality conditions:

- **Gaseous pollutants** (24-hour monitoring, May 2026, stations AAQ1–AAQ13): Concentrations of CO, NO₂, O₃, and benzene were below applicable national standards (SanPiN No. 0053-23) at all 13 monitoring stations. SO₂ concentrations (0.044–0.058 mg/m³) were below the national 24-hour MPC of 0.05 mg/m³ but exceeded the WHO harmonized 24-hour benchmark of 0.040 mg/m³ at all stations, representing the only pollutant-level exceedance of the harmonized framework recorded during the baseline campaign. Benzene concentrations at several stations approached 80–95% of the national MPC, warranting continued monitoring during construction and operations.
- **Particulate matter** (24-hour monitoring, June 2026, Stations 1 – 12): All recorded PM_{2.5} and PM₁₀ concentrations were below the WHO harmonized 24-hour benchmarks of 0.015 mg/m³ and 0.045 mg/m³ respectively at all 12 monitoring stations. The highest PM_{2.5} values were recorded at Station 8 (Gijduvon district, 0.010 mg/m³ daytime, 0.013 mg/m³ night-time), reaching approximately 67–87% of the WHO 24-hour benchmark. Regional IQAir data for May 2026 indicated that PM_{2.5} annual mean concentrations in the Bukhara region exceeded the WHO annual guideline of 0.005 mg/m³ by a factor of approximately 1.8, confirming that while 24-hour concentrations during the monitoring period were within the harmonized benchmark, regional annual mean PM_{2.5} conditions exceed WHO guideline levels.
- Baseline conditions differ between the two project components. Along the rehabilitation sections of the M-37 corridor, existing traffic, roadside commercial activities, settlement proximity, and re-suspended dust from degraded pavement surfaces represent the dominant air quality influences. Along the proposed Bukhara bypass alignment, lower existing traffic volumes and a predominantly agricultural and peri-urban setting mean that regional background dust transport and dispersed local emission sources are the dominant baseline influences, with comparatively lower pollutant concentrations observed during the monitoring period.

4. Laboratory Protocols and Monitoring Photographs

4.1. Ambient Air Quality Monitoring

(a) Bypass Air Quality Monitoring Campaign



	
Ambient air sampling in Section 4	
	
Ambient air sampling in Section 5	
	
Ambient air sampling in Section 8	
	
Ambient air sampling in Section 8	
	
Ambient air sampling in Section 9	



(b) Rehabilitation Corridor Air quality monitoring





		
Ambient air sampling in Galaosiy District, Bukhara		
		
Ambient air sampling in Jondor District, Bukhara		
		
Ambient air sampling in Karakul District, Bukhara		
		
Ambien Air Sampling in Olot District, Bukhara		

1) General Air Quality Laboratory Test results



[illegible]

Date		Page		Subject		Teacher		Student	
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Name of the person	Date of birth		Sex	Religion	Marital status	Occupation	Address	Signature	Date
	Day	Month							
1. Mr. A. B. C.	15	10	M	Hindu	Married	Teacher	123 Main St, City, State	[Signature]	10/15/2023
2. Mrs. D. E. F.	22	08	F	Muslim	Married	Homemaker	456 Park Ave, City, State	[Signature]	08/22/2023
3. Mr. G. H. I.	05	03	M	Sikh	Single	Student	789 School St, City, State	[Signature]	03/05/2023
4. Ms. J. K. L.	18	12	F	Buddhist	Single	Engineer	101 Tech Blvd, City, State	[Signature]	12/18/2023
5. Mr. M. N. O.	30	07	M	Hindu	Married	Doctor	202 Hospital Dr, City, State	[Signature]	07/30/2023
6. Mrs. P. Q. R.	12	09	F	Muslim	Married	Businesswoman	303 Market St, City, State	[Signature]	09/12/2023
7. Mr. S. T. U.	25	06	M	Sikh	Single	Artist	404 Studio Lane, City, State	[Signature]	06/25/2023
8. Ms. V. W. X.	08	11	F	Buddhist	Single	Lawyer	505 Court Ave, City, State	[Signature]	11/08/2023
9. Mr. Y. Z. A.	10	04	M	Hindu	Married	Farmer	606 Farm Rd, City, State	[Signature]	04/10/2023
10. Mrs. B. C. D.	20	02	F	Muslim	Married	Teacher	707 School St, City, State	[Signature]	02/20/2023

[illegible]

[illegible]

Name		Age		Sex		Race		Religion		Marital Status		Education		Occupation		Income		Assets		Liabilities		Net Worth	
First	Last	Yr	Mo	Day	M	F	W	B	C	O	M	S	D	H	Prof	Unemp	Yr	Mo	Yr	Mo	Yr	Mo	
John	Doe	1950	01	15	M		W		C		M		H	Prof			50	01	100000	01	100000	01	100000
Jane	Doe	1952	03	20	F		W		C		M		H	Prof			52	03	100000	03	100000	03	100000
Robert	Smith	1945	07	10	M		W		C		M		H	Prof			45	07	100000	07	100000	07	100000
Mary	Smith	1947	09	25	F		W		C		M		H	Prof			47	09	100000	09	100000	09	100000
William	Brown	1955	12	05	M		W		C		M		H	Prof			55	12	100000	12	100000	12	100000
Elizabeth	Brown	1957	06	18	F		W		C		M		H	Prof			57	06	100000	06	100000	06	100000
James	Wilson	1960	04	12	M		W		C		M		H	Prof			60	04	100000	04	100000	04	100000
Patricia	Wilson	1962	08	22	F		W		C		M		H	Prof			62	08	100000	08	100000	08	100000
Charles	Miller	1965	11	08	M		W		C		M		H	Prof			65	11	100000	11	100000	11	100000
Barbara	Miller	1967	02	14	F		W		C		M		H	Prof			67	02	100000	02	100000	02	100000
Thomas	Moore	1970	05	01	M		W		C		M		H	Prof			70	05	100000	05	100000	05	100000
Linda	Moore	1972	09	16	F		W		C		M		H	Prof			72	09	100000	09	100000	09	100000
Richard	Clark	1975	10	03	M		W		C		M		H	Prof			75	10	100000	10	100000	10	100000
Susan	Clark	1977	03	28	F		W		C		M		H	Prof			77	03	100000	03	100000	03	100000
David	Green	1980	07	11	M		W		C		M		H	Prof			80	07	100000	07	100000	07	100000
Karen	Green	1982	12	04	F		W		C		M		H	Prof			82	12	100000	12	100000	12	100000
Michael	White	1985	06	19	M		W		C		M		H	Prof			85	06	100000	06	100000	06	100000
Christina	White	1987	11	07	F		W		C		M		H	Prof			87	11	100000	11	100000	11	100000
Christopher	Black	1990	04	21	M		W		C		M		H	Prof			90	04	100000	04	100000	04	100000
Amanda	Black	1992	08	13	F		W		C		M		H	Prof			92	08	100000	08	100000	08	100000
Matthew	Gray	1995	12	02	M		W		C		M		H	Prof			95	12	100000	12	100000	12	100000
Olivia	Gray	1997	05	17	F		W		C		M		H	Prof			97	05	100000	05	100000	05	100000
Benjamin	White	2000	09	08	M		W		C		M		H	Prof			00	09	100000	09	100000	09	100000
Sophia	White	2002	03	24	F		W		C		M		H	Prof			02	03	100000	03	100000	03	100000
Ethan	Black	2005	11	05	M		W		C		M		H	Prof			05	11	100000	11	100000	11	100000
Ava	Black	2007	06	12	F		W		C		M		H	Prof			07	06	100000	06	100000	06	100000
Lucas	Gray	2010	02	01	M		W		C		M		H	Prof			10	02	100000	02	100000	02	100000
Mia	Gray	2012	07	15	F		W		C		M		H	Prof			12	07	100000	07	100000	07	100000
Noah	White	2015	10	03	M		W		C		M		H	Prof			15	10	100000	10	100000	10	100000
Isabella	White	2017	04	26	F		W		C		M		H	Prof			17	04	100000	04	100000	04	100000
Liam	Black	2020	08	10	M		W		C		M		H	Prof			20	08	100000	08	100000	08	100000
Charlotte	Black	2022	01	18	F		W		C		M		H	Prof			22	01	100000	01	100000	01	100000
Oliver	Gray	2025	05	07	M		W		C		M		H	Prof			25	05	100000	05	100000	05	100000
Amelia	Gray	2027	12	22	F		W		C		M		H	Prof			27	12	100000	12	100000	12	100000
William	White	2030	03	11	M		W		C		M		H	Prof			30	03	100000	03	100000	03	100000
Sophia	White	2032	09	29	F		W		C		M		H	Prof			32	09	100000	09	100000	09	100000
Ethan	Black	2035	11	04	M		W		C		M		H	Prof			35	11	100000	11	100000	11	100000
Ava	Black	2037	06	16	F		W		C		M		H	Prof			37	06	100000	06	100000	06	100000
Lucas	Gray	2040	02	09	M		W		C		M		H	Prof			40	02	100000	02	100000	02	100000
Mia	Gray	2042	07	23	F		W		C		M		H	Prof			42	07	100000	07	100000	07	100000
Noah	White	2045	10	06	M		W		C		M		H	Prof			45	10	100000	10	100000	10	100000
Isabella	White	2047	04	27	F		W		C		M		H	Prof			47	04	100000	04	100000	04	100000
Liam	Black	2050	08	12	M		W		C		M		H	Prof			50	08	100000	08	100000	08	100000
Charlotte	Black	2052	01	20	F		W		C		M		H	Prof			52	01	100000	01	100000	01	100000
Oliver	Gray	2055	05	08	M		W		C		M		H	Prof			55	05	100000	05	100000	05	100000
Amelia	Gray	2057	12	24	F		W		C		M		H	Prof			57	12	100000	12	100000	12	100000
William	White	2060	03	13	M		W		C		M		H	Prof			60	03	100000	03	100000	03	100000
Sophia	White	2062	09	31	F		W		C		M		H	Prof			62	09	100000	09	100000	09	100000
Ethan	Black	2065	11	09	M		W		C		M		H	Prof			65	11	100000	11	100000	11	100000
Ava	Black	2067	06	21	F		W		C		M		H	Prof			67	06	100000	06	100000	06	100000
Lucas	Gray	2070	02	14	M		W		C		M		H	Prof			70	02	100000	02	100000	02	100000
Mia	Gray	2072	07	28	F		W		C		M		H	Prof			72	07	100000	07	100000	07	100000
Noah	White	2075	10	11	M		W		C		M		H	Prof			75	10	100000	10	100000	10	100000
Isabella	White	2077	04	29	F		W		C		M		H	Prof			77	04	100000	04	100000	04	100000
Liam	Black	2080	08	17	M		W		C		M		H	Prof			80	08	100000	08	100000	08	100000
Charlotte	Black	2082	01	25	F		W		C		M		H	Prof			82	01	100000	01	100000	01	100000
Oliver	Gray	2085	05	12	M		W		C		M		H	Prof			85	05	100000	05	100000	05	100000
Amelia	Gray	2087	12	30	F		W		C		M		H	Prof			87	12	100000	12	100000	12	100000
William	White	2090	03	18	M		W		C		M		H	Prof			90	03	100000	03	100000	03	100000
Sophia	White	2092	09	26	F		W		C		M		H	Prof			92	09	100000	09	100000	09	100000
Ethan	Black	2095	11	10	M		W		C		M		H	Prof			95	11	100000	11	100000	11	100000
Ava	Black	2097	06	22	F		W		C		M		H	Prof			97	06	100000	06	100000	06	100000
Lucas	Gray	2100	02	05	M		W		C		M		H	Prof			00	02	100000	02	100000	02	100000
Mia	Gray	2102	07	19	F		W		C		M		H	Prof			02	07	100000	07	100000	07	100000
Noah	White	2105	10	07	M		W		C		M		H	Prof			05	10	100000	10	100000	10	100000
Isabella	White	2107	04	23	F		W		C		M		H	Prof			07	04	100000	04	100000	04	100000
Liam	Black	2110	08	11	M		W		C		M		H	Prof			10	08	100000	08	100000	08	100000
Charlotte	Black	2112	01	27	F		W		C		M		H	Prof			12	01	100000	01	100000	01	100000
Oliver	Gray	2115	05	15	M		W		C		M		H	Prof			15	05	100000	05	100000	05	100000
Amelia	Gray	2117	12	31	F		W		C		M		H	Prof			17	12	100000	12	100000	12	100000
William	White	2120	03	20	M		W		C		M		H	Prof			20	03	100000	03	100000	03	100000
Sophia	White	2122	09	28	F		W		C		M		H	Prof			22	09	100000	09	100000	09	100000
Ethan	Black	2125	11	16	M		W		C		M		H	Prof			25	11	100000	11	100000	11	100000
Ava	Black	2127	06	24	F		W		C		M		H	Prof			27	06	100000	06	100000	06	100000
Lucas	Gray	2130	02	12	M		W		C		M		H	Prof			30	02	100000	02	100000	02	100000
Mia	Gray	2132	07	26	F		W		C		M		H	Prof			32	07	100000	07	100000	07	100000
Noah	White	2135	10	14	M		W		C		M		H	Prof			35	10	100000	10	100000	10	100000
Isabella	White	2137	04	30	F		W		C		M		H	Prof									

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
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Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
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Name of the person	Date of birth		Sex	Religion	Marital status	Occupation	Address	Signature	Date
	Day	Month							
1. Mr. A. B. C.	15	10	M	Hindu	Married	Teacher	123 Main St, New York, NY	[Signature]	10/15/2023
2. Mrs. D. E. F.	22	08	F	Muslim	Married	Homemaker	456 Oak St, Los Angeles, CA	[Signature]	08/22/2023
3. Mr. G. H. I.	05	03	M	Buddhist	Single	Student	789 Pine St, San Francisco, CA	[Signature]	03/05/2023
4. Mrs. J. K. L.	18	12	F	Catholic	Married	Nurse	101 Elm St, Chicago, IL	[Signature]	12/18/2023
5. Mr. M. N. O.	30	07	M	Sikh	Married	Engineer	202 Maple St, Mumbai, India	[Signature]	07/30/2023
6. Mrs. P. Q. R.	12	09	F	Jain	Married	Businesswoman	303 Cedar St, Ahmedabad, India	[Signature]	09/12/2023
7. Mr. S. T. U.	25	06	M	Hindu	Single	Software Developer	404 Birch St, Bangalore, India	[Signature]	06/25/2023
8. Mrs. V. W. X.	08	11	F	Muslim	Married	Teacher	505 Spruce St, Karachi, Pakistan	[Signature]	11/08/2023
9. Mr. Y. Z. A.	14	04	M	Buddhist	Single	Student	606 Willow St, Dhaka, Bangladesh	[Signature]	04/14/2023
10. Mrs. B. C. D.	20	02	F	Catholic	Married	Homemaker	707 Ash St, Manila, Philippines	[Signature]	02/20/2023

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Experiment No.	Date	Apparatus		Theory	Procedure	Observations	Results	Conclusion
		Name	Model					
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1. Kyzyltepa District, pre-school

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
1990	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100

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Date	Time	Location	Observer	Temperature (°C)		Wind Speed (km/h)	Wind Direction	Clouds (%)	Precipitation (mm)	Remarks
				Air	Water					
10/10/2000	08:00	Station	John	15.0	18.0	10	SE	10	0.0	Clear
10/10/2000	12:00	Station	John	22.0	25.0	15	SE	20	0.0	Clear
10/10/2000	16:00	Station	John	18.0	20.0	10	SE	10	0.0	Clear
10/10/2000	20:00	Station	John	12.0	15.0	5	SE	10	0.0	Clear
10/10/2000	00:00	Station	John	8.0	10.0	5	SE	10	0.0	Clear
10/10/2000	04:00	Station	John	10.0	12.0	5	SE	10	0.0	Clear
10/10/2000	08:00	Station	John	15.0	18.0	10	SE	10	0.0	Clear
10/10/2000	12:00	Station	John	22.0	25.0	15	SE	20	0.0	Clear
10/10/2000	16:00	Station	John	18.0	20.0	10	SE	10	0.0	Clear
10/10/2000	20:00	Station	John	12.0	15.0	5	SE	10	0.0	Clear
10/10/2000	00:00	Station	John	8.0	10.0	5	SE	10	0.0	Clear
10/10/2000	04:00	Station	John	10.0	12.0	5	SE	10	0.0	Clear
10/10/2000	08:00	Station	John	15.0	18.0	10	SE	10	0.0	Clear
10/10/2000	12:00	Station	John	22.0	25.0	15	SE	20	0.0	Clear
10/10/2000	16:00	Station	John	18.0	20.0	10	SE	10	0.0	Clear
10/10/2000	20:00	Station	John	12.0	15.0	5	SE	10	0.0	Clear
10/10/2000	00:00	Station	John	8.0	10.0	5	SE	10	0.0	Clear
10/10/2000	04:00	Station	John	10.0	12.0	5	SE	10	0.0	Clear
10/10/2000	08:00	Station	John	15.0	18.0	10	SE	10	0.0	Clear

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Description of work	Estimated cost			Actual cost	Variance
	Estimated cost		Actual cost		
	Estimated cost	Actual cost			
1. General	100.00	100.00	0.00	0.00	0.00
2. Materials	200.00	200.00	0.00	0.00	0.00
3. Labor	300.00	300.00	0.00	0.00	0.00
4. Overhead	400.00	400.00	0.00	0.00	0.00
5. Subcontract	500.00	500.00	0.00	0.00	0.00
6. Equipment	600.00	600.00	0.00	0.00	0.00
7. Transportation	700.00	700.00	0.00	0.00	0.00
8. Insurance	800.00	800.00	0.00	0.00	0.00
9. Miscellaneous	900.00	900.00	0.00	0.00	0.00
10. Total	2,900.00	2,900.00	0.00	0.00	0.00

Experiment name (Investigator and year)	Experimental conditions		No. of subjects	No. of trials	No. of correct responses	No. of correct responses / No. of trials
	Condition 1	Condition 2				
Experiment 1 (Smith and Jones, 1978)	Condition 1	Condition 2	20	10	8	0.80
Experiment 2 (Brown and White, 1980)	Condition 1	Condition 2	25	15	12	0.80
Experiment 3 (Green and Black, 1982)	Condition 1	Condition 2	30	20	16	0.80
Experiment 4 (Blue and Grey, 1984)	Condition 1	Condition 2	35	25	20	0.80
Experiment 5 (Red and Yellow, 1986)	Condition 1	Condition 2	40	30	24	0.80
Experiment 6 (Purple and Orange, 1988)	Condition 1	Condition 2	45	35	28	0.80
Experiment 7 (Pink and Brown, 1990)	Condition 1	Condition 2	50	40	32	0.80
Experiment 8 (Gold and Silver, 1992)	Condition 1	Condition 2	55	45	36	0.80
Experiment 9 (Copper and Iron, 1994)	Condition 1	Condition 2	60	50	40	0.80
Experiment 10 (Zinc and Lead, 1996)	Condition 1	Condition 2	65	55	44	0.80
Experiment 11 (Aluminum and Magnesium, 1998)	Condition 1	Condition 2	70	60	48	0.80
Experiment 12 (Sodium and Potassium, 2000)	Condition 1	Condition 2	75	65	52	0.80
Experiment 13 (Calcium and Phosphorus, 2002)	Condition 1	Condition 2	80	70	56	0.80
Experiment 14 (Nitrogen and Oxygen, 2004)	Condition 1	Condition 2	85	75	60	0.80
Experiment 15 (Hydrogen and Helium, 2006)	Condition 1	Condition 2	90	80	64	0.80
Experiment 16 (Lithium and Beryllium, 2008)	Condition 1	Condition 2	95	85	68	0.80
Experiment 17 (Boron and Carbon, 2010)	Condition 1	Condition 2	100	90	72	0.80
Experiment 18 (Nitrogen and Oxygen, 2012)	Condition 1	Condition 2	105	95	76	0.80
Experiment 19 (Fluorine and Neon, 2014)	Condition 1	Condition 2	110	100	80	0.80
Experiment 20 (Sodium and Magnesium, 2016)	Condition 1	Condition 2	115	105	84	0.80
Experiment 21 (Aluminum and Silicon, 2018)	Condition 1	Condition 2	120	110	88	0.80
Experiment 22 (Phosphorus and Sulfur, 2020)	Condition 1	Condition 2	125	115	92	0.80
Experiment 23 (Chlorine and Argon, 2022)	Condition 1	Condition 2	130	120	96	0.80
Experiment 24 (Potassium and Calcium, 2024)	Condition 1	Condition 2	135	125	100	0.80
Experiment 25 (Scandium and Titanium, 2026)	Condition 1	Condition 2	140	130	104	0.80
Experiment 26 (Vanadium and Chromium, 2028)	Condition 1	Condition 2	145	135	108	0.80
Experiment 27 (Manganese and Iron, 2030)	Condition 1	Condition 2	150	140	112	0.80
Experiment 28 (Cobalt and Nickel, 2032)	Condition 1	Condition 2	155	145	116	0.80
Experiment 29 (Copper and Zinc, 2034)	Condition 1	Condition 2	160	150	120	0.80
Experiment 30 (Gallium and Germanium, 2036)	Condition 1	Condition 2	165	155	124	0.80
Experiment 31 (Arsenic and Selenium, 2038)	Condition 1	Condition 2	170	160	128	0.80
Experiment 32 (Bromine and Krypton, 2040)	Condition 1	Condition 2	175	165	132	0.80
Experiment 33 (Rubidium and Strontium, 2042)	Condition 1	Condition 2	180	170	136	0.80
Experiment 34 (Yttrium and Zirconium, 2044)	Condition 1	Condition 2	185	175	140	0.80
Experiment 35 (Niobium and Molybdenum, 2046)	Condition 1	Condition 2	190	180	144	0.80
Experiment 36 (Technetium and Ruthenium, 2048)	Condition 1	Condition 2	195	185	148	0.80
Experiment 37 (Rhodium and Palladium, 2050)	Condition 1	Condition 2	200	190	152	0.80
Experiment 38 (Silver and Cadmium, 2052)	Condition 1	Condition 2	205	195	156	0.80
Experiment 39 (Indium and Tin, 2054)	Condition 1	Condition 2	210	200	160	0.80
Experiment 40 (Antimony and Tellurium, 2056)	Condition 1	Condition 2	215	205	164	0.80
Experiment 41 (Bismuth and Polonium, 2058)	Condition 1	Condition 2	220	210	168	0.80
Experiment 42 (Astatine and Francium, 2060)	Condition 1	Condition 2	225	215	172	0.80
Experiment 43 (Radium and Actinium, 2062)	Condition 1	Condition 2	230	220	176	0.80
Experiment 44 (Thorium and Protactinium, 2064)	Condition 1	Condition 2	235	225	180	0.80
Experiment 45 (Uranium and Neptunium, 2066)	Condition 1	Condition 2	240	230	184	0.80
Experiment 46 (Plutonium and Americium, 2068)	Condition 1	Condition 2	245	235	188	0.80
Experiment 47 (Curium and Berkelium, 2070)	Condition 1	Condition 2	250	240	192	0.80
Experiment 48 (Einsteinium and Fermium, 2072)	Condition 1	Condition 2	255	245	196	0.80</

Description of Accountable Unit	Summary of Income and Expenses				Accountant's Signature
	Income		Expenses		
	Actual	Budget	Actual	Budget	
1. Salary					
2. Social Security					
3. Health Insurance					
4. Life Insurance					
5. Pension					
6. Other					
Total Income					
7. Office Rent					
8. Utilities					
9. Telephone					
10. Postage					
11. Travel					
12. Other					
Total Expenses					
Net Income					

Signature of Accountant: _____ Date: _____

Signature of Representative: _____ Date: _____

[illegible][illegible][illegible][illegible]

(a) Particulate Matter Laboratory Test Report

[illegible]



Appendix 10. Noise and Vibration Monitoring Campaign Results

This appendix presents the full noise monitoring station details, GPS coordinates, distances to the project corridor, and detailed station-by-station 24-hour monitoring results, including discrete hourly L_{Amax} peak events, supporting the baseline noise and vibration.

1. Noise Monitoring Stations, GPS Coordinates, and Distances

A dedicated ambient noise and vibration monitoring campaign was conducted between 10 and 17 May 2026 by a certified, accredited laboratory of the Public Health and Wellbeing Service, in accordance with GOST 23337-2004, GOST 20444-2014, and SanPIN No. 0008-20. Thirteen stations (N1–N13) were established: seven along the rehabilitation corridor (N1–N7) and six within the proposed Bukhara bypass (N8–N13).

The monitoring program was designed to establish existing daytime and nighttime ambient noise conditions and characterize baseline acoustic environments near identified sensitive receptors. Monitoring locations were selected considering:

- proximity to sensitive receptors
- representation of different land-use conditions
- existing traffic intensity
- rehabilitation versus bypass sections
- potential exposure to construction and operational noise impacts.

The monitoring campaign covered representative locations across Kyzyltepa district in Navoi Province and Gijduvon, Vobkent, Bukhara district, Jondor, Karakul, and Alat districts in Bukhara Province, together with locations situated along the proposed Bukhara bypass and missing link sections. Monitoring points were intentionally positioned near identified sensitive receptors, particularly educational institutions, residential areas, and settlements situated close to the project corridor. Monitoring locations include:

- near a pre-school in Kyzyltepa district
- near School No. 29 in Gijduvon district
- near a sports school in Vobkent district
- near Music and Art School No. 7 in Galaosiyu
- between School No. 13 and Jondor Pedagogical College in Jondor district
- near Technical School No. 1 in Karakul district
- near the district college in Alat district.

Additional monitoring points were established along the proposed Bukhara bypass to characterize baseline acoustic conditions within greenfield environments currently experiencing comparatively lower traffic-related noise exposure. These monitoring locations include roadside sections, cemeteries, nearby settlements, and the closest residential households situated within the bypass Aol.



The selected monitoring locations therefore reflect the distribution of sensitive receptors identified during screening and provide representative baseline coverage for both rehabilitation and greenfield bypass sections of the project corridor. Monitoring locations and coordinates are presented in Table 23.

Table 19: Selected Noise Level Monitoring Locations

N Code	District / Area	Monitoring Location	GPS Coordinates	Distance to Corridor (m)
N1	Kyzyltepa, Navoi Province	Pre-school "Dono Bolajon", Bulakrabot settlement	40°03'22.61"N, 64°47'54.34"E	50
N2	Gijduvon, Bukhara Province	School No. 29, Khatcha town	40°04'19.17"N, 64°44'24.81"E	46
N3	Vobkent, Bukhara Province	Vobkent District Sports School, Rabotokhun community	40°00'48.94"N, 64°31'29.67"E	112
N4	Galaosiyo, Bukhara Province	Music and Art School No. 7, Galaosiyo community	39°51'38.71"N, 64°26'45.25"E	126
N5	Bukhara Bypass	Roadside section, Dekhcha community, Aminobod settlement	39°48'11.95"N, 64°22'9.04"E	13
N6	Bukhara Bypass	Cemetery, Dekhcha community, Rabot-Eshon settlement	39°47'44.50"N, 64°21'39.57"E	51
N7	Bukhara Bypass	Nearest household, residential area in Chor-Bakr settlement	39°46'25.59"N, 64°20'24.79"E	80
N8	Bukhara Bypass	Nearest household, residential area in Shergiron community	39°46'6.06"N, 64°20'36.80"E	40
N9	Bukhara Bypass	Near residential area in Shergiron community, Takhmach settlement	39°45'53.73"N, 64°20'46.53"E	85
N10	Bukhara Bypass	Near residential area in Kulonkhona community	39°45'4.91"N, 64°21'50.15"E	115

(Source: Laboratory protocols and ESIA compilation, 2026)

2. Detailed 24-Hour Noise Monitoring Results

Noise measurements were conducted using a calibrated ASSISTENT TOTAL³ sound level analyzer (serial No. 421423), verified under State calibration certificate No. 05.58961-2025 issued by the Uzbek National Institute of Metrology on 19 June 2025.

Measurements were conducted in accordance with GOST 23337-2004, GOST 20444-2014, and SanPiN No. 0008-20. At each monitoring location, equivalent continuous sound pressure levels (LAeq) were recorded at hourly intervals over a full 24-hour monitoring period, resulting in 24 hourly LAeq values per location with three replicate

³ ASSISTENT TOTAL Sound Level Analyzer, Specifications, "NTM-Zashchita" Instrument-making company, <https://ntm.ru/products/87/7382> (accessed May 2026)



measurements, lasting 15 minutes. The maximum hourly daytime LAeq and maximum hourly nighttime LAeq values reported in Table 22 represent the highest single hourly equivalent level recorded within the respective daytime (07:00–23:00) and nighttime (23:00–07:00) periods. Full octave-band sound pressure levels (center frequencies 31.5 Hz to 8000 Hz) were also recorded at each measurement interval. The primary noise source was classified as fluctuating non-continuous transport noise at all monitoring locations.

Meteorological conditions, nearby activities, and site characteristics were documented during monitoring to support interpretation of results.

The 24-hour monitoring campaign provides a representative snapshot of existing daytime and nighttime acoustic conditions along the project corridor during the spring monitoring period. When interpreted together with observed traffic conditions, land-use characteristics, and field observations, the monitoring results are considered sufficient to characterize baseline acoustic environments associated with both the existing M37 rehabilitation corridor and the proposed greenfield bypass alignment.

Table 24 summarizes the results of the 24-hour monitoring campaign.



Table 20: Summary of 24-Hour Noise Monitoring Results

N Code	Project Component	Monitoring Date	Daytime LAeq* (07:00–23:00), dBA	Nighttime LAeq (23:00–07:00), dBA	LAmix, dBA (max observed)	Harmonized framework for the Project (Table 23)	Compliance Summary
N1	Rehabilitation	10–11 May 2026	51.8	36.8	76.4	<u>LAeq:</u> 55 dB(A) daytime 45 dB(A) nighttime (SanPiN No. 0008-20 and WHO aligned) <u>LAmix:</u> 70 dBA daytime 60 dBA nighttime (SanPiN No. 0008-20)	- LAeq: Fully compliant - LAmix: Exceedance observed +6.4 dBA above 70 dBA limit - Observed discrete hourly peaks above 55 dBA during the following time: 10:00 – 11:00: 58.8 dBA (+3.8 dB) 18:00 – 19:00: 58.6 dBA (+3.6 dB) 08:00 – 09:00: 56.3 dBA (+1.3 dB). - Morning and late-afternoon heavy vehicle traffic surges.
N2	Rehabilitation	10–11 May 2026	51.7	36.8	78.5	<u>LAeq:</u> 55 dB(A) daytime 45 dB(A) nighttime (SanPiN No. 0008-20 and WHO aligned) <u>LAmix:</u> 70 dBA daytime 60 dBA nighttime (SanPiN No. 0008-20)	- LAeq: Fully compliant - LAmix: Exceedance observed +8.5 dBA above 70 dBA limit - Observed discrete hourly peaks above 55 dBA during the following time: 10:30 – 11:30: 58.8 dBA (+3.8 dB) 19:30 – 20:30: 58.8 dBA (+3.8 dB) 09:30 – 10:30: 56.8 dBA (+1.8 dB). - Morning peak and evening traffic surges.
N3	Rehabilitation	11–12 May 2026	50.1	36.9	77.1	<u>LAeq:</u> 55 dB(A) daytime 45 dB(A) nighttime (SanPiN No. 0008-20 and WHO aligned) <u>LAmix:</u> 70 dBA daytime 60 dBA nighttime (SanPiN No. 0008-20)	- LAeq: Fully compliant - LAmix: Exceedance observed +7.1 dBA above 70 dBA limit - Observed discrete hourly peaks above 55 dBA during the following time: 12:00 – 13:00: 59.2 dBA (+4.2 dB) 19:00 – 20:00: 56.8 dBA (+1.8 dB). - Midday and late-afternoon traffic activity.
N4	Rehabilitation	11–12 May 2026	37.3	36.8	65.4	<u>LAeq:</u> 55 dB(A) daytime 45 dB(A) nighttime (SanPiN No. 0008-20 and WHO aligned) <u>LAmix:</u>	Fully compliant for LAeq and LAmix with harmonized framework for the project; no exceedance recorded.



N Code	Project Component	Monitoring Date	Daytime LAeq* (07:00–23:00), dBA	Nighttime LAeq (23:00–07:00), dBA	LAmix, dBA (max observed)	Harmonized framework for the Project (Table 23)	Compliance Summary
						70 dBA daytime 60 dBA nighttime (SanPiN No. 0008-20)	
N5	Rehabilitation	12–13 May 2026	50.3	36.9	77.2	<u>LAeq:</u> 55 dB(A) daytime 45 dB(A) nighttime (SanPiN No. 0008-20 and WHO aligned) <u>LAmix:</u> 70 dBA daytime 60 dBA nighttime (SanPiN No. 0008-20)	- LAeq: Fully compliant - LAmix: Exceedance observed +7.2 dBA above 70 dBA limit - Observed discrete hourly peaks above 55 dBA during the following time: – 09:00 – 10:00: 57.7 dBA (+2.7 dB) – 12:00 – 13:00: 56.9 dBA (+1.9 dB). - Morning rush and midday traffic.
N6	Rehabilitation	12–13 May 2026	48.2	36.8	75.3	<u>LAeq:</u> 55 dB(A) daytime 45 dB(A) nighttime (SanPiN No. 0008-20 and WHO aligned) <u>LAmix:</u> 70 dBA daytime 60 dBA nighttime (SanPiN No. 0008-20)	- LAeq: Fully compliant - LAmix: Exceedance observed +5.3 dBA above 70 dBA limit - Observed discrete hourly peaks above 55 dBA during the following time: – 13:30 – 14:30: 57.1 dBA (+2.1 dB) – 09:30 – 10:30: 56.7 dBA (+1.7 dB). - Passing heavy vehicles, midday and morning.
N7	Rehabilitation	13–14 May 2026	49.8	36.8	75.4	<u>LAeq:</u> 55 dB(A) daytime 45 dB(A) nighttime (SanPiN No. 0008-20 and WHO aligned) <u>LAmix:</u> 70 dBA daytime 60 dBA nighttime (SanPiN No. 0008-20)	- LAeq: Fully compliant - LAmix: Exceedance observed +5.4 dBA above 70 dBA limit - Observed discrete hourly peaks above 55 dBA during the following time: – 08:00 – 09:00: 58.3 dBA (+3.3 dB) – 12:00 – 13:00: 58.1 dBA (+3.1 dB). - Morning traffic surge and midday heavy vehicles.
N8	Bypass	13–14 May 2026	51.9	36.8	78.6	<u>LAeq:</u> 55 dB(A) daytime 45 dB(A) nighttime (SanPiN No. 0008-20 and WHO aligned) <u>LAmix:</u>	- LAeq: Fully compliant - LAmix: Exceedance observed +8.6 dBA above 70 dBA limit - Observed discrete hourly peaks above 55 dBA during the following time: – 08:00 – 09:00: 58.3 dBA (+3.3 dB) – 10:00 – 11:00: 58.8 dBA (+3.8 dB) – 18:00 – 19:00: 57.6 dBA (+2.6 dB).



N Code	Project Component	Monitoring Date	Daytime LAeq* (07:00–23:00), dBA	Nighttime LAeq (23:00–07:00), dBA	LAm _{ax} , dBA (max observed)	Harmonized framework for the Project (Table 23)	Compliance Summary
						70 dBA daytime 60 dBA nighttime (SanPiN No. 0008-20)	Mixed vehicle movements on adjoining local road, morning and late-afternoon.
N9	Bypass	14–15 May 2026	37.3	36.8	65.4	<u>LAeq:</u> 55 dB(A) daytime 45 dB(A) nighttime (SanPiN No. 0008-20 and WHO aligned) <u>LAm_{ax}:</u> 70 dBA daytime 60 dBA nighttime (SanPiN No. 0008-20)	Fully compliant for <u>LAeq</u> and <u>LAm_{ax}</u> with harmonized framework for the project; no exceedance recorded.
N10	Bypass	14–15 May 2026	45.7	38.2	73.3	<u>LAeq:</u> 55 dB(A) daytime 45 dB(A) nighttime (SanPiN No. 0008-20 and WHO aligned) <u>LAm_{ax}:</u> 70 dBA daytime 60 dBA nighttime (SanPiN No. 0008-20)	<u>LAeq</u>: Fully compliant <u>LAm_{ax}</u>: Exceedance observed +3.3 dBA above 70 dBA limit - No hourly <u>LAeq</u> exceeded 55 dBA. - The <u>LAm_{ax}</u> peak is attributed to a single passing vehicle event; not indicative of sustained elevated noise.
N11	Bypass	15–16 May 2026	37.2	36.8	58.5	<u>LAeq:</u> 55 dB(A) daytime 45 dB(A) nighttime (SanPiN No. 0008-20 and WHO aligned) <u>LAm_{ax}:</u> 70 dBA daytime 60 dBA nighttime (SanPiN No. 0008-20)	Fully compliant for <u>LAeq</u> and <u>LAm_{ax}</u> with harmonized framework for the project; no exceedance recorded.
N12	Bypass	15–16 May 2026	37.2	36.8	69.3	<u>LAeq:</u> 55 dB(A) daytime 45 dB(A) nighttime (SanPiN No. 0008-20 and WHO aligned) <u>LAm_{ax}:</u>	Fully compliant for <u>LAeq</u> and <u>LAm_{ax}</u> with harmonized framework for the project; no exceedance recorded.



N Code	Project Component	Monitoring Date	Daytime LAeq* (07:00–23:00), dBA	Nighttime LAeq (23:00–07:00), dBA	LAm _{ax} , dBA (max observed)	Harmonized framework for the Project (Table 23)	Compliance Summary
						70 dBA daytime 60 dBA nighttime (SanPiN No. 0008-20)	
N13	Bypass	16–17 May 2026	37.2	36.8	69.0	<u>LAeq:</u> 55 dB(A) daytime 45 dB(A) nighttime (SanPiN No. 0008-20 and WHO aligned) <u>LAm_{ax}:</u> 70 dBA daytime 60 dBA nighttime (SanPiN No. 0008-20)	Fully compliant for <u>LAeq</u> and <u>LAm_{ax}</u> with harmonized framework for the project; no exceedance recorded.

*LAeq values represent the energy-equivalent (logarithmic) average across all hourly measurements within the stated period: 16 readings for daytime (07:00–23:00) and 8 readings for nighttime (23:00–07:00), in accordance with SanPiN No. 0008-20. (Source: Laboratory protocols provided by the Public Health Service laboratory and ESIA compilation, 2026).



3. Laboratory Protocols and Monitoring Photographs

(a) Bypass Noise Monitoring Campaign

	
Noise monitoring in Section 4	
	
Noise monitoring in Section 5	
	
Noise monitoring in Section 8	
	
Noise monitoring in Section 8	



	
Noise monitoring in Section 9	
	
Noise monitoring in Section 10	

(b) Rehabilitation Corridor Noise Monitoring

	
Noise monitoring in Kyzyltepa District, Navoi	
	
Noise monitoring in Gijduvon District, Bukhara	



	
Noise monitoring in Vobkent District, Bukhara	
	
Noise monitoring in Galaosiyo city, Bukhara	

(c) Bypass Noise Monitoring Laboratory Test Report

1. Bukhara District, Dehcha community

Министерство транспорта Республики Узбекистан Национальное предприятие Строительное объединение «СМУ-03» Санитарно-гигиеническая лаборатория	Кем организован: ИТУТ Форма № 341, утверждена Главным Министром администрации Республики Узбекистан № 299 от 24 декабря 2021 года
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**№ 5 ПРОТОКОЛ
ПО ИЗМЕРЕНИЮ ШУМА**
 от «12-13» мая 2026 года

1. Местопроведение измерений: Рядом с дорогой в Тухарском районе, координаты: 39.803137, 64.389520
наименование объекта, адрес, категория, участок

2. Средства измерений: Анализатор шума и вибрации, ASSISTENT TOTAL, № 421423
Наименование, марка, модель, номер
 Сертификат Государственный номер: № 25 28965-2025, от 11.06.2025г.
 ГУ «Узбекистон давлатий агентлиги метрология»
 Директор: Сидиков С.И.

3. Нормативно-методическая документация, в соответствии с которой производились измерения и даны заключения: ГОСТ - 23337-2004, ГОСТ 20444-2014, СанПиН 0008-20

4. Основные источники шума: шум транспортных, автотранспортных, работающих во время: пешеходный, городской, звуковой, пилотный (шумок) (шумок) (шумок)
транспортная магистраль

5. Количество измерений или работанных зон: одно

6. Элементы измерения (зондирование, рабочие места, ручные инструменты) должны быть отмечены точкой измерения микрофона (акселерометра) и они пронумерованы в порядке измерения

Лаборант 

Заключение 

Исполнитель Ж.У.

Техник И.И.



4. Результаты измерений шума												Уровень шума, дБ, в октавных полосах частот (дБ, дБА, в 1 м от источника)	Максимальный уровень шума, дБ, в октавных полосах частот (дБ, дБА, в 1 м от источника)
№	Наименование пункта, участка для проведения работ по обеспечению безопасности дорожного движения (объект)	Уровни звукового давления (дБ), в октавных полосах частот (октавные частоты, Гц)											
		125	160	200	250	315	400	500	630	800	1000	1250	
1	2	3	4	5	6	7	8	9	10	11	12	13	
Шум от автотранспорта (дБ, дБА, в 1 м от источника)													
Средний уровень звукового давления (дБ, дБА, в 1 м от источника)													
Максимальный уровень звукового давления (дБ, дБА, в 1 м от источника)													
1	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	56	57	58	59	60	61	62	63	64	65	66	
2	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	57	58	59	60	61	62	63	64	65	66	67	
3	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	58	59	60	61	62	63	64	65	66	67	68	
4	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	59	60	61	62	63	64	65	66	67	68	69	
5	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	60	61	62	63	64	65	66	67	68	69	70	
6	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	61	62	63	64	65	66	67	68	69	70	71	
7	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	62	63	64	65	66	67	68	69	70	71	72	
8	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	63	64	65	66	67	68	69	70	71	72	73	
9	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	64	65	66	67	68	69	70	71	72	73	74	
10	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	65	66	67	68	69	70	71	72	73	74	75	
11	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	66	67	68	69	70	71	72	73	74	75	76	
12	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	67	68	69	70	71	72	73	74	75	76	77	
13	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	68	69	70	71	72	73	74	75	76	77	78	
14	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	69	70	71	72	73	74	75	76	77	78	79	
Шум от автотранспорта (дБ, дБА, в 1 м от источника)													
Средний уровень звукового давления (дБ, дБА, в 1 м от источника)													
Максимальный уровень звукового давления (дБ, дБА, в 1 м от источника)													
15	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	69	70	71	72	73	74	75	76	77	78	79	
16	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	70	71	72	73	74	75	76	77	78	79	80	
17	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	71	72	73	74	75	76	77	78	79	80	81	
18	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	72	73	74	75	76	77	78	79	80	81	82	
19	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	73	74	75	76	77	78	79	80	81	82	83	
20	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	74	75	76	77	78	79	80	81	82	83	84	
21	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	75	76	77	78	79	80	81	82	83	84	85	
Шум от автотранспорта (дБ, дБА, в 1 м от источника)													
Средний уровень звукового давления (дБ, дБА, в 1 м от источника)													
Максимальный уровень звукового давления (дБ, дБА, в 1 м от источника)													
22	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	75	76	77	78	79	80	81	82	83	84	85	
23	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	76	77	78	79	80	81	82	83	84	85	86	
24	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	77	78	79	80	81	82	83	84	85	86	87	

25	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	78	79	80	81	82	83	84	85	86	87	88	89
26	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	79	80	81	82	83	84	85	86	87	88	89	90
27	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	80	81	82	83	84	85	86	87	88	89	90	91
28	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	81	82	83	84	85	86	87	88	89	90	91	92
29	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	82	83	84	85	86	87	88	89	90	91	92	93
30	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	83	84	85	86	87	88	89	90	91	92	93	94
31	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	84	85	86	87	88	89	90	91	92	93	94	95
Шум от автотранспорта (дБ, дБА, в 1 м от источника)													
Средний уровень звукового давления (дБ, дБА, в 1 м от источника)													
Максимальный уровень звукового давления (дБ, дБА, в 1 м от источника)													
32	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	85	86	87	88	89	90	91	92	93	94	95	96
33	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	86	87	88	89	90	91	92	93	94	95	96	97
34	11.01.2012. Шум от автотранспорта (дБ, дБА, в 1 м от источника)	87	88	89	90	91	92	93	94	95	96	97	98

М.П. и подпись ответственного исполнителя: _____, _____, 11.01.2012г.

Заключение: Согласно требованиям нормативных документов, установленных уровнем шума в таблице 1 Санитарных правил, шума в жилых помещениях № 0001-20 Республики Узбекистан «О доступности уровня шума в жилых помещениях, общественных зданий, на территории проживания населения и в жилых зданиях, рядом с дорогами в Республике Узбекистан, утвержденным: _____, на основании проведенных измерений установленный уровень шума в жилых помещениях не превышает 12 дБ.

Подпись: _____, _____

Подпись: _____, _____

2. Bukhara District, Dehcha community

Министерство здравоохранения Республики Узбекистан Национальное учреждение Специализированное областное учреждение С.З.и.ОЗ. Санитарно-эпидемиологический надзор	Код приложения по КТЗ Учетная форма № 341, утвержденная Правлением Министра здравоохранения Республики Узбекистан № 308 от 28 декабря 2022 года
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**№ 6 ПРОТОКОЛ
ПО ИЗМЕРЕНИЮ ШУМА**

от « 12-12 » мая 2026 года

1. Место проведения измерений: Рядом с кладбищем в Бухарском районе, координаты- 39.795335 64.361041

Наименование объекта, дата, отделение, участка

2. Средства измерений: Анализатор шума и вибрации, ASSISTENT TOTAL, № 421423

Наименование, марка, модельный номер

Ссылка на Государственный измеритель: № 05.58961-2025 от 19.05.2025г.

ГУ "Государственный институт метрологии"

Договор с номером ГИ

3. Нормативно-методическая документация, в соответствии с которой проводились измерения и даны заключения: ГОСТ - 23357-2004 , ГОСТ 20444-2014, СанПиН 0008-20

4. Основные метрические характер: шум, постоянный, импульсный, колеблющийся по времени, импульсный, прерывистый; импульсный, тонкоимпульсный (нужно подчеркнуть) транспортная нагрузка

5. Количество работающих или работающих лиц: много лиц

6. Средства измерения (измеряющие, рабочие места, ручные инструменты) должны быть опечатаны, иметь номерные микрофоны (свидетельства) и быть проверенными в сроки измерения.

Лаборант



Наличие ЖУ

Заказчик



Визирь И.И.

17	11.01.2018, 8:00 - 9:00	19	24	30	26	19	32	20	17	18	17,3	80,1
18	11.01.2018, 8:00 - 9:00	41	27	32	28	25	31	18	40	18	36,5	68,9
19	11.01.2018, 8:00 - 9:00	42	40	36	31	22	34	23	17	19	28,3	72,3
20	11.01.2018, 8:00 - 9:00	51	34	48	42	18	32	20	24	22	36,2	61,3
21	11.01.2018, 8:00 - 9:00	19	54	30	40	30	30	28	20	24	36,1	51,9
11.01.2018, 8:00 - 9:00												
		50	30	44	38	36	34	40	38	40	39	78
22	11.01.2018, 8:00 - 9:00	40	18	30	34	41	18	32	30	28	32,3	64,3
23	11.01.2018, 8:00 - 9:00	18	30	34	32	40	30	28	20	24	32,3	61,9
24	11.01.2018, 8:00 - 9:00	38	44	32	30	40	24	30	28	18	31,8	61,8

1. **Introduction**
 2. **Background**
 3. **Methodology**
 4. **Results**
 5. **Conclusion**
 6. **References**

3. Bukhara District, Chor-Bakr settlement

Министерство транспорта Республики Узбекистан Национальный проект Строительство обходного участка СЗД в ОЗ Самарканд – Ташкентское направление	Код организации по ЕДНТ Форма № 141 утверждена Приказом Министра транспорта Республики Узбекистан № 209 от 26 декабря 2021 года
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**№ 7 ПРОТОКОЛ
ПО ИЗМЕРЕНИЮ ШУМА**

от « 13 » 11 л. мая 2024 года

1. Место проведения измерений: Ближайшее домохозяйство в Бухарском районе
координаты: 39.6026N, 64.2034E

Наименование объекта или территории, участка

2. Средства измерений: Анализатор шума и вибрации, AASOUND TOTAL, № 421473
Наименование, марка, модель измер.
 Описание в Государственной измерит. № 07.0004.2021 от 25.08.2021.
 ГГ "Узбекистон метрологический институт измерений"
 Дата ввоза в страну СЗ

3. Нормативно-технические документы, в соответствии с которыми проводились измерения и даны заключения: ГОСТ - 27137-2004, ГОСТ 20444-2014, СанПиН 0908-20

4. Основные источники шума: шумо-механический, энергетический, локализованный по времени, импульсный, кратковременный, импульсный, точечный (шумок измерителя)
продолжительный, непрерывный

5. Качество проводимых или выполняемых измерений: хорошее

6. Такие места измерения (жилые дома, рабочие места, ручные инструменты) должны быть отмечены путем измерения микрофона (накладками) и они маркированы в журнале измерений

[Подпись]
 Заборный

[Подпись]
 Заборный И.И.

[illegible]

8.10.0 и административно-территориальное деление: Республика Бурятия, 14.05.2024



Downloaded At: 11:53 11 September 2009

4. Bukhara District, Shergiron community

Министерство здравоохранения Республики Узбекистан Наименование организации Государственное областное учреждение СЗЖи ОЗ Санитарно-эпидемиологический лабораторный	Код организации по КТУТ Учетная форма № 141, утвержденная Постановом Министра здравоохранения Республики Узбекистан № 189 от 20 декабря 2023 года
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**№ 8 ПРОТОКОЛ
ПО ИЗМЕРЕНИЮ ШУМА**
 от «15-16» мая 2024 года

1. Место проведения измерений: Ближайшее домохозяйство в Бухарском районе,
координаты- 39.788208, 64.343712

Наименование объекта, дата, название участка

2. Средства измерений: Анализатор шума и вибрации АСН1200, TOTAL, № 421421
 Калибровка, номер, дата калибровки
 Сертификат ГИЗ государственной измерит. № 42138961, 2023, от 10.06.2023г.,
 ГИЗ "Узбекский национальный институт метрологии"
 Дата вступления в силу СИ

3. Нормативно-методическая документация, в соответствии с которой проводились измерения и анализ результатов: ГОСТ - 23317-2004, ГОСТ 29444-2014, СанПиН 0008-20

4. Основные источники характер шума (постоянный, импульсный, колебательный во времени, прерывистый, прерывистый, импульсный, тональный (шумовое загрязнение))
транспортная деятельность

5. Количество проживающих в месте измерения: много лиц

6. Опись средств измерения (зондом, рабочим местом, ручные инструменты) должны быть отмечены точки измерения микрофонов (микрометры) и они пронумерованы в порядке измерения

Лаборант: 

Заведующий: 

Наличием Ж.У.

Визиром Н.Н.

4. Структура затрат на оплату труда												Сумма расч. 1.6 с учетом суммы расч. 1.5а, 1.5б	Максимальная доплата расч. 4.1
Наименование	Нормы затрат на оплату труда, исходя из среднегодового заработка работника (с учетом районного коэффициента и коэффициента индексации)	Примеры вариантов расчета, в зависимости от выбора тарифной категории оплаты											
		13.1	13	13.2	14	15	16	17	18	19	20		
1	2	3	4	5	6	7	8	9	10	11	12	13	
НДН от 1.5а (расч. 1.5а.1) - 7 от 1.5а													
Тарифная категория оплаты (с учетом районного коэффициента и коэффициента индексации)													
	Доплата, исходя из среднегодового заработка	38	39	40	41	42	43	44	45	46	47	48	
1	11.01.2004 (расч. 1.5а)												
2	11.01.2004 (расч. 1.5а)	43	51	46	42	33	33	38	35	41	24.8	36.3	
3	11.01.2004 (расч. 1.5а)	44	52	47	43	34	34	39	36	42	25.2	36.7	
4	11.01.2004 (расч. 1.5а)	45	53	48	44	35	35	40	37	43	25.6	37.1	
5	11.01.2004 (расч. 1.5а)	46	54	49	45	36	36	41	38	44	26.0	37.5	
6	11.01.2004 (расч. 1.5а)	47	55	50	46	37	37	42	39	45	26.4	37.9	
7	11.01.2004 (расч. 1.5а)	48	56	51	47	38	38	43	40	46	26.8	38.3	
8	11.01.2004 (расч. 1.5а)	49	57	52	48	39	39	44	41	47	27.2	38.7	
9	11.01.2004 (расч. 1.5а)	50	58	53	49	40	40	45	42	48	27.6	39.1	
10	11.01.2004 (расч. 1.5а)	51	59	54	50	41	41	46	43	49	28.0	39.5	
11	11.01.2004 (расч. 1.5а)	52	60	55	51	42	42	47	44	50	28.4	39.9	
12	11.01.2004 (расч. 1.5а)	53	61	56	52	43	43	48	45	51	28.8	40.3	
13	11.01.2004 (расч. 1.5а)	54	62	57	53	44	44	49	46	52	29.2	40.7	
14	11.01.2004 (расч. 1.5а)	55	63	58	54	45	45	50	47	53	29.6	41.1	
15	11.01.2004 (расч. 1.5а)	56	64	59	55	46	46	51	48	54	30.0	41.5	
16	11.01.2004 (расч. 1.5а)	57	65	60	56	47	47	52	49	55	30.4	41.9	
17	11.01.2004 (расч. 1.5а)	58	66	61	57	48	48	53	50	56	30.8	42.3	
18	11.01.2004 (расч. 1.5а)	59	67	62	58	49	49	54	51	57	31.2	42.7	
19	11.01.2004 (расч. 1.5а)	60	68	63	59	50	50	55	52	58	31.6	43.1	
20	11.01.2004 (расч. 1.5а)	61	69	64	60	51	51	56	53	59	32.0	43.5	
НДН от 1.5а (расч. 1.5а.2) - 10 от 1.5а													
16	11.01.2004 (расч. 1.5а)	63	67	61	60	44	40	47	44	45	30	39	
17	11.01.2004 (расч. 1.5а)	64	68	62	61	45	41	48	45	46	30.4	39.4	
18	11.01.2004 (расч. 1.5а)	65	69	63	62	46	42	49	46	47	30.8	39.8	
19	11.01.2004 (расч. 1.5а)	66	70	64	63	47	43	50	47	48	31.2	40.2	

		40	42	44	46	48	50	54	58	62	66	70	74
17	1440/215, Approx. 43°												
18	1440/215, Approx. 43°	44	42	40	38	36	34	32	30	28	26	24	22
19	1440/215, Approx. 43°	45	46	47	48	49	50	51	52	53	54	55	56
20	1440/215, Approx. 43°	47	48	49	50	51	52	53	54	55	56	57	58
21	1440/215, Approx. 43°	48	49	50	51	52	53	54	55	56	57	58	59
		1440/215, Approx. 43°											
		40	42	44	46	48	50	52	54	56	58	60	62
22	1440/215, Approx. 43°	50	52	54	56	58	60	62	64	66	68	70	72
23	1440/215, Approx. 43°	52	54	56	58	60	62	64	66	68	70	72	74
24	1440/215, Approx. 43°	54	56	58	60	62	64	66	68	70	72	74	76

Итого в документе представлено восемь страниц. Приложение № 2. 14.01.2006
наименование: Сторонами торгов (аукциона) являются: администрация города Железноводск и Сторонами торгов
являются: администрация города Железноводск. 20.01.2006. 20.01.2006. 20.01.2006. 20.01.2006. 20.01.2006. 20.01.2006. 20.01.2006. 20.01.2006.
наименование: Администрация города Железноводск. 20.01.2006. 20.01.2006. 20.01.2006. 20.01.2006. 20.01.2006. 20.01.2006. 20.01.2006. 20.01.2006.
наименование: Администрация города Железноводск. 20.01.2006. 20.01.2006. 20.01.2006. 20.01.2006. 20.01.2006. 20.01.2006. 20.01.2006. 20.01.2006.

5. Bukhara District, Shergiron community

Министерство здравоохранения Республики Узбекистан Наименование организации Государственный санитарно-эпидемиологический центр ГСЭЦ в ГИ Санитарно-гигиеническая лаборатория	Регистрационный номер ГТСТ Учетная форма № 341, утвержденная Приказом Министра здравоохранения Республики Узбекистан № 398 от 26 декабря 2025 года
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**№ 9 ПРОТОКОЛ
ПО ИЗМЕРЕНИЮ ШУМА**

от «14-15» мая 2026 года

1. Место проведения измерений: Рядом с населенным пунктом в Бухарском районе, координаты- 39.751383.54.364119

Наименование объекта, адрес, отделение, участок

2. Средства измерений: Анализатор шума и вибрации, ACOUSTIC TOTAL, № 421-425
Наименование, марка, модель измерителя

Ссылка на Государственный измеритель: № 15.5896-2025, от 19.06.2025г.

ГЭ: Гидрофонный измеритель акустического давления
Дата вступления в силу

3. нормативно-методические документы, в соответствии с которыми проводятся измерения и анализ результатов: ГОСТ-23357-2014, ГОСТ 20444-2014, СанПиН 0018-20

4. Оценка источника шума: шум: постоянный, непостоянный, колеблющийся по времени; импульсный, прерывистый, импульсный, тонкий (нужно подчеркнуть):
транспортных средств

5. Количество работающих или работающих лиц: много, лиц

6. Если места измерения (жилища, рабочие места, другие помещения) должны быть отмечены точки измерения микрофонов (акустических) и они пронумерованы в порядке измерения

Лаборант



Исполнитель Ж.У.

Заказчик



Бухаров Н.Н.

19	15.01.2016, Tuesday	40	24	32	39	50	36	22	38	38	50.5	14.7
20	15.02.2016, Tuesday	46	22	38	36	54	31	28	30	22	48.3	17.7
21	15.03.2016, Tuesday	36	32	48	42	58	32	38	21	32	46.3	13.9
22	15.04.2016, Tuesday	38	34	46	41	50	32	27	36	25	50.5	14.8
$\Delta T_{\text{max}} = 1.00 \times 10^{-6} \text{ s} = 1.00 \mu\text{s}$												
23	15.05.2016, Tuesday	48	28	36	43	43	38	34	38	26	51.3	15.4
24	15.06.2016, Tuesday	42	22	43	40	37	34	36	22	32	51.3	15.4
25	15.07.2016, Tuesday	38	32	47	44	38	33	27	32	28	51.3	15.4



6. Bukhara district, Kulonkhona community

Министерство транспорта Республики Узбекистан Национальное предприятие Специализированное областное учреждение СЭ и ОЭ Станционно-эксплуатационная лаборатория	Вид организации по КТУТ Учетная форма № 141, утвержденная Правлением Министра транспорта Республики Узбекистан № 188 от 26 декабря 2021 года
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**№ 10 ПРОТОКОЛ
ПО ИЗМЕРЕНИЮ ШУМА**

от « 14.12 » мая 2026 года

1. Место проведения измерений Рядом с населенным пунктом в Бухарском районе, координаты: 36.764801 64.340000
 Назначение объекта, адрес, этаж, район

2. Средства измерений: Анализатор шума и вибрации АЗВ01102, тип А, № 421423
 Назначение, марка, технический паспорт

Средства Государственной поверки: № 01.086) 3025 от 15.06.2025г.

ТУ Узбекской национальной власти метрологии

Дата поверки: поверки СИ

3. Нормативно-методическая документация, в соответствии с которой проводились измерения и анализ измерений: ГОСТ - 23317-2004, ГОСТ 30444-2014, СанПиН 0008-20

4. Основные источники шума: шум: транспортный, промышленный, приближающийся из центра, музыкальный, бытовые, музыкальный, бытовой бытовой (шумеры) - транспортная магистраль

5. Качество проведения, при работе: хорошо

6. Если место измерения (жилье, рабочая зона, другие помещения) должно быть отмечено, то на измерении микрофона (индикатор) и на фотографиях в журнале измерений

Подписи:

Исполнитель: 

Зам.отделенной: 

Исполнитель: Низамов Ж.У

Бухаров Н.Н.

[illegible]

1. Kyzyltepa District, Pre-school

Министерство здравоохранения Республики Узбекистан	Бюл. организации по КТУТ
Наименование организации: Специализированная областная унитарная СЗБ и ОЗ Санитарно-гигиеническая лаборатория	Учетная форма № 341, утвержденная Приказом Министра здравоохранения Республики Узбекистан № 399 от 26 ноября 2022 года

№ 1 ПРОТОКОЛ
ПО ИЗМЕРЕНИЮ ШУМА

от «10-11» мая 2026 года

1. Место проведения измерений: Рядом с детским садом в Кзылтепском районе
Навоийской области, координаты - 40.038120.64798115
Наименование объекта, застройки, участка
2. Средства измерений: Анализатор шума и вибрации, ASSISTENT TOTAL, № 421423
Наименование, марка, модель и номер
Сведения о Государственной поверке: № 05.38961-2023, от 19.06.2023г.
ГУ "Узбекский национальный институт метрологии"
Дата и номер поверки ГИ
3. Нормативно-методическая документация, в соответствии с которой проводились измерения и
было дан заключение: ГОСТ - 23337-2004, ГОСТ 20444-2014, СанПиН 0008-20
4. Основные источники характер шума: постоянный; прерывистый; колеблющийся во времени;
непостоянный; прерывистый; импульсный, тональный (нужное подчеркнуть): транспортная
магистраль
5. Количество проживающих или работающих лиц: много лиц
6. Если места измерения (жизненные, рабочие места, ручные инструменты) должны быть
отмечены точки измерения микрофонов (индикаторов) и они просуммарованы и указаны
измерения

Лаборант



Ишикулов Ж.У.

Зав. лабораторией



Бакиров И.П.

[illegible][illegible]

Time spent on task 18.38
min

2. Gijduvon District, School No.29

Министерство здравоохранения Республики Узбекистан Наименование организации: Государственное областное учреждение "С.Ж.и.О.И. Санитарно-эпидемиологический лабораторный	Код организации по КТУП Форма формы № 341, утвержденная Приказом Министра здравоохранения Республики Узбекистан № 200 от 28 ноября 2025 года
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**№ 2 ПРОТОКОЛ
ГД ИЗМЕРЕНИЙ ШУМА**

от « 10-11 » мая 2025 года

1. Место проведения измерений: д. ГИДУВОН, ШКОЛА №29, Самаркандская область.
Адрес: 40.072132, 64.739420
Описание объекта, адрес, координаты, этаж

2. Средства измерений: Анализатор шума и вибрации, ASSISTENT T01.01, № 421473
Наименование, марка, модель, номер
 Свидетельство Государственной поверки: № 01.1896-2025, от 19.06.2025г.

3. У "Узбекистон санитарно-эпидемиологический институт" Медицина
Должность, инициалы

3. Нормативно-методическая документация, в соответствии с которой проводились измерения и дана оценка: ГОСТ - 23337-2024, ГОСТ 20444-2014, СанПиН 0018-10

4. Основные источники характера шума: постоянный, импульсный, комбинированный, кратковременный, периодический, прерывистый, импульсный, социальный (шум от транспорта) ТРАНСКОММУНАЛЬНЫЙ
НАСКОЛЬКО

5. Количество присутствующих или работающих лиц: нет

6. Если места измерения (контакты, рабочие места, ручные инструменты) должны быть отмечены точкой измерения микрофона (акустическая) и они соответствуют и порядке измерения

Лаборант



Зав. лабораторией



Выполнено Ж.У.

Беленко И.И.

		30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
10	11.01.2016 (approx. 10 ⁰)	38	33	43	36	34	30	28	26	22	17.7	15.1				
14	11.01.2016 (approx. 0 ⁰⁰)	36	42	34	38	32	30	26	34	29	17.3	14.1				
17	11.01.2016 (approx. 10 ⁰⁰)	32	48	34	42	32	28	34	32	14	17.1	14.6				
18	11.01.2016 (approx. 21 ⁰⁰)	30	44	32	30	28	26	22	30	17	16.8	16.1				
19	11.01.2016 (approx. 01 ⁰⁰)	48	38	42	32	30	34	26	24	22	16.1	15.2				
20	11.01.2016 (approx. 21 ⁰⁰)	38	40	42	38	32	28	34	32	26	16.2	15.9				
21	11.01.2016 (approx. 00 ⁰⁰)	40	34	44	30	28	26	22	20	17	16.1	14.7				
R ₁ (m) and C ₁ (km/h) (approx. 20 ⁰⁰ - 1 ⁰⁰)																
22	11.01.2016 (approx. 21 ⁰⁰)	34	48	32	34	48	40	38	32	38	16.1	16.5				
23	11.01.2016 (approx. 00 ⁰⁰)	40	40	30	32	30	48	42	34	36	16.3	16.2				
24	11.01.2016 (approx. 00 ⁰⁰)	41	36	38	48	40	34	38	42	38	N.A.	16.1				

Keywords

3. Vobkent District, Sports school

Министерство транспорта Республики Узбекистан Национальное агентство Сертификации объектов управления СМ и ОЗ Санитарно-эпидемиологическая лаборатория	Копия разрешения от ЕТСТ Учетная форма № 381, утвержденная Приказом Министра здравоохранения Республики Узбекистан № 346 от 26 декабря 2021 года
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**№ 3 ПРОТОКОЛ
ПО ИЗМЕРЕНИЮ ШУМА**
 от « 11 » 12 » мая 2022 года

1. Место проведения измерений: Рядом с спорт школой в Вобкент, Бухарская область, информация: 40.912535.64.525830

Наименование объекта, дела (здания), участка

2. Средства измерений: Аниматор лотка и цифровая, ASSISTANT TOTAL, № 421432

Наименование, марка, заводской номер

Ссылка на Государственный номер: № 05.38961-2023, от 19.06.2023г.

ГУ "Узбекский аккредитованный институт метрологии"

Дата и номер о поверки СИ

3. Нормативно-методические документация, в соответствии с которыми проводилось измерение и дано заключение: ГОСТ - 25333-2004, ГОСТ 20444-2014, СанПиН 9008-20

4. Описание методики характера шума: постоянный; импульсный; комбинированный по времени; непостоянный; прерывистый; импульсный; тональный (шумные аппаратуры);

транспортная магистраль

5. Количество продолжительности или работности шум: _____ минут/дней

6. Если места измерения (жилищные, рабочие места, ручные инструменты) должны быть отмечены точкой измерения микрофонов (индикатором) и они соответствуют в порядке измерения

Лаборант



Заведующий



Исполнитель Ж.У

Башаров Н.Н.

16	1245.363, Approx. 41°	38	54	40	24	49	38	24	29	34	35.2	33.3
17	1245.363, Approx. 42°	56	51	34	48	34	34	21	39	34	33.2	31.3
18	1245.363, Approx. 43°	52	48	24	38	34	22	26	14	31	34.3	31.4
19	1245.363, Approx. 44°	68	51	34	38	34	22	38	14	34	34.2	32.3
20	1245.363, Approx. 45°	43	38	14	39	22	21	34	22	31	34.1	31.1
21	1245.363, Approx. 46°	43	43	43	34	38	39	22	39	314	35.2	30.3
$\sum_{i=1}^n \text{error}^2 = 1.0000000000000000 \times 10^{-10}$												
		38	54	40	24	49	38	24	29	34	35	36
22	1245.363, Approx. 47°	54	49	34	43	34	34	29	21	31	33.3	31.3
23	1245.363, Approx. 48°	21	49	14	44	31	34	24	21	34	33.3	31.4
24	1245.363, Approx. 49°	68	54	21	41	34	34	22	34	34	33.2	31.4

bioRxiv preprint doi: <https://doi.org/10.1101/2019.04.11.333811>; this version posted April 11, 2019. The copyright holder for this preprint (which was not certified by peer review) is the author/funder, who has granted bioRxiv a license to display the preprint in perpetuity. It is made available under aCC-BY-NC-ND 4.0 International license.

4. Galaosiyo city, Bukhara District, music and art school No.7

Министерство здравоохранения Республики Узбекистан Наименование организации Структурное подразделение учреждения СЗД и ЛД Санитарно-эпидемиологический надзор	Вид приложения по КТУ Учетная форма № 141, утверждена Приказом Министра здравоохранения Республики Узбекистан № 198 от 28 декабря 2021 года
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**№ 4 ПРОТОКОЛ
ПО ИЗМЕРЕНИЮ ШУМА**

от «11» 12» мая 2028 года

1. Место проведения измерений: Рядом со школой №7 в Галаосио, с. Галаосио, Бухарская область, координаты: 38.880472 64.448098
 Наименование объекта, дата, отделений, участка

2. Средства измерений: Аппаратура шума и вибрации ASSISTENT TOTAL № 421421
 Наименование, марка, заводской номер
 Система и Государственный номер: № 05.58861-2025, от 19.06.2025г.,
 ГУ "Узбекский национальный институт метрологии"
 Дата и номер о поверки СИ

3. Нормативно-методические документы, в соответствии с которыми проводились измерения и дана оценка: ГОСТ - 23377-2004, ГОСТ 20444-2016, СанПиН 0008-20

4. Оцененные источники характер шума: постоянный, импульсный, интермиттирующий во времени; непостоянный, кратковременный, импульсный, локальный (нужное подчеркнуть);
 транспортная деятельность

5. Количество присутствующих или работающих лиц: 1000000000

6. Если места измерения (жилищные, рабочие места, ручные инструменты) должны быть отмечены точки измерения микрофонами (аппаратура) и они привинчены к вертикали измерения

Лаборант



Начальник ЗСН



Вн. отделение



Назаров И.Н.

[illegible]

№ 100 и в соответствии с требованиями законодательства Российской Федерации, утвержденными в 2002 году.



Discussion

Appendix 11. Biodiversity Baseline Assessment Results

This appendix presents the full section-by-section habitat descriptions, complete tree and plant species tables (with abundance counts), complete rehabilitation corridor tables, consolidated flora and fauna species tables, and individual species-of-concern assessments that support the condensed baseline summary in Section 4.2 of the main ESIA text.



1. Field Survey Methodologies Across Taxa

Table 21: Field Survey Methodologies Across Taxa

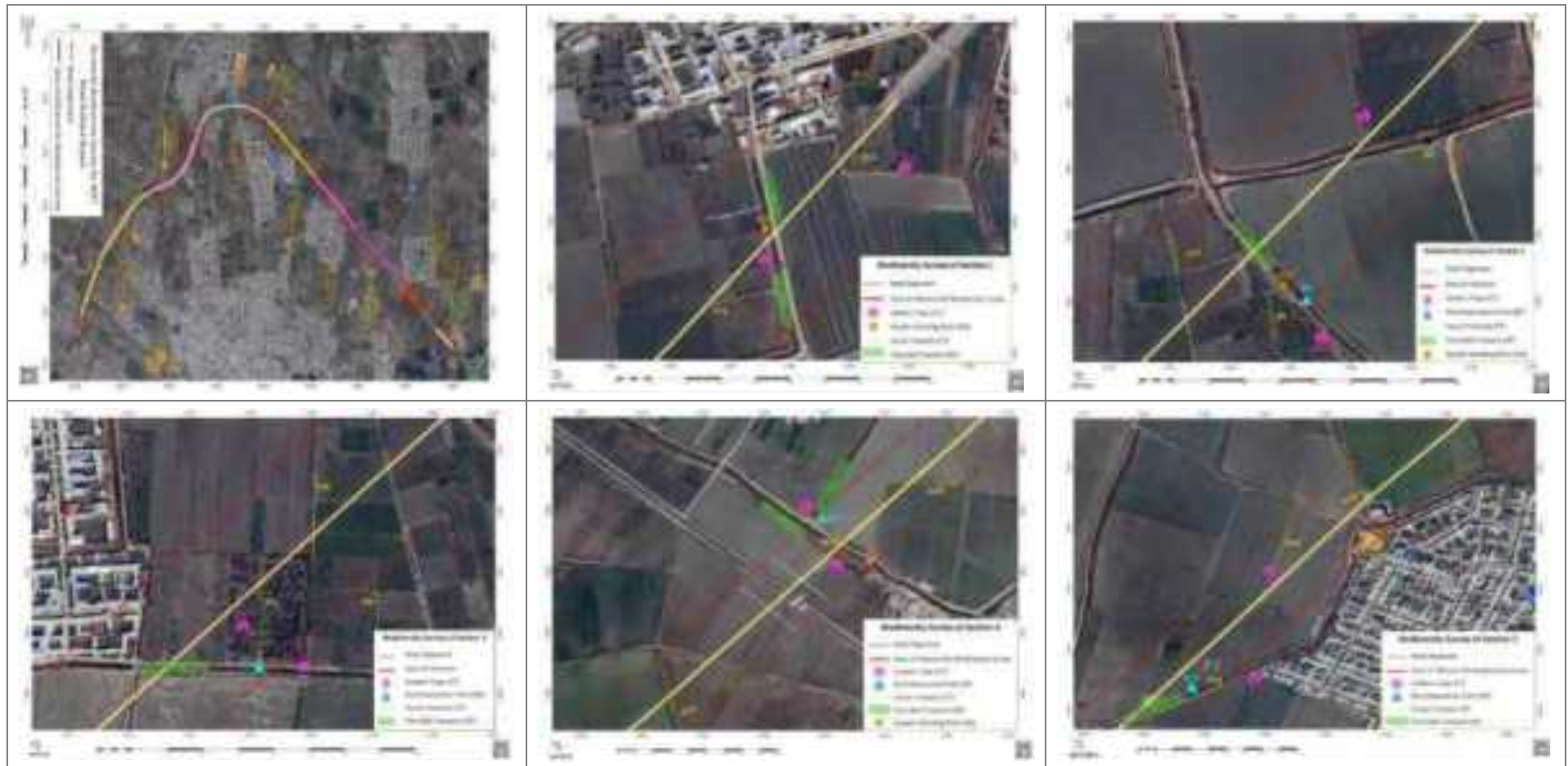
Survey Type	Taxon / Focus	Timing (h)	Duration	Sampling Unit	No. of Units	Total No. of Surveys	Description
Diurnal Transect Surveys	Birds	06:00–10:00 16:00–19:00 repeated across ≥3 survey visits	60–90 min per transects per visit	250 m transect along and adjacent to road corridor	10 transects total (1 per section)	30 survey events	Visual and auditory survey along transects to record species presence, abundance, and habitat use.
Nocturnal Transect Surveys	Birds, mammals	20:00–23:00 repeated across ≥3 survey visits	60–90 min per transect per visit	Same transects as diurnal surveys	10 transects total (1 per section)	30 survey events	Detection of nocturnal species using visual observation and auditory cues.
Herpetofauna Surveys	Amphibians & reptiles	Morning / evening repeated across ≥3 survey visits	30–60 min per section per visit	Targeted search within corridor buffer (up to 100 m)	10 sections	30 survey events	Visual encounter surveys in suitable microhabitats (irrigation channels, vegetation edges).
Camera Trapping	Mammals (non-volant)	24 hours/day	Minimum 2–4 weeks	Camera trap stations at representative locations	10 stations (CT1–CT10)	Continuous monitoring	Detection of medium and large mammals using infrared-triggered cameras.
Point-Based Bird Observations	Birds	06:00–10:00 16:00–19:00 repeated across ≥3 survey visits	20–30 min per point per visit	Fixed bird observation point	10 stations (BP1–BP10)	30 survey events (3 per station)	Visual and auditory bird observations at fixed points; mobile applications may be used as a supporting identification tool.
Bat Survey	Bats	18:30–19:30 repeated across ≥3 survey visits	30–60 min per section per visit	Fixed observation point along transects and open areas	10 stations (BS1–BS10)	30 survey events (3 per station)	Visual observations of bat activity during dusk using direct observation using binoculars where available. Opportunistic identification based on flight patterns and behavior.



Survey Type	Taxon / Focus	Timing (h)	Duration	Sampling Unit	No. of Units	Total No. of Surveys	Description
Aquatic / Semi-Aquatic Surveys	Amphibians, aquatic fauna	Daytime, 2–3 visits per key waterbody location	Site-specific per visit	Water bodies (canals, drains, irrigation systems)	Key waterbodies within corridor	2–3 visits per key waterbody	Assessment of aquatic habitats and species presence, including habitat characterization and ecological connectivity.
Vegetation Sampling	Flora	Daytime, repeated across ≥ 3 surveys per plot	60–90 min per plot per visit	Belt transect plots (50x5 m)	20–30 plots across 10 sections	≥ 60 plot surveys (≥ 3 per plot)	Detailed vegetation sampling within plots, including species identification, DBH measurement, and recording of dominant and conservation-significant species, repeated across multiple visits to capture seasonal variability.



3. Biodiversity Sampling Plan







2. Bypass Corridor: Section-by-Section Habitat Descriptions (Sections 1–10)

Section 1

Section 1 of the bypass corridor is located within a predominantly modified agricultural landscape adjacent to rural settlement areas. Based on interpretation of high-resolution satellite imagery, vegetation and habitat mapping, and completed biodiversity field surveys, the proposed alignment traverses intensively managed agricultural land interspersed with orchards, mulberry plantations, irrigation and drainage canals, access tracks, and settlement-associated disturbed areas.

The dominant habitat within Section 1 consists of irrigated agricultural land and actively cultivated fields characterized by regular field boundaries, irrigation infrastructure, and evidence of intensive agricultural management. These habitats have undergone prolonged anthropogenic modification associated with agricultural production and land management activities. Ecological integrity is generally low due to recurrent cultivation, vegetation alteration, and continuous human disturbance.

Vegetation within Section 1 is primarily associated with managed agricultural systems and anthropogenic environments. Floral communities are represented by cultivated agricultural vegetation, orchard and mulberry plantation communities, field-margin ruderal vegetation, and canal-associated herbaceous vegetation. Agricultural fields are predominantly occupied by vineyards, cultivated cropland, and orchard systems characteristic of irrigated agricultural landscapes within Bukhara Province.

Orchard and plantation habitats constitute an important structural component of the local vegetation mosaic. Field surveys identified cultivated fruit and woody tree species including apricot (*Prunus armeniaca*), cherry (*Prunus avium*), mulberry (*Morus bombycis*), grapevine (*Vitis vinifera*), and poplar shelterbelts (*Populus spp.*), as summarized in Table 29. These managed woody habitats provide greater vegetation complexity than cultivated cropland and support localized ecological functions including nesting, perching, foraging, and refuge opportunities for common bird species, rodents, reptiles, and invertebrates adapted to agricultural landscapes.

Herbaceous vegetation occurring along field boundaries, irrigation canals, drainage channels, and disturbed areas is dominated by synanthropic and ruderal plant communities adapted to irrigated agricultural conditions and frequent disturbance. These vegetation communities are primarily associated with canal banks, field margins, roadsides, and anthropogenically disturbed microhabitats.

The northern portion of Section 1 adjoins settlement and transport infrastructure, creating localized disturbed and anthropogenic habitats associated with roads, property boundaries, residential areas, and developed land. These environments are highly modified and generally support disturbance-tolerant flora and fauna characteristic of human-dominated environments. Woody vegetation within Section 1 was mapped as vegetation



clusters and plantation units rather than as individual trees, consistent with biodiversity survey methodology and habitat mapping requirements.

Based on completed habitat mapping and biodiversity field verification, the habitats within Section 1 were classified as presented in Table 22.

Table 22: Habitat Classification, Bypass Section 1

Habitat Unit	Description	IFC PS6 Category	Ecological Sensitivity
Irrigated agricultural land	Irrigated cropland, vineyards, and actively cultivated agricultural fields	Modified Habitat	Low
Orchard and mulberry plantation habitat	Cultivated orchard plots, mulberry plantations, and shelterbelt vegetation with perennial woody species	Modified Habitat	Low to Moderate
Canal-associated ruderal vegetation	Herbaceous and ruderal vegetation associated with irrigation and drainage canals and field margins	Modified Habitat	Low
Disturbed / settlement-associated land	Roads, field margins, developed edges, residential interfaces, and disturbed areas	Modified Habitat	Low
Project alignment corridor	Proposed road footprint and associated construction disturbance zone	Modified Habitat	Low

(Source: ESIA)

Ecological connectivity within Section 1 is limited and primarily associated with irrigation canals, field margins, orchards, and linear shelterbelt vegetation that form narrow habitat linkages within the agricultural matrix. Transport infrastructure, cultivated fields, and settlement areas create fragmented ecological conditions, and habitat connectivity is therefore largely restricted to common disturbance-tolerant fauna adapted to agricultural environments.

Overall, Section 1 is characterized as a modified agricultural mosaic with limited natural habitat characteristics. Ecological value is primarily associated with structurally diverse cultivated vegetation and canal-edge vegetation rather than natural or semi-natural ecosystems. All mapped habitat units within Section 1 are classified as Modified Habitat. No Natural Habitat or Critical Habitat, including internationally or nationally recognized biodiversity areas or habitat supporting species of conservation significance, was identified within this section.

Section 2

Section 2 of the bypass corridor is located within a predominantly modified agricultural landscape characterized by irrigated cultivation, woody plantations, and linear water management infrastructure. The proposed alignment traverses actively managed agricultural land interspersed with mulberry plantations, orchards, vineyards, irrigation and drainage infrastructure, and disturbed areas associated with field roads, agricultural margins, and localized infrastructure disturbance.

The dominant habitat within Section 2 consists of irrigated agricultural land and actively cultivated fields associated primarily with wheat and other agricultural crops. These habitats exhibit regular field geometry, irrigation management, and continuous agricultural



disturbance. Ecological integrity is generally low due to long-term land cultivation, vegetation modification, and intensive agricultural management.

Vegetation within Section 2 is predominantly associated with managed agricultural systems and anthropogenic environments. Floral communities are represented by cultivated agricultural vegetation, mulberry plantations, orchard and garden vegetation, vineyard plots, collector and canal-associated herbaceous vegetation, and disturbed ruderal communities occurring along roadsides and field margins. The southwestern portion of Section 2 contains orchard and vineyard habitat associated with small agricultural plots and plantation vegetation mapped during biodiversity surveys.

Woody vegetation forms an important structural component of Section 2 and was mapped as vegetation clusters and plantation units. Field surveys recorded extensive mulberry plantations (*Morus bombycis*), the most abundant woody vegetation type within the section. Additional cultivated tree species include apricot, cherry, apple, peach, plum, and grapevine. These plantations and orchard clusters support localized ecological functions including nesting, refuge, shading, and foraging opportunities for common wildlife species adapted to agricultural environments.

Collector and drainage infrastructure forms an important habitat feature within Section 2. Canal and collector margins support herbaceous and riparian ruderal vegetation adapted to irrigated agricultural landscapes and periodic soil disturbance. These communities occur primarily along canal banks, field margins, roadsides, and anthropogenically modified microhabitats.

One plant species of conservation and commercial significance was recorded: Liquorice (*Glycyrrhiza glabra* L., family Fabaceae), documented along canal margins and moist disturbed soils. This species holds commercial and medicinal value and is subject to protective regulation in Uzbekistan under national legislation governing wild plant resources. Although not listed as threatened under the IUCN Red List (assessed as Least Concern globally), it is subject to collection pressure in Central Asia due to its pharmaceutical importance and is considered a species of regional conservation interest warranting documentation and monitoring. The individuals recorded are associated with canal margin habitats and are not considered to represent a significant population; disturbance to canal-margin habitats supporting this species during construction should be minimized where feasible. This record is carried forward into the consolidated flora assessment.

Vegetation and habitat conditions within Section 2 support primarily common wildlife species associated with agricultural and disturbed environments. Biodiversity surveys recorded typical avifauna, amphibians, reptiles, and small mammals adapted to cultivated landscapes and irrigation infrastructure. Of note, two individuals of the nationally protected Zarafshan pheasant (*Phasianus colchicus zerafschanicus*) were observed during field surveys; survey findings indicate the species does not utilize Section 2 as permanent breeding or resident habitat, and its occurrence is considered incidental. These observations do not alter the overall habitat classification or indicate the presence of Critical Habitat within Section 2.



Based on completed habitat mapping and biodiversity field verification, habitats within Section 2 were classified as presented in Table 23.

Table 23: Habitat Classification, Bypass Section 2

Habitat Unit	Description	IFC PS6 Category	Ecological Sensitivity
Irrigated agricultural land	Wheat fields and actively cultivated agricultural land	Modified Habitat	Low
Mulberry plantation habitat	Mulberry plantations and associated woody vegetation	Modified Habitat	Low–Moderate
Orchard / garden habitat	Orchard plots and cultivated fruit tree vegetation	Modified Habitat	Low–Moderate
Vineyard habitat	Managed grapevine plots	Modified Habitat	Low–Moderate
Collector and canal-associated vegetation	Collector and drainage canals with riparian ruderal vegetation*	Modified Habitat	Low–Moderate
Disturbed / field margin habitat	Field roads, disturbed margins and roadside vegetation	Modified Habitat	Low
Project alignment corridor	Proposed road footprint and disturbance zone	Modified Habitat	Low

Note: *Glycyrrhiza glabra* (Licorice) was recorded within canal-margin habitats of Section 2. (Source: ESIA)

Ecological connectivity within Section 2 is limited and occurs primarily through collector and drainage canals, field margins, vineyards, orchards, and linear plantation vegetation that form narrow habitat linkages within the agricultural matrix. Transport infrastructure, cultivated land, and settlement-associated disturbance create fragmented ecological conditions, restricting habitat connectivity primarily to common disturbance-tolerant fauna adapted to agricultural landscapes.

Overall, Section 2 is characterized as a modified agricultural mosaic with limited natural habitat characteristics. All mapped habitat units within Section 2 are classified as Modified Habitat. No Natural Habitat or Critical Habitat was identified within this section.

1.5. Section 3

Section 3 of the bypass corridor is located within an intensively cultivated agricultural landscape adjacent to rural settlement areas and irrigation infrastructure. The proposed alignment traverses irrigated agricultural fields interspersed with orchards, vineyard plots, mulberry vegetation, irrigation and drainage canals, and disturbed land associated with field roads and settlement interfaces.

Vegetation within Section 3 is predominantly associated with managed agricultural systems and anthropogenic environments. Floral communities are represented by cultivated agricultural vegetation, orchard and garden vegetation, vineyard plots, mulberry stands occurring along field margins and small plantation areas, canal-associated herbaceous vegetation, and ruderal vegetation occurring along roadsides and disturbed margins.

Woody vegetation forms an important structural component of Section 3. Field observations identified orchards composed primarily of apple, peach, quince, apricot, and cherry, together with localized mulberry vegetation and vineyard plots.

Irrigation and drainage infrastructure constitutes an important habitat feature within Section 3. Collector and drainage canals support narrow linear vegetation communities associated



with moist soils and recurrent water flow, dominated by *Phragmites australis* and associated ruderal species.

Faunal observations indicate that Section 3 is utilized primarily by common and widely distributed species associated with agricultural and settlement environments. No evidence of specialized habitat use or habitat-dependent species of conservation significance was identified during field surveys.

Based on completed habitat mapping and biodiversity field verification, habitats within Section 3 were classified as presented in Table 24.

Table 24: Habitat Classification, Bypass Section 3

Habitat Unit	Description	IFC PS6 Category	Ecological Sensitivity
Irrigated agricultural land	Large cultivated agricultural fields and irrigated cropland	Modified Habitat	Low
Mulberry vegetation	Mulberry stands along field margins and small plantation areas	Modified Habitat	Low–Moderate
Orchard / garden habitat	Orchard plots and cultivated fruit tree vegetation	Modified Habitat	Low–Moderate
Vineyard habitat	Managed grapevine plots and associated cultivation	Modified Habitat	Low–Moderate
Collector and canal-associated vegetation	Irrigation and drainage canals with riparian ruderal vegetation	Modified Habitat	Low–Moderate
Disturbed / field margin habitat	Field roads, disturbed margins, and roadside vegetation	Modified Habitat	Low
Project alignment corridor	Proposed road footprint and associated construction disturbance zone	Modified Habitat	Low

(Source: ESIA)

Ecological connectivity within Section 3 is limited and occurs primarily through irrigation canals, field boundaries, orchard vegetation, and localized mulberry and vineyard plots. Overall, Section 3 is characterized as a modified agricultural mosaic with limited natural habitat characteristics. All mapped habitat units within Section 3 are classified as Modified Habitat. No Natural Habitat or Critical Habitat was identified within this section.

Section 4

Section 4 of the bypass corridor is situated within an intensively cultivated agricultural landscape intersected by irrigation and drainage infrastructure and influenced by nearby rural settlement and transport corridors. The proposed alignment traverses a mosaic of irrigated agricultural fields, orchards, vineyard plots, lucerne (alfalfa) cultivation, canal-associated vegetation, and disturbed land.

The dominant habitat type within Section 4 consists of irrigated agricultural land characterized by wheat, cotton, and lucerne cultivation supported by permanent irrigation systems. Section 4 contains several cultivated vegetation sub-types providing greater structural complexity than surrounding crop fields, including orchard and garden habitat, vineyard plots, and localized tree lines. Vineyard habitat represents a prominent land-use feature, occupying extensive cultivated parcels adjacent to the proposed alignment.



Field observations identified orchard and plantation vegetation dominated by cultivated fruit tree species including apricot, cherry, plum, apple, mulberry, poplar, almond, pear, and quince, together with vineyard vegetation.

Irrigation and drainage infrastructure forms an important habitat feature within Section 4, with canal margins characterized by reed-dominated vegetation (*Phragmites australis*) together with ruderal and synanthropic species.

Based on completed habitat mapping, habitats within Section 4 were classified as presented in Table 25.

Table 25: Habitat Classification, Bypass Section 4

Habitat Unit	Description	IFC PS6 Category	Ecological Sensitivity
Irrigated agricultural land	Wheat, cotton, and cultivated agricultural fields	Modified Habitat	Low
Lucerne field habitat	Lucerne (alfalfa) cultivation and associated vegetation	Modified Habitat	Low
Orchard / garden habitat	Fruit orchards and cultivated woody vegetation	Modified Habitat	Low–Moderate
Vineyard habitat	Managed grapevine plantations	Modified Habitat	Low–Moderate
Canal-associated vegetation	Irrigation and collector canals with reed and ruderal vegetation	Modified Habitat	Low–Moderate
Disturbed / field margin habitat	Field roads, disturbed margins, and agricultural transition areas	Modified Habitat	Low
Project alignment corridor	Proposed road footprint and disturbance zone	Modified Habitat	Low

(Source: ESIA)

Overall, Section 4 is characterized by a modified agricultural mosaic. All mapped habitat units within Section 4 are classified as Modified Habitat. No Natural Habitat or Critical Habitat was identified within this section.

Section 5

Section 5 of the bypass corridor is located within an intensively cultivated agricultural landscape adjoining a densely developed rural settlement area and intersected by irrigation and collector canal infrastructure. The proposed alignment traverses a mosaic of irrigated wheat fields, lucerne cultivation, canal-associated vegetation, field margin habitats, and settlement-influenced agricultural land.

The dominant habitat type consists of irrigated agricultural land characterized primarily by wheat cultivation and lucerne fields. A collector canal bordered by dense reed vegetation traverses the section. Field observations documented wheat fields bounded by irrigation channels and field-edge tree lines composed primarily of mulberry, together with scattered fruit trees and willows near settlement margins. A single pine tree (*Pinus* sp.) was observed adjacent to a one-storey agricultural service station building near the collector canal.

Table 26: Habitat Classification, Bypass Section 5

Habitat Unit	Description	IFC PS6 Category	Ecological Sensitivity
Irrigated agricultural land	Wheat and cultivated agricultural fields	Modified Habitat	Low



Habitat Unit	Description	IFC PS6 Category	Ecological Sensitivity
Lucerne field habitat	Perennial lucerne cultivation	Modified Habitat	Low
Canal-associated vegetation	Collector canals with reed and marsh vegetation	Modified Habitat	Low–Moderate
Field margin / ruderal habitat	Disturbed margins and agricultural transition zones	Modified Habitat	Low
Built-up / settlement habitat	Residential settlement, associated infrastructure, and scattered vegetation	Modified Habitat	Low–Moderate
Project alignment corridor	Proposed road footprint and disturbance zone	Modified Habitat	Low

(Source: ESIA)

Overall, Section 5 is characterized by a modified agricultural mosaic. All mapped habitat units within Section 5 are classified as Modified Habitat. No Natural Habitat or Critical Habitat was identified within this section.

Section 6

Section 6 of the bypass corridor is located within an intensively cultivated agricultural landscape intersected by irrigation infrastructure and adjoining a rural settlement area. The section traverses a mosaic of irrigated agricultural land, lucerne and wheat fields, vineyards, orchards, reed-dominated irrigation canals, and settlement-associated vegetation.

Wheat cultivation forms one of the principal habitat components, particularly in the northern and central portions. Vineyards and orchard habitats are concentrated primarily in the southwestern and western portions. A principal irrigation canal traverses the section from northeast toward west–southwest and is bordered by dense reed vegetation, including cattail (*Typha angustifolia*) and reed grass (*Calamagrostis pseudophragmites*). Field boundaries are characterized by planted tree lines of elm, poplar, and mulberry.

Table 27: Habitat Classification, Bypass Section 6

Habitat Unit	Description	IFC PS6 Category	Ecological Sensitivity
Irrigated agricultural land	Wheat and cultivated fields	Modified Habitat	Low
Lucerne field habitat	Managed fodder cultivation	Modified Habitat	Low
Vineyard habitat	Cultivated grape production	Modified Habitat	Low
Orchard habitat	Fruit tree plantations and gardens	Modified Habitat	Low
Canal-associated vegetation	Reed and wetland vegetation along canals	Modified Habitat	Low–Moderate
Tree-line habitat	Linear field-boundary and roadside trees	Modified Habitat	Low–Moderate
Settlement-associated habitat	Residential and service infrastructure with vegetation	Modified Habitat	Low
Disturbed and roadside habitat	Roadsides, sheds, and disturbed ground	Modified Habitat	Low

(Source: ESIA)

No species listed in the Red Book of Uzbekistan were recorded within Section 6. Overall, Section 6 is characterized by a modified agricultural mosaic. All mapped habitat units within



Section 6 are classified as Modified Habitat. No Natural Habitat or Critical Habitat was identified within this section.

1.6. Section 7

Section 7 of the bypass corridor is situated within an intensively cultivated agricultural landscape intersected by irrigation infrastructure and bordered by settlement areas in the southeastern portion. The section comprises irrigated agricultural land, fruit orchards, vineyards interspersed within orchards, lucerne fields, wheat fields, reed-dominated irrigation canals, fallow fields prepared for future cultivation, and settlement-associated vegetation.

A major ecological and landscape feature is the irrigation canal located in the northern portion, extending east to west, with dense reed growth and marsh-associated vegetation forming a narrow linear wetland corridor. Fruit orchards occur primarily in the northern and central portions adjacent to the canal system, composed of apricot, apple, cherry, and sweet cherry trees. The southern portion is characterized predominantly by wheat cultivation and fallow agricultural land.

Biodiversity surveys did not record invasive plant infestations of management concern or plant species of conservation significance within Section 7.

Table 28: Habitat Classification, Bypass Section 7

Habitat Unit	Description	IFC PS6 Category	Ecological Sensitivity
Irrigated agricultural land	Wheat and cultivated fields	Modified Habitat	Low
Lucerne field habitat	Managed fodder cultivation	Modified Habitat	Low
Orchard habitat	Fruit-tree cultivation	Modified Habitat	Low–Moderate
Vineyard habitat	Vineyard rows within orchards	Modified Habitat	Low
Canal-associated vegetation	Reed and marsh vegetation along canals	Modified Habitat	Low–Moderate
Irrigation canal habitat	Small irrigation and drainage canals	Modified Habitat	Low–Moderate
Tree-line habitat	Field-boundary and canal-margin trees	Modified Habitat	Low–Moderate
Fallow / cotton-preparation field	Seasonal agricultural preparation	Modified Habitat	Low
Settlement-associated habitat	Residential and service infrastructure	Modified Habitat	Low

(Source: ESIA)

No species listed in the Red Book of the Republic of Uzbekistan were recorded within Section 7. Overall, Section 7 is characterized by a modified agricultural mosaic. All mapped habitat units within Section 7 are classified as Modified Habitat. No Natural Habitat or Critical Habitat was identified within this section.

Section 8

Section 8 of the bypass corridor traverses a predominantly modified agricultural landscape located adjacent to established rural settlement areas. The alignment passes through intensively cultivated agricultural land interspersed with irrigation and drainage canals,



roadside vegetation, orchards, settlement-associated vegetation, and disturbed agricultural margins.

The agricultural landscape is dominated by irrigated cropland, consisting primarily of cultivated cotton and mixed crop fields. Linear vegetation associated with irrigation and drainage canals forms an important secondary habitat feature, with canal margins supporting reeds (*Phragmites*) and localized marsh vegetation. Field boundaries and roadside vegetation are lined by tree lines of mulberry, poplar, and elm.

Habitats identified within Section 8 do not meet IFC PS6 criteria for Natural Habitat or Critical Habitat; no legally protected ecosystems, designated biodiversity areas, or habitats supporting species of conservation significance were identified.

Table 29: Habitat Classification, Bypass Section 8

Habitat Unit	Description	IFC PS6 Category	Ecological Sensitivity
Irrigated agricultural land	Cotton and cultivated agricultural fields	Modified Habitat	Low
Herbaceous agricultural vegetation	Mixed herbaceous cover and partially cultivated fields	Modified Habitat	Low
Orchard habitat	Fruit-tree clusters and managed orchard vegetation	Modified Habitat	Low–Moderate
Vineyard habitat	Managed grapevine plots and household vineyard vegetation	Modified Habitat	Low
Canal-associated vegetation	Reed and marsh vegetation along irrigation and drainage canals	Modified Habitat	Low–Moderate
Irrigation canal habitats	Irrigation and drainage canals with associated vegetation	Modified Habitat	Low–Moderate
Tree-line habitat	Field-boundary, roadside and canal-margin trees	Modified Habitat	Low–Moderate
Settlement-associated habitat	Residential areas, service structures and disturbed vegetation	Modified Habitat	Low

(Source: ESIA)

All mapped habitat units within Section 8 are classified as Modified Habitat. No Natural Habitat or Critical Habitat was identified within this section.

Section 9 (Link to Bukhara Ring Road)

Section 9 of the bypass corridor traverses a predominantly irrigated agricultural landscape characterized by cultivated cropland, vineyard parcels, orchard patches, irrigation and collector canals, and localized settlement-associated areas.

The landscape is dominated by intensively managed irrigated agricultural fields, primarily wheat and cultivated cropland supported by an extensive irrigation and collector canal system. Orchard and vineyard habitats occur locally within and adjacent to cultivated fields. Linear tree plantings of elm and mulberry occur along field boundaries, canals, and access tracks.

Table 30: Habitat Classification, Bypass Section 9

Habitat Unit	Description	IFC PS6 Category	Ecological Sensitivity
Irrigated agricultural land	Wheat and cultivated fields	Modified Habitat	Low
Vineyard habitat	Managed grape cultivation	Modified Habitat	Low



Habitat Unit	Description	IFC PS6 Category	Ecological Sensitivity
Orchard habitat	Fruit-tree cultivation	Modified Habitat	Low–Moderate
Canal-associated vegetation	Reed and marsh vegetation along canals	Modified Habitat	Low–Moderate
Irrigation and collector canals	Artificial irrigation and drainage network	Modified Habitat	Low–Moderate
Tree-line habitat	Field-boundary and roadside trees	Modified Habitat	Low–Moderate
Ruderal/disturbed vegetation	Disturbed and synanthropic vegetation	Modified Habitat	Low
Settlement-associated habitat	Farm structures and settlement edges	Modified Habitat	Low

(Source: ESIA)

No habitats of conservation significance, protected vegetation communities, or IFC PS6 Critical Habitat features were identified within the Section 9 survey corridor. All mapped habitat units are classified as Modified Habitat.

Section 10

Section 10 of the bypass corridor traverses a heterogeneous agricultural and peri-urban landscape located near the planned connection between the bypass alignment and the existing A380 highway. The section is characterized by intensively cultivated agricultural land, collector and drainage canals, localized orchard and tree clusters, settlement-associated habitat, and two cemetery areas situated adjacent to residential zones.

Major watercourses identified during field surveys and satellite interpretation include Canal Jondor, Canal Shakhruddin, and the drainage canal after Sakovich. Localized orchard and woody vegetation clusters occur primarily adjacent to settlements and along field boundaries, including elm, mulberry, and tamarisk.

Invasive Species: One invasive plant species of management concern was recorded: Russian Knapweed (*Acroptilon repens* (L.) DC., family Asteraceae), documented within disturbed soils and ruderal habitat. This species is a highly competitive perennial invasive forb, native to Central Asia but recognized as an aggressive weed in disturbed and agricultural environments, capable of forming dense monocultures that suppress native and cultivated vegetation, reduce forage value, and prove extremely difficult to eradicate once established. It is associated with soil disturbance, vegetation clearing, and movement of contaminated soil or fill material, activities directly associated with road construction. Given its coincidence with the planned connection to the Bukhara Ring Road and an area of significant earthworks activity, this requires specific management attention:

- All construction vehicles and equipment operating within the Section 10 area should be subject to wheel wash and equipment hygiene protocols prior to moving to other sections of the project corridor.
- Topsoil and fill material from the Section 10 area should not be reused in sections of the bypass where *Acroptilon repens* has not been recorded, unless confirmed free of propagules.
- Post-construction vegetation monitoring within and adjacent to the Section 10 footprint should include specific surveillance for *Acroptilon repens* spread, with provisions for early intervention treatment where new infestations are detected.



Table 31: Habitat Classification, Bypass Section 10

Habitat Unit	Description	IFC PS6 Category	Ecological Sensitivity
Irrigated agricultural land	Wheat and cultivated agricultural fields	Modified Habitat	Low
Canal-associated vegetation	Reed and marsh vegetation along canals	Modified Habitat	Low–Moderate
Irrigation and collector canals	Artificial irrigation and drainage network	Modified Habitat	Low–Moderate
Orchard habitat	Fruit-tree clusters and managed orchards	Modified Habitat	Low–Moderate
Tree-line habitat	Canal- and roadside woody vegetation	Modified Habitat	Low–Moderate
Ruderal/disturbed vegetation*	Disturbed and synanthropic vegetation	Modified Habitat	Low–Moderate
Settlement-associated habitat	Residential and farm-associated habitat	Modified Habitat	Low
Cemetery habitat	Disturbed vegetated cemetery land	Modified Habitat	Low

Note: *Acroptilon repens* (Russian Knapweed) was recorded within ruderal/disturbed habitat of Section 10. (Source: ESIA)

All mapped habitat units within Section 10 are classified as Modified Habitat. No Natural Habitat or Critical Habitat was identified. Ecological sensitivity is generally low to low–moderate, reflecting the highly modified character of the landscape, intensive agricultural use, and settlement influence.

1.7. Trees Recorded in Bypass Corridor

Table 32: Tree recorded in Bypass Corridor during Field Surveys

No.	Scientific Name	Common Name	Recorded Abundance / Occurrence	Habitat Association	Section
1	<i>Prunus armeniaca</i> L.	Apricot	50	Orchard habitat	Section 1
2	<i>Populus nigra</i> L. / <i>Populus alba</i> L.	Poplar	248	Shelterbelt / linear plantation	Section 1
3	<i>Prunus avium</i> L.	Cherry	50	Orchard habitat	Section 1
4	<i>Morus bombycis</i> Koidz.	Mulberry	1028	Mulberry plantation / agricultural habitat	Section 1
5	<i>Vitis vinifera</i> L.	Grapevine	88	Vineyard habitat	Section 1
6	<i>Prunus armeniaca</i> L.	Apricot	105	Orchard / garden habitat	Section 2
7	<i>Prunus avium</i> L.	Cherry	34	Orchard habitat	Section 2
8	<i>Morus bombycis</i> Koidz.	Mulberry	1153	Mulberry plantation	Section 2
9	<i>Malus domestica</i> Borkh.	Apple	25	Orchard / small garden habitat	Section 2
10	<i>Prunus persica</i> (L.) Batsch	Peach	8	Orchard habitat	Section 2
11	<i>Prunus domestica</i> L.	Plum	118	Orchard / garden habitat	Section 2



No.	Scientific Name	Common Name	Recorded Abundance / Occurrence	Habitat Association	Section
12	Vitis vinifera L.	Grapevine	40	Vineyard habitat	Section 2
13	Prunus persica (L.) Batsch	Peach	5	Orchard / garden habitat	Section 2
14	Populus nigra L. / Populus alba L.	Poplar	17	Tree line	Section 2
15	Ulmus spp.	Elm	5	Orchard / garden habitat	Section 2
16	Malus domestica Borkh.	Apple	40	Orchard / garden habitat	Section 3
17	Prunus persica (L.) Batsch	Peach	30	Orchard habitat	Section 3
18	Cydonia oblonga Mill.	Quince	15	Orchard habitat	Section 3
19	Prunus armeniaca L.	Apricot	70	Orchard habitat	Section 3
20	Prunus avium L.	Cherry	25	Orchard habitat	Section 3
21	Morus bombycis Koidz.	Mulberry	260	Field margins / plantation vegetation	Section 3
22	Vitis vinifera L.	Grapevine	110	Vineyard habitat	Section 3
23	Elaeagnus angustifolia	Oleaster	4	Field boundaries / roadside	Section 3
24	Morus bombycis Koidz.	Mulberry	145	Field margins / plantation vegetation	Section 4
25	Malus domestica Borkh.	Apple	137	Orchard habitat	Section 4
26	Prunus domestica L.	Plum	259	Orchard habitat	Section 4
27	Vitis vinifera L.	Grapevine	1001	Vineyard habitat	Section 4
28	Populus nigra L. / Populus alba L.	Poplar	28	Tree line / canal margins	Section 4
29	Prunus dulcis (Mill.) D.A.Webb	Almond	3	Orchard habitat	Section 4
30	Pyrus communis L.	Pear	2	Orchard habitat	Section 4
31	Cydonia oblonga Mill.	Quince	2	Orchard habitat	Section 4
32	Morus bombycis Koidz.	Mulberry	154	Field margins / settlement edge	Section 5
33	Salix alba L.	White Willow	25	Canal margins	Section 5
34	Prunus armeniaca L.	Apricot	1	Settlement-associated orchard	Section 5
35	Malus domestica Borkh.	Apple	6	Orchard / garden habitat	Section 5
36	Pinus sp.	Pine	1	Agricultural service area	Section 5
37	Ulmus minor Mill.	Elm	110	Field boundaries / roadside	Section 6
38	Cupressus macrocarpa Hartw.	Monterey Cypress	87	Settlement and cultivated plots	Section 6
39	Prunus avium L.	Sweet Cherry	122	Orchards / gardens	Section 6
40	Vitis vinifera L.	Grapevine	1384	Vineyards	Section 6



No.	Scientific Name	Common Name	Recorded Abundance / Occurrence	Habitat Association	Section
41	Morus bombycis Koidz.	Mulberry	17	Field margins	Section 6
42	Populus nigra / P. alba	Poplar	43	Canal and roadside	Section 6
43	Prunus armeniaca L.	Apricot	12	Orchard habitat	Section 6
44	Elaeagnus angustifolia	Oleaster	3	Field margins / settlement edge	Section 6
45	Fraxinus sogdiana	Oleaceae	3	Settlement edge and access roads	Section 6
46	Prunus armeniaca L.	Apricot	412	Orchard habitat	Section 7
47	Morus bombycis Koidz.	Mulberry	59	Canal and field margins	Section 7
48	Malus domestica Borkh.	Apple	27	Orchard habitat	Section 7
49	Prunus avium L.	Sweet Cherry	73	Orchard habitat	Section 7
50	Salix alba L.	White Willow	37	Irrigation canals	Section 7
51	Prunus dulcis	Almond	4	Orchard habitat	Section 7
52	Morus alba L.	Mulberry	68	Field boundaries and settlement margins	Section 8
53	Populus alba L. / Populus nigra L.	Poplar	41	Irrigation canals and roadside vegetation	Section 8
54	Ulmus pumila L.	Elm	33	Settlement edge and access roads	Section 8
55	Prunus armeniaca L.	Apricot	46	Orchard habitat	Section 8
56	Malus domestica Borkh.	Apple	24	Orchard habitat	Section 8
57	Vitis vinifera L.	Grapevine	250	Vineyard and settlement-associated vegetation	Section 8
58	Prunus persica (L.) Batsch	Peach	90	Orchard habitat	Section 8
59	Ulmus spp.	Elm	42	Tree-line and roadside habitat	Section 9
60	Morus alba L.	White Mulberry	37	Agricultural and roadside habitat	Section 9
61	Vitis vinifera L.	Grapevine	150	Vineyard habitat	Section 9
62	Prunus armeniaca L.	Apricot	31	Orchard habitat	Section 9
63	Salix alba L.	White Willow	18	Irrigation canal habitat	Section 9
64	Tamarix sp.	Tamarisk	46	Canal and disturbed habitat	Section 10
65	Ulmus spp.	Elm	38	Tree-line habitat	Section 10
66	Morus spp.	Mulberry	27	Settlement and roadside habitat	Section 10
67	Lycium ruthenicum Murray	Russian Boxthorn	21	Ruderal and disturbed habitat	Section 10
68	Populus alba L. / Populus nigra L.	Poplar	2	Field boundaries and settlement margins	Section 10



No.	Scientific Name	Common Name	Recorded Abundance / Occurrence	Habitat Association	Section
69	Salix alba L.	White Willow	2	Canal and field margins	Section 10
70	Orchard tree clusters (Prunus, Malus, etc.)	Fruit trees	85	Orchard habitat	Section 10



1.8. Plant Species Recorded in Bypass Corridor

Table 33: Plants Recorded in Bypass Corridor during Field Surveys

No.	Scientific Name	Common Name	Family	Typical Habitat	Section
1	Capsella bursa-pastoris (L.) Medik.	Shepherd's Purse	Brassicaceae	Field margins / disturbed land	Section 1
2	Cichorium intybus L.	Chicory	Asteraceae	Roadsides / disturbed land	Section 1
3	Veronica polita Fr.	Grey Field-Speedwell	Plantaginaceae	Cultivated fields / disturbed soils	Section 1
4	Medicago sativa L.	Alfalfa (Lucerne)	Fabaceae	Agricultural land / field margins	Section 1
5	Alhagi kirghisorum Schrenk	Camelthorn	Fabaceae	Dry disturbed ground / ruderal habitat	Section 1
6	Phragmites australis (Cav.) Trin. ex Steud.	Common Reed	Poaceae	Irrigation and drainage canals	Section 1
7	Sonchus oleraceus L.	Common Sow-Thistle	Asteraceae	Ruderal vegetation / field margins	Section 1
8	Rumex chalepensis Mill.	Aleppo Dock	Polygonaceae	Canal margins / moist disturbed soils	Section 1
9	Cynodon dactylon (L.) Pers.	Bermuda Grass	Poaceae	Roadsides / canal banks / disturbed land	Section 1
10	Symphyotrichum graminifolium (Spreng.) G.L. Nesom	Grass-leaved Aster	Asteraceae	Ruderal vegetation	Section 1
11	Convolvulus arvensis L.	Field Bindweed	Convolvulaceae	Agricultural fields / disturbed soils	Section 1
12	Lepidium latifolium L.	Broadleaf Pepperweed	Brassicaceae	Canal margins / moist disturbed land	Section 1
13	Lepidium ruderae L.	Narrowleaf Pepperweed	Brassicaceae	Disturbed ground / ruderal habitat	Section 1
14	Plantago lanceolata L.	Ribwort Plantain	Plantaginaceae	Field margins / roadsides	Section 1
15	Setaria viridis (L.) P. Beauv.	Green Foxtail	Poaceae	Cultivated and disturbed land	Section 1
16	Leuzea repens (L.) D.J.N. Hind	Russian Knapweed	Asteraceae	Disturbed agricultural land	Section 1
17	Cardaria repens (Schrenk) Jarm.	Hoary Cress	Brassicaceae	Ruderal and disturbed habitat	Section 1
18	Clematis orientalis L.	Oriental Clematis	Ranunculaceae	Field edges / shrub vegetation	Section 1
19	Tamarix sp.	Tamarisk	Tamaricaceae	Canal banks / riparian habitat	Section 1
20	Aeluropus lagopoides (L.) Thwaites	Coastal Saltgrass	Poaceae	Saline disturbed soils / canal margins	Section 1
21	Karelinia caspia (Pall.) Less.	Caspian Karelinia	Asteraceae	Disturbed and semi-arid habitat	Section 1
22	Glycyrrhiza glabra	Licorice	Fabaceae	Agricultural land / disturbed soils	Section 1
23	Zygophyllum oxianum Boriss.	Amu Darya Bean-Caper	Zygophyllaceae	Dry disturbed habitat	Section 1
24	Goldbachia laevigata	Goldbachia	Brassicaceae	Field margins / disturbed land	Section 1
25	Cucurbita pepo	Pumpkin	Cucurbitaceae	Agricultural land / disturbed soils	Section 1



No.	Scientific Name	Common Name	Family	Typical Habitat	Section
26	<i>Lepidium draba</i>	Whitetop	Brassicaceae	Ruderal vegetation	Section 1
27	<i>Rumex crispus</i>	Curly Dock	Polygonaceae	Moist disturbed habitat	Section 1
28	<i>Raphanus sativus</i>	Radish	Brassicaceae	Field margins / disturbed land	Section 1
29	<i>Solanum tuberosum</i>	Potato	Solanaceae	Agricultural land / disturbed soils	Section 1
30	<i>Matricaria chamomilla</i>	German Chamomile	Asteraceae	Field margins / disturbed land	Section 1
31	<i>Capsella bursa-pastoris</i> (L.) Medik.	Shepherd's Purse	Brassicaceae	Field margins / disturbed land	Section 2
32	<i>Cichorium intybus</i> L.	Chicory	Asteraceae	Roadsides / disturbed habitat	Section 2
33	<i>Veronica polita</i> Fr.	Grey Field-Speedwell	Plantaginaceae	Cultivated fields / disturbed soils	Section 2
34	<i>Medicago sativa</i> L.	Alfalfa (Lucerne)	Fabaceae	Agricultural land / field margins	Section 2
35	<i>Alhagi kirghisorum</i> Schrenk	Camelthorn	Fabaceae	Dry disturbed ground / ruderal habitat	Section 2
36	<i>Phragmites australis</i> (Cav.) Trin. ex Steud.	Common Reed	Poaceae	Collector and drainage canals	Section 2
37	<i>Sonchus oleraceus</i> L.	Common Sow-Thistle	Asteraceae	Ruderal vegetation / field margins	Section 2
38	<i>Rumex chalepensis</i> Mill.	Aleppo Dock	Polygonaceae	Canal margins / moist disturbed soils	Section 2
39	<i>Cynodon dactylon</i> (L.) Pers.	Bermuda Grass	Poaceae	Canal banks / disturbed land	Section 2
40	<i>Symphyotrichum graminifolium</i> (Spreng.) G.L. Nesom	Grass-leaved Aster	Asteraceae	Ruderal vegetation	Section 2
41	<i>Convolvulus arvensis</i> L.	Field Bindweed	Convolvulaceae	Agricultural land / disturbed soils	Section 2
42	<i>Lepidium latifolium</i> L.	Broadleaf Pepperweed	Brassicaceae	Canal margins / moist habitat	Section 2
43	<i>Lepidium ruderales</i> L.	Narrowleaf Pepperweed	Brassicaceae	Disturbed land / roadsides	Section 2
44	<i>Plantago lanceolata</i> L.	Ribwort Plantain	Plantaginaceae	Field margins / roadsides	Section 2
45	<i>Cardaria repens</i> (Schrenk) Jarm.	Hoary Cress	Brassicaceae	Ruderal and disturbed habitat	Section 2
46	<i>Tamarix</i> sp.	Tamarisk	Tamaricaceae	Collector and canal margins	Section 2
47	<i>Aeluropus lagopoides</i> (L.) Thwaites	Coastal Saltgrass	Poaceae	Saline disturbed soils / canal margins	Section 2
48	<i>Karelinia caspia</i> (Pall.) Less.	Caspian Karelinia	Asteraceae	Semi-arid disturbed habitat	Section 2
49	<i>Descurainia sophia</i> (L.) Webb ex Prantl	Flixweed	Brassicaceae	Disturbed soils / agricultural margins	Section 2
50	<i>Taraxacum contristans</i> Kovalevsk.	Dandelion	Asteraceae	Disturbed land / field margins	Section 2
51	<i>Cynanchum sibiricum</i> Willd.	Siberian Swallowwort	Apocynaceae	Ruderal vegetation / disturbed habitat	Section 2
52	<i>Artemisia annua</i> L.	Annual Wormwood	Asteraceae	Disturbed and ruderal habitat	Section 2
53	<i>Artemisia diffusa</i>	sagebrush	Asteraceae	Canal margins / moist soils	Section 2
54	<i>Glycyrrhiza glabra</i> L.	Licorice	Fabaceae	Canal margins / moist soils	Section 2



No.	Scientific Name	Common Name	Family	Typical Habitat	Section
55	Cirsium arvense (L.) Scop.	Creeping Thistle	Asteraceae	Disturbed agricultural land	Section 2
56	Trididum ravenae (L.) H. Scholz	Ravenna Grass	Poaceae	Collector and canal vegetation	Section 2
57	Atriplex tatarica L.	Tatarian Orache	Amaranthaceae	Saline disturbed soils	Section 2
58	Limonium otalepis (Schrenk) Kuntze	Sea Lavender / Statice	Plumbaginaceae	Saline and disturbed habitats	Section 2
59	Capsella bursa-pastoris (L.) Medik.	Shepherd's Purse	Brassicaceae	Field margins	Section 2
60	Typha angustifolia L.	Narrowleaf Cattail	Typhaceae	Irrigation canals / marsh vegetation	Section 2
61	Phragmites australis (Cav.) Trin. ex Steud.	Common Reed	Poaceae	Canal and drainage margins	Section 3
62	Tamarix sp.	Tamarisk	Tamaricaceae	Canal margins	Section 3
63	Capsella bursa-pastoris (L.) Medik.	Shepherd's Purse	Brassicaceae	Field margins / disturbed land	Section 3
64	Cichorium intybus L.	Chicory	Asteraceae	Roadsides / disturbed habitat	Section 3
65	Convolvulus arvensis L.	Field Bindweed	Convolvulaceae	Agricultural land / disturbed soils	Section 3
66	Cynodon dactylon (L.) Pers.	Bermuda Grass	Poaceae	Canal banks / disturbed land	Section 3
67	Plantago lanceolata L.	Ribwort Plantain	Plantaginaceae	Field margins / roadsides	Section 3
68	Medicago sativa L.	Alfalfa (Lucerne)	Fabaceae	Agricultural land / field margins	Section 3
69	Sonchus oleraceus L.	Common Sow-Thistle	Asteraceae	Ruderal vegetation	Section 3
70	Lepidium ruderale L.	Narrowleaf Pepperweed	Brassicaceae	Disturbed land / roadsides	Section 3
71	Gossypium arboreum	Cotton	Malvaceae	Cultivated fields	Section 3
72	Elymus repens	Couchgrass (Witchgrass)	Poaceae	Field margins / disturbed land	Section 3
73	Cardaria repens (Schrenk) Jarm.	Hoary Cress	Brassicaceae	Ruderal and disturbed habitat	Section 3
74	Rumex obtusifolius	Broadleaf Dock	Polygonaceae	Disturbed soils / agricultural margins	Section 3
75	Trididum ravenae (L.) H. Scholz	Ravenna Grass	Poaceae	Canal margins / disturbed land	Section 4
76	Capsella bursa-pastoris (L.) Medik.	Shepherd's Purse	Brassicaceae	Field margins	Section 4
77	Cichorium intybus L.	Chicory	Asteraceae	Roadsides / disturbed habitat	Section 4
78	Veronica polita Fr.	Grey Field-Speedwell	Plantaginaceae	Cultivated fields	Section 4
79	Medicago sativa L.	Lucerne (Alfalfa)	Fabaceae	Agricultural fields	Section 4
80	Phragmites australis (Cav.) Trin. ex Steud.	Common Reed	Poaceae	Canal margins	Section 4
81	Sonchus oleraceus L.	Common Sow-Thistle	Asteraceae	Ruderal vegetation	Section 4
82	Rumex chalepensis Mill.	Aleppo Dock	Polygonaceae	Moist disturbed soils	Section 4
83	Cynodon dactylon (L.) Pers.	Bermuda Grass	Poaceae	Canal banks	Section 4
84	Convolvulus arvensis L.	Field Bindweed	Convolvulaceae	Agricultural land	Section 4
85	Lepidium latifolium L.	Broadleaf Pepperweed	Brassicaceae	Canal margins	Section 4
86	Plantago lanceolata L.	Ribwort Plantain	Plantaginaceae	Roadsides	Section 4



No.	Scientific Name	Common Name	Family	Typical Habitat	Section
87	<i>Taraxacum contristans</i> Kovalevsk.	Dandelion	Asteraceae	Disturbed land	Section 4
88	<i>Atriplex tatarica</i> L.	Tatarian Orache	Amaranthaceae	Saline disturbed soils	Section 4
89	<i>Lactuca tatarica</i> L.	Tatar Lettuce	Asteraceae	Ruderal habitat	Section 4
90	<i>Clematis orientalis</i> L.	Oriental Clematis	Ranunculaceae	Disturbed vegetation	Section 4
91	<i>Daucus carota</i> L.	Wild Carrot	Apiaceae	Field margins	Section 4
92	<i>Setaria viridis</i> (L.) P. Beauv.	Green Foxtail	Poaceae	Disturbed agricultural land	Section 4
93	<i>Trifolium</i>	Clover	Fabaceae	Agricultural fields	Section 4
94	<i>Triticum aestivum</i>	Wheat	Gramineae	Agricultural fields	Section 4
95	<i>Chenopodium album</i>	Lamb's Quarters	Amaranthaceae	Disturbed agricultural land	Section 4
96	<i>Capsella bursa-pastoris</i> (L.) Medik.	Shepherd's Purse	Brassicaceae	Field margins	Section 5
97	<i>Cichorium intybus</i> L.	Chicory	Asteraceae	Disturbed land	Section 5
98	<i>Medicago sativa</i> L.	Lucerne (Alfalfa)	Fabaceae	Agricultural fields	Section 5
99	<i>Leuzea repens</i> (L.) D.J.N. Hind	Russian Knapweed	Asteraceae	Disturbed agricultural land	Section 5
100	<i>Zygophyllum oxianum</i> Boriss.	Amu Darya Bean-Caper	Zygophyllaceae	Dry disturbed habitat	Section 5
101	<i>Alhagi kirghisorum</i> Schrenk	Camelthorn	Fabaceae	Field margins	Section 5
102	<i>Phragmites australis</i> (Cav.) Trin. ex Steud.	Common Reed	Poaceae	Canal margins	Section 5
103	<i>Rumex chalepensis</i> Mill.	Aleppo Dock	Polygonaceae	Moist disturbed soils	Section 5
104	<i>Cynodon dactylon</i> (L.) Pers.	Bermuda Grass	Poaceae	Canal banks	Section 5
105	<i>Convolvulus arvensis</i> L.	Field Bindweed	Convolvulaceae	Agricultural fields	Section 5
106	<i>Lepidium latifolium</i> L.	Broadleaf Pepperweed	Brassicaceae	Canal margins	Section 5
107	<i>Cardaria repens</i> (Schrenk) Jarm.	Hoary Cress	Brassicaceae	Disturbed land	Section 5
108	<i>Karelinia caspia</i> (Pall.) Less.	Caspian Karelinia	Asteraceae	Ruderal habitat	Section 5
109	<i>Descurainia sophia</i> (L.) Webb ex Prantl	Flixweed	Brassicaceae	Disturbed vegetation	Section 5
110	<i>Cirsium arvense</i> (L.) Scop.	Creeping Thistle	Asteraceae	Ruderal vegetation	Section 5
111	<i>Atriplex tatarica</i> L.	Tatarian Orache	Amaranthaceae	Saline disturbed soils	Section 5
112	<i>Clematis orientalis</i> L.	Oriental Clematis	Ranunculaceae	Canal margins	Section 5
113	<i>Setaria viridis</i> (L.) P. Beauv.	Green Foxtail	Poaceae	Agricultural margins	Section 5
114	<i>Olimarabidopsis pumila</i> (Steph.) Al-Shehbaz et al.	Dwarf Rockcress	Brassicaceae	Dry disturbed habitat	Section 5
115	<i>Trifolium</i>	Clover	Fabaceae	Agricultural fields	Section 5
116	<i>Triticum aestivum</i>	Wheat	Gramineae	Agricultural fields	Section 5
117	<i>Artemisia annua</i> L.	Annual Wormwood	Asteraceae	Canal margins	Section 5
118	<i>Carex stricta</i>	Tussock Sedge	Cyperaceae	Moist disturbed soils	Section 5



No.	Scientific Name	Common Name	Family	Typical Habitat	Section
119	<i>Polygonum aviculare</i>	Knotgrass	Polygonaceae	Settlement-associated disturbed habitat	Section 5
120	<i>Capsella bursa-pastoris</i> (L.) Medik.	Shepherd's Purse	Brassicaceae	Field margins / disturbed soils	Section 6
121	<i>Cichorium intybus</i> L.	Chicory	Asteraceae	Roadsides / disturbed land	Section 6
122	<i>Leuzea repens</i> (L.) D.J.N. Hind	Russian Knapweed	Asteraceae	Agricultural margins / disturbed fields	Section 6
123	<i>Zygophyllum oxianum</i> Boriss.	Amu Darya Bean-Caper	Zygophyllaceae	Dry disturbed habitat	Section 6
124	<i>Alhagi kirghosorum</i> Schrenk	Camelthorn	Fabaceae	Field margins / semi-dry soils	Section 6
125	<i>Phragmites australis</i> (Cav.) Trin. ex Steud.	Common Reed	Poaceae	Irrigation canals / reed belts	Section 6
126	<i>Sonchus oleraceus</i> L.	Sow Thistle	Asteraceae	Disturbed land / cultivated margins	Section 6
127	<i>Rumex chalepensis</i> Mill.	Aleppo Dock	Polygonaceae	Moist disturbed soils / canal margins	Section 6
128	<i>Cynodon dactylon</i> (L.) Pers.	Bermuda Grass	Poaceae	Canal banks / disturbed ground	Section 6
129	<i>Symphyotrichum graminifolium</i> (Spreng.) G.L. Nesom	Grassleaf American-Aster	Asteraceae	Ruderal vegetation / canal margins	Section 6
130	<i>Convolvulus arvensis</i> L.	Field Bindweed	Convolvulaceae	Agricultural fields	Section 6
131	<i>Lepidium latifolium</i> L.	Broadleaf Pepperweed	Brassicaceae	Canal margins / moist disturbed areas	Section 6
132	<i>Plantago lanceolata</i> L.	Ribwort Plantain	Plantaginaceae	Field margins / roadsides	Section 6
133	<i>Cardaria repens</i> (Schrenk) Jarm.	Hoary Cress	Brassicaceae	Disturbed agricultural land	Section 6
134	<i>Tamarix</i> sp.	Tamarisk	Tamaricaceae	Canal margins / saline disturbed habitat	Section 6
135	<i>Calamagrostis pseudophragmites</i> (Haller f.) Koeler	Reed Grass	Poaceae	Reed belts / irrigation canals	Section 6
136	<i>Asperugo procumbens</i> L.	German Madwort	Boraginaceae	Ruderal vegetation / disturbed soils	Section 6
137	<i>Descurainia sophia</i> (L.) Webb ex Prantl	Flixweed	Brassicaceae	Roadsides / disturbed habitat	Section 6
138	<i>Taraxacum contristans</i> Kovalevsk.	Dandelion	Asteraceae	Agricultural margins / disturbed ground	Section 6
139	<i>Cirsium arvense</i> (L.) Scop.	Creeping Thistle	Asteraceae	Ruderal vegetation / cultivated land	Section 6
140	<i>Tripidium ravennae</i> (L.) H. Scholz	Ravenna Grass	Poaceae	Canal vegetation / moist disturbed areas	Section 6



No.	Scientific Name	Common Name	Family	Typical Habitat	Section
141	<i>Atriplex tatarica</i> L.	Tatarian Orache	Amaranthaceae	Saline disturbed soils	Section 6
142	<i>Setaria viridis</i> (L.) P. Beauv.	Green Foxtail	Poaceae	Agricultural fields / margins	Section 6
143	<i>Plantago major</i> L.	Broadleaf Plantain	Plantaginaceae	Disturbed and moist soils	Section 6
144	<i>Olimarabidopsis pumila</i> (Steph.) Al-Shehbaz et al.	Dwarf Rockcress	Brassicaceae	Dry disturbed habitat	Section 6
145	<i>Typha angustifolia</i> L.	Narrowleaf Cattail	Typhaceae	Irrigation canals / marsh vegetation	Section 6
146	<i>Polygonum aviculare</i>	Knotgrass	Polygonaceae	Field margins	Section 6
147	<i>Triticum aestivum</i>	Wheat	Gramineae	Agricultural fields	Section 6
148	<i>Medicago sativa</i> L.	Lucerne (Alfalfa)	Fabaceae	Agricultural fields	Section 6
149	<i>Tripsidium ravennae</i>	Ravenna Grass	Poaceae	Canal vegetation	Section 7
150	<i>Capsella bursa-pastoris</i> (L.) Medik.	Shepherd's Purse	Brassicaceae	Disturbed agricultural margins	Section 7
151	<i>Alhagi kirghosorum</i>	Camelthorn	Fabaceae	Dry disturbed soils	Section 7
152	<i>Cichorium intybus</i>	Chicory	Asteraceae	Roadsides / field edges	Section 7
153	<i>Veronica polita</i>	Speedwell	Plantaginaceae	Ruderal vegetation	Section 7
154	<i>Medicago sativa</i>	Lucerne (Alfalfa)	Fabaceae	Cultivated fields	Section 7
155	<i>Phragmites australis</i>	Common Reed	Poaceae	Irrigation canals	Section 7
156	<i>Rumex chalepensis</i>	Aleppo Dock	Polygonaceae	Moist disturbed soils	Section 7
157	<i>Cynodon dactylon</i>	Bermuda Grass	Poaceae	Canal margins	Section 7
158	<i>Symphyotrichum graminifolium</i>	Grass-leaved Aster	Asteraceae	Canal vegetation	Section 7
159	<i>Convolvulus arvensis</i>	Field Bindweed	Convolvulaceae	Agricultural fields	Section 7
160	<i>Lepidium latifolium</i>	Broadleaf Pepperweed	Brassicaceae	Moist canal habitat	Section 7
161	<i>Lepidium ruderae</i>	Narrowleaf Pepperweed	Brassicaceae	Disturbed habitat	Section 7
162	<i>Plantago lanceolata</i>	Ribwort Plantain	Plantaginaceae	Field margins	Section 7
163	<i>Cardaria repens</i>	Hoary Cress	Brassicaceae	Ruderal habitat	Section 7
164	<i>Taraxacum contristans</i>	Dandelion	Asteraceae	Agricultural margins	Section 7
165	<i>Atriplex tatarica</i>	Tatarian Orache	Amaranthaceae	Saline disturbed soils	Section 7
166	<i>Clematis orientalis</i>	Oriental Clematis	Ranunculaceae	Canal and shrub margins	Section 7
167	<i>Setaria viridis</i>	Green Foxtail	Poaceae	Agricultural fields	Section 7
168	<i>Olimarabidopsis pumila</i>	Dwarf Rockcress	Brassicaceae	Dry disturbed soils	Section 7
169	<i>Typha angustifolia</i>	Narrowleaf Cattail	Typhaceae	Marsh and canal habitat	Section 7
170	<i>Chenopodium album</i>	Lamb's Quarters	Amaranthaceae	Disturbed agricultural land	Section 7
171	<i>Lycium ruthenicum</i>	Russian Box Thorn	Solanaceae	Dry disturbed areas	Section 7
172	<i>Zygophyllum oxianum</i>	Amu Darya Bean-Caper	Zygophyllaceae	Semi-arid disturbed soils	Section 7
173	<i>Aeluropus lagopoides</i>	Creeping Saltgrass	Poaceae	Saline canal margins	Section 7



No.	Scientific Name	Common Name	Family	Typical Habitat	Section
174	<i>Artemisia annua</i>	Annual Wormwood	Asteraceae	Ruderal habitat	Section 7
175	<i>Cynanchum sibiricum</i>	Siberian Cynanchum	Apocynaceae	Canal margins and shrubs	Section 7
176	<i>Daucus carota</i> L.	Wild Carrot	Apiaceae	Field margins	Section 7
177	<i>Vicia sativa</i>	Wild Pea	Fabaceae	Disturbed agricultural land	Section 7
178	<i>Phalaris arundinacea</i>	Reed Canary Grass	Poaceae	Semi-arid disturbed soils	Section 7
179	<i>Phragmites australis</i>	Common Reed	Poaceae	Irrigation and drainage canals	Section 8
180	<i>Cynodon dactylon</i>	Bermuda Grass	Poaceae	Canal margins and disturbed agricultural land	Section 8
181	<i>Medicago sativa</i>	Lucerne (Alfalfa)	Fabaceae	Cultivated agricultural fields	Section 8
182	<i>Convolvulus arvensis</i>	Field Bindweed	Convolvulaceae	Agricultural fields and field margins	Section 8
183	<i>Capsella bursa-pastoris</i> (L.) Medik.	Shepherd's Purse	Brassicaceae	Disturbed agricultural margins	Section 8
184	<i>Cichorium intybus</i>	Chicory	Asteraceae	Roadsides and ruderal vegetation	Section 8
185	<i>Alhagi kirghisorum</i>	Camelthorn	Fabaceae	Dry disturbed soils and settlement margins	Section 8
186	<i>Rumex chalepensis</i>	Aleppo Dock	Polygonaceae	Moist disturbed soils and canal margins	Section 8
187	<i>Lepidium latifolium</i>	Broadleaf Pepperweed	Brassicaceae	Canal habitat and moist disturbed areas	Section 8
188	<i>Tripsidium ravennae</i>	Ravenna Grass	Poaceae	Canal vegetation and ruderal habitat	Section 8
189	<i>Veronica polita</i>	Speedwell	Plantaginaceae	Ruderal vegetation and disturbed fields	Section 8
190	<i>Polygonum aviculare</i>	Knotgrass	Polygonaceae	Settlement-associated disturbed habitat	Section 8
191	<i>Triticum aestivum</i>	Wheat	Gramineae	Agricultural fields	Section 8
192	<i>Papaver rhoeas</i>	Corn Poppy	Papaveraceae	Settlement-associated disturbed habitat	Section 8
193	<i>Halimodendron halodendron</i>	Russian Peashrub	Fabaceae	Canal margins and disturbed soils	Section 8
194	<i>Taraxacum contristans</i> Kovalevsk.	Dandelion	Asteraceae	Disturbed agricultural land	Section 8
195	<i>Phragmites australis</i>	Common Reed	Poaceae	Canal vegetation	Section 9
196	<i>Medicago sativa</i>	Lucerne (Alfalfa)	Fabaceae	Cultivated fields	Section 9
197	<i>Cynodon dactylon</i>	Bermuda Grass	Poaceae	Canal margins and disturbed soils	Section 9
198	<i>Alhagi kirghisorum</i>	Camelthorn	Fabaceae	Dry disturbed soils	Section 9
199	<i>Convolvulus arvensis</i>	Field Bindweed	Convolvulaceae	Agricultural fields	Section 9
200	<i>Cichorium intybus</i>	Chicory	Asteraceae	Roadsides and field margins	Section 9



No.	Scientific Name	Common Name	Family	Typical Habitat	Section
201	<i>Rumex chalepensis</i>	Aleppo Dock	Polygonaceae	Moist disturbed habitat	Section 9
202	<i>Capsella bursa-pastoris</i> (L.) Medik.	Shepherd's Purse	Brassicaceae	Ruderal vegetation	Section 9
203	<i>Lepidium latifolium</i>	Broadleaf Pepperweed	Brassicaceae	Moist canal habitat	Section 9
204	<i>Tripidium ravennae</i>	Ravenna Grass	Poaceae	Canal-associated vegetation	Section 9
205	<i>Glycyrrhiza glabra</i>	Licorice	Fabaceae	Agricultural land / disturbed soils	Section 9
206	<i>Taraxacum contristans</i> Kovalevsk.	Dandelion	Asteraceae	Disturbed agricultural land	Section 9
207	<i>Tamarix</i> sp.	Tamarisk	Tamaricaceae	Canal margins	Section 9
208	<i>Triticum aestivum</i>	Wheat	Gramineae	Agricultural fields	Section 9
209	<i>Sophora pachycarpa</i>	Bitter Licorice	Fabaceae	Agricultural fields and field margins	Section 9
210	<i>Veronica polita</i> Fr.	Speedwell	Plantaginaceae	Disturbed agricultural margins	Section 10
211	<i>Alhagi kirghosorum</i> Schrenk	Camelthorn	Fabaceae	Dry disturbed soils	Section 10
212	<i>Phragmites australis</i> (Cav.) Trin. ex Steud.	Common Reed	Poaceae	Canal vegetation	Section 10
213	<i>Helosciadium nodiflorum</i> (L.) W.D.J.Koch	Fool's Watercress	Apiaceae	Moist canal habitat	Section 10
214	<i>Cirsium arvense</i> (L.) Scop.	Canada Thistle	Asteraceae	Disturbed habitat	Section 10
215	<i>Lactuca tatarica</i> L.	Tatar Lettuce	Asteraceae	Ruderal vegetation	Section 10
216	<i>Cynanchum sibiricum</i> Willd.	Siberian Swallowwort	Apocynaceae	Canal margins	Section 10
217	<i>Tripidium ravennae</i> (L.) H.Scholz	Ravenna Grass	Poaceae	Canal vegetation	Section 10
218	<i>Atriplex tatarica</i> L.	Tatarian Orache	Amaranthaceae	Saline and disturbed soils	Section 10
219	<i>Rumex chalepensis</i> Mill.	Aleppo Dock	Polygonaceae	Moist disturbed habitat	Section 10
220	<i>Cynodon dactylon</i> (L.) Pers.	Bermuda Grass	Poaceae	Canal margins and disturbed soils	Section 10
221	<i>Plantago lanceolata</i> L.	Ribwort Plantain	Plantaginaceae	Roadsides and disturbed land	Section 10
222	<i>Lemna minor</i> L.	Common Duckweed	Araceae	Slow-moving canal water	Section 10
223	<i>Zygophyllum oxianum</i> Boriss.	Oxus Bean-caper	Zygophyllaceae	Dry disturbed habitat	Section 10
224	<i>Karelinia caspia</i> (Pall.) Less.	Caspian Karelinia	Asteraceae	Ruderal habitat	Section 10
225	<i>Acroptilon repens</i> (L.) DC.	Russian Knapweed	Asteraceae	Disturbed soils	Section 10
226	<i>Trachomitum lancifolium</i> (Russanov) Pobed.	Lanceleaf Dogbane	Apocynaceae	Canal margins	Section 10



3. Rehabilitation Corridor

3.1. Vegetation Recorded at Targeted Survey Locations

Table 34: Tree and Woody vegetation at Targeted Survey Locations, Rehabilitation Corridor

Scientific Name	Common Name	Lots 1–2 (Kyzyltepa–Bukhara)	Habitat Association
<i>Morus bombycis</i> / <i>M. alba</i>	Mulberry	Abundant; dominant shelterbelt and field-margin species	Shelterbelts, field margins, settlement edges, roadsides
<i>Ulmus pumila</i> / <i>U. minor</i>	Elm	Common; field boundaries and roadside plantings	Field boundary tree lines, roadside and canal-margin plantings
<i>Populus nigra</i> / <i>P. alba</i>	Poplar	Common; canal margins and shelterbelts	Canal and drainage margins, roadside shelterbelts
<i>Prunus armeniaca</i> L.	Apricot	Common; orchards and agricultural gardens	Orchard habitat, agricultural gardens, settlement-associated land
<i>Malus domestica</i> Borkh.	Apple	Occasional; orchard habitat	Orchard habitat, household gardens
<i>Prunus domestica</i> L.	Plum	Occasional; orchard and garden habitat	Orchard habitat, agricultural gardens
<i>Prunus avium</i> L.	Sweet Cherry	Occasional; orchard habitat	Orchard habitat, household gardens
<i>Vitis vinifera</i> L.	Grapevine (Vineyard)	Present; agricultural plots and household gardens	Cultivated vineyard parcels and household cultivation
<i>Salix alba</i> L.	White Willow	Occasional; canal and drainage margins	Irrigation and drainage canal margins
<i>Pinus</i> sp.	Pine	Occasional; public institution frontages, interspersed within poplar shelterbelt	Ornamental planting at public buildings (schools, hospitals, khokimiyat, service centers)
<i>Juniperus</i> sp.	Juniper	Occasional; public institution frontages, interspersed within poplar shelterbelt	Ornamental planting at public buildings; interspersed with poplar roadside plantings

(Source: ESIA biodiversity survey)

Table 35: Canal-Associated and Herbaceous Vegetation Recorded at Canal Crossings and Roadside Habitats, Rehabilitation Corridor

Scientific Name	Common Name	Family	Habitat / Occurrence
<i>Phragmites australis</i> (Cav.) Trin. ex Steud.	Common Reed	Poaceae	Dominant canal and drainage margin vegetation throughout corridor
<i>Tamarix</i> sp.	Tamarisk	Tamaricaceae	Canal banks, saline disturbed soils; increasingly frequent westward
<i>Cynodon dactylon</i> (L.) Pers.	Bermuda Grass	Poaceae	Canal banks, roadsides, disturbed agricultural margins throughout
<i>Medicago sativa</i> L.	Lucerne / Alfalfa	Fabaceae	Cultivated agricultural fields and field margins
<i>Alhagi kirghisorum</i> Schrenk	Camelthorn	Fabaceae	Dry disturbed soils, field margins, roadsides throughout
<i>Convolvulus arvensis</i> L.	Field Bindweed	Convolvulaceae	Agricultural fields and disturbed margins throughout
<i>Capsella bursa-pastoris</i> (L.) Medik.	Shepherd's Purse	Brassicaceae	Field margins, disturbed land throughout
<i>Cichorium intybus</i> L.	Chicory	Asteraceae	Roadsides and disturbed habitat throughout
<i>Rumex chalepensis</i> Mill.	Aleppo Dock	Polygonaceae	Moist disturbed soils, canal margins
<i>Plantago lanceolata</i> L.	Ribwort Plantain	Plantaginaceae	Field margins, roadsides throughout



Scientific Name	Common Name	Family	Habitat / Occurrence
<i>Lepidium latifolium</i> L.	Broadleaf Pepperweed	Brassicaceae	Canal margins, moist disturbed soils
<i>Cardaria repens</i> (Schrenk) Jarm.	Hoary Cress	Brassicaceae	Ruderal and disturbed habitat throughout
<i>Karelinia caspia</i> (Pall.) Less.	Caspian Karelinia	Asteraceae	Semi-arid disturbed habitat; more frequent in western sections
<i>Aeluropus lagopoides</i> (L.) Thwaites	Coastal Saltgrass	Poaceae	Saline canal margins; western sections
<i>Artemisia annua</i>	Annual Wormwood	Asteraceae	Kyzyltepa
<i>Hordeum murinum</i>	Wall Barley	Poaceae	Gjduvon
<i>Medicago lupulina</i>	Black Medick	Fabaceae	Bukhara
<i>Bassia scoparia</i>	Summer Cypress	Amaranthaceae	Bukhara

(Source: ESIA biodiversity survey)

Table 36: Agricultural and Horticultural Cultivation Recorded Adjacent to the Rehabilitation Corridor (Lots 1–2)

Crop / Vegetation Type	Common Name	Cultivation Form	Occurrence
<i>Gossypium hirsutum</i> L.	Cotton	Open-field irrigated cultivation	Dominant field crop throughout Lots 1–3; present in parts of Lot 4; most extensive single agricultural land use along corridor
<i>Triticum aestivum</i> L.	Wheat	Open-field irrigated cultivation	Widespread throughout Lots 1–3; present near settlements in Lot 4; second most extensive field crop
<i>Solanum lycopersicum</i> L.	Tomato	Greenhouse cultivation	Prevalent in peri-urban sections of Gjduvon, Vobkent, Bukhara districts; polytunnel/glass greenhouse structures adjacent to carriageway
<i>Cucumis sativus</i> L.	Cucumber	Greenhouse cultivation	Associated with tomato greenhouse clusters in peri-urban sections; Lots 1–2
<i>Raphanus sativus</i> L.	Radish	Open-field cultivation	Small household and commercial plots adjacent to settlements throughout Lots 1–2
Mixed herb cultivation	Culinary herbs (dill, coriander, parsley, etc.)	Open-field / household cultivation	Household plots and small market gardens adjacent to settlements; Lots 1–2
<i>Medicago sativa</i> L.	Lucerne / Alfalfa (fodder)	Open-field cultivation	Widespread cultivated fodder crop throughout agricultural sections of corridor

(Source: ESIA biodiversity survey)



3.2. Trees Recorded in Rehabilitation Corridor

Table 37: Trees Recorded in Rehabilitation Corridor

No.	Scientific Name	Common Name	Lots 1–2 (Kyzyltepa–Bukhara)	Habitat Association
1.	<i>Morus bombycis</i> Koidz. / <i>Morus alba</i> L.	Mulberry	Abundant; dominant shelterbelt and field-margin species	Shelterbelts, field margins, settlement edges, roadsides
2.	<i>Ulmus pumila</i> L. / <i>Ulmus minor</i> Mill.	Elm	Common; field boundaries and roadside plantings	Field boundary tree lines, roadside and canal-margin plantings
3.	<i>Populus nigra</i> L. / <i>Populus alba</i> L.	Poplar	Common; canal margins and shelterbelts	Canal and drainage margins, roadside shelterbelts
4.	<i>Prunus armeniaca</i> L.	Apricot	Common; orchards and agricultural gardens	Orchard habitat, agricultural gardens, settlement-associated land
5.	<i>Malus domestica</i> Borkh.	Apple	Occasional; orchard habitat	Orchard habitat, household gardens
6.	<i>Prunus domestica</i> L.	Plum	Occasional; orchard and garden habitat	Orchard habitat, agricultural gardens
7.	<i>Prunus avium</i> L.	Sweet Cherry	Occasional; orchard habitat	Orchard habitat, household gardens
8.	<i>Vitis vinifera</i> L.	Grapevine (Vineyard)	Present; agricultural plots and household gardens	Cultivated vineyard parcels and household cultivation
9.	<i>Salix alba</i> L.	White Willow	Occasional; canal and drainage margins	Irrigation and drainage canal margins
10.	<i>Pinus</i> sp.	Pine	Occasional; primarily associated with public institution frontages and interspersed within poplar shelterbelt plantings	Ornamental planting at public buildings (schools, hospitals, khokimiyat, service centers); interspersed with poplar roadside plantings; isolated individuals among deciduous plantings
11.	<i>Juniperus</i> sp.	Juniper	Occasional; primarily associated with public institution frontages and interspersed within poplar shelterbelt plantings	Ornamental planting at public buildings (schools, hospitals, khokimiyat, service centers); interspersed with poplar roadside plantings; isolated individuals among deciduous plantings
12.	<i>Platycladus orientalis</i>	Thuja (Oriental Arborvitae)	Occasional	Kyzyltepa, Gijduvon, Vobkent, Bukhara
13.	<i>Prunus persica</i>	Peach	Occasional	Gijduvon
14.	<i>Paulownia</i>	Paulownia	Rare	Vobkent



4. IFC PS6 Habitat Classification – Rehabilitation Corridor

Table 38: IFC PS6 Habitat Classification and Ecological Sensitivity, Rehabilitation Corridor

Habitat Unit	Description and Distribution	IFC PS6 Category	Ecological Sensitivity
Roadside and transport corridor habitat	Existing M37 carriageway, embankments, shoulders, and immediately adjacent disturbed land with ruderal vegetation	Modified Habitat	Low
Irrigated agricultural land	Cultivated cotton, wheat, lucerne, and mixed cropland adjacent to carriageway	Modified Habitat	Low
Shelterbelt and roadside tree-line habitat	Linear mulberry, elm, and poplar plantations along carriageway and field boundaries; densest in Lots 1–2	Modified Habitat	Low–Moderate
Orchard and fruit-tree habitat	Apricot, apple, plum, sweet cherry orchards and household gardens adjacent to settlements	Modified Habitat	Low–Moderate
Vineyard habitat	Managed grapevine cultivation in agricultural plots adjacent to carriageway	Modified Habitat	Low–Moderate
Greenhouse cultivation	Polytunnel and glass greenhouse structures for tomato and cucumber production	Modified Habitat	Low
Canal-associated vegetation	Reed-dominated irrigation and drainage canal margins at crossings and adjacent sections	Modified Habitat	Low–Moderate
Settlement and peri-urban habitat	Residential areas, commercial facilities, disturbed land, and associated ruderal vegetation	Modified Habitat	Low

(Source: ESIA biodiversity survey and habitat assessment, spring 2026)

All habitat units identified along the rehabilitation corridor are classified as Modified Habitat under IFC PS6 definitions. No Natural Habitat, defined as areas where the ecological community is largely composed of native plant and animal species, and where human activity has not essentially modified the area's primary ecological functions, was identified along the rehabilitation corridor alignment. No Critical Habitat features were identified within the rehabilitation corridor survey area. The most ecologically sensitive habitat units are the shelterbelt and tree-line vegetation (Low–Moderate, connectivity function) and canal-associated reed vegetation at crossing locations (Low–Moderate).



5. Ecological Corridors and Connectivity Features

Table 39: Ecological Corridors and Connectivity Features, M37 Project Corridor

Corridor / Feature	Feature Type	Spatial Extent / Distribution	Ecological Function and Supporting Species	Connectivity Value	Project Interaction
Irrigation and collector canal network	Linear aquatic / riparian corridor	Throughout full corridor	Primary ecological corridor in an otherwise arid matrix; supports reed and wetland vegetation (<i>Phragmites australis</i> , <i>Typha angustifolia</i> , <i>Tamarix</i> spp.); movement, foraging, breeding, and refuge for birds, reptiles, amphibians, small mammals, and aquatic fauna; hydrological connectivity between agricultural, oasis, and distal wetland systems	High	Multiple crossings; canal bank disturbance; risk of vegetation loss and hydrological disruption
Shelterbelt and roadside tree-line network (Lots 1–2)	Linear terrestrial corridor	Continuous to semi-continuous along M37 in Lots 1–2; field boundaries and road shoulders	Principal above-ground linear movement corridor for passerine birds, small raptors, bats, and small mammals; nesting and foraging for common agricultural bird species; mulberry, elm, and poplar dominant with occasional pine and juniper at public institution frontages	Moderate–High	Direct disturbance during road widening and interchange construction; tree removal within footprint
Orchard and mulberry plantation stepping-stone network (Lots 1–2)	Patch / stepping-stone corridor	Bypass sections 1–8 and rehabilitation Lots 1–2; largest clusters in bypass Section 2 (1,153 mulberry) and Section 7 (~412 apricot)	Stepping-stone habitat patches supporting bird movement and foraging; refuge and nesting for passerines and small raptors; bats foraging in orchards at dusk	Moderate	Partial loss of orchard habitat within bypass and widening footprints; fragmentation of stepping-stone network
Zarafshan River corridor	Natural riparian / fluvial corridor	Crosses rehabilitation corridor at Kyzyltepa–Gijduvon section (Lot 1); riparian vegetation along bridges	Natural perennial watercourse; most ecologically significant natural surface water feature; bridge crossing structures provide nesting habitat for swallows, swifts, and bats	Moderate–High	Bridge rehabilitation works; potential disturbance to riparian banks and channel
Major collector canals, Bukhara bypass area (Lots 2)	Linear aquatic / riparian corridor	Jondor Canal, Shakhrud Canal, Djuizar Canal, Sakovich drainage canal; concentrated bypass Sections 9–10	Dense reed and marsh vegetation; aquatic connectivity between peri-urban Bukhara agricultural zone and broader drainage network	High	Multiple crossings; concentrated earthworks in canal-convergence zone

(Source: ESIA biodiversity survey and GIS analysis, spring 2026)



6. Regional Flora Context

The M37 project corridor is located within the Kyzylkum and Lower Zarafshan botanical-geographical regions of Bukhara Province. The broader flora of Bukhara Province has been inventoried by the Institute of Botany of Uzbekistan, which records 764 species of vascular plants in 339 genera and 66 families across the province, of which 546 species occur in the project area districts. Among the provincial flora, 25 plant species are listed in the Red Book of Uzbekistan, and 14 species are endemic to Uzbekistan.

Table 40: Flora Family Composition, Bukhara Province Regional Context and M37 Survey Records

Family	No. of Genera	No. of Species	Survey Records (M37)	Characteristic Genera / Notes
Asteraceae	51	110	11 spp.	<i>Astragalus</i> , <i>Artemisia</i> , <i>Cichorium</i> , <i>Sonchus</i> , <i>Karelinia</i> , <i>Acroptilon</i> ; most diverse family
Amaranthaceae	31	105	3 spp.	<i>Atriplex</i> , <i>Chenopodium</i> , <i>Climacoptera</i> ; dominant in saline and disturbed habitats; includes Red Book <i>Climacoptera merkulowiczii</i>
Fabaceae	19	64	6 spp.	<i>Medicago</i> , <i>Alhagi</i> , <i>Glycyrrhiza</i> (commercial interest), <i>Astragalus</i> ; includes Red Book <i>Lagochilus</i> , <i>Eremosparton</i>
Poaceae	34	59	12 spp.	<i>Phragmites</i> , <i>Cynodon</i> , <i>Setaria</i> , <i>Aeluropus</i> , <i>Tripsidium</i> ; dominant canal and ruderal family
Brassicaceae	32	58	8 spp.	<i>Capsella</i> , <i>Lepidium</i> , <i>Cardaria</i> , <i>Descurainia</i> ; disturbance-tolerant ruderal species
Polygonaceae	6	31	2 spp.	<i>Rumex</i> ; includes IUCN-listed <i>Calligonum</i> species in Aol desert habitats
Apiaceae	16	27	2 spp.	<i>Daucus</i> , <i>Helosciadium</i> ; includes Red Book <i>Ferula kyzylkumica</i> in project Aol
Boraginaceae	14	26	1 sp.	<i>Asperugo</i> ; disturbance-tolerant ruderal
Caryophyllaceae	12	21	—	Includes Red Book <i>Acanthophyllum</i> , <i>Silene tomentella</i> ; not recorded in survey corridors
Ranunculaceae	9	20	1 sp.	<i>Clematis orientalis</i> ; field edges and shrub habitats
Lamiaceae	—	—	—	Includes Red Book <i>Lagochilus inebrians</i> , <i>Phlomis aralensis</i> in Aol
Liliaceae / Iridaceae	—	—	—	Includes Red Book <i>Tulipa lehmanniana</i> , <i>T. korolkowii</i> in Aol desert habitats
Zygophyllaceae	—	—	1 sp.	<i>Zygophyllum oxianum</i> recorded in surveys; <i>Z. bucharicum</i> (CR) in broader Aol
Other families	—	—	13 spp.	Tamaricaceae, Convolvulaceae, Plantaginaceae, Typhaceae, Rosaceae, Moraceae, Ulmaceae, Paulowniaceae, Salicaceae, Araceae, Apocynaceae, Plumbaginaceae, Vitaceae

(Sources: Inventory of the Flora of Bukhara Province, Institute of Botany of the Republic of Uzbekistan; ESIA biodiversity field surveys, spring 2026)

7. Natural Vegetation Communities of the Project Area

The natural and semi-natural vegetation of the project area is characterized by shrub-desert communities adapted to arid, saline, and sandy substrates. Seven principal plant



communities are recognized within the Kyzylkum desert and Lower Zarafshan botanical regions:

1. **Artemisia community**, the most widespread community across the Aol, dominated by *Artemisia diffusa* on sandy and loamy desert substrates; *Artemisia turanica* is an associated species in arid western sections.
2. **Salsola community**, thriving on saline and sandy soils, dominated by *Salsola leptoclada*, *S. arbuscula*, *S. gemmascens*, *Caroxylon orientale*, *Oreosalsola arbusculiformis* (syn. *Salsola arbusculiformis*), and *S. rigida*; *S. leptoclada* is particularly widespread between Kagan district and Kuyumazar Reservoir/Lake Tudakul.
3. **Astragalus community**, on semi-consolidated sandy soils, dominated by *Astragalus villosissimus* and *Convolvulus hamadae* mixed with *Salsola* species and *Artemisia diffusa*; some *Astragalus* species (e.g., *A. membranaceus*) traditionally used medicinally.
4. **Calligonum community**, on weakly consolidated sands south of Kagan district and near Kuyumazar Reservoir/Lake Tudakul; supports *Calligonum* species listed as Endangered under IUCN.
5. **White Saxaul community**, *Haloxylon persicum* together with Sandy Acacia (*Ammodendron conollyi*) on unconsolidated dunes and idle lands.
6. **Ephemeral community**, sparsely distributed throughout all plant communities; thin ground cover of grasses including *Carex physodes* (Desert Sedge) and *Poa bulbosa* (Bulbous Bluegrass), appearing in spring within *Artemisia* and *Astragalus* vegetation.
7. **Other saltwort, ephemeral, and sagebrush communities**, including *Poa bulbosa*, *Convolvulus hamadae*, *Ferula foetida*, *Cousinia hamadae*, and *Alhagi pseudalhagi*, found in sandy soils with *Salsola arbuscula* and *Haloxylon persicum*.

Phragmites communis, *Tamarix*, and *Deschampsia cespitosa* are abundant along earthen irrigation canals, collector ditches, and flooded natural lowlands throughout the corridor. In Kyzyltepa district (Navoi Province), desert areas are covered with sparse ephemeral sagebrush vegetation including *Xylosalsola arbuscula*, *Caroxylon orientale*, *Artemisia diffusa*, *Poa bulbosa*, *Carex physodes*, *Tamarix*, *Deschampsia cespitosa*, and *Alhagi pseudalhagi*. Individual specimens of *Ferula kyzylkumica*, a nationally endemic Red Book species, have been recorded at the intersection of Kagan and Karaulbazar districts within the broader project Aol.

These natural vegetation communities are **not present within the M37 construction footprint**, which traverses modified agricultural and roadside habitats. However, representatives of the *Artemisia* community (*A. diffusa*, *A. turanica*) and *Salsola* community (*Caroxylon orientale*, *Oreosalsola arbusculiformis*, *Xylosalsola arbuscula*) were recorded during rehabilitation corridor in targeted surveys, confirming a transition to natural desert vegetation character in these sections and strengthening the ecological rationale for footprint minimization and rapid surface stabilization there.



8. Fauna Species

Field surveys were conducted from March – May 2026 for the bypass and rehabilitation corridors.

8.1. Fauna Species Recorded in Bypass Corridor

Table 41: Fauna Species Recorded in Bypass Corridor

No.	Scientific Name	Common Name	Type	Section
1	Corvus frugilegus	Rook	Bird	Section 1
2	Pica-pica	Magpie	Bird	Section 1
3	Columba livia	Rock Dove	Bird	Section 1
4	Acridotheres tristis	Myna	Bird	Section 1
5	Passer montanus	Eurasian Tree Sparrow	Bird	Section 1
6	Fringilla coelebs	Chaffinch	Bird	Section 1
7	Chiroptera	Bat	Mammal	Section 1
8	Harpalus rubripes	Ground Beetle	Insect	Section 1
9	Harpalus rufipes	Strawberry Seed Beetle	Insect	Section 1
10	Agriotes meticulosus	Click Beetle	Insect	Section 1
11	Rana ridibunda	Marsh Frog	Herpetofauna	Section 2
12	Ablefurus deserti Strauch	Lizard	Herpetofauna	Section 2
13	Corvus frugilegus	Rook	Bird	Section 2
14	Galerida cristata	Crested Lark	Bird	Section 2
15	Hippolais rama	Syke's Warbler	Bird	Section 2
16	Columba livia	Rock Dove	Bird	Section 2
17	Pica-pica	Magpie	Bird	Section 2
18	Acridotheres tristis	Myna	Bird	Section 2
19	Passer montanus	Eurasian Tree Sparrow	Bird	Section 2
20	Fringilla coelebs	Chaffinch	Bird	Section 2
21	Streptopelia decaocto	Eurasian Collared Dove	Bird	Section 2
22	Phasianus colchicus	Common Pheasant	Bird	Section 2
23	Gallinula chloropus	Moorhen	Bird	Section 2
24	Ellobius talpinus	Northern Mole Vole	Mammal	Section 2
25	Calathus ambiguus	Ground Beetle	Insect	Section 2
26	Hypera postica	Alfalfa Weevil	Insect	Section 2
27	Agriotes meticulosus	Click Beetle	Insect	Section 2
28	Xanthogaleruca luteola	Elm Leaf Beetle	Insect	Section 2
29	Rana ridibunda	Marsh Frog	Herpetofauna	Section 3
30	Pica-pica	Magpie	Bird	Section 3
31	Apus apus	Common Swift	Bird	Section 3
32	Passer montanus	Eurasian Tree Sparrow	Bird	Section 3
33	Coracias garrulus	European Roller	Bird	Section 3
34	Ondatra zibethicus	Muskrat	Mammal	Section 3
30	Camelus dromedarius	Camel	Mammal	Section 3
36	Harpalus rubripes	Ground Beetle	Insect	Section 3
37	Agriotes meticulosus	Click Beetle	Insect	Section 3
38	Amara aenea	Sun Beetle	Insect	Section 3

No.	Scientific Name	Common Name	Type	Section
39	Calathus ambiguus	Ground Beetle	Insect	Section 3
40	Hypera postica	Alfalfa Weevil	Insect	Section 3
40	Messor	Harvester Ant	Insect	Section 3
42	Turdus merula	Common Blackbird	Bird	Section 4
43	Fringilla coelebs	Chaffinch	Bird	Section 4
44	Columba livia	Rock Dove	Bird	Section 4
45	Pica-pica	Magpie	Bird	Section 4
46	Circus pygargus	Montagu's Harrier	Bird	Section 4
47	Parus bokharensis	Bukhara Tit	Bird	Section 4
48	Corvus cornix	Crow	Bird	Section 4
49	Gallinla chloropus	Moorhen	Bird	Section 4
50	Elobius talpinus	Northern Mole Vole	Mammal	Section 4
51	Spermophilus	Ground Squirrel	Mammal	Section 4
52	Harpulus rubripes	Ground Beetle	Insect	Section 4
53	Harpalus rufipes	Strawberry Seed Beetle	Insect	Section 4
54	Agriotes meticulosus	Click Beetle	Insect	Section 4
55	Amara aenea	Sun Beetle	Insect	Section 4
56	Armadillidium vulgare	Woodlouse	Insect	Section 4
56	Messor	Harvester Ant	Insect	Section 4
58	Parus bokharensis	Bukhara Tit	Bird	Section 5
59	Circus pygargus	Montagu's Harrier	Bird	Section 5
60	Pica-pica	Magpie	Bird	Section 5
61	Corvus frugilegus	Rook	Bird	Section 5
62	Columba livia	Rock Dove	Bird	Section 5
63	Motacilla alba personata	Masked Wagtail	Bird	Section 5
64	Equus caballus	Domestic Horse	Mammal	Section 5
65	Ovis aries	Domestic Sheep	Mammal	Section 5
66	Harpalus rufipes	Strawberry Seed Beetle	Insect	Section 5
67	Harpulus rubripes	Ground Beetle	Insect	Section 5
68	Calathus ambiguus	Ground Beetle	Insect	Section 5
69	Hypera postica	Alfalfa Weevil	Insect	Section 5
70	Agriotes meticulosus	Click Beetle	Insect	Section 5
71	Xanthogaleruca luteola	Elm Leaf Beetle	Insect	Section 5
72	Pica-pica	Magpie	Bird	Section 6
73	Columba livia	Rock Dove	Bird	Section 6
74	Acridotheres tristis	Myna	Bird	Section 6
75	Corvus frugilegus	Rook	Bird	Section 6
76	Gallinla chloropus	Moorhen	Bird	Section 6
77	Pavo cristatus	Peacock	Bird	Section 6
78	Streptopelia decaocto	Eurasian Collared Dove	Bird	Section 6
79	Ovis aries	Domestic Sheep	Mammal	Section 6
80	Elobius talpinus	Northern Mole Vole	Mammal	Section 6
81	Harpulus rubripes	Ground Beetle	Insect	Section 6
82	Harpalus rufipes	Strawberry Seed Beetle	Insect	Section 6
83	Calathus ambiguus	Ground Beetle	Insect	Section 6
84	Hypera postica	Alfalfa Weevil	Insect	Section 6
85	Agriotes meticulosus	Click Beetle	Insect	Section 6

No.	Scientific Name	Common Name	Type	Section
86	<i>Amara aenea</i>	Sun Beetle	Insect	Section 6
87	<i>Xanthogaleruca luteola</i>	Elm Leaf Beetle	Insect	Section 6
88	<i>Armadillidium vulgare</i>	Woodlouse	Insect	Section 6
89	<i>Channa argus</i>	Northern Snakehead	Fish	Section 7
90	<i>Circus pygargus</i>	Montagu's Harrier	Bird	Section 7
91	<i>Corvus cornix</i>	Crow	Bird	Section 7
92	<i>Corvus frugilegus</i>	Rook	Bird	Section 7
93	<i>Turdus merula</i>	Common Blackbird	Bird	Section 7
94	<i>Columba livia</i>	Rock Dove	Bird	Section 7
95	<i>Parus bokharensis</i>	Bukhara Tit	Bird	Section 7
96	<i>Pica-pica</i>	Magpie	Bird	Section 7
97	<i>Fringilla coelebs</i>	Chaffinch	Bird	Section 7
98	<i>Acridotheres tristis</i>	Myna	Bird	Section 7
99	<i>Motacilla alba personata</i>	Masked Wagtail	Bird	Section 7
100	<i>Ciconia</i>	Stork	Bird	Section 7
101	<i>Elobius talpinus</i>	Northern Mole Vole	Mammal	Section 7
102	<i>Amara aenea</i>	Sun Beetle	Insect	Section 7
103	<i>Hypera postica</i>	Alfalfa Weevil	Insect	Section 7
104	<i>Harpalus rubripes</i>	Ground Beetle	Insect	Section 7
105	<i>Calathus ambiguus</i>	Ground Beetle	Insect	Section 7
106	<i>Armadillidium vulgare</i>	Woodlouse	Insect	Section 7
107	<i>Messor</i>	Harvester Ant	Insect	Section 7
108	<i>Corvus frugilegus</i>	Rook	Bird	Section 8
109	<i>Pica-pica</i>	Magpie	Bird	Section 8
110	<i>Acridotheres tristis</i>	Myna	Bird	Section 8
111	<i>Columba livia</i>	Rock Dove	Bird	Section 8
112	<i>Corvus corone</i>	Crow	Bird	Section 8
113	<i>Passer montanus</i>	Eurasian Tree Sparrow	Bird	Section 8
114	<i>Spermophilus</i>	Ground Squirrel	Mammal	Section 8
115	<i>Myocastor coypus</i>	Nutria	Mammal	Section 8
114	<i>Elobius talpinus</i>	Northern Mole Vole	Mammal	Section 8
117	<i>Agriotes meticulosus</i>	Click Beetle	Insect	Section 8
118	<i>Hypera postica</i>	Alfalfa Weevil	Insect	Section 8
119	<i>Xanthogaleruca luteola</i>	Elm Leaf Beetle	Insect	Section 8
120	<i>Gambusia affinis</i>	Mosquitofish	Fish	Section 9
121	<i>Pseudorasbora parva</i>	Stone Moroko	Fish	Section 9
122	<i>Rana ridibunda</i>	Marsh Frog	Herpetofauna	Section 9
123	<i>Ablefurus deserti</i> Strauch	Lizard	Herpetofauna	Section 9
124	<i>Lacerta agilis</i>	Sand Lizard	Herpetofauna	Section 9
125	<i>Eremias grammica</i>	Reticulate Racerunner	Herpetofauna	Section 9
126	<i>Pica-pica</i>	Magpie	Bird	Section 9
127	<i>Acridotheres tristis</i>	Myna	Bird	Section 9
128	<i>Passer montanus</i>	Eurasian Tree Sparrow	Bird	Section 9
129	<i>Gallinula chloropus</i>	Moorhen	Bird	Section 9
130	<i>Circus pygargus</i>	Montagu's Harrier	Bird	Section 9
131	<i>Fulica atra</i>	Eurasian Coot	Bird	Section 9
132	<i>Falco tinnunculus</i>	Common Kestrel	Bird	Section 9



No.	Scientific Name	Common Name	Type	Section
133	<i>Coracias garrulus</i>	European Roller	Bird	Section 9
134	<i>Apus apus</i>	Common Swift	Bird	Section 9
135	<i>Gallinla chloropus</i>	Moorhen	Bird	Section 9
136	<i>Elobius talpinus</i>	Northern Mole Vole	Mammal	Section 9
137	<i>Gammarus pulex</i>	Freshwater Shrimp	Crustacean	Section 9
138	<i>Ischnura forcipata</i>	Forktail	Insect	Section 9
139	<i>Lasius niger</i>	Black Garden Ant	Insect	Section 9
140	<i>Bombus terrestris</i>	Buff-tailed Bumblebee	Insect	Section 9
141	<i>Chironomus plumosus</i>	Buzzer Midge	Insect	Section 9
142	<i>Armadillidium vulgare</i>	Woodlouse	Insect	Section 9
143	<i>Gambusia affinis</i>	Mosquitofish	Fish	Section 10
144	<i>Pseudorasbora parva</i>	Stone Moroko	Fish	Section 10
145	<i>Rana ridibunda</i>	Marsh Frog	Herpetofauna	Section 10
146	<i>Ablefarus deserti</i> Strauch	Lizard	Herpetofauna	Section 10
147	<i>Lacerta agilis</i>	Sand Lizard	Herpetofauna	Section 10
148	<i>Eremias grammica</i>	Reticulate Racerunner	Herpetofauna	Section 10
149	<i>Pica-pica</i>	Magpie	Bird	Section 10
150	<i>Acridotheres tristis</i>	Myna	Bird	Section 10
151	<i>Passer montanus</i>	Eurasian Tree Sparrow	Bird	Section 10
152	<i>Gallinla chloropus</i>	Moorhen	Bird	Section 10
153	<i>Circus pygargus</i>	Montagu's Harrier	Bird	Section 10
154	<i>Fulica atra</i>	Eurasian Coot	Bird	Section 10
155	<i>Falco tinnunculus</i>	Common Kestrel	Bird	Section 10
156	<i>Milvus migrans</i>	Black Kite	Bird	Section 10
157	<i>Circus aeruginosus</i>	Western Marsh Harrier	Bird	Section 10
158	<i>Coracias garrulus</i>	European Roller	Bird	Section 10
159	<i>Rhodospiza obsoleta</i>	Desert Finch	Bird	Section 10
160	<i>Elobius talpinus</i>	Northern Mole Vole	Mammal	Section 10
161	<i>Gammarus pulex</i>	Freshwater Shrimp	Crustacean	Section 10
162	<i>Ischnura forcipata</i>	Forktail	Insect	Section 10
163	<i>Lasius niger</i>	Black Garden Ant	Insect	Section 10
164	<i>Bombus terrestris</i>	Buff-tailed Bumblebee	Insect	Section 10
165	<i>Chironomus plumosus</i>	Buzzer Midge	Insect	Section 10
166	<i>Planorbis planorbis</i>	Snail	Insect	Section 10

8.2. Fauna Species Recorded in Rehabilitation Corridor

Table 42: Fauna Species Recorded in Rehabilitation Corridor

No.	Scientific Name	Common Name	Type	District
1	<i>Motacilla alba personata</i>	Masked Wagtail	Bird	Kyzyltepa
2	<i>Corvus frugilegus</i>	Rook	Bird	Kyzyltepa
3	<i>Fringilla coelebs</i>	Chaffinch	Bird	Kyzyltepa
4	<i>Corvus orientalis</i>	Crow	Bird	Kyzyltepa
7	<i>Lasius niger</i>	Black Garden Ant	Insect	Kyzyltepa
8	<i>Armadillidium vulgare</i>	Woodlouse	Insect	Kyzyltepa
7	<i>Corvus frugilegus</i>	Rook	Bird	Gijduvon

No.	Scientific Name	Common Name	Type	District
8	<i>Motacilla alba personata</i>	Masked Wagtail	Bird	Gijduvon
9	<i>Passer montanus</i>	Eurasian Tree Sparrow	Bird	Gijduvon
10	<i>Gallinla chloropus</i>	Moorhen	Bird	Gijduvon
11	<i>Pica-pica</i>	Magpie	Bird	Gijduvon
12	<i>Ovis aries</i>	Domestic Sheep	Mammal	Gijduvon
13	<i>Corvus frugilegus</i>	Rook	Bird	Vobkent
14	<i>Acridotheres tristis</i>	Myna	Bird	Vobkent
15	<i>Motacilla alba personata</i>	Masked Wagtail	Bird	Vobkent
16	<i>Passer montanus</i>	Eurasian Tree Sparrow	Bird	Vobkent
17	<i>Armadillidium vulgare</i>	Woodlouse	Insect	Vobkent
18	<i>Messor</i>	Harvester Ant	Insect	Vobkent
19	<i>Passer montanus</i>	Eurasian Tree Sparrow	Bird	Bukhara
20	<i>Motacilla alba personata</i>	Masked Wagtail	Bird	Bukhara
21	<i>Columba livia</i>	Rock Dove	Bird	Bukhara
22	<i>Spermophilus</i>	Ground Squirrel	Mammal	Bukhara

9. Species of Conservation Significance

9.1. Group A, Red Book of Uzbekistan Plant Species

Five plant species listed in the Red Book of the Republic of Uzbekistan have documented habitat within the project area or 5 km Aol. **None were recorded within the project construction footprint** during primary field surveys, conducted during the appropriate detection season. Their presence in the broader Aol is confirmed by the Institute of Botany of Uzbekistan provincial flora inventory and desktop screening.

A1, *Ferula kyzylkumica* (Apiaceae), Kyzylkum Giant Fennel

- Status: Red Book of the Republic of Uzbekistan; national endemic. Locally known as “sassyk,” “kamol,” or “murcha kamol.” Used in folk medicine as an expectorant and anthelmintic.
- Habitat and distribution in project area: Solitary specimens recorded sporadically in open desert at the intersection of Kagan and Karaulbazar districts. Restricted to open sandy and loamy desert substrates outside the modified agricultural corridor.
- Field survey finding: Not recorded within project survey corridors during spring 2026 surveys across any of the ten bypass sections or rehabilitation corridor targeted survey locations.

A2, *Lagochilus inebrians* (Lamiaceae), Intoxicating Mint

- Habitat and distribution: Widely distributed in Bukhara Province; approximately 162 individual plants documented in Kagan district and northeast of the Siyos-Poyon water distribution unit. A perennial herb 20–80 cm in height with stems woody at the base, traditionally used for sedative properties. Not recorded within project survey corridors. **No direct impact anticipated.**

A3, *Phlomoides aralensis* (Lamiaceae), Aral Phlomoides

- Habitat and distribution: East of Kagan district, between Lake Tudakul and Kagan district; approximately 20 individual specimens in a one-hectare area.



- Field survey finding: Not recorded within project survey corridors; located outside the modified agricultural footprint. **No direct impact anticipated.**

A4, *Tulipa lehmanniana* (Liliaceae), Lehmann's Tulip:

- Habitat and distribution: Southern and eastern Kagan district and southeast toward Karaulbazar district; approximately 20,000 plants in the broader Aol. Spring-ephemeral bulbous geophyte.
- Field survey finding: Not recorded within project survey corridors. Surveys were conducted April–May 2026, covering the full flowering period for this spring-ephemeral species, providing a robust detection window. Its association with open desert substrates outside the irrigated oasis zone is consistent with absence from the modified agricultural survey corridors. **No direct impact anticipated.**

A5, *Climacoptera merkulowiczii* (Amaranthaceae), Merkulowicz's Climacoptera

- Habitat and distribution: Lower Zarafshan River salt marshes and surroundings of Kuyumazar Reservoir; Kagan district environs.
- Field survey finding: Not recorded within project survey corridors; salt marsh and reservoir-edge habitat association places outside the modified agricultural and roadside survey areas. **No direct impact anticipated; no action required beyond documentation.**

9.2. Group B, IUCN Red List Plant Species

B1, *Zygophyllum bucharicum* (Zygophyllaceae), Bukhara Bean-Caper

- IUCN status: **Critically Endangered** (CR B1ab(iii)+2ab(iii)). National endemic to Uzbekistan, possibly extending to Tajikistan. Restricted to a narrow ecological range. Threatened by overgrazing.
- Important distinction: *Zygophyllum oxianum* (Amu Darya Bean-Caper), recorded across multiple bypass and rehabilitation corridor sections, is a distinct species and does not carry Critically Endangered status. The two species must not be conflated in field records or reporting.
- Habitat and distribution: Prevalent throughout Bukhara Province including Kagan district. Documented in saline soils, idle land, and alongside roads, habitat types confirmed present throughout the rehabilitation corridor by the soils baseline survey. Widely used in local folk medicine.
- Field survey finding: **Not recorded during the spring 2026 field surveys.**

B2–B4, *Calligonum matteianum* (EN), *Calligonum molle* (EN), *Calligonum paletzkianum* (VU) (Polygonaceae)

- IUCN status: *C. matteianum* and *C. molle*, Endangered (EN B2ab(iii,v)); *C. paletzkianum*, Vulnerable (VU B2ab(iii,v)). Restricted to narrow ecological niches in Bukhara Province and/or the Kyzylkum desert; threatened by cutting and grazing. Known locally as “juzgun” or “kandim.”
- Habitat and distribution: Sundukli sands in the surroundings of Lake Dengizkul and southwestern Kyzylkum desert. Occasionally appear as isolated specimens mixed with White Saxaul (*Haloxylon persicum*) on idle lands or along abandoned canals in desert areas east and south of Kagan district.



9.3. Group C, Red Book of Uzbekistan Fauna Species

C1, *Phasianus colchicus ssp. zerafschanicus* Tarnani, Zarafshan Pheasant

- Status: Listed in the Red Book of the Republic of Uzbekistan; nationally protected. IUCN Least Concern at species level. The *zerafschanicus* subspecies has a restricted range within the Zarafshan and Bukhara oasis agricultural systems.
- Survey finding: Two individuals recorded in bypass Section 2 within orchard and mulberry plantation habitat during primary field surveys, spring 2026. The biologist's field assessment notes this subspecies does not remain at fixed locations but moves between habitat patches within the irrigated agricultural landscape; the two individuals are interpreted as transient rather than breeding birds, consistent with the observation of two isolated individuals rather than a territorial pair or breeding group, and the absence of nesting or territorial behavior.
- Significance: This record does not alter the Modified Habitat classification of Section 2. The modified orchard and plantation vegetation of Section 2 may function as transient foraging habitat but does not constitute critical breeding habitat. **Does not trigger a Critical Habitat determination under IFC PS6.**

C2, *Parus bokharensis* Lichtenstein, Bukhara Tit

- Status: Listed in the Red Book of the Republic of Uzbekistan; nationally protected. Endemic subspecies of the Central Asian oasis region. IUCN Least Concern at species level. - Survey finding: Recorded foraging in orchard and shelterbelt habitats in bypass Sections 4, 5, and 7. Closely associated with mulberry, poplar, elm, and orchard tree cover, the dominant structural vegetation of the shelterbelt system along the bypass alignment. Also recorded along the rehabilitation corridor in Lots 1–2 shelterbelt sections.
- Significance: Distribution across three bypass sections and the rehabilitation corridor confirms that the shelterbelt and orchard vegetation system functions as core foraging and potentially nesting habitat for this nationally protected subspecies, the strongest single ecological argument for the conservation value of the roadside shelterbelt network beyond its agricultural role.
- Required action: Shelterbelt and orchard tree removal must be minimized to the extent strictly necessary. Where removal is unavoidable, compensatory replanting using the same or ecologically equivalent native tree species must be implemented at a minimum ratio of 1:10 (one tree removed – ten replanted). The joint affected tree inventory (design institute & ESIA team, 24–30 April 2026) provides the quantitative basis for calculating the total compensatory replanting obligation. The inventory confirms shelterbelt and ornamental trees at overpass, junction, and linear corridor locations in Lots 1–2, precisely the habitat types confirmed to support *Parus bokharensis*, will be the most significantly affected woody vegetation category, with several locations involving removal of 200–1,200 individuals; the compensatory replanting programme must be scaled accordingly. Vegetation clearance in bypass Sections 4, 5, 7 and Lots 1–2 shelterbelt zones must avoid the breeding season (March–June inclusive). **No Critical Habitat trigger under IFC PS6.**



9.4. Group D, IUCN Red List Fauna Species

D1, *Vanellus leucurus* (Lichtenstein), White-tailed Lapwing

- IUCN status: Near Threatened (NT). Confirmed CAF waterbird species. Breeds near inland water bodies and seasonal wetlands in arid and semi-arid zones.
- Survey finding: Confirmed at Karakul town and north of Bandboshi village, Karakul district, through iNaturalist/GBIF records. Not recorded during field surveys of the bypass sections, consistent with association with permanent open water bodies rather than the narrower canal crossings surveyed in the northern bypass sections. Karakul district canal habitats fall within the Lot 4 rehabilitation corridor Aol.
- Significance: The only IUCN threatened or near-threatened animal species confirmed within the project Aol. Its Near Threatened status and CAF designation make it the highest-priority fauna conservation concern identified in the project area. **No Critical Habitat trigger under IFC PS6.**

D2–D5, Siberian Crane, Ferruginous Duck, Curlew Sandpiper, Grey Plover

- None recorded during primary field surveys; included in the baseline on WPE flyway-range data grounds only. No site-specific management action is triggered by range data alone; document in baseline and include in construction monitoring records, with particular attention to canal crossings during migration seasons (March–May, August–October).

9.5. Group E, Invasive and Introduced Species

E1, *Acroptilon repens* (L.) DC. (syn. *Rhaponticum repens*), Russian Knapweed

- Status: Invasive perennial forb. Not IUCN-listed; not in Red Book. Documented in the CABI Invasive Species Compendium as a highly competitive species capable of forming dense monocultures that suppress native and cultivated vegetation and are extremely difficult to eradicate once established.
- Survey finding: Recorded in bypass Section 10 (field survey) within disturbed soils and ruderal habitat near the Bukhara Ring Road connection. Additionally confirmed in Gijduvon district rehabilitation corridor (iNaturalist), extending its known presence beyond the bypass footprint. Spreads via vegetative root fragments and wind-dispersed achenes; construction earthworks, soil movement, and contaminated equipment are the principal dispersal vectors relevant to this project.

E2, *Paulownia* sp., Paulownia

- Status: Introduced fast-growing deciduous tree actively promoted under government afforestation and land rehabilitation programs in Bukhara Province. *Paulownia tomentosa* is recognized as invasive in parts of North America and Europe where it establishes in disturbed habitats; its invasive behavior in Central Asian arid environments has not been documented at equivalent scale.
- Survey finding: Recorded exclusively in rehabilitation corridor Lots 1–2 at deliberately established managed plantation plots and urban landscaping sites. No spontaneous naturalization in unmanaged habitats (canal margins, road shoulders) was identified during surveys.

E3–E4, *Gambusia affinis* and *Pseudorasbora parva*, Introduced Fish Species



- Status: Both introduced fish recorded in bypass Sections 9–10 collector canals. *Gambusia affinis* (Western Mosquitofish) has been deliberately introduced across Central Asian irrigation systems for mosquito control. *Pseudorasbora parva* (Stone Moroko) is an invasive cyprinid from East Asia widely established in irrigation networks throughout the region.
- Required action: *Gambusia affinis*, no management action required (established species managed for mosquito control). *Pseudorasbora parva*, construction dewatering pumps must be cleaned between canal sections to avoid transferring fish between canal units currently isolated from one another. **No further management action required.**

9.6. Group F, Species of Commercial/Regulatory Interest

F1, *Glycyrrhiza glabra* L., Liquorice (Fabaceae)

- Status: IUCN Least Concern. Subject to national regulatory provisions on wild plant resource collection given pharmaceutical and commercial value.
- Survey finding: Recorded in bypass Section 2 within canal margin and moist disturbed soil habitats only. The individuals recorded are associated with canal margin modified habitat and do not represent a significant or isolated population. **No Critical Habitat trigger under IFC PS6.**

9.7. IFC PS6 Conservation Significance Conclusion (Full)

Based on the consolidated assessment of all species of conservation significance across the M37 project corridor:

1. **No Critical Habitat under IFC PS6 was identified** within the project construction footprint. All species of conservation significance recorded within or adjacent to the footprint are associated with Modified Habitat conditions. No species is dependent on or primarily associated with intact Natural Habitat or Critical Habitat ecosystems within the project area.
2. **Two nationally protected Red Book fauna subspecies** were recorded within the bypass footprint, *Phasianus colchicus* ssp. *zerafschanicus* (2 transient individuals, Section 2) and *Parus bokharensis* (foraging in bypass Sections 4, 5, 7 and rehabilitation corridor Lots 1–2). Both utilize the modified agricultural and plantation habitat as foraging and transient habitat and neither triggers Critical Habitat.
3. ***Zygophyllum bucharicum* (IUCN CR) represents the most significant conservation risk** in the project area. A mandatory pre-construction botanical re-survey of saline sections in Lots 3–5 is required before the Modified Habitat classification for these sections can be confirmed with full certainty and before earthworks commence.
4. ***Vanellus leucurus* (IUCN NT, CAF)** is confirmed in the Karakul district Aol (Lot 4) and requires canal construction timing provisions and monitoring during the breeding and migration season.
5. ***Acroptilon repens* (invasive)** requires active corridor-wide biosecurity measures. The remaining invasive and introduced species are managed through targeted equipment hygiene and monitoring provisions.



9.8. Consolidated Species of Conservation Significance, M37 Project Corridor (All Taxa)

Species are organized into six groups: (A) Red Book of Uzbekistan plant species; (B) IUCN Red List plant species; (C) Nationally Protected Fauna; (D) IUCN-listed fauna; (E) Invasive and introduced species; (F) Species of commercial/regulatory interest.

Table 43: Consolidated Species of Conservation Significance, M37 Project Corridor (All Taxa)

Ref.	Taxa	Scientific Name	Common Name	IUCN Status	Red Book	Survey Finding / Location	IFC PS6 Class	Required Action
A1.	Flora	<i>Ferula kyzylkumica</i> (Apiaceae)	Kyzylkum Giant Fennel	Not assessed	Listed, Endemic	Not in footprint; solitary specimens at Kagan/Karaulbazar junction in open desert Aol	Modified Habitat	Halt-and-notify during earthworks; halt works if encountered; notify supervisor before resumption
A2.	Flora	<i>Lagochilus inebrians</i> (Lamiaceae)	Intoxicating Mint	Not assessed	Listed	Not in footprint; ~162 plants in Kagan district Aol	Modified Habitat	Desktop record; no direct impact; document in baseline
A3.	Flora	<i>Phlomoidea aralensis</i> (Lamiaceae)	Aral Phlomoidea	Not assessed	Listed	Not in footprint; ~20 plants east of Kagan district Aol	Modified Habitat	Desktop record; no direct impact
A4.	Flora	<i>Tulipa lehmanniana</i> (Liliaceae)	Lehmann's Tulip	Not assessed	Listed	Not in footprint; ~20,000 plants in Kagan–Karaulbazar Aol; surveyed during flowering season	Modified Habitat	Field-verified absent from footprint; no direct impact
A5.	Flora	<i>Climacoptera merkulowiczii</i> (Amaranthaceae)	Merkulowicz's Climacoptera	Not assessed	Listed	Not in footprint; Lower Zarafshan salt marshes and Kuyumazar area, Aol	Modified Habitat	Desktop record; habitat outside footprint; no direct impact
B1.	Flora	<i>Zygophyllum bucharicum</i> (Zygophyllaceae)	Bukhara Bean-Caper	CR	—	Not recorded during field surveys (not targeted by species-specific survey effort); documented in Kagan district saline soils/roadsides	Modified Habitat	MANDATORY pre-construction re-survey: targeted botanical survey of saline sections by qualified botanist, March–May, before earthworks commence; if found in footprint, halt works



Ref.	Taxa	Scientific Name	Common Name	IUCN Status	Red Book	Survey Finding / Location	IFC PS6 Class	Required Action
								and implement protective measures
B2.	Flora	Calligonum mattheianum (Polygonaceae)	Matt's Calligonum	EN	—	Not in footprint; Sundukli sandy desert near Lake Dengizkul (Aol)	Modified Habitat	Sandy desert; remote from alignment; no direct impact
B3.	Flora	Calligonum molle (Polygonaceae)	Soft Calligonum	EN	—	Not in footprint; Sundukli sands (Aol)	Modified Habitat	As B2
B4.	Flora	Calligonum paletzkianum (Polygonaceae)	Paletsky's Calligonum	VU	—	Not in footprint; Kyzylkum / Sundukli sands (Aol)	Modified Habitat	As B2
C1.	Avifauna	Phasianus colchicus ssp. zerafschanicus Tarnani	Zarafshan Pheasant	LC	Listed — Red Book of Uzbekistan	2 transient individuals recorded in bypass Section 2 orchard/mulberry habitat; not breeding	Modified Habitat	No vegetation clearance in Section 2 orchard/plantation during March–June breeding season; report any nesting observations to supervisor; no Critical Habitat trigger
C2.	Avifauna	Parus bokharensis Lichtenstein	Bukhara Tit	LC	Listed — Red Book of Uzbekistan	Recorded foraging in orchard and shelterbelt habitat in bypass Sections 4, 5, and 7; also rehabilitation corridor Lots 1–2	Modified Habitat	Minimize shelterbelt/orchard tree removal; compensatory replanting at minimum 1:10 ratio; no vegetation clearance in affected sections during March–June; no Critical Habitat trigger
D1.	Avifauna	Vanellus leucurus (Lichtenstein)	White-tailed Lapwing	NT	—	Confirmed at Karakul town and Bandboshi village (iNaturalist); Central Asian Flyway species; uses canal habitats in Lot 4 Aol	Modified Habitat	Maintain water flow continuity at canal crossings during migration/breeding; include in construction monitoring records; no Critical Habitat trigger
D2.	Avifauna	Leucogeranus leucogeranus	Siberian Crane	CR	—	Not recorded during primary surveys; WPE flyway range	Modified Habitat	Document in baseline; include in construction monitoring



Ref.	Taxa	Scientific Name	Common Name	IUCN Status	Red Book	Survey Finding / Location	IFC PS6 Class	Required Action
						overlaps with project corridor coordinates; CAF species; regional context only		records; no site-specific management action triggered by range data alone
D3.	Avifauna	<i>Aythya nyroca</i>	Ferruginous Duck	NT	—	WPE range overlaps; passage migrant	Modified Habitat	Include in canal monitoring records during migration seasons
D4.	Avifauna	<i>Calidris ferruginea</i>	Curlew Sandpiper	VU	—	WPE range overlaps; passage migrant	Modified Habitat	Include in canal monitoring records during migration seasons
D5.	Avifauna	<i>Pluvialis squatarola</i>	Grey Plover	VU	—	WPE range overlaps; passage migrant	Modified Habitat	Include in canal monitoring records during migration seasons
E1.	Flora	<i>Acroptilon repens</i> (L.) DC. (syn. <i>Rhaponticum repens</i>)	Russian Knapweed	Not assessed	Not listed	INVASIVE: bypass Section 10 (primary survey) + Gijduvon rehabilitation corridor (iNaturalist); spreads via earthworks and contaminated equipment	Modified Habitat	Corridor-wide biosecurity: map infestation pre-works; wheel-wash all equipment from bypass Section 10; no topsoil/fill redistribution without <i>Acroptilon</i> -free confirmation; post-construction surveillance with treatment provisions
E2.	Flora	<i>Paulownia</i> sp.	Paulownia	Not assessed	Not listed	Introduced plantation species, Lots 1–2 managed plots only; no naturalization in unmanaged habitats detected	Modified Habitat	Post-construction monitoring for naturalization in unmanaged habitats; conditional intervention if self-seeding detected; transplantation assessment during pre-construction tree survey
E3.	Fish	<i>Gambusia affinis</i> (Baird & Girard)	Western Mosquitofish	LC	Not listed	Introduced fish; Sections 9–10 collector canals; established	Modified Habitat	Document only; no management action required



Ref.	Taxa	Scientific Name	Common Name	IUCN Status	Red Book	Survey Finding / Location	IFC PS6 Class	Required Action
						across Central Asian irrigation network		
E4.	Fish	<i>Pseudorasbora parva</i> (Temminck & Schlegel)	Stone Moroko	LC	Not listed	Introduced invasive fish; Sections 9–10; widely established	Modified Habitat	Clean dewatering pumps between canal sections; avoid inter-canal fish transfer during construction dewatering
E5.	Fish	<i>Channa argus</i>	Northern Snakehead	Not assessed (globally invasive)	Not listed	INVASIVE: bypass Section 7. Documented negative impacts on commercial fisheries in the lower Amudarya River basin; outcompetes and displaces native predator species	Modified Habitat	Prevent further spread via construction dewatering/water transfer between canal sections; no translocation of water or fish between isolated canal units; report further occurrences to environmental supervisor; containment measures required
E6.	Mammal	<i>Ondatra zibethicus</i>	Muskrat	Not assessed (introduced)	Not listed	Introduced semi-aquatic rodent; bypass Section 3; established in Central Asian irrigation/canal systems	Modified Habitat	Document only; no specific management action required beyond standard canal-work protocols
E7.	Mammal	<i>Myocastor coypus</i>	Nutria	Not assessed (introduced; invasive elsewhere)	Not listed	Introduced semi-aquatic rodent; bypass Section 8; recognized as invasive in parts of its introduced range (burrowing damage to canal banks)	Modified Habitat	Monitor for canal bank burrowing damage during construction; no active control measures currently warranted based on single-record observation
F1.	Flora	<i>Glycyrrhiza glabra</i> L. (Fabaceae)	Liquorice	LC	Not listed (commercial/regulatory)	Recorded at canal margins, bypass Section 2; subject to national commercial/regulatory provisions on wild plant resource collection	Modified Habitat	Minimize canal-margin disturbance in Section 2; no Critical Habitat trigger

10. Habitat Classification Maps



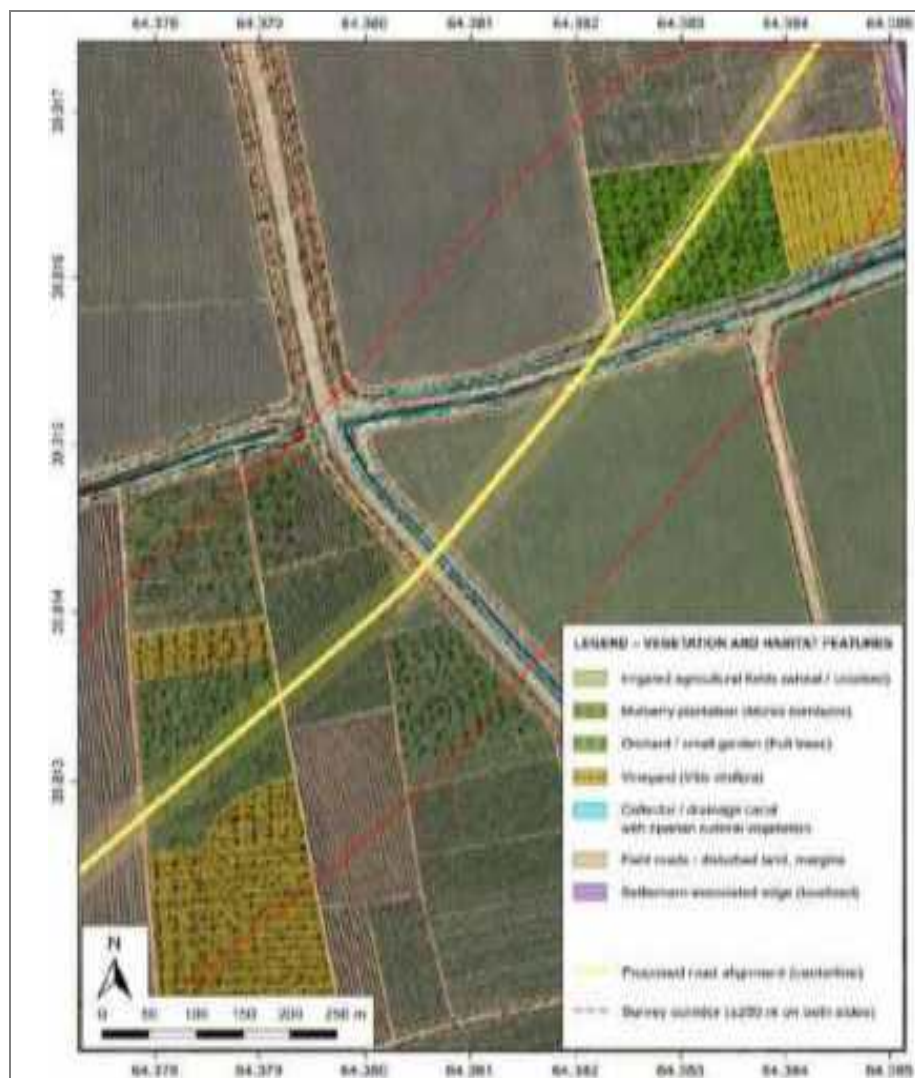


Figure 14: Vegetation and Habitat Features Map – Bypass Section 2
(Source: ESIA)

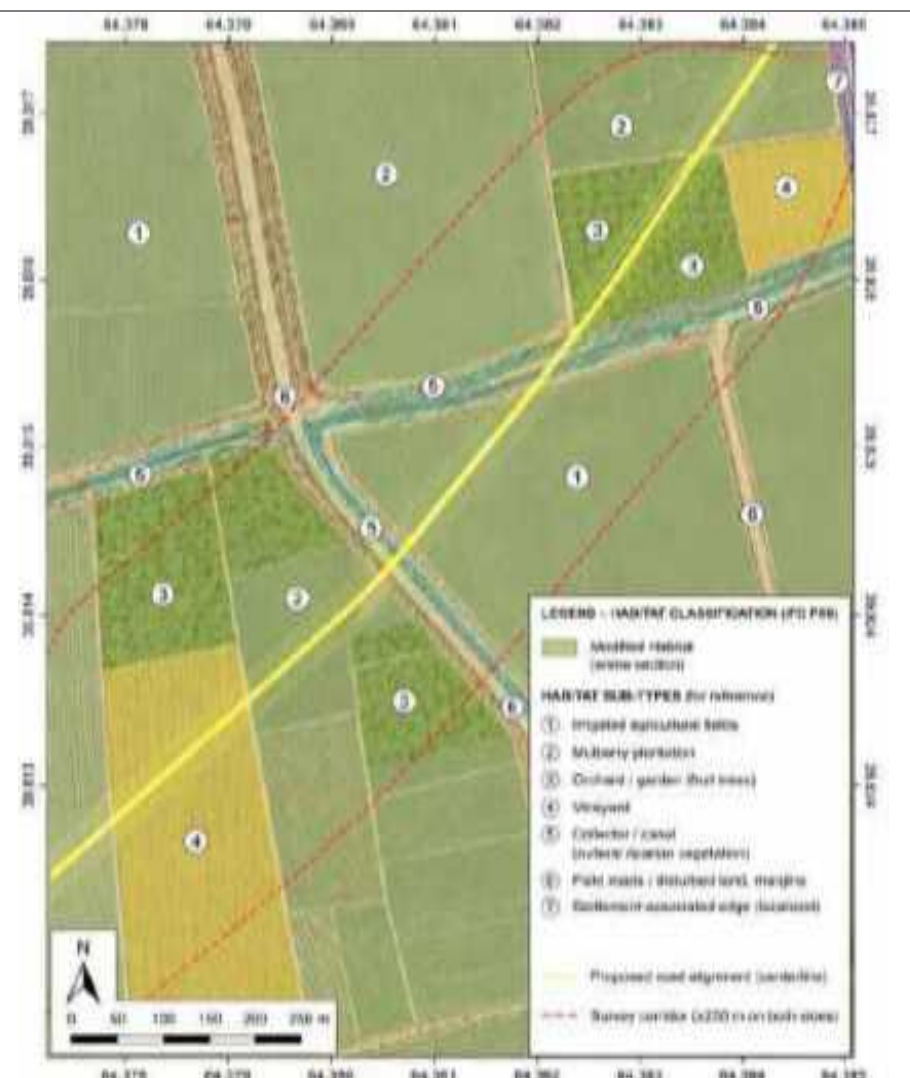
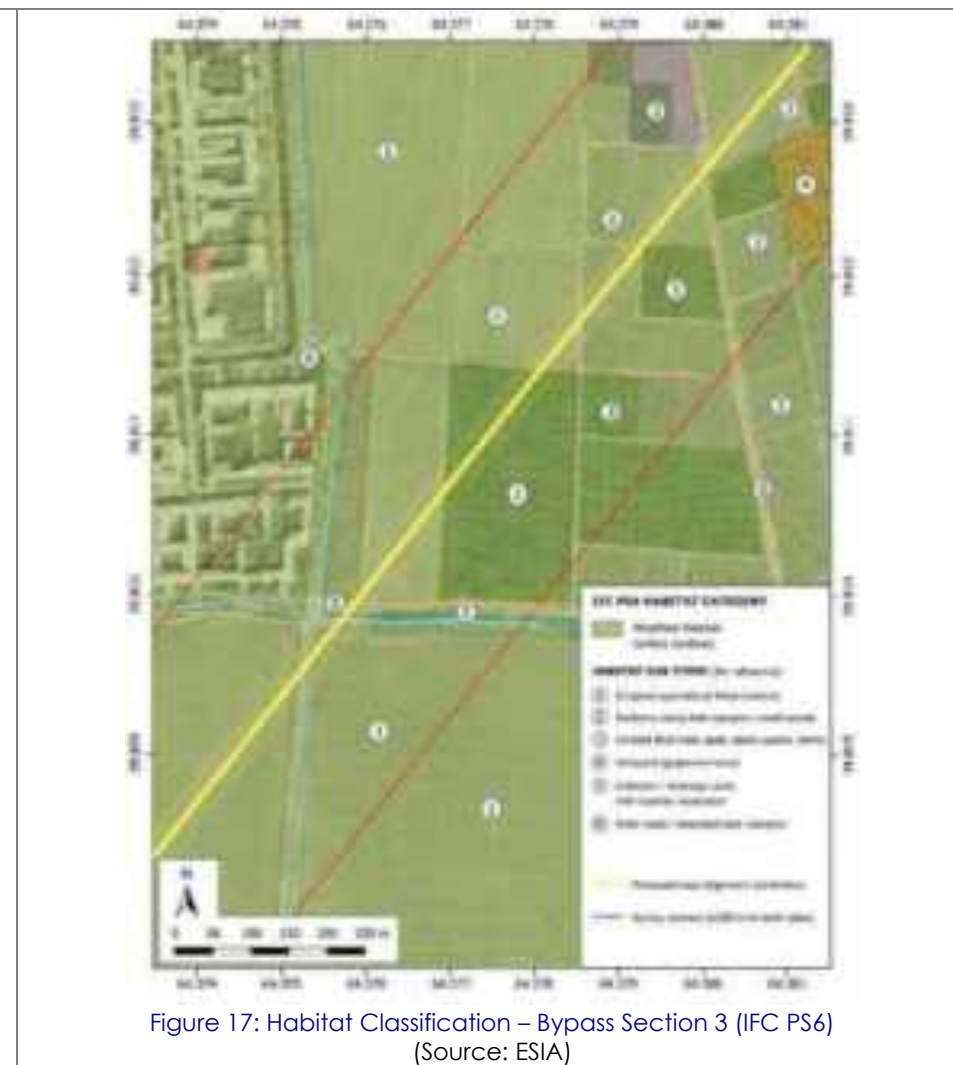
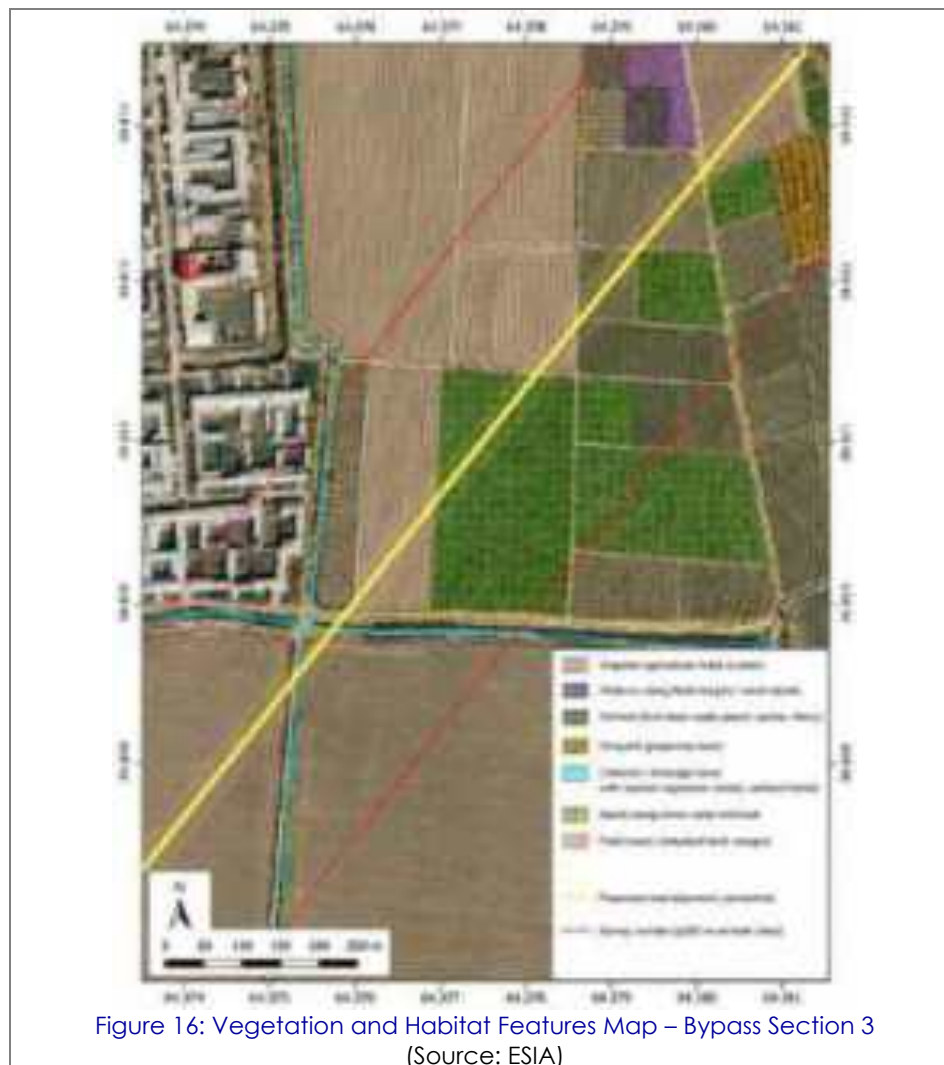
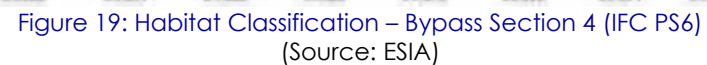


Figure 15: Habitat Classification – Bypass Section 2 (IFC PS6)
(Source: ESIA)





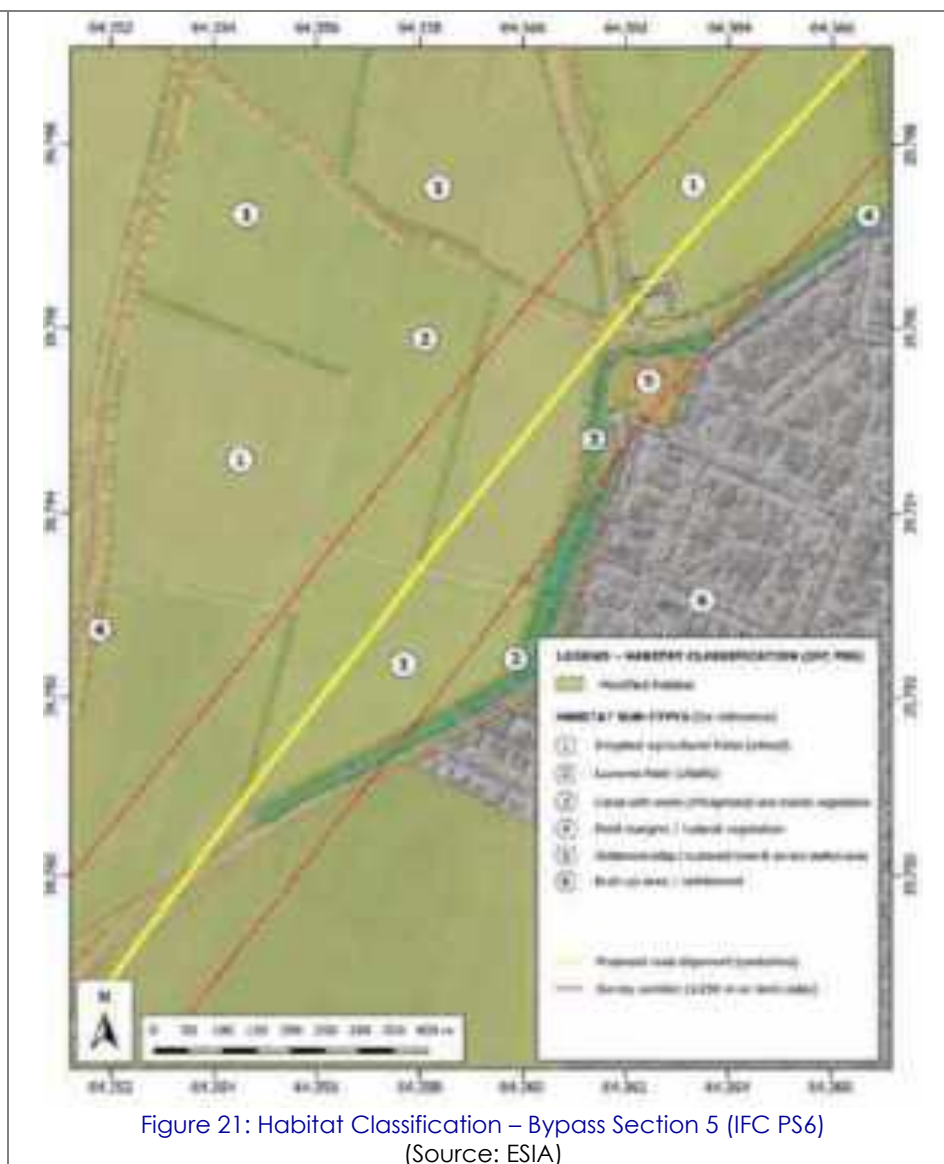
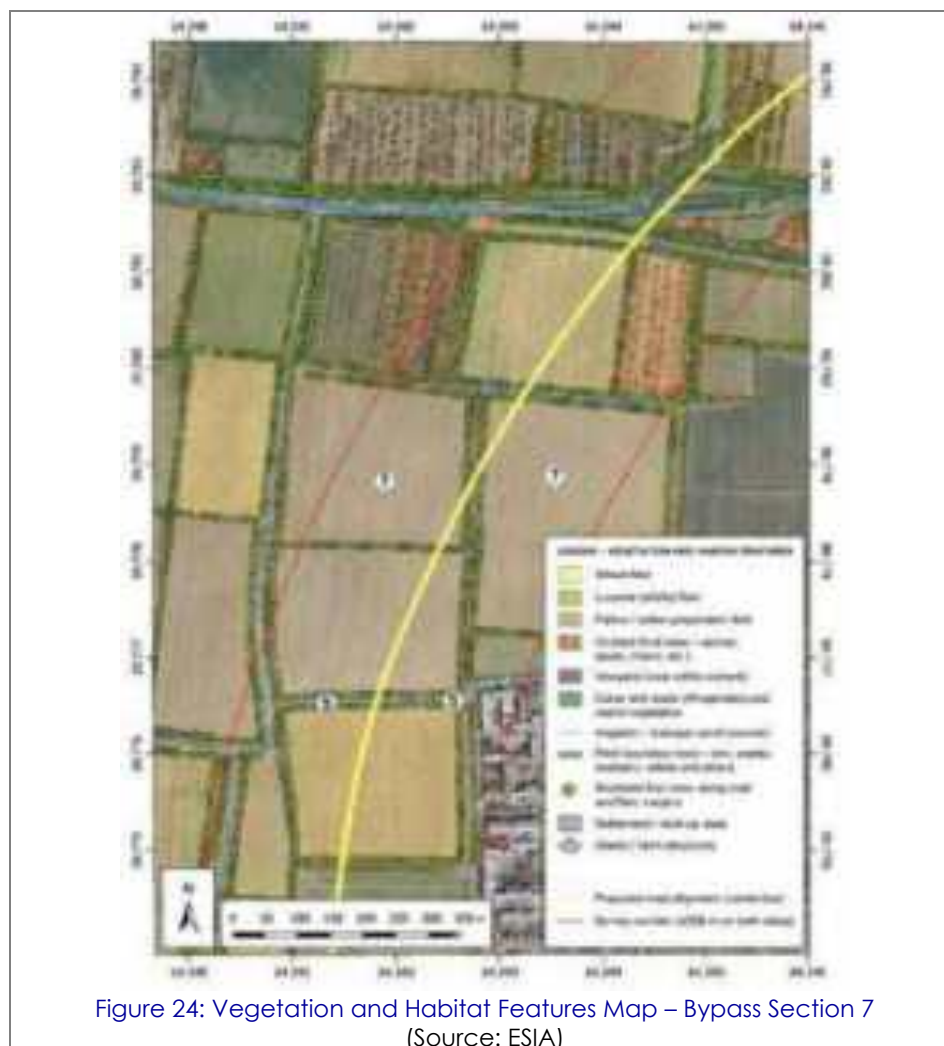




Figure 22: Vegetation and Habitat Features Map – Bypass Section 6
(Source: ESIA)



Figure 23: Habitat Classification – Bypass Section 6 (IFC PS6)
(Source: ESIA)



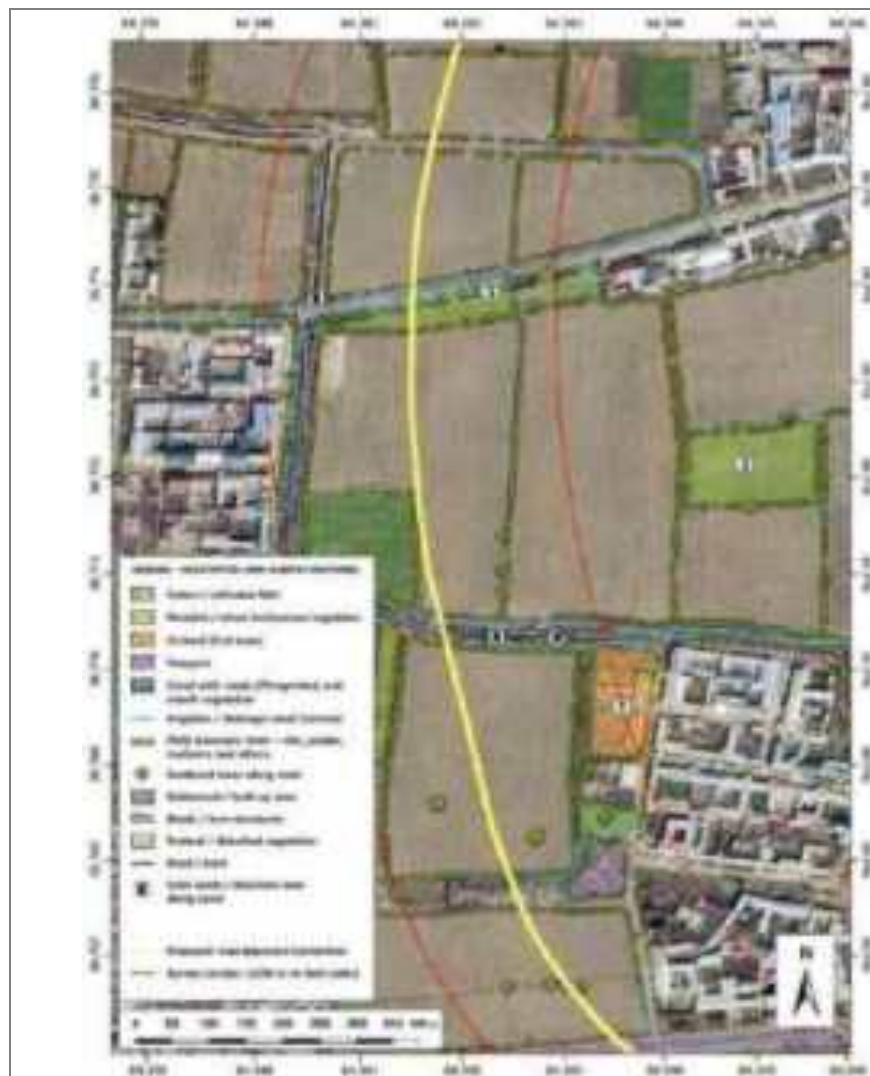


Figure 26: Vegetation and Habitat Features Map – Bypass Section 8
(Source: ESIA)

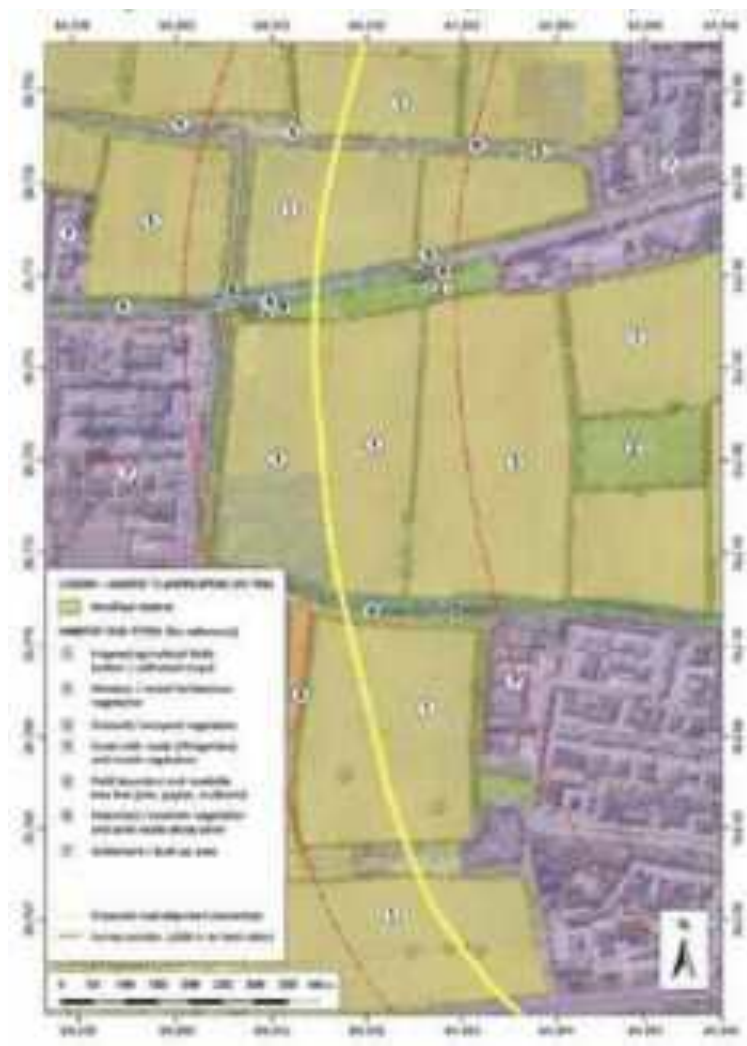


Figure 27: Habitat Classification – Bypass Section 8 (IFC PS6)
(Source: ESIA)



Figure 28: Vegetation and Habitat Features Map – Bypass Section 9
(Source: ESIA)



Figure 29: Habitat Classification – Bypass Section 9 (IFC PS6)
(Source: ESIA)



Figure 30: Vegetation and Habitat Features Map – Bypass Section 10
(Source: ESIA)



Figure 31: Habitat Classification – Bypass Section 10 (IFC PS6)
(Source: ESIA)

11.iNaturalist: Spatial Distribution of Observations Relative to the Project Corridor

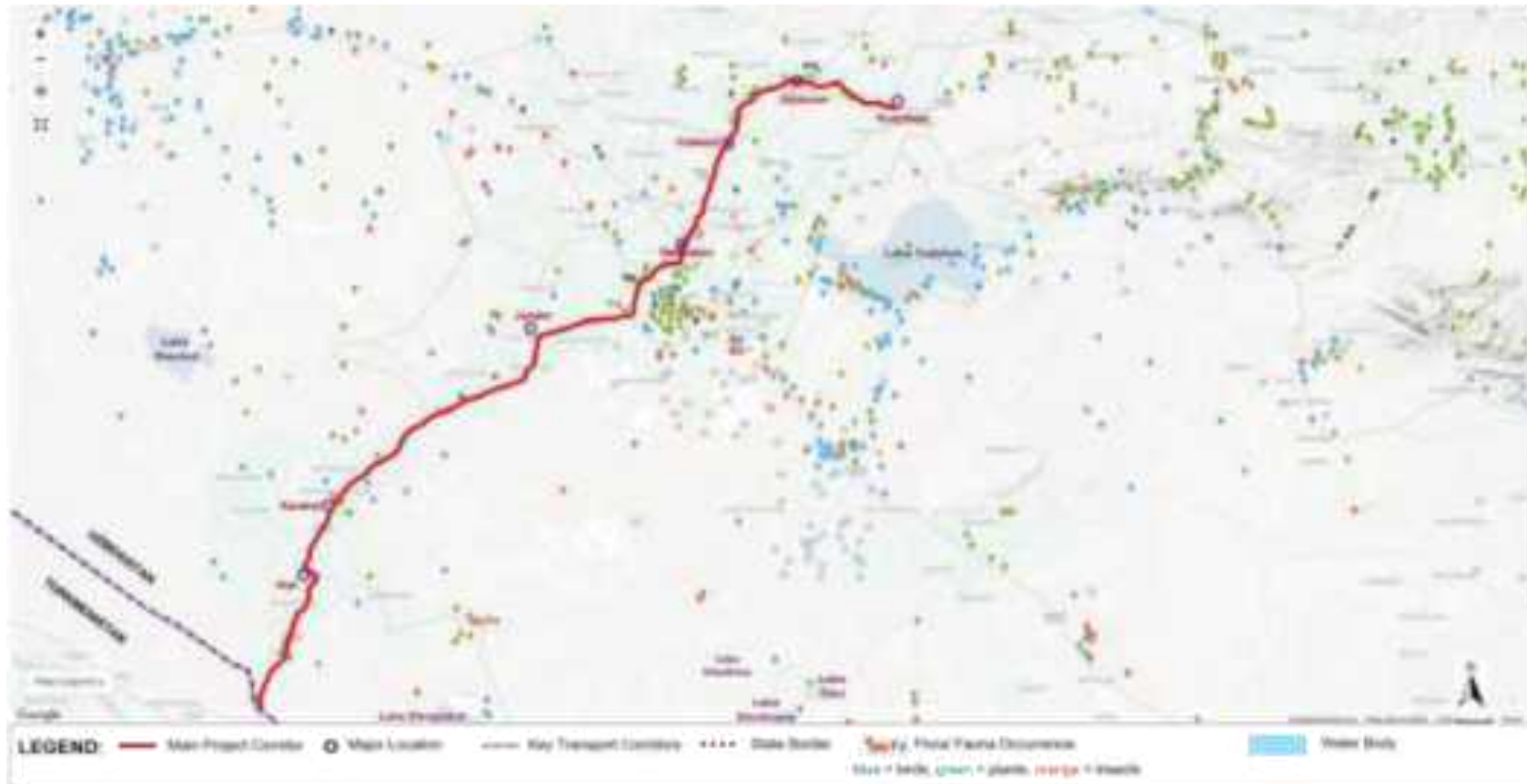


Figure 32: Spatial Distribution of iNaturalist Biodiversity Observations in the Vicinity of the M37 Project Corridor

(Source: iNaturalist / GBIF, observations accessed May 2026; M37 project alignment and major settlements added by ESIA team. Map data © 2026 Google. Each marker represents an individual species observation; marker colors reflect taxonomic groups as per iNaturalist default classification.)

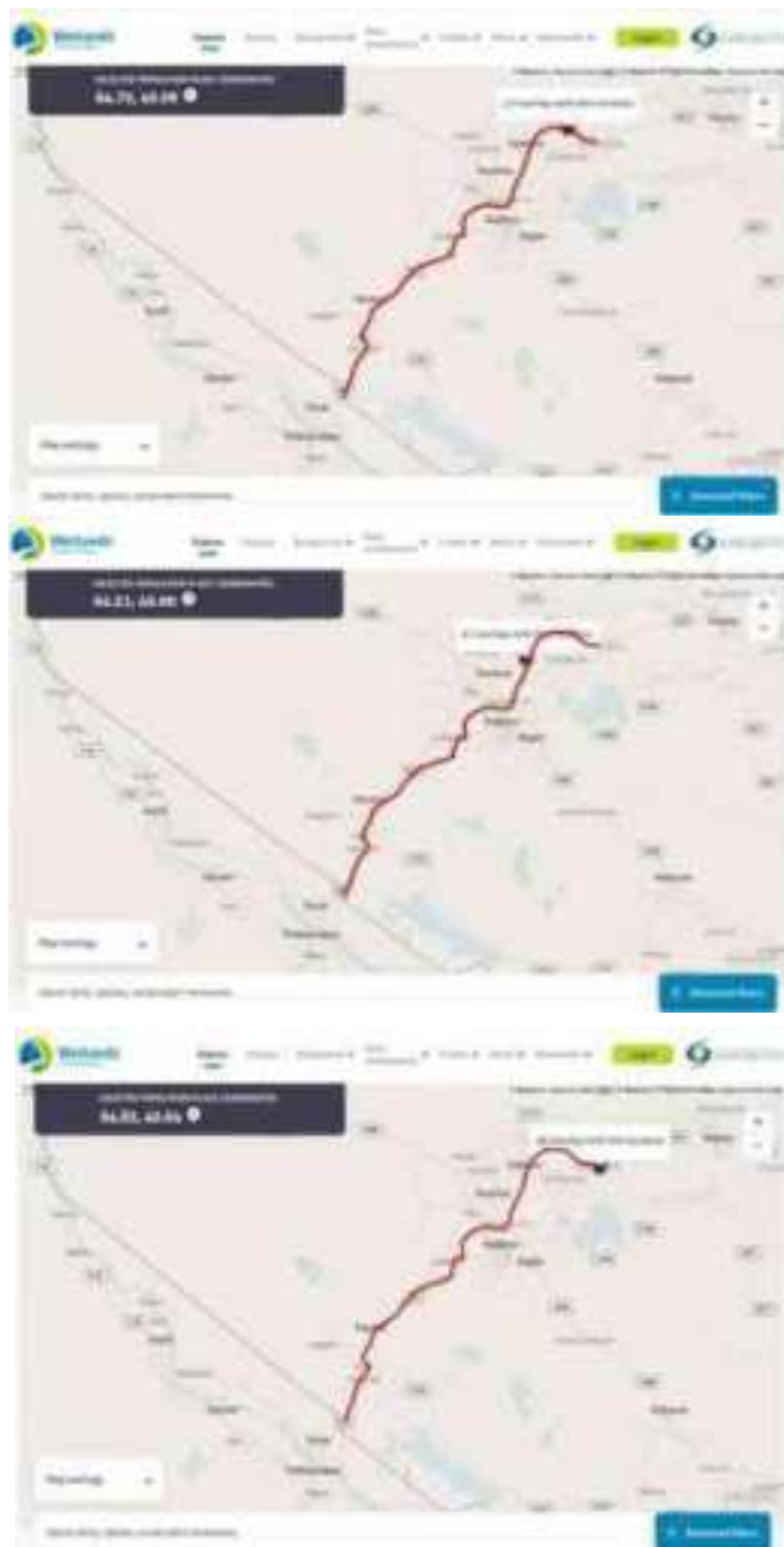


Figure 33: Wetlands International WPE – Species with Flyway Range Overlap at Selected Coordinates along the M37 Corridor

(Source: Wetlands International Waterbird Population Estimates (WPE) Data; wpp.wetlands.org, accessed June 2026; M37 corridor alignment added by ESIA)



12.iNaturalist/GBIF Dataset Supplementary Data

Purpose and Scope

This appendix presents species occurrence records compiled from the iNaturalist citizen science platform (inaturalist.org) and the Global Biodiversity Information Facility (GBIF) for the M37 project corridor districts of Gijduvon, Vobkent, Bukhara in Bukhara Province and Kyzyltepa district of Navoi Province. Records were compiled and reviewed in May 2026.

iNaturalist is a joint initiative of the California Academy of Sciences and the National Geographic Society. Research Grade observations on iNaturalist (those confirmed by two or more independent identifications agreeing to species level) are ingested by GBIF and serve as a recognized source of occurrence data in peer-reviewed biodiversity science and national biodiversity inventories. These records are therefore treated as a legitimate secondary data source supplementary to the primary ESIA field surveys conducted in spring 2026, consistent with the IFC PS6 requirement to draw on best available information for biodiversity baseline characterization.

Records were filtered to the project corridor Aol districts and reviewed for identification quality. Only records identified to species level (or the lowest reliable taxonomic level) are presented. Genus-level and higher taxonomic records are included in the tables for contextual reference but are not incorporated into the primary species inventories in Section 4.2.5 (Flora Baseline) and Section 4.2.6 (Fauna Baseline) of the ESIA.

Data Quality and Limitations

The following limitations of the iNaturalist/GBIF dataset are acknowledged and should be considered when interpreting the records presented in this appendix:

- **Observer coverage bias:** iNaturalist records are concentrated near roads, settlements, and accessible locations where observers are active. The apparent absence of records in desert sections of the corridor partly reflects lower human observer activity in remote areas rather than lower biodiversity. This dataset is suitable for confirming species' presence but cannot be used to infer species absence.
- **Taxonomic resolution:** a proportion of records were submitted at genus, family, or higher taxonomic level, particularly for invertebrates and grasses. These records are included in the tables for contextual reference but cannot be attributed to specific species and are not added to the species-level baseline survey.
- **Temporal coverage:** records span multiple years up to May 2026. Not all records are from the baseline survey period (spring 2026); older records provide historical context for species presence in the project area rather than current survey data.
- **Research Grade status:** all records included in this appendix were verified as identified to at least genus level on iNaturalist. Where records are at species level, Research Grade confirmation (two or more agreeing identifications) was checked where possible. Individual observation URLs are available in the source iNaturalist dataset.



These limitations do not diminish the utility of the dataset for the purposes for which it is used in this ESIA: corroboration of primary field survey findings, extension of the known species list to locations not covered by targeted surveys, and identification of species of conservation or management significance.

Status Classification Keys

(a) IUCN Red List Status codes:

- CR = Critically Endangered
- EN = Endangered
- VU = Vulnerable
- NT = Near Threatened
- LC = Least Concern
- NE = Not Evaluated (species not formally assessed by IUCN, or record at genus/higher taxonomic level).

(b) Central Asian Flyway (avifauna only)

- Yes = species confirmed on the Central Asian Flyway (CAF) Action Plan species list and documented to use the project corridor region as migratory route, breeding, or staging area
- Partial = species with broader regional distribution but specific CAF corridor use not individually confirmed for the project area
- "—" = resident or non-flyway species

(c) Notes/ESIA Relevance Column

Entries in the Notes column are colour-coded for rapid identification of records requiring management attention:

- red highlight = invasive species or venomous/hazardous species
- yellow highlight = added to project baseline; not recorded in primary field surveys
- green highlight = conservation significance (IUCN NT or above).

Flora Occurrence Records

Dataset Overview

The iNaturalist flora dataset for the project corridor comprises 63 records in total. After filtering to species-level or lowest reliable taxonomic level and removing records outside the Aol, 24 records are presented in Table 44. These records span 17 plant families and cover observations from Gijduvon, Vobkent, Bukhara districts. No flora observations were available from Jondor or Alat districts in the iNaturalist database, consistent with lower observer activity in the more arid western sections of the corridor.



Table 44: iNaturalist / GBIF Flora Occurrence Records – M37 Project Corridor

#	Family	Scientific Name	Common Name	Genus	Observation Location / Occurrence in Aol	IUCN Status	Red Book of Uzbekistan	Notes
1	Amaranthaceae	<i>Atriplex tatarica</i> L.	Tatarian Orache	<i>Atriplex</i>	Gijduvon district; Vobkent district (Khargush mahalla)	LC	—	Corroborates field survey; saline disturbed soils
2	Amaranthaceae	<i>Chenopodium album</i> L.	Common Lambsquarters	<i>Chenopodium</i>	Uzanon mahalla, Gijduvon district	LC	—	Corroborates field survey; disturbed agricultural land
3	Amaranthaceae	<i>Chenopodium ficifolium</i> Sm.	Fig-leaved Goosefoot	<i>Chenopodium</i>	Uzanon mahalla, Gijduvon district	LC	—	Ruderal and disturbed agricultural habitat*
4	Apocynaceae	<i>Cynanchum acutum</i> L.	Sharp Stranglewort	<i>Cynanchum</i>	Gijduvon district (Lyabirut mahalla)	LC	—	Canal margins and ruderal habitat; climbing perennial*
5	Asteraceae	<i>Rhaponticum repens</i> (L.) Hiljin [syn. <i>Acroptilon repens</i> (L.) DC.]	Russian Knapweed (invasive)	<i>Rhaponticum</i> / <i>Acroptilon</i>	Uzanon mahalla, Gijduvon district (rehabilitation corridor)	NE	—	INVASIVE SPECIES — extends known range to rehabilitation corridor
6	Asteraceae	<i>Lactuca</i> sp.	Wild Lettuce	<i>Lactuca</i>	Lyabirut mahalla, Gijduvon district	NE	—	Genus-level; cf. <i>Lactuca tatarica</i> in field survey; ruderal
7	Asteraceae	<i>Sonchus oleraceus</i> L.	Common Sow-Thistle	<i>Sonchus</i>	Shirin mahalla, Vobkent district	LC	—	Corroborates field survey; ruderal and field margin habitat



#	Family	Scientific Name	Common Name	Genus	Observation Location / Occurrence in Aol	IUCN Status	Red Book of Uzbekistan	Notes
8	Asteraceae	<i>Xanthium sp.</i>	Cocklebur	<i>Xanthium</i>	Lyabirut mahalla, Gijduvon district	NE	—	Genus-level; ruderal annual; noted for context only
9	Brassicaceae	<i>Eruca vesicaria</i> (L.) Cav.	Rocketsalad / Arugula	<i>Eruca</i>	Gijduvon district	LC	—	Disturbed agricultural margins; cultivated and naturalized*
10	Brassicaceae	<i>Lepidium sp.</i>	Pepperweed	<i>Lepidium</i>	Lyabirut mahalla, Gijduvon district	NE	—	Genus-level; cf. <i>Lepidium latifolium</i> in field survey; canal margins
11	Convolvulaceae	<i>Convolvulus arvensis</i> L.	Field Bindweed	<i>Convolvulus</i>	Tinchlik mahalla, Karakul town	LC	—	Corroborates field survey; confirms presence in Karakul rehabilitation section
12	Convolvulaceae	<i>Cuscuta sp.</i>	Dodder	<i>Cuscuta</i>	Lyabirut mahalla, Gijduvon district	NE	—	Genus-level; obligate parasite on host plants in canal-margin vegetation
13	Cupressaceae	<i>Juniperus sp.</i>	Juniper	<i>Juniperus</i>	Gijduvon district	NE	—	Corroborates field survey; ornamental planting at public institution frontages
14	Malvaceae	<i>Malva sylvestris</i> L.	Common Mallow	<i>Malva</i>	Uzanon mahalla, Gijduvon district	LC	—	Ruderal and settlement margin habitat; biennial herb*



#	Family	Scientific Name	Common Name	Genus	Observation Location / Occurrence in Aol	IUCN Status	Red Book of Uzbekistan	Notes
15	Malvaceae	<i>Althaea cannabina</i> L.	Hemp-leaved Mallow	<i>Althaea</i>	Galaosiyo, Bukhara district	LC	—	Ruderal and disturbed habitat; perennial herb*
16	Mazaceae	<i>Dodartia orientalis</i> L.	Dodartia	<i>Dodartia</i>	Dekhodji mahalla, Bukhara district	LC	—	Native desert-steppe perennial; disturbed and sandy soils*
17	Moraceae	<i>Morus</i> sp.	Mulberry	<i>Morus</i>	Gijduvon district	NE	—	Genus-level; corroborates field survey (<i>Morus bombycis</i> / <i>M. alba</i> in shelterbelts)
18	Poaceae	<i>Phragmites australis</i> (Cav.) Trin. ex Steud.	Common Reed	<i>Phragmites</i>	Lyabirut mahalla, Gijduvon district; Karakul town; Shurabad mahalla, Karakul district	LC	—	Corroborates field survey; confirms dominant canal vegetation across multiple rehabilitation sections
19	Plantaginaceae	<i>Plantago lanceolata</i> L.	Ribwort Plantain	<i>Plantago</i>	Dekhcha mahalla, Bukhara district	LC	—	Corroborates field survey; confirmed in bypass / Bukhara district section
20	Polygonaceae	<i>Rumex</i> sp.	Dock / Sorrel	<i>Rumex</i>	Lyabirut mahalla, Gijduvon district	NE	—	Genus-level; cf. <i>Rumex chalapensis</i> in field survey; canal margins
21	Ranunculaceae	<i>Clematis orientalis</i> L.	Oriental Virgin's-Bower	<i>Clematis</i>	Lyabirut mahalla, Gijduvon district	LC	—	Corroborates field survey; climbing



#	Family	Scientific Name	Common Name	Genus	Observation Location / Occurrence in Aol	IUCN Status	Red Book of Uzbekistan	Notes
								perennial on field edges and shrub habitats
22	Solanaceae	<i>Lycium ruthenicum</i> Murray	Russian Boxthorn	<i>Lycium</i>	Desert area north of Bandboshi village, Karakul district	LC	—	Corroborates field survey; confirmed in Karakul desert section; spiny shrub on dry disturbed soils
23	Zygophyllaceae	<i>Zygophyllum fabago</i> L.	Syrian Bean-Caper	<i>Zygophyllum</i>	Lyabirut mahalla, Gijduvon district	LC	—	Distinct from <i>Z. oxianum</i> in field survey; perennial subshrub; ruderal and disturbed habitat; traditionally used in folk medicine*
24	Asparagaceae	<i>Yucca</i> sp.	<i>Yucca</i> (ornamental)	<i>Yucca</i>	Gijduvon district	NE	—	Introduced ornamental; not native; not added to flora species list

(Sources: iNaturalist (inaturalist.org) / GBIF, accessed May 2026. Observation URLs for each record are available in the source dataset. IUCN status: iNaturalist species page and IUCN Red List (2024). Red Book status: Red Book of the Republic of Uzbekistan. NE = Not Evaluated (typically genus-level or unassessed record).



Species Composition and Habitat Context

The flora records corroborate the modified agricultural and ruderal character of the survey corridor identified during primary field surveys. Most species-level records represent widespread, disturbance-tolerant taxa characteristic of irrigated oasis and roadside habitats:

- *Phragmites australis* (Common Reed) in canal margins,
- *Convolvulus arvensis* (Field Bindweed) in agricultural fields,
- *Sonchus oleraceus* (Common Sow-Thistle) in ruderal habitats, and
- *Lycium ruthenicum* (Russian Boxthorn) in Karakul desert margins.

Six species-level records represent NEW additions to the project area flora baseline not previously recorded during primary ESIA field surveys:

- *Chenopodium ficifolium* (Fig-leaved Goosefoot),
- *Cynanchum acutum* (Sharp Stranglewort),
- *Eruca vesicaria* (Rocketsalad),
- *Malva sylvestris* (Common Mallow),
- *Althaea cannabina* (Hemp-leaved Mallow),
- *Dodartia orientalis* (Dodartia), and
- *Zygophyllum fabago* (Syrian Bean-Caper).

All are native or naturalized species of no conservation concern individually, appropriate to the modified habitat character of the project corridor.

Invasive Species Range Extension

The most significant finding in the flora dataset is the iNaturalist record of *Rhaponticum repens* (Russian Knapweed, synonymous with *Acroptilon repens*) at Uzanon mahalla, Gijduvon district, within the rehabilitation corridor. This extends the confirmed presence of this invasive species beyond bypass Section 10 (where it was recorded during primary field surveys) into the rehabilitation corridor sections of the project. Russian Knapweed is a highly competitive perennial invasive forb capable of forming dense monocultures that suppress native and cultivated vegetation. The extended distribution confirmed by iNaturalist data strengthens the recommendation for corridor-wide biosecurity measures during construction – not only in bypass Section 10 – and is reflected in the ESMP.

Avifauna (Birds) Occurrence Records

Eight bird species were identified to species level in the iNaturalist dataset within the project Aol. Records span settlements, agricultural land, and desert sections of the corridor from Gijduvon district in the north-east to Alat district in the south-west. The dataset supplements primary field survey avifauna records and provides additional distributional data for migratory and resident species along the rehabilitation corridor.

The avifauna records reflect the full ecological gradient of the project corridor. In the northern agricultural sections, settlement-associated species dominate:



- *Common Myna (Acridotheres tristis)* is an introduced species now widely established across Central Asia
- *Feral Pigeon (Columba livia var. domestica)* are characteristic of the peri-urban M37 corridor environment
- *Eurasian Tree Sparrow (Passer montanus)* is a common resident of agricultural habitats and shelterbelt vegetation confirmed along the rehabilitation corridor, using the roadside tree-line system as foraging and nesting habitat.

In the more arid central and southern sections, ecologically significant migratory and waterbird species are confirmed.

- The *Citrine Wagtail (Motacilla citreola)* and *Black-headed Wagtail (Motacilla flava ssp. feldegg)* are confirmed CAF migratory species that use irrigated agricultural land and canal margins as breeding and staging habitats – confirming the ecological corridor function of the irrigation canal network.
- The *Black-crowned Night Heron (Nycticorax nycticorax)* is a colonial waterbird using canal infrastructure for foraging, confirmed at Karakul district.
- The *Little Owl (Athene noctua)* is a resident of open desert and agricultural landscapes confirmed in the Lot 5 desert section near Alat.

Species of Conservation Significance – *Vanellus leucurus*

The *White-tailed Lapwing (Vanellus leucurus)* is the only species of IUCN conservation significance in the avifauna dataset, assessed as Near Threatened (NT) on the IUCN Red List. It is a confirmed CAF waterbird that breeds near inland water bodies and seasonal wetlands in arid and semi-arid zones – habitat conditions present along the canal network in Karakul district where it is recorded. The species is sensitive to disturbance of breeding sites near water.

CAF Context

Four of the eight bird species recorded are confirmed CAF species: *Motacilla flava ssp. feldegg*, *Motacilla citreola*, *Vanellus leucurus*, and *Nycticorax nycticorax*. Their presence along the project corridor confirms the role of the irrigation canal network as migratory staging and foraging habitat for waterbirds and insectivorous migrants within the broader CAF system.

Table 45 summarizes the occurrence records of avifauna from iNaturalist and GBIF along the M37 project corridor.



Table 45: iNaturalist / GBIF Avifauna (Birds) Occurrence Records — M37 Project Corridor

#	Family	Scientific Name	Common Name	Genus	Observation Location / Occurrence in AoI	IUCN Status	Red Book of Uzbekistan	Central Asian Flyway	Notes
1.	Sturnidae	<i>Acridotheres tristis</i> (L.)	Common Myna	<i>Acridotheres</i>	Vobkent, Bukhara Province	LC	—	—	Introduced/invasive bird widely established in Central Asia; synanthropic; common in settlements and modified habitats along corridor
2.	Columbidae	<i>Columba livia</i> var. <i>domestica</i> Gmelin	Feral Pigeon	<i>Columba</i>	Kalaya mahalla, Bukhara district	LC	—	—	Domestic/feral form; settlement-associated; nests on buildings and structures; common throughout corridor settlements
3.	Passeridae	<i>Passer montanus</i> (L.)	Eurasian Tree Sparrow	<i>Passer</i>	Gijduvon district	LC	—	Partial	Common resident breeder in modified agricultural and settlement habitats; confirmed along rehabilitation corridor; uses tree-line and shelterbelt vegetation
4.	Tytonidae/ Strigidae	<i>Athene noctua</i> (Scopoli)	Little Owl	<i>Athene</i>	Desert northwest of Alat town toward Jigachi village	LC	—	—	Resident species of desert and open agricultural landscapes; confirmed in desert section; nests in soil burrows and rock crevices; ecologically relevant to desert section construction
5.	Motacillidae	<i>Motacilla flava</i> ssp. <i>feldegg</i> Michahelles	Black-headed Wagtail	<i>Motacilla</i>	Chandirabad village, northwest of Alat town	LC	—	Yes	Migratory subspecies breeding across Central Asia; confirmed CAF species; uses irrigated agricultural and canal habitats as breeding and staging grounds
6.	Motacillidae	<i>Motacilla citreola</i> Pallas	Citrine Wagtail	<i>Motacilla</i>	Mirza-Kala village, Karakul district	LC	—	Yes	Migratory waterbird; confirmed CAF species; uses canal margins and wet agricultural habitats as staging areas

#	Family	Scientific Name	Common Name	Genus	Observation Location / Occurrence in Aol	IUCN Status	Red Book of Uzbekistan	Central Asian Flyway	Notes
									during spring and autumn migration
7.	Charadriidae	<i>Vanellus leucurus</i> (Lichtenstein)	White-tailed Lapwing	<i>Vanellus</i>	Karakul town; north of Bandboshi village, Karakul district	NT	—	Yes	Conservation significance – Near Threatened (IUCN NT); confirmed CAF species; breeds near inland water bodies in arid and semi-arid zones; present near Karakul canal habitats within project Aol
8.	Ardeidae	<i>Nycticorax nycticorax</i> (L.)	Black-crowned Night Heron	<i>Nycticorax</i>	Shurabad mahalla, Karakul district	LC	—	Yes	Colonial waterbird; confirmed CAF species; uses canal and irrigation infrastructure as foraging and staging habitat; nocturnal; confirmed in Karakul district within Aol

(Sources: iNaturalist / GBIF, accessed May 2026. Central Asian Flyway (CAF) species list; BirdLife International (2024); Wetlands International Waterbird Population Estimates. IUCN status: IUCN Red List (2024). Yes = species confirmed on Central Asian Flyway species list and using corridor as migratory route or breeding/staging area; Partial = uses broader region but CAF corridor use not specifically confirmed; — = resident or non-flyway species.)



Other Fauna Occurrence Records (Reptiles, Amphibians, Invertebrates)

Twenty-one faunal records covering non-avian taxa comprising six reptile species, one amphibian species, and 14 invertebrate records (butterflies, moths, wasps, bees, beetles, ants, spiders, and centipede). Records span the full length of the project corridor from Gijduvon and Galaosiyo. The reptile and amphibian records are of particular ESIA relevance given their sensitivity to road infrastructure, construction disturbance, and habitat modification.

Reptiles – Desert Section Records of Construction Relevance

Six reptile species are confirmed in the project Aol, all from the desert sections. All are native Central Asian desert species of no IUCN conservation concern individually, but their collective presence confirms a herpetofauna community of ecological significance in the desert road corridor:

- *Phrynocephalus interscapularis* (Lichtenstein's Toadhead Agama) is the most ESIA-relevant reptile record: confirmed directly along the existing M37 road in Karakul and Alat districts and in the desert toward Lake Dengizkul. This small agamid lizard is a ground-dwelling desert specialist that uses open sandy terrain and roadside verges. Its confirmed presence on the road surface and verges confirms the road-as-barrier effect for desert reptiles and road mortality risk that should be addressed in the construction-phase for Lots 4–5.
- *Teratoscincus scincus* (Common Wonder Gecko) is a nocturnal desert gecko confirmed at Karakul. Construction lighting in desert sections during night work may attract and disorient nocturnal reptiles, increasing road mortality risk. Night construction activities in Lots 4–5 should include lighting management provisions.
- *Eremias grammica* (Reticulate Racerunner) is a fast diurnal lizard confirmed near Alat. *Phrynocephalus reticulatus* (Reticulated Toad-headed Agama) is a smaller desert agamid confirmed at Karakul. *Ablepharus deserti* (Desert Lidless Skink) is a small smooth-scaled lizard confirmed at Jondor district, at the agricultural-desert transition zone.

Critical Record: *Echis carinatus* (Saw-scaled Viper)

The *Saw-scaled Viper* (*Echis carinatus*) is confirmed at Engels village in Alat district desert. This is a medically significant venomous snake responsible for a significant proportion of snakebite fatalities in arid regions of Central and South Asia. The species is cryptic, terrestrial, nocturnal to crepuscular, and aggressive when disturbed, all characteristics that create elevated occupational health risk during ground-disturbing construction activities in desert terrain.

Amphibians: Marsh Frog in Canal Habitats

The *Marsh Frog* (*Pelophylax ridibundus*) is confirmed at Khodjakhayran mahalla, the amphibian species record for the rehabilitation corridor sections of the project. This large frog is strongly associated with permanent water bodies and irrigation canals and is likely present at canal crossing locations throughout the rehabilitation corridor wherever permanent water flow exists. Its presence is relevant to the ecological connectivity and canal disturbance impact assessment. Canal reinstatement following crossing works should ensure continuity of water flow.



Invertebrates

Fourteen invertebrate records are presented, comprising butterflies, moths, wasps, bees, beetles, ants, spiders, and a centipede. The majority are at genus or subfamily level and are included for contextual reference only. Species-level invertebrate records of note include: *Vanessa cardui* (*Painted Lady butterfly*, widespread migratory species), *Theretra alecto* (*Levant Hawkmoth* – large moth associated with *Apocynaceae* host plants recorded in the survey area), *Polistes wattii* (*Arabian Paper Wasp*), *Gastrophysa polygoni* (*Knotweed Leaf Beetle*), and three ant species including *Camponotus xerxes*. None of the invertebrate records trigger conservation significance under IUCN or national Red Book criteria.



Table 46: iNaturalist / GBIF Other Fauna Occurrence Records – M37 Project Corridor

#	Family	Scientific Name	Common Name	Genus	Observation Location / Occurrence in AoI	IUCN Status	Red Book UZB	Notes
1.	Scincidae	<i>Ablepharus deserti</i> (Strauch)	Desert Lidless Skink	<i>Ablepharus</i>	Khodjakhayran mahalla, Jondor district	LC	—	Small diurnal lizard of agricultural-desert interface habitats; confirmed in Lot 3 rehabilitation corridor zone
2.	Agamidae	<i>Phrynocephalus reticulatus</i> (Eichwald)	Reticulated Toad-headed Agama	<i>Phrynocephalus</i>	Shurabad mahalla, Karakul district	LC	—	Small desert agamid lizard; sandy and loamy desert habitats; confirmed in desert section
3.	Agamidae	<i>Phrynocephalus interscapularis</i> Lichtenstein	Lichtenstein's Toadhead Agama	<i>Phrynocephalus</i>	Desert east of Karakul town; along M37 road between Turkmen border and Alat town; area toward Lake Dengizkul	LC	—	Recorded directly along M37 road; small ground-dwelling desert lizard; confirms road-as-barrier risk for desert reptiles; road mortality risk during construction
4.	Sphaerodactylidae	<i>Teratoscincus scincus</i> (Schlegel)	Common Wonder Gecko	<i>Teratoscincus</i>	Desert area, Karakul district	LC	—	Nocturnal desert gecko; sandy desert habitat; construction lighting may attract and disorient nocturnal reptiles
5.	Lacertidae	<i>Eremias grammica</i> (Lichtenstein)	Reticulate Racerunner	<i>Eremias</i>	Desert area, Engels village, Alat district	LC	—	Fast-running diurnal desert lizard; open sandy desert substrate
6.	Viperidae	<i>Echis carinatus</i> (Schneider)	Saw-scaled Viper	<i>Echis</i>	Desert area, Engels village, Alat district	LC	—	Venomous snake confirmed in desert; aggressive when disturbed; responsible for human fatalities in region; ESMP must include snake awareness and first-aid protocol for all workers
7.	Ranidae	<i>Pelophylax ridibundus</i> (Pallas)	Marsh Frog	<i>Pelophylax</i>	Khodjakhayran mahalla, Jondor district	LC	—	Largest European/Central Asian frog; associated with permanent water bodies and irrigation canals; first amphibian species record for



#	Family	Scientific Name	Common Name	Genus	Observation Location / Occurrence in Aol	IUCN Status	Red Book UZB	Notes
								the Jondor rehabilitation corridor section; relevant to canal crossing impact assessment
8.	Pieridae	<i>Pieridae</i> subfamily <i>Pierinae</i>	White Butterfly (subfamily)	—	Gijduvon district	NE	—	Subfamily level; common agricultural butterfly
9.	Nymphalidae	<i>Vanessa cardui</i> (L.)	Painted Lady	<i>Vanessa</i>	Shirin mahalla, Bukhara district	LC	—	Migratory butterfly; widespread; uses agricultural flower resources; no conservation concern; corroborates modified agricultural habitat character
10.	Sphingidae	<i>Theretra alecto</i> (L.)	Levant Hawkmoth	<i>Theretra</i>	Khodjakhayran mahalla, Jondor district	NE	—	Large nocturnal moth; feeds on nectar of canal-margin and garden plants; larvae on Apocynaceae host plants recorded in survey area
11.	Acrididae / Oedipodinae	<i>Oedipodinae</i> (subfamily)	Bandwing Grasshopper	—	Gijduvon district	NE	—	Subfamily-level; characteristic of dry grassland and disturbed desert margins; common along rehabilitation corridor; no species-level record
12.	Vespidae	<i>Polistes wattii</i> <i>de Saussure</i>	Arabian Paper Wasp	<i>Polistes</i>	Kalaya mahalla, Bukhara district	NE	—	Colonial paper wasp; nests in sheltered sites on vegetation and structures; present in settlement and orchard habitats along corridor
13.	Apidae	<i>Thyreus</i> sp.	Cloak-and-Dagger Bee	<i>Thyreus</i>	Arabkhana mahalla and Galaosiyo, Bukhara district	NE	—	Genus-level; cleptoparasitic bee that lays eggs in nests of Megachile host bees; both genera recorded at same location; agricultural habitat
14.	Megachilidae	<i>Megachile</i> sp.	Leafcutter Bee	<i>Megachile</i>	Galaosiyo, Bukhara district	NE	—	Genus-level; important crop and wild plant pollinator; cuts



#	Family	Scientific Name	Common Name	Genus	Observation Location / Occurrence in AoI	IUCN Status	Red Book UZB	Notes
								leaf material for nest construction; agricultural and canal-margin habitat
15.	Chrysomelidae	<i>Gastrophysa polygoni</i> (L.)	Knotweed Leaf Beetle	<i>Gastrophysa</i>	Arabkhana mahalla and Galaosiyo, Bukhara district	NE	—	Herbivorous beetle feeding on <i>Polygonum</i> (knotweed) host plants; ruderal and disturbed habitat
16.	Formicidae	<i>Crematogaster subdentata</i> Mayr	Ant	<i>Crematogaster</i>	Galaosiyo, Bukhara district	NE	—	Medium-sized ant; nests in soil and plant debris; modified and agricultural habitat
17.	Formicidae	<i>Camponotus turkestanicus</i> Emery	Turkestan Carpenter Ant	<i>Camponotus</i>	Khodjakhayran mahalla, Jondor district	NE	—	One of the largest ant species in Central Asia; nests in soil and wood; agricultural and disturbed habitat
18.	Formicidae	<i>Camponotus xerxes</i> Forel	Desert Carpenter Ant	<i>Camponotus</i>	Desert west of Janafar and Yangimozor villages, Karakul district	NE	—	Desert species of carpenter ant; confirmed in open desert; excavates nests in dry sandy substrate
19.	Thomisidae	<i>Thomisus</i> sp.	Flower Crab Spider	<i>Thomisus</i>	Galaosiyo, Bukhara district	NE	—	Genus-level; ambush predator on flowers; common in agricultural and ruderal habitats; no species-level identification
20.	Lycosidae	<i>Pardosinae</i> (subfamily)	Wolf Spider	—	Khodjakhayran mahalla, Jondor district	NE	—	Subfamily-level; ground-hunting spiders; common across all habitat types; no species-level identification possible from record
21.	Scutigeridae	<i>Scutigera coleoptrata</i> (L.)	House Centipede	<i>Scutigera</i>	Khodjakhayran mahalla, Jondor district	NE	—	Fast-moving synanthropic centipede; predator of small invertebrates; associated with human settlements and structures

(Sources: iNaturalist / GBIF, accessed May 2026. IUCN status: IUCN Red List (2024). NE = Not Evaluated [species not formally assessed by IUCN, typically invertebrates]. Note on *Echis carinatus*: the Saw-scaled Viper is a medically significant venomous species)



Summary of Key Findings from iNaturalist / GBIF Dataset

The following findings from the iNaturalist/GBIF dataset are of specific relevance to the biodiversity baseline and impact assessment:

- *Rhaponticum repens* (syn. *Acroptilon repens*) – Russian Knapweed (invasive): This species is recorded at Uzanon mahalla, Gijduvon district, confirming the presence of this invasive species in the rehabilitation corridor sections of the project. Extends confirmed invasive species range beyond bypass Section 10 (primary survey) to the rehabilitation corridor. This finding strengthens the case for corridor-wide biosecurity measures during construction, not only in bypass Section 10.
- *Vanellus leucurus* (White-tailed Lapwing, IUCN NT, CAF): This species is confirmed at Karakul town and near Bandboshi village, Karakul district. This is the only species of IUCN conservation concern in the fauna dataset.
- *Phrynocephalus interscapularis* (Lichtenstein's Toadhead Agama): This species is confirmed in Karakul and Alat districts and in the desert toward Lake Dengizkul. This specific reptile species utilizes the existing road corridor and adjacent desert habitat.
- *Echis carinatus* (Saw-scaled Viper): This species is confirmed in the desert. This medically significant venomous species requires snake awareness and first-aid protocol in the ESMP for construction works, and pre-mobilization worker training.
- *Pelophylax ridibundus* (Marsh Frog): This species is confirmed at canal habitats, providing the first amphibian species record for the rehabilitation corridor. Relevant to canal crossing construction impact assessment.
- Four CAF bird species confirmed within the project Aol: *Motacilla flava* ssp. *feldegg*, *Motacilla citreola*, *Vanellus leucurus*, and *Nycticorax nycticorax*. These species use canal and wetland habitats along the corridor as migratory staging and foraging areas, confirming the ecological corridor function of the irrigation canal network.



13. Photographs of Biodiversity Survey Campaign

This section presents photographic records of biodiversity survey campaigns, investigations undertaken for the bypass and rehabilitation sections of the project corridor and identified flora and fauna species.

A. Bypass Section + Missing Link to Bukhara Ring Road

Biodiversity Survey of Section 1

(a) Transect Surveys





Belt Transect Plots



Camera Trap Station



(b) Fauna Survey

	
Magpie's nest (<i>Pica-pica</i>)	Common mayna (<i>Acridotheres tristis</i>)
	
Common Chaffinch (<i>Fringilla coelebs</i>)	Rook (<i>Corvus frugilegus</i>)

(a) Flora Survey

	
Vineyard	Mulberry shrubs
	
Sweet Cherry Tree (<i>Prunus avium</i>)	Grapevines (<i>Vitis Vinifera</i>)



	
White Poplar Tree (<i>Populus Alba</i>)	Apricot tree (<i>Prunus armeniaca</i>)
	
Licorice (<i>Glycyrrhiza glabra</i>)	Goldbachia (<i>Goldbachia laevigata</i>)
	
Pumpkin (<i>Cucurbita pepo</i>)	Whitetop (<i>Lepidium draba</i>)
	
Alfalfa (<i>Medicago sativa</i>)	Curly Dock (<i>Rumex crispus</i>)



	
Radish (<i>Raphanus sativus</i>)	Potato (<i>Solanum tuberosum</i>)
	
German Chamomile (<i>Matricaria chamomilla</i>)	Shepherd's Purse (<i>Capsella bursa-pastoris</i>)

Biodiversity Survey of Section 2

(a) Field Surveys







Belt Transect Plots



Camera Trap Station



(b) Fauna Survey

	
Northern mole vole's burrow (<i>Ellobius talpinus</i>)	Northern mole vole's burrow (<i>Ellobius talpinus</i>)
	
Magpie's nest (<i>Pica-pica</i>)	Magpie's nest (<i>Pica-pica</i>)
	
Common pigeon (<i>Columba livia</i>)	Eurasian tree sparrow (<i>Passer montanus</i>)
	
Common Myna (<i>Acridotheres tristis</i>)	Rook (<i>Corvus frugilegus</i>)



(c) Flora Survey

	
Grapevines (<i>Vitis Vinifera</i>)	Mulberry shrubs (<i>Morus bombycis</i>)
	
Clover field	Apricot (<i>Prunus armeniaca</i>)
	
Plum trees (<i>Prunus domestica</i>)	Sweet cherry (<i>Prunus avium</i>)
	
Peach tree (<i>Prunus persica</i>)	Vineyard (<i>Vitis Vinifera</i>)



	
Poplars (<i>Populus alba</i>)	Elm (<i>Ulmus</i>)
	
Shepherd's Purse (<i>Capsella bursa-pastoris</i>)	Common Reed (<i>Phragmites australis</i>)
	
Alfalfa (<i>Medicago sativa</i>)	Licorice (<i>Glycyrrhiza glabra</i>)
	
Hoary Cress (<i>Lepidium draba</i>)	Bermuda Grass (<i>Cynodon dactylon</i>)



Alfalfa (<i>Medicago sativa</i>)	Narrowleaf Cattail (<i>Typha angustifolia</i>)

Biodiversity Survey of Section 3

(a) Field Surveys

Biodiversity Survey team during field survey	



	
Belt Transect Plots	
	
Camera Trap Station	

(b) Fauna Survey

	
Muskrat burrow (<i>Ondatra zibethicus</i>)	Dromedary Camel (<i>Camelus dromedarius</i>)
	
Magpie's nest (<i>Pica-pica</i>)	Magpie (<i>Pica-pica</i>)



	
Common Swift (<i>Apus apus</i>)	Eurasian Tree Sparrow (<i>Passer montanus</i>)
	
European Roller (<i>Coracias garrulus</i>)	Harvester Ant Nest (<i>Messor species</i>)

(c) Flora Survey

	
Cotton field (<i>Gossypium arboreum</i>)	Vineyard (<i>Vitis Vinifera</i>)
	
Peach Orchard (<i>Prunus persica</i>)	Oleaster (<i>Elaeagnus angustifolia</i>)

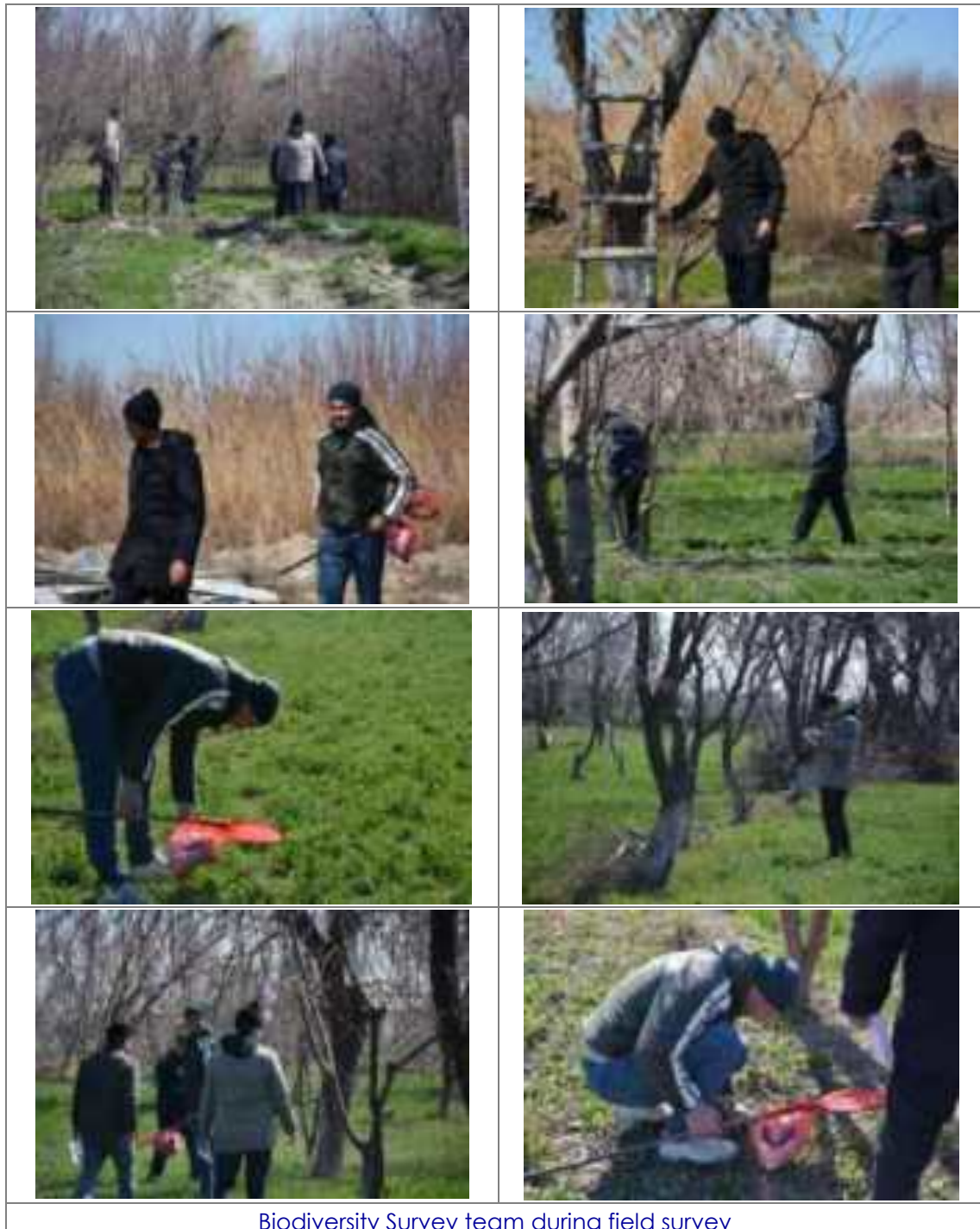


	
Mulberry (<i>Morus bombycis</i>)	Sweet cherry (<i>Prunus avium</i>)
	
Apricot trees (<i>Prunus armeniaca</i>)	Couch Grass / Witchgrass (<i>Elymus repens</i>)
	
Hoary Cress (<i>Lepidium draba</i>)	Broadleaf Dock (<i>Rumex obtusifolius</i>)



Biodiversity Survey of Section 4

(a) Field Surveys





Belt Transect Plots



Camera Trap Station



(a) Fauna Survey

	
Crows (<i>Corvus</i>)	Common Pigeon (<i>Columba livia</i>)
	
Magpie's nest (<i>Pica-pica</i>)	Magpie (<i>Pica-pica</i>)
	
Common Moorhen (<i>Gallinula chloropus</i>)	Common Chaffinch (<i>Fringilla coelebs</i>)
	
Northern Mole Vole's Nest (<i>Ellobius talpinus</i>)	Ground Squirrel's burrow (<i>Spermophilus</i>)



	
Woodlouse (<i>Armadillidium vulgare</i>)	Harvester Ant Nest (<i>Messor species</i>)

(b) Flora Survey

	
Clover field (<i>Trifolium</i>)	Vineyard (<i>Vitis Vinifera</i>)
	
Wheat field (<i>Triticum aestivum</i>)	Common Reed (<i>Phragmites australis</i>)
	
Plum Orchard (<i>Prunus domestica L.</i>)	Apple tree (<i>Malus domestica Borkh.</i>)



	
Alfalfa (<i>Medicago sativa</i>)	Common Dandelion (<i>Taraxacum officinale</i>)
	
Lamb's quarters (<i>Chenopodium album</i>)	Common Reed (<i>Phragmites australis</i>)
	
Common Reed (<i>Phragmites australis</i>)	White Mulberry (<i>Morus alba</i>)

Biodiversity Survey of Section 5

(a) Field Surveys





Biodiversity Survey team during field survey



Belt Transect Plots



Camera Trap Station



(b) Fauna Survey

	
Rook (<i>Corvus frugilegus</i>)	Montagu's Harrier (<i>Circus pygargus</i>)
	
Rook (<i>Corvus frugilegus</i>)	Magpie's Nest (<i>Pica-pica</i>)
	
Domestic Horse (<i>Equus caballus</i>)	Domestic Sheep (<i>Ovis aries</i>)
	
Harvester Ant's Nest (<i>Messor structor</i>)	Masked Wagtail (<i>Motacilla alba personata</i>)



(c) Flora Survey

	
Clover field (<i>Trifolium</i>)	Common Reed (<i>Phragmites australis</i>)
	
Wheat field (<i>Triticum aestivum</i>)	Mulberry Tree (<i>Morus alba</i>)
	
Tussock Sedge (<i>Carex stricta</i>)	Prostrate knotweed (<i>Polygonum aviculare</i>)
	
Common Reed (<i>Phragmites australis</i>)	Wormwood (<i>Artemisia</i>)



Biodiversity Survey of Section 6

(a) Field Surveys





(b) Fauna Survey





	
Domestic Sheep (<i>Ovis aries</i>)	Eurasian Collared Dove (<i>Streptopelia decaocto</i>)

(a) Flora Survey

	
Vineyard (<i>Vitis Vinifera</i>)	Apricot trees (<i>Prunus armeniaca</i>)
	
Oleaster tree (<i>Elaeagnus angustifolia</i>)	White Mulberry (<i>Morus Alba</i>)
	
Tamarisk (<i>Tamarix</i>)	Prostrate knotweed (<i>Polygonum aviculare</i>)



	
Common Reed (<i>Phragmites australis</i>)	Shepherd's Purse (<i>Capsella bursa-pastoris</i>)
	
Oleaceae Tree (<i>Fraxinus sogdiana</i>)	Turkestan Elm Tree (<i>Ulmus pinnato-ramosa</i>)
	
Bermuda Grass (<i>Cynodon dactylon</i>)	Sweet Cherry Tree (<i>Prunus avium</i>)
	
Wheat Field (<i>Triticum aestivum</i>)	Alfalfa Field (<i>Medicago sativa</i>)



Biodiversity Survey of Section 7

(a) Field Surveys



Biodiversity Survey team during field survey



Belt Transect Plots



(b) Fauna Survey





	
Masked Wagtail (<i>Motacilla alba personata</i>)	Storks (<i>Ciconia</i>)
	
Common Myna (<i>Acridotheres tristis</i>)	Rock Dove (<i>Columba livia</i>)

(c) Flora Survey

	
Apple trees (<i>Malus domestica</i>)	Cherry tree (<i>Prunus cerasus</i>)
	
Almond Tree (<i>Prunus dulcis</i>)	Mulberry Tree (<i>Morus bombycis</i>)



	
White Willow (<i>Salix alba</i>)	Apricot trees (<i>Prunus armeniaca</i>)
	
Wild Carrot (<i>Daucus carota</i>)	Dandelion (<i>Taraxacum officinale</i>)
	
Common Reed (<i>Phragmites australis</i>)	Wild Pea (<i>Vicia sativa</i>)
	
Reed Canary Grass (<i>Phalaris arundinacea</i>)	Shepherd's Purse (<i>Capsella bursa-pastoris</i>)



Biodiversity Survey of Section 8

(a) Field Surveys





(b) Fauna Survey

	
Ground Squirrel (<i>Spermophilus fulvus</i>)	Nutria (<i>Myocastor coypus</i>)
	
Northern Mole Vole's Nest (<i>Ellobius talpinus</i>)	Harvester Ant Nest (<i>Messor species</i>)
	
Magpie's Nest (<i>Pica-pica</i>)	Magpie (<i>Pica-pica</i>)
	
Common Myna (<i>Acridotheres tristis</i>)	Rock Pigeon (<i>Columba livia</i>)



	
Carrion Crow (<i>Corvus corone</i>)	Eurasian Tree Sparrow (<i>Passer montanus</i>)

(c) Flora Survey

	
Apricot trees (<i>Prunus armeniaca</i>)	Mulberry Tree (<i>Morus bombycis</i>)
	
Apple Tree (<i>Malus domestica</i>)	White Mulberry Tree (<i>Morus alba</i>)
	
Winter wheat Field (<i>Triticum aestivum</i>)	Peach Trees (<i>Prunus persica</i>)



	
Kirghiz Camelthorn (<i>Alhagi kirghisorum</i> <i>Schrenk</i>)	Common Reed (<i>Phragmites australis</i>)
	
Corn poppy (<i>Papaver rhoeas</i>)	Shepherd's Purse (<i>Capsella bursa-</i> <i>pastoris</i>)
	
Perennial Pepperweed (<i>Lepidium</i> <i>latifolium</i>)	Russian Peashrub (<i>Halimodendron</i> <i>halodendron</i>)
	
Common Dandelion (<i>Taraxacum</i> <i>officinale</i>)	Alfalfa (<i>Medicago sativa</i>)



Biodiversity Survey of Section 9

(a) Field Surveys





(b) Fauna Survey





	
Moorhen (<i>Gallinula chloropus</i>)	Common Swift (<i>Apus apus</i>)
	
Harvester Ant Nest (<i>Messor species</i>)	Woodlouse (<i>Armadillidium vulgare</i>)

(c) Flora Survey

	
Apricot trees (<i>Prunus armeniaca</i>)	Mulberry Tree (<i>Morus alba</i>)
	
Licorice (<i>Glycyrrhiza glabra</i>)	Common Dandelion (<i>Taraxacum officinale</i>)



	
Tamarisk Shrub (<i>Tamarix</i>)	Common Reed (<i>Phragmites australis</i>)
	
Camelthorn (<i>Alhagi maurorum</i>)	Wheat Field (<i>Triticum aestivum</i>)
	
Wheat Field (<i>Triticum aestivum</i>)	Licorice (<i>Glycyrrhiza glabra</i>)
	
Bitter Licorice (<i>Sophora pachycarpa</i>)	Vineyard (<i>Vitis vinifera</i>)



Biodiversity Survey of Section 10

(a) Field Surveys



Biodiversity Survey team during field survey



	
	
Belt Transect Plots	
	
Camera Trap Station	



(b) Fauna Survey

	
Common Kestrel (<i>Falco tinnunculus</i>)	Black Kite (<i>Milvus migrans</i>)
	
Common Moorhen (<i>Gallinula chloropus</i>)	Western Marsh Harrier (<i>Circus aeruginosus</i>)
	
Common Myna (<i>Acridotheres tristis</i>)	European Roller (<i>Coracias garrulus</i>)
	
Desert Finch's Nest (<i>Rhodospiza obsoleta</i>)	Northern Mole Vole's Burrow (<i>Ellobius talpinus</i>)



(c) Flora Survey

	
Vineyard (<i>Vitis vinifera</i>)	Willow tree (<i>Salix alba</i>)
	
Lombardy Poplar Tree (<i>Populus nigra</i>)	Central Asian Field Elm (<i>Ulmus densa</i>)
	
Tamarisk Shrub (<i>Tamarix</i>)	Common Reed (<i>Phragmites australis</i>)
	
Camelthorn (<i>Alhagi maurorum</i>)	Russian Olive (<i>Elaeagnus angustifolia</i>)



	
Wormwood (<i>Artemisia</i>)	Alfalfa/Lucerne (<i>Medicago sativa</i>)
	
White Mulberry Tree (<i>Morus alba</i>)	Wheat field (<i>Triticum aestivum</i>)

1.1. Herbarium collection

	
Dwarf Rocket (<i>Olimarabidopsis pumila</i>)	Narrow-leaved Pepperwort (<i>Lepidium ruderae</i>)

	
Creeping Thistle (<i>Cirsium arvense</i>)	Green Foxtail (<i>Setaria viridis</i>)
	
Syberian Swallow-Wort (<i>Cynanchum sibiricum</i>)	Aleppo Dock (<i>Rumex halepensis</i>)
	
Russian Knapweed (<i>Acroptilon repens</i>)	Perennial Ryegrass (<i>Lolium perenne</i>)

	
Narrowleaf Cattail (<i>Typha angustifolia</i>)	Saltmarsh sea-lavender (<i>Limonium otolepis</i>)
	
Mangrove Grass (<i>Aeluropus lagopoides</i>)	Henbit Dead-nettle (<i>Lamium amplexicaule</i>)
	
African Mustard (<i>Strigosella africana</i>)	Flixweed (<i>Descurainia sophia</i>)

	
Flixweed (<i>Descurainia sophia</i>)	Sword-leaf Dogbane (<i>Trachomitum lancifolium</i>)
	
Five-stamen Tamarisk (<i>Tamarix ramosissima</i>)	Five-stamen Tamarisk (<i>Tamarix ramosissima</i>)
	
Caspian Karelina (<i>Karelinia caspica</i>)	Oxus Bean-caper (<i>Zygophyllum oxianum</i>)

	
Five-stamen Tamarisk (<i>Tamarix ramosissima</i>)	Oxus Bean-caper (<i>Zygophyllum oxianum</i>)
	
Caspian Karelinia (<i>Karelinia caspica</i>)	Sword-leaf Dogbane (<i>Trachomitum lancifolium</i>)
	
Marshwort (<i>Apium nodiflorum</i>)	Ribwort Plantain (<i>Plantago lanceolata</i>)

	
Common Reed (<i>Phragmites australis</i>)	Marshwort (<i>Apium nodiflorum</i>)
	
Russian Boxthorn (<i>Lycium ruthenicum</i>)	Russian Boxthorn (<i>Lycium ruthenicum</i>)
	
Tatarian Saltbush (<i>Atriplex tatarica</i>)	Central Asian Dandelion (<i>Taraxacum contristans</i>)

	
Marshwort (<i>Apium nodiflorum</i>)	Central Asian Dandelion (<i>Taraxacum contristans</i>)
	
Sweet Wormwood (<i>Artemisia annua</i>)	Common Mallow (<i>Malva neglecta</i>)



1.2. Rehabilitation Section

Biodiversity Survey of Kyzyltepa District

(a) Fauna Survey

	
Masked Wagtail (<i>Motacilla alba</i>)	Oriental Crows (<i>Corvus orientalis</i>)
	
Common Chaffinch (<i>Fringilla coelebs</i>)	Rook's nest (<i>Corvus frugilegus</i>)
	
Woodlouse (<i>Armadillidium vulgare</i>)	Black Garden Ant's Nest (<i>Lasius niger</i>)



(b) Flora Survey

	
Eldar Pine Tree (<i>Pinus eldarica</i>)	Elm Tree (<i>Ulmus pinnato-rasmosa</i>)
	
Elm Tree (<i>Ulmus pinnato-rasmosa</i>)	Cotton field (<i>Gossypium hirsutum</i>)
	
Bermuda Grass (<i>Cynodon dactylon</i>)	Annual Wormwod (<i>Artemisia annua</i>)
	
Dense-leaf Elm Tree (<i>Ulmus densa</i>)	Oriental Arborvitae Tree (<i>Platycladus orientalis</i>)



	
Eldar Pine Tree (<i>Pinus eldarica</i>)	Dense-leaf Elm Tree (<i>Ulmus densa</i>)

Biodiversity Survey of Gijduvon District

(b) Fauna Survey

	
Common Moorhen (<i>Gallinula chloropus</i>)	Masked Wagtail (<i>Motacilla alba</i>)
	
Rook (<i>Corvus frugilegus</i>)	Eurasian Tree Sparrow (<i>Passer montanus</i>)



	
Domestic Sheep (<i>Ovis aries</i>)	Magpie (<i>Pica-pica</i>)

(c) Flora Survey

	
Peach Tree Saplings (<i>Prunus persica</i>)	Common Reed (<i>Phragmites australis</i>)
	
Winter Wheat (<i>Triticum aestivum</i>)	Poplar Tree (<i>Populus bolleana</i>)
	
Common Reed (<i>Phragmites australis</i>)	Central Asian Elm (<i>Ulmus pinnato-ramosa</i>)



	
Oriental Arborvitae Tree (<i>Platycladus orientalis</i>)	Central Asian Elm (<i>Ulmus pinnato-ramosa</i>)
	
Dense-leaf Elm Tree (<i>Ulmus densa</i>)	Eldar Pine (<i>Pinus eldarica</i>)
	
Wall Barley (<i>Hordeum murinum</i>)	Grapevine (<i>Vitis Vinifera</i>)

Biodiversity Survey of Vobkent District

(a) Fauna Survey

	
White Wagtail (<i>Motacilla alba personata</i>)	Eurasian Tree Sparrow (<i>Passer montanus</i>)



	
Rook (<i>Corvus frugilegus</i>)	Common Myna (<i>Acridotheres tristis</i>)
	
Woodlouse (<i>Armadillidium vulgare</i>)	Harvester Ant Nest (<i>Messor species</i>)

(b) Flora Survey

	
Central Asian Elm (<i>Ulmus pinnato-ramosa</i>)	Eldar Pine Tree (<i>Pinus eldarica</i>)
	
Eldar Pine Tree (<i>Pinus eldarica</i>)	Dense-leaf Elm (<i>Ulmus densa</i>)



	
Goldenrain Tree (<i>Koelreuteria paniculata</i>)	Chinese Thuja Tree (<i>Platycladus orientalis</i>)
	
Oriental Arborvitae Tree (<i>Platycladus orientalis</i>)	Eldar Pine (<i>Pinus eldarica</i>)
	
Dense-leaf Elm Tree (<i>Ulmus densa</i>)	Alfalfa (<i>Medicago sativa</i>)
	
Grapevine (<i>Vitis Vinifera</i>)	White Mulberry (<i>Morus alba</i>)



Biodiversity Survey of Bukhara District

(a) Fauna Survey

	
Masked Wagtail (<i>Motacilla personata</i>)	Eurasian Tree Sparrow (<i>Passer montanus</i>)
	
Rock Dove (<i>Columba livia</i>)	Ground Squirrel's Burrow (<i>Spermophilus relictus</i>)

(b) Flora Survey

	
Apricot Tree (<i>Prunus armeniaca</i>)	Turkestan Elm Tree (<i>Ulmus pinnato-ramosa</i>)



	
Plum Tree (<i>Malus domestica</i>)	Eldar Pine Tree (<i>Pinus eldarica</i>)
	
Chinese Thuja Tree (<i>Platycladus orientalis</i>)	Eldar Pine Tree (<i>Pinus eldarica</i>)
	
Oriental Arborvitae Tree (<i>Platycladus orientalis</i>)	Camelthorn (<i>Alhagi pseudoalhagi</i>)
	
Alfalfa (<i>Medicago sativa</i>)	Black Medick (<i>Medicago lupulina</i>)



	
Summer Cypress (<i>Bassia scoparia</i>)	Sweet Cherry (<i>Prunus avium</i>)
	
Turkestan Elm Tree (<i>Ulmus pinnato-ramosa</i>)	Apricot Tree (<i>Prunus armeniaca</i>)



14. Wetlands International WPE: CAF Species Overlap across the M37 Corridor (Lots 1-2)

Table 47: Central Asian Flyway Species with Population Range Overlap across the M37 Project Corridor

#	Scientific Name	Common Name	Family	IUCN Category	GPS Position	M37 Corridor	CAF Action Plan
1.	Anser anser	Greylag Goose	Duck, geese and swans	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
2.	Tadorna tadorna	Common Shelduck	Duck, geese and swans	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
3.	Netta rufina	Red-crested Pochard	Duck, geese and swans	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
4.	Aythya ferina	Common Pochard	Duck, geese and swans	Vulnerable (VU)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
5.	Aythya nyroca	Ferruginous Duck	Duck, geese and swans	Near Threatened (NT)	64.85, 40.04 64.70, 40.09 64.52, 40.00	Kyzyltepa District Gijduvon District Vobkent District	YES



#	Scientific Name	Common Name	Family	IUCN Category	GPS Position	M37 Corridor	CAF Action Plan
					64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	
6.	<i>Aythya fuligula</i>	Tufted Duck	Duck, geese and swans	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
7.	<i>Spatua querquedula</i>	Garganey	Duck, geese and swans	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
8.	<i>Spatula clypeata</i>	Northern Shoveler	Duck, geese and swans	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
9.	<i>Mareca strepera</i>	Gadwall	Duck, geese and swans	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
10.	<i>Mareca penelope</i>	Eurasian Wigeon	Duck, geese and swans	Least Concern (LC)	64.85, 40.04 64.70, 40.09	Kyzyltepa District Gijduvon District	YES



#	Scientific Name	Common Name	Family	IUCN Category	GPS Position	M37 Corridor	CAF Action Plan
					64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	
11.	Anas platyrhynchos	Mallard	Duck, geese and swans	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
12.	Anas acuta	Northern Pintail	Duck, geese and swans	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
13.	Anas crecca	Common Teal	Duck, geese and swans	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
14.	Phoenicopteridae	Greater Flamingo	Flamingos	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES



#	Scientific Name	Common Name	Family	IUCN Category	GPS Position	M37 Corridor	CAF Action Plan
15.	<i>Rallu aquaticus</i>	Western Water Rail	Rails, crakes and allies	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
16.	<i>Zapornia pusilla</i>	Baillon's Crake	Rails, crakes and allies	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
17.	<i>Leucogeranus leucogeranus</i>	Siberian Crane	Cranes	Critically Endangered (CR)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass	YES
18.	<i>Anthropoides virgo</i>	Demoiselle Crane	Cranes	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
19.	<i>Grus grus</i>	Common Crane	Crane	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES



#	Scientific Name	Common Name	Family	IUCN Category	GPS Position	M37 Corridor	CAF Action Plan
20.	<i>Ciconia nigra</i>	Black Stork	Storks	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
21.	<i>Ciconia ciconia</i>	White Stork	Storks	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
22.	<i>Platalea leucorodia</i>	Eurasian Spoonbill	Ibises and spoonbills	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
23.	<i>Botaurus stellaris</i>	Eurasian Bittern	Herons and egrets	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
24.	<i>Ixobrychus minutus</i>	Common Little Bittern	Herons and egrets	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES

#	Scientific Name	Common Name	Family	IUCN Category	GPS Position	M37 Corridor	CAF Action Plan
25.	<i>Pluvialis squatarola</i>	Grey Plover	Plovers	Vulnerable (VU)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
26.	<i>Charadrius alexandrinus</i>	Kentish Plover	Plovers	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
27.	<i>Numenius phaeopus</i>	Whimbrel	Sandpipers and allies	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
28.	<i>Numenius arquata</i>	Eurasian Curlew	Sandpipers and allies	Near Threatened (NT)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
29.	<i>Limosa limosa</i>	Black-tailed Godwit	Sandpipers and allies	Near Threatened (NT)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES



#	Scientific Name	Common Name	Family	IUCN Category	GPS Position	M37 Corridor	CAF Action Plan
30.	<i>Arenaria interpres</i>	Ruddy Turnstone	Sandpipers and allies	Near Threatened (NT)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
31.	<i>Calidris pugnax</i>	Ruff	Sandpipers and allies	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
32.	<i>Calidris ferruginea</i>	Curlew Sandpiper	Sandpipers and allies	Vulnerable (VU)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
33.	<i>Calidris temminckii</i>	Temminck's Stint	Sandpipers and allies	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00	Kyzyltepa District Gijduvon District Vobkent District	YES
34.	<i>Calidris Alba</i>	Sanderling	Sandpipers and allies	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
35.	<i>Calidris Alpina</i>	Dunlin	Sandpipers and allies	Near Threatened (NT)	64.85, 40.04 64.70, 40.09 64.52, 40.00	Kyzyltepa District Gijduvon District Vobkent District	YES



#	Scientific Name	Common Name	Family	IUCN Category	GPS Position	M37 Corridor	CAF Action Plan
					64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	
36.	<i>Calidris minuta</i>	Little Stint	Sandpipers and allies	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
37.	<i>Gallinago stenura</i>	Pin-tailed Snipe	Sandpipers and allies	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
38.	<i>Xenus cinereus</i>	Terek Sandpiper	Sandpipers and allies	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
39.	<i>Actitis hypoleucos</i>	Common Sandpiper	Sandpipers and allies	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
40.	<i>Tringa nebularia</i>	Common Greenshank	Sandpipers and allies	Least Concern (LC)	64.85, 40.04 64.70, 40.09	Kyzyltepa District Gijduvon District	YES



#	Scientific Name	Common Name	Family	IUCN Category	GPS Position	M37 Corridor	CAF Action Plan
					64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	
41.	<i>Tringa glareola</i>	Wood Sandpiper	Sandpipers and allies	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
42.	<i>Tringa stagnatilis</i>	Marsh Sandpiper	Sandpipers and allies	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
43.	<i>Larus ridibundus</i>	Black-headed Gull	Gulls and terns	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
44.	<i>Larus ichthyaetus</i>	Pallas's Gull	Gulls and terns	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES



#	Scientific Name	Common Name	Family	IUCN Category	GPS Position	M37 Corridor	CAF Action Plan
45.	Larus fuscus	Lesser Black-backed Gull	Gulls and terns	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
46.	Gelochelidon nilotica	Common Gull-billed Tern	Gulls and terns	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES
47.	Hydroprogne caspia	Caspian tern	Gulls and terns	Least Concern (LC)	64.85, 40.04 64.70, 40.09 64.52, 40.00 64.44, 39.85 64.29, 39.81 64.34, 39.76 64.37, 39.75	Kyzyltepa District Gijduvon District Vobkent District Bukhara District Bukhara District Bukhara District Bypass Bukhara District Bypass	YES

WPE= Waterbird Population Estimates

(Source: Wetlands International WPE Database, wpp.wetlands.org, accessed June 2026)



Appendix 12. Socioeconomic Parameters of the Project Area

Table 48: Bukhara Province – Socioeconomic Baseline Data (2023–2026)

#	Indicator	2023	2024	2025	2026
EMPLOYMENT					
1	Permanent population of working age, thousand people [a]	1,083.1	1,084.8	—	1,092.0
2	Employment rate, % [b]	68.7%	68.6%	—	78.3%
3	Unemployment rate, % [a]	6.5%	5.4%	—	5.4%
4	Economically active population, thousand people [a]	858.8	853.5	—	853.5
5	Economically inactive population, thousand people [a]	230.4	238.5	—	238.5
6	People employed in the economy, thousand people [a]	803.2	807.8	—	807.8
7	Unemployed people, thousand people [a]	55.6	45.7	—	45.7
8	– of which employed in agriculture [a]	228.8	224.8	—	—
9	– of which employed in industry [a]	95.9	91.3	—	—
10	– of which employed in construction [a]	110.1	103.9	—	—
11	– of which employed in education [a]	75.9	77.5	—	—
12	– of which employed in healthcare [a]	40.2	43.2	—	—
13	– employed in state sector [a]	436.0	451.6	—	—
14	– employed in non-state sector [a]	367.2	356.2	—	—
15	Average nominal wage (UZS/month) [b, d]	3,883,868	4,343,931	5,093,118	5,472,055 (Jan–Mar 2026)
16	Minimum wage (UZS/month) [c]	980,000 → 1,050,000	1,155,000	1,271,000	1,271,000 (until Sept. 2026) 1,360,000 (from Sept. 2026)
17	Total income per capita, thousand UZS [b]	25,341.6	29,918.8	35,176.2	—
18	Poverty rate, % [b]	11.8%	8.7%	6.0%	—
19	Active enterprises, units [a]	—	—	—	35,223 (01.05.2026)
HOUSEHOLD STRUCTURE					
20	Number of households, thousand [b]	418.1	419.6	424.8	—
21	Households with 5 or more members, % [b]	58.8%	65.6%	63.0%	—
22	Households with children under 16, % [b]	71.9%	76.0%	75.0%	—
23	Households with 4 or more children, % [b]	4.5%	6.1%	6.2%	—

#	Indicator	2023	2024	2025	2026
24	Population with higher education (25+), % [b]	16.7%	14.8%	14.6%	—
25	Population with secondary vocational education (25+), % [b]	42.3%	48.1%	42.5%	—
HEALTHCARE					
26	Hospital facilities, units [a]	66	134	—	—
27	Doctors, people [a]	6,618	6,719	—	—
28	– of them female [a]	3,105	3,010	—	—
29	Paramedical staff, people [a]	535	22,632	—	—
30	Registered respiratory disease cases [a]	243,617	209,705	—	—
EDUCATION					
31	Pre-school institutions, units [a]	621	2,153	—	—
32	General education schools, units [a]	583	588	—	—
33	General education school pupils [a]	337,685	342,820	—	—
34	Academic lyceums, units [a]	5	5	—	—
35	Vocational schools, units [a]	20	20	—	—
36	Vocational school students [a]	4,647	12,857	—	—
37	Higher education institutions, units [a]	— *	13	13	13
38	Higher education students [a]	— *	—	10,755	—
HOUSING STOCK					
39	Total housing units [g]	—	—	—	462,390 (01.01.2026)
40	Apartments in multi-family buildings [b]	—	—	—	85,037 (01.01.2026)
41	Individual houses [b]	—	—	—	377,353 (01.01.2026)
SOCIAL PROTECTION AND PENSIONS					
42	People with disabilities receiving pensions/benefits, thousand [d]	51.5	54.4	57.3	—
43	– of them women [d]	23.6	24.7	28.9	—
44	– of them men [d]	27.9	29.8	28.4	—
45	Total pension and social benefit recipients, thousand [d]	259.6	272.3	298.4	—
46	– of them women [d]	152.3	158.4	169.4	—
47	Pension recipients, thousand [d]	223.7	269.9	—	—
48	Average age pension (UZS) [d]	1,245,314	1,443,631	—	—
49	Average disability pension (UZS) [d]	1,270,390	1,464,176	—	—
50	Average pension: Group I disability (UZS) [d]	1,398,584	1,603,862	—	—

#	Indicator	2023	2024	2025	2026
51	Average pension: Group II disability (UZS) [d]	1,291,169	1,484,703	—	—
52	Average pension: Group III disability (UZS) [d]	895,146	1,023,030	—	—
53	Average pension: loss of breadwinner (UZS) [d]	1,116,157	1,317,041	—	—
54	Average social benefit (UZS) [d]	758,558	834,384	—	—
55	Average length-of-service pension (UZS) [d]	2,988,863	3,546,115	—	—

[a] Bukhara Province Department of National Statistics Committee of Uzbekistan⁴.

[b] National Statistics Committee of Uzbekistan (Letter #01/3-02-07-192, dated 20.05.2026, Appendix 12).

[c] The Government Portal of the Republic of Uzbekistan⁵:

- From 01.04.2023, minimum wage is UZS 980,000 as per Presidential Decree UP-45 of 28.03.2023⁶)
- From 01.12.2023, minimum wage is UZS 1,050,000 as per Presidential Decree UP-196 of 17.11.2023⁷)
- From 01.10.2024, minimum wage is UZS 1,155,000 as per Presidential Decree UP-108 of 12.08.2024⁸)
- From 01.08.2025, minimum wage is UZS 1,271,000 as per Presidential Decree No. UP-115 of 23.06.2026⁹
- From 01.09.2026, minimum wage is UZS 1,360,000 as per Presidential Decree No. UP-91 of 02.06.2025¹⁰

[d] Gender Statistics Department, National Statistics Committee of the Republic of Uzbekistan¹¹.

Table 49: Navoi Province – Socioeconomic Baseline Data (2023–2026)

#	Indicator	2023	2024	2025	2025/2026
POPULATION					
1	Total permanent population (thousand)	1,055.5	1,075.3	1,094.7	1,111.9 (01.01.2026)
2	– Male (thousand)	534.8	544.8	554.7	563.2 (01.01.2026)
3	– Female (thousand)	520.6	530.4	540.0	548.7 (01.01.2026)
5	Population density, persons/km ² [a]	—	—	10.0	10.2 (01.01.2026)
6	Births (Navoi Province)	26,805	25,763	24,127	—
7	Deaths (Navoi Province)	4,588	4,881	4,781	—
8	Natural population growth	22,217	20,882	19,346	—
9	Net migration balance (Navoi Province)	–2,406	–1,445	–2,153	—
AGE STRUCTURE (as of 01.01.2026) [a]					
19	Children aged 0–15 (thousand)	—	—	—	347,063 (31.2%)

⁴ FOOTNOTE #23

⁵ The Government Portal of the Republic of Uzbekistan, Minimum Wage, (<https://gov.uz/en/advice/673/document/2934> (accessed June 2026)

⁶ Presidential Decree No. UP-45 of 28.03.2023, On Increasing Wages, Pensions, and Social Benefits, <https://lex.uz/ru/docs/6417215> (accessed June 2026)

⁷ Presidential Decree No. UP-196 of 17.11.2023, On Increasing Wages, Pensions, and Social Benefits, <https://lex.uz/ru/docs/6665687> (accessed June 2026)

⁸ Presidential Decree No. UP-108 of 12.08.2024, On Increasing Wages, Pensions, and Social Benefits, <https://lex.uz/ru/docs/7059452> (accessed June 2026)

⁹ Presidential Decree No. UP-91 of 02.06.2025, On Increasing Wages, Pensions, Stipends, and Social Benefits, <https://www.lex.uz/acts/7553336> (accessed June 2026)

¹⁰ Presidential Decree No. UP-115 of 23.06.2026, On Increasing Wages, Pensions, Stipends, and Social Benefits, <https://lex.uz/ru/docs/8283680> (accessed June 2026)

¹¹ Gender Statistics Department, National Statistics Committee of the Republic of Uzbekistan, www.gender.stat.uz (accessed June 2026)



#	Indicator	2023	2024	2025	2025/2026
11	Working-age population 16–59 (thousand)	—	—	—	649,272 (58.4%)
12	Population aged 60 and above (thousand)	—	—	—	115,563 (10.4%)
13	Marriages registered (Navoi Province)	7,951	7,538	7,334	—
14	Divorces registered (Navoi Province)	1,492	1,258	1,376	—
INCOME AND POVERTY [b]					
15	Total population income (billion UZS)	35,412.5	41,771.5	49,311.1	—
16	Income growth rate (% vs prior year)	117.2%	118.0%	118.0%	—
17	Per capita income (thousand UZS)	33,238.7	38,499.1	44,694.2	—
18	Per capita income growth rate (%)	114.9%	115.8%	116.1%	—
19	Poverty rate (%) [c]	7.6%	5.7%	4.2%	—
20	Primary income share (incl. labour & property)	87.1%	86.8%	86.4%	—
21	of which: wages from employment	39.3%	38.1%	38.3%	—
22	of which: self-employment income	41.0%	40.3%	39.6%	—
23	of which: property income	1.8%	1.8%	2.7%	—
24	Transfer payments share	12.9%	13.2%	13.6%	—
HOUSEHOLD STRUCTURE [b]					
25	Number of households (thousand)	245.1	248.8	263.6	—
26	Households with 5 or more members (%)	41.0%	47.5%	38.1%	—
27	Households with children under 16 (%)	66.2%	65.6%	62.3%	—
28	Households with 4 or more children (%)	2.9%	4.6%	2.1%	—
29	Population with higher education, 25+ (%)	18.9%	17.1%	17.1%	—
30	Population with secondary vocational education, 25+ (%)	32.8%	44.3%	46.8%	—
HEALTHCARE [a]					
31	Hospital facilities (units)	40	44	—	—
32	Doctors (persons)	3,236	3,337	—	—
33	– of which female	1,362	1,361	—	—
34	Paramedical staff (persons)	15,620	14,988	—	—
35	Registered respiratory disease cases	126,290	150,721	—	—
EDUCATION [a]					
36	Pre-school institutions	1,385	1,466	—	—
37	General education schools	379	384	—	—



#	Indicator	2023	2024	2025	2025/2026
38	General education school pupils	192,027	194,687	—	—
39	Academic lyceums	3	3	—	—
40	Academic lyceum pupils	579	572	—	—
41	Vocational schools	11	11	—	—
42	Vocational school students	3,274	3,217	—	—
43	Higher education institutions	—	4	4	4
44	Higher education students	—	—	5,735	—

(Source: National Statistics Committee of Uzbekistan (Letter #01/3-02-07-192, dated 20.05.2026))

Table 50: Population and Demographic Indicators – Project Districts (2025–2026)

Indicator	Gijduvon	Bukhara	Jondor	Vobkent	Karakul	Alat
GEOGRAPHY						
Area (km²)	3,840.7	1,297.3	5,172.0	394.5	6,954.1	3,225.7
Population 01.01.2026 (thousand)	331.9	185.0	191.9	154.0	176.4	107.3
Population density (persons/km²)	86.4	142.6	37.1	390.4	25.4	33.3
Urban population (thousand)	96.3	41.9	36.9	29.7	67.4	40.2
Rural population (thousand)	235.6	143.1	155.0	124.3	109.0	67.1
Rural share (%)	71.0%	77.4%	80.8%	80.7%	61.8%	62.5%
POPULATION DYNAMICS (2025)						
Births	7,391	3,912	4,284	3,742	3,666	2,334
Deaths	1,547	768	783	582	808	509
Natural growth	5,844	3,144	3,501	3,160	2,858	1,825
In-migrants	646	1,582	342	401	321	186
Out-migrants	2,063	1,454	732	787	1,041	473
Net migration balance	-1,417	+128	-390	-386	-720	-287
Marriages registered	2,347	1,203	1,452	1,112	1,293	798
Divorces registered	424	201	137	131	192	129
Divorce/marriage ratio	18.1%	16.7%	9.4%	11.8%	14.8%	16.2%
AGE STRUCTURE (01.01.2025)						
Children 0–15 (%)	31.6%	28.0%	30.8%	30.0%	30.5%	29.7%
Working-age 16–59 (%)	58.6%	60.7%	58.3%	59.8%	59.3%	60.0%
Aged 60 and above (%)	9.8%	11.3%	10.9%	10.2%	10.2%	8.7%

(Source: National Statistics Committee of Uzbekistan (Letter #01/3-02-07-192, dated 20.05.2026))

Table 51: Economic Output Indicators – Project Districts (2023–2026)

Indicator	Gijduvon	Bukhara	Jondor	Vobkent	Karakul	Alat
INDUSTRIAL OUTPUT (billion UZS)						

Indicator	Gijduvon	Bukhara	Jondor	Vobkent	Karakul	Alat
2023	2,102.8	892.9	1,025.0	806.1	1,250.0	401.2
2024	2,744.1	1,215.5	1,573.6	1,245.0	1,108.2	915.4
2025	3,182.8	1,412.3	1,707.0	1,366.3	1,293.7	1,112.0
2026 (Jan–Mar)	1,127.3	298.1	342.5	349.1	262.2	334.4
Growth rate 2025 (PVI %)	107.4%	106.6%	107.1%	103.6%	108.5%	105.1%
Growth rate 2026 Q1 (PVI %)	113.8%	108.1%	107.8%	114.2%	107.2%	108.6%
AGRICULTURAL OUTPUT (billion UZS, incl. forestry & fisheries)						
2023	4,391.6	4,097.6	4,986.2	3,364.2	3,698.1	2,726.3
2024	4,845.5	4,547.1	5,506.1	3,771.4	3,940.9	2,870.0
2025	5,375.7	4,947.6	6,119.6	4,155.8	4,530.9	3,367.9
2026 (Jan–Mar)	536.1	681.2	763.6	445.3	495.6	428.3
Growth rate 2025 (%)	101.6%	103.6%	104.6%	104.2%	104.5%	105.7%
Ag/Industrial output ratio 2025	1.7×	3.5×	3.6×	3.0×	3.5×	3.0×

(Source: National Statistics Committee of Uzbekistan (Letter #01/3-02-07-192, dated 20.05.2026))

Table 52: Social Infrastructure Indicators – Project Districts (2024–2026)

Indicator	Gijduvon	Bukhara	Jondor	Vobkent	Karakul	Alat
HOUSING STOCK (01.01.2026)						
Total housing units	64,119	43,422	39,811	31,245	35,896	22,577
– apartments in multi-family buildings	2,422	5,359	1,173	625	1,735	694
– individual houses	61,697	38,063	38,638	30,620	34,161	21,883
Individual house share (%)	96.2%	87.7%	97.1%	98.0%	95.2%	96.9%
EDUCATION (2024/2025 academic year)						
Pre-school institutions	438	124	197	154	110	96
General education schools	76	56	52	44	58	38
General education pupils	55,526	24,078	31,556	22,286	29,341	17,265
Vocational school students	2,350	791	1,183	1,259	776	578
HEALTHCARE (2024)						
Hospital facilities	10	17	3	5	6	4
Doctors	488	282	370	249	324	194
Doctor-to-population ratio (per 1,000)	1.5	1.6	2.0	1.6	1.9	1.8
Paramedical staff	2,416	903	1,589	1,474	1,654	1,180
Respiratory disease cases (2024)	34,592	10,099	18,494	12,157	16,281	7,632
MARRIAGES AND FAMILY STRUCTURE (2025)						
Marriages	2,347	1,203	1,452	1,112	1,293	798
Divorces	424	201	137	131	192	129
Marriage rate per 1,000	7.1	6.5	7.6	7.2	7.3	7.4

(Source: National Statistics Committee of Uzbekistan (Letter #01/3-02-07-192, dated 20.05.2026))



Table 53: Population Change Indicators

Administrative Unit	Kyzyltepa District			Kyzyltepa city		
	2023-2024	2024-2025	2025-2026	2023-2024	2024-2025	2025-2026
Permanent Population Total as of the start of the year	159,195	161,783	164,586	12,814	12,935	13,082
Births Total	3,788	3,890	3,775	320	325	280
Deaths Total	631	684	708	107	111	91
In-migration	372	703	821	84	148	167
Out-migration	941	1,106	1,336	176	215	169
Permanent Population Total as of the end of the year	161,783	164,586	167,138	12,935	13,082	13,269
Male	81,801	83,332	84,690	6,563	6,650	6,738
Female	79,982	81,254	82,448	6,372	6,432	6,531

(Source: National Statistics Committee of Uzbekistan (Letter #01/3-02-07-192, dated 20.05.2026))

Table 54: Age-group Population Structure – Kyzyltepa District

Age Group	Population as of 01.01.2024	Population as of 01.01.2025	Population as of 01.01.2026
Total	161,783	164,586	167,138
0–2	10,904	11,126	11,343
3–5	9,518	10,000	10,377
6–7	5,826	5,957	6,192
8–15	21,481	22,258	22,219
16–17	4,959	4,700	5,013
18–19	4,644	4,786	4,942
20–24	10,675	10,703	10,978
25–29	13,037	12,148	11,046
30–34	14,868	14,510	14,958
35–39	13,103	13,917	13,833
40–49	20,612	21,065	21,260
50–59	16,004	16,233	16,776
60–69	11,748	12,357	12,810
70–74	2,382	2,747	3,191
75–79	980	1,115	1,219
80–84	609	506	578
85+	433	458	403

(Source: National Statistics Committee of Uzbekistan (Letter #01/3-02-07-192, dated 20.05.2026))

Table 55: Registered Marriages by Urban/Rural Breakdown (2023–2025)

Region / District	2023			2024			2025		
	Marriages	Urban	Rural	Marriages	Urban	Rural	Marriages	Urban	Rural
Navoi Province	7,951	4,163	3,788	7,538	3,972	3,566	7,334	3,631	3,703



Region / District	2023			2024			2025		
	Marriages	Urban	Rural	Marriages	Urban	Rural	Marriages	Urban	Rural
Kyzyltepa District	1,203	363	840	1,122	347	775	1,116	340	776

(Source: National Statistics Committee of Uzbekistan (Letter #01/3-02-07-192, dated 20.05.2026))

Table 56: Registered Divorces by Urban/Rural Breakdown (2023–2025)

Region / District	2023			2024			2025		
	Divorces Total	Urban	Rural	Divorces Total	Urban	Rural	Divorces Total	Urban	Rural
Navoi Province	1,492	883	609	1,258	707	551	1,376	803	573
Kyzyltepa District	181	67	114	169	47	122	160	56	104

(Source: National Statistics Committee of Uzbekistan (Letter #01/3-02-07-192, dated 20.05.2026))

Table 57: Pre-school educational institutions

Region / District	2023/2024	2024/2025
Navoi Province	1,385	1,466
Kyzyltepa District	197	216

(Source: National Statistics Committee of Uzbekistan (Letter #01/3-02-07-192, dated 20.05.2026))

Table 58: General Secondary Schools and Pupil Enrolment

Region / District	2023/2024		2024/2025	
	Institutions	Pupils	Institutions	Pupils
Navoi Province	379	192,027	384	194,687
Kyzyltepa District	33	22,802	44	24,357

(Source: National Statistics Committee of Uzbekistan (Letter #01/3-02-07-192, dated 20.05.2026))

Table 59: Vocational and Technical Schools

Region / District	2023/2024		2024/2025	
	Institutions	Students	Institutions	Students
Navoi Province	11	3,274	11	3,217
Kyzyltepa District	1	343	2	446

(Source: National Statistics Committee of Uzbekistan (Letter #01/3-02-07-192, dated 20.05.2026))



Table 60: Healthcare personnel – Kyzyltepa District vs. Navoi Province (2023–2024)

Region / District	2023 Hospitals	2023 Doctors	incl. Women	2023 Mid-level Staff	incl. Women	2024 Hospitals	2024 Doctors	incl. Women	2024 Mid-level Staff
Navoi Region	40	3,236	1,362	15,620	14,424	44	3,337	1,361	14,988
Kyzyltepa District	3	271	117	1,939	1,843	3	285	145	1,625

(Source: National Statistics Committee of Uzbekistan (Letter #01/3-02-07-192, dated 20.05.2026))

Table 61: Summary of Key Socio-Economic Indicators for Kyzyltepa District

Indicator	Value	Reference / Year
Total land area	2,185.19 km ²	01.01.2026
Permanent population	167,138 persons	01.01.2026
– Male	84,690	01.01.2026
– Female	82,448	01.01.2026
Natural population growth (births – deaths)	+3,067	2025
Registered marriages	1,116	2025
Registered divorces	160	2025
Pre-school institutions	216	2024/2025
General schools / pupils	44 / 24,357	2024/2025
Vocational schools / students	2 / 446	2024/2025
Hospital institutions	3	2024
Physicians	285	2024
Respiratory disease incidence	11,817 persons	2024
Total housing units	33,953	01.01.2026
– Individual houses	31,585 (93%)	01.01.2026
Industrial output	389.8 bn UZS (0.5% of region)	Q1 2026
Agricultural output	4,791.9 bn UZS	2025*
Active enterprises	3,432 (14.1% of region)	01.05.2026

(Source: National Statistics Committee of Uzbekistan (Letter #01/3-02-07-192, dated 20.05.2026))

Appendix 13. Household Survey Findings

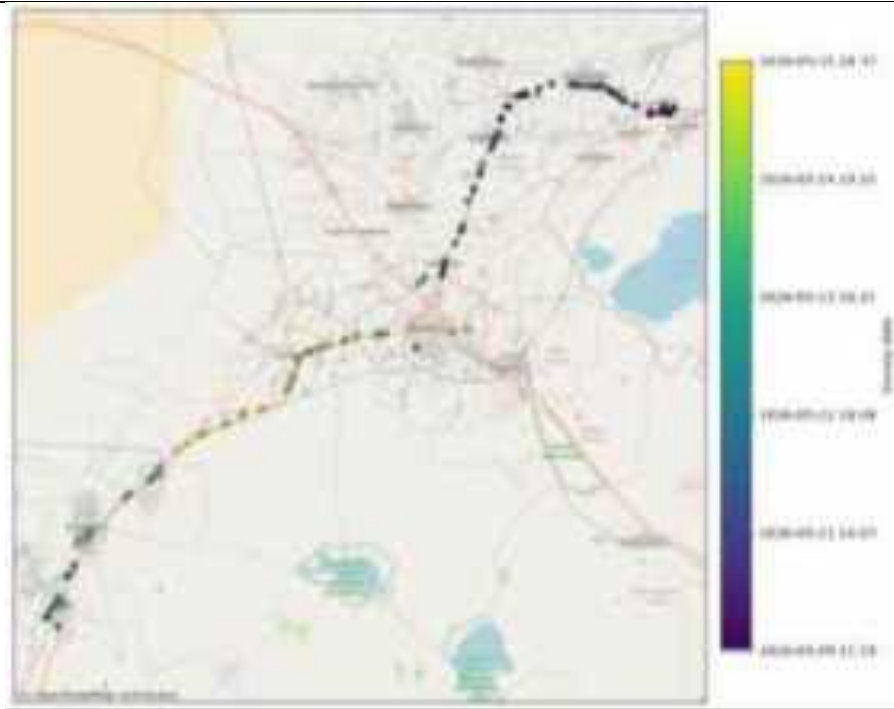


Figure 34: Survey Locations Map
(Source: ESIA)

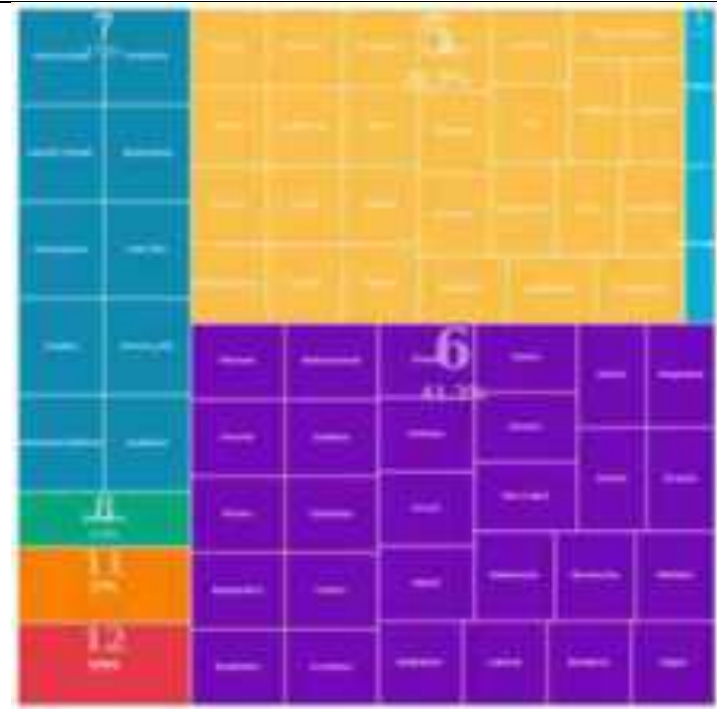


Figure 35: Communities by Survey Count
(Source: ESIA)

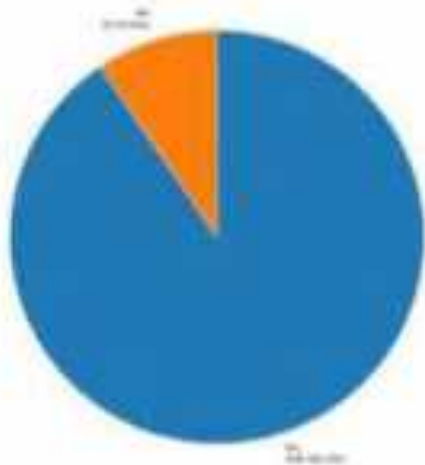


Figure 36: Project Awareness of Respondents

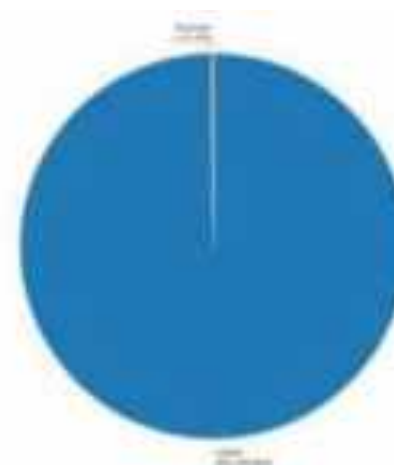


Figure 37: Survey Language



Figure 38: Distribution of Households by Region

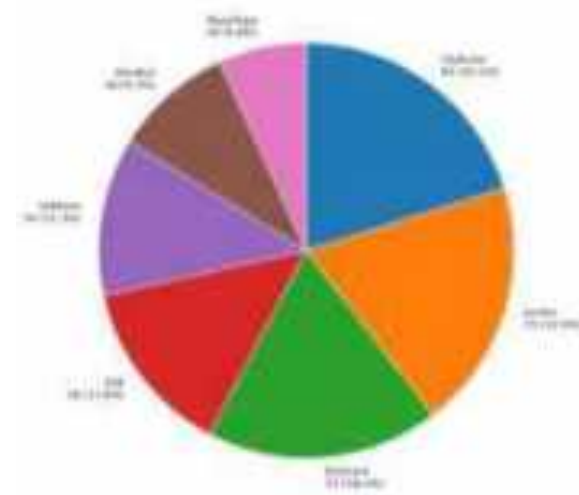


Figure 39: Proportion of Surveyed Districts

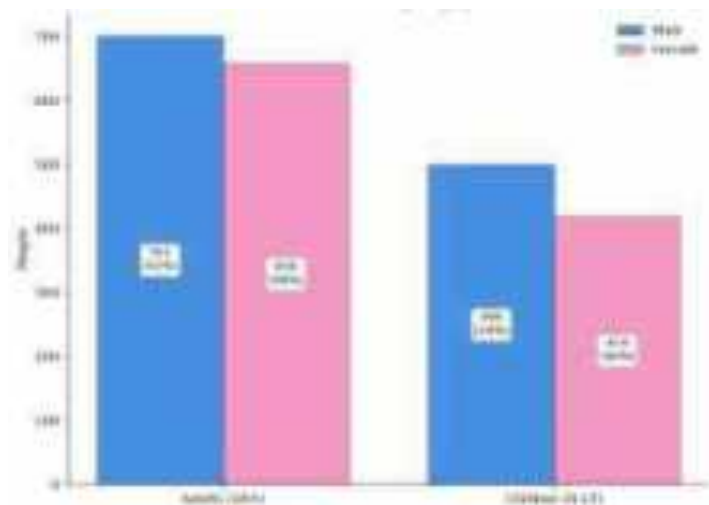


Figure 40: Overall Surveyed Population

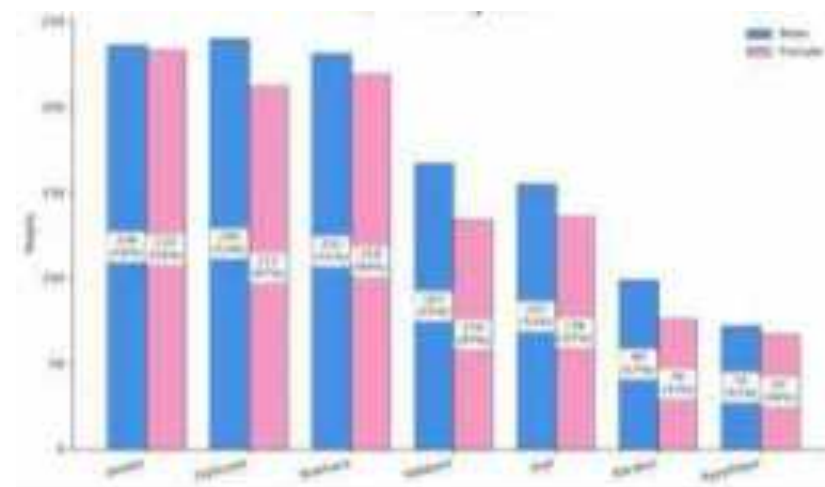


Figure 41: Gender Composition by District

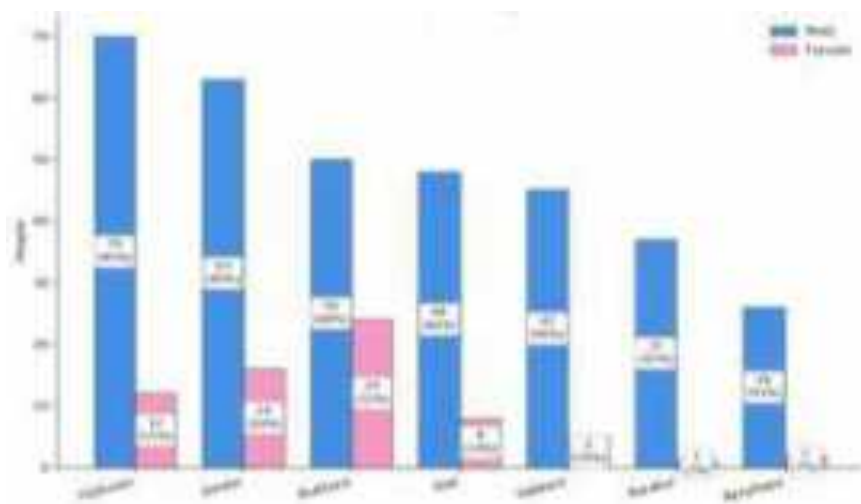


Figure 42: Proportion of Respondents by Gender

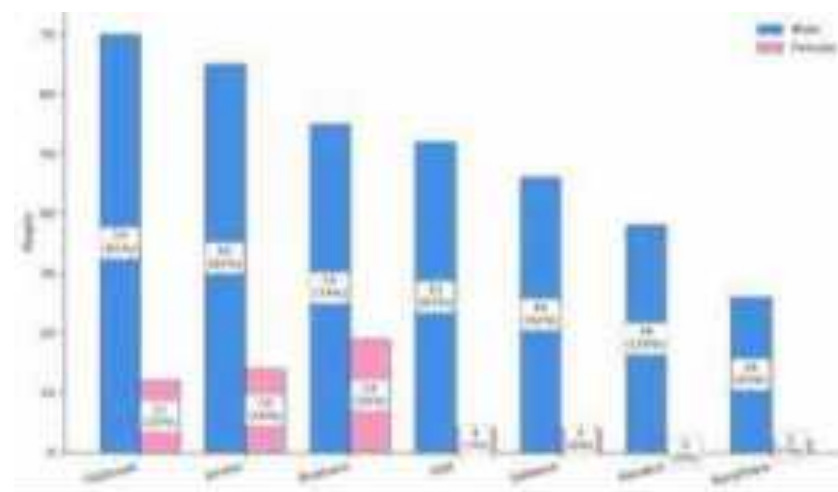


Figure 43: Household Head Gender

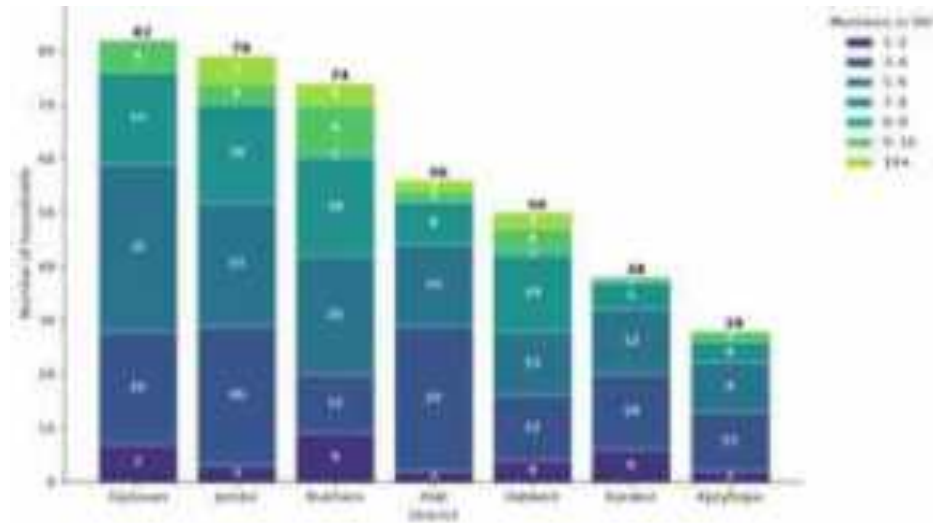


Figure 44: Number of Households by Size

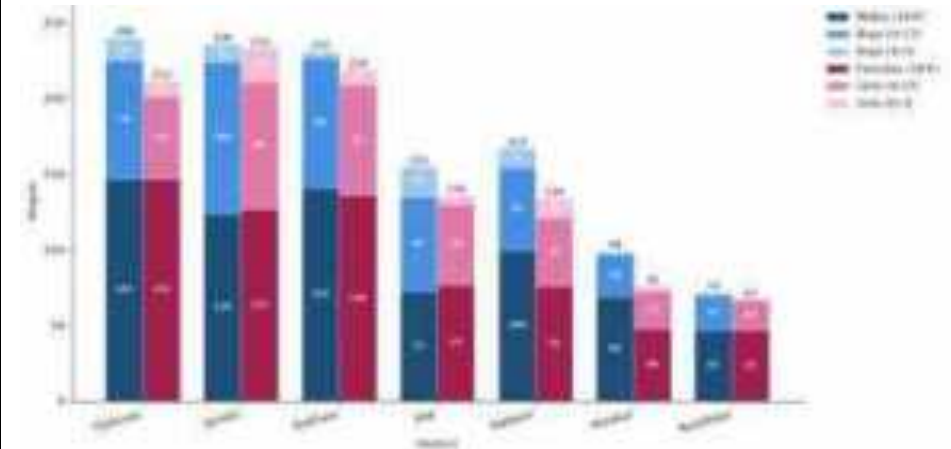


Figure 45: Household Composition

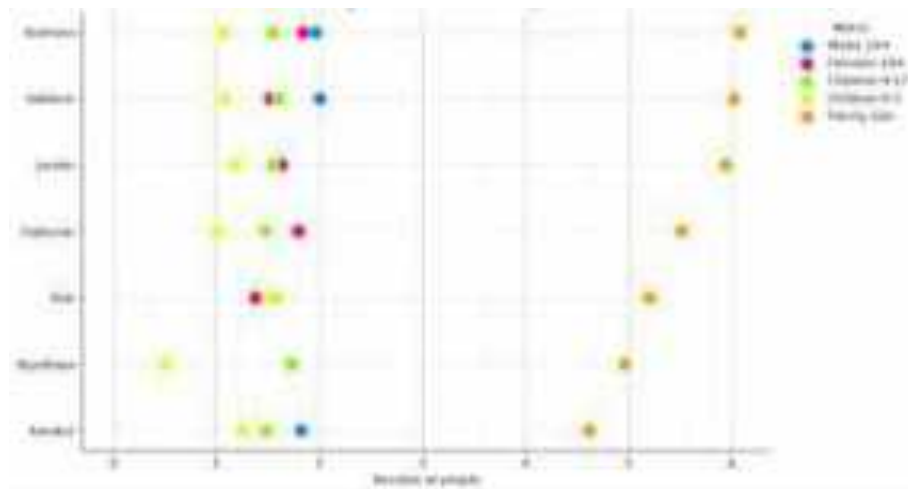


Figure 46: Average Household Size by Mean



Figure 47: Average Household Size by Actual

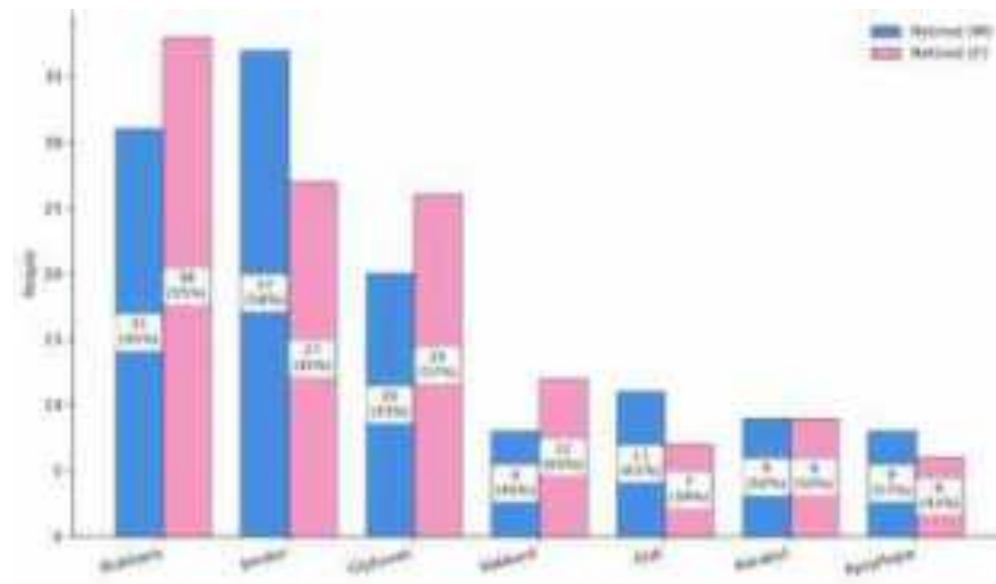


Figure 48: Number of Retired People by Gender

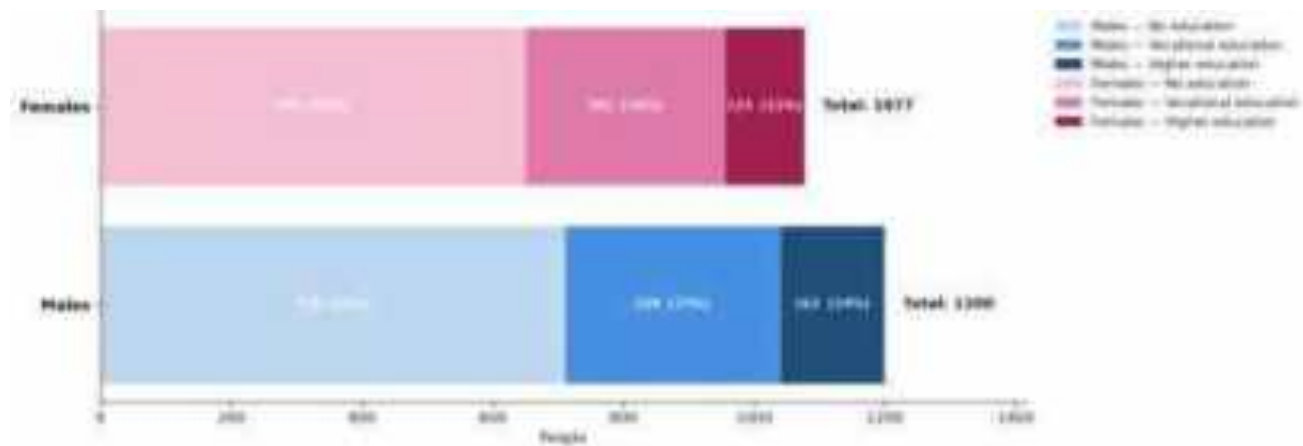


Figure 49: Overall Education Level of Respondents by Gender

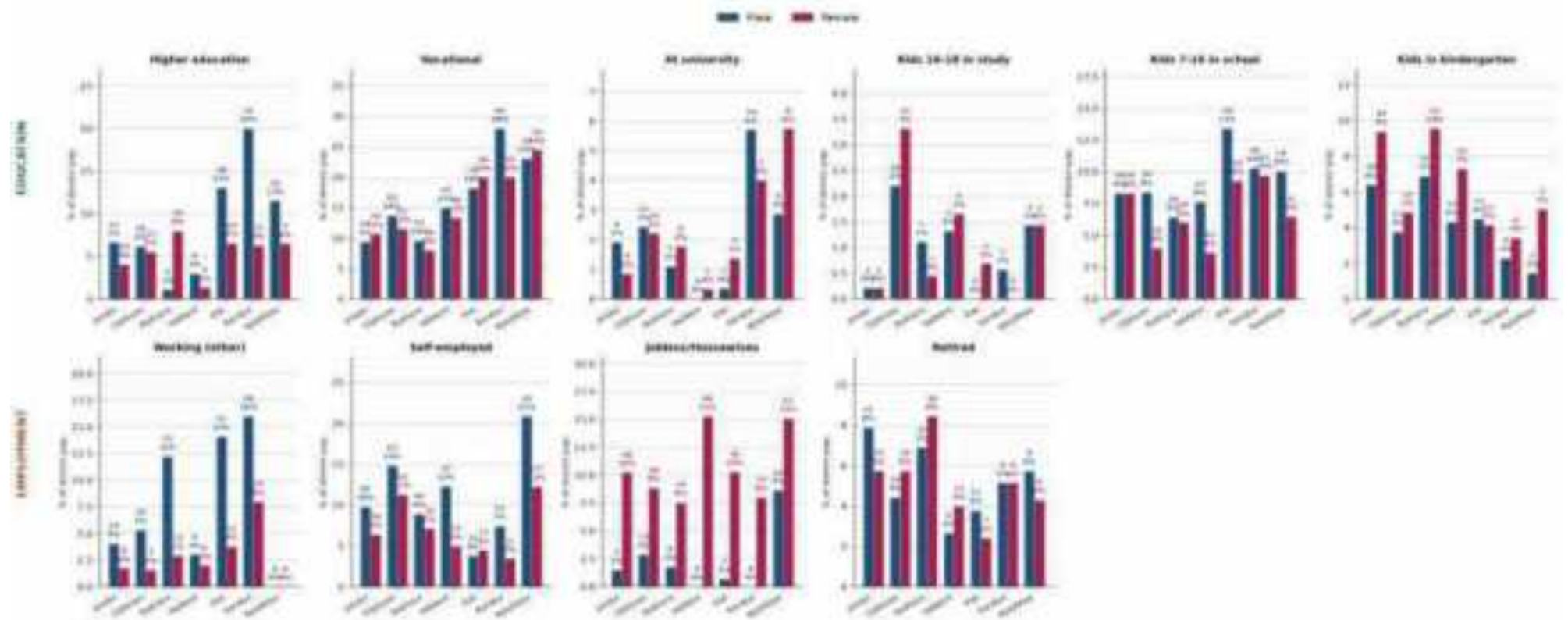


Figure 50: Education and Employment (gender-split)

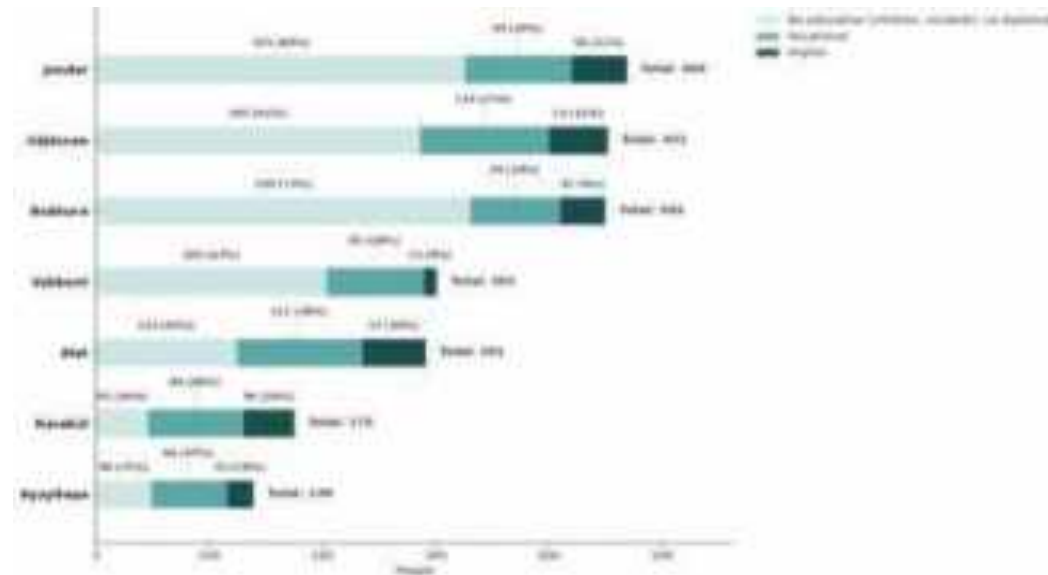


Figure 51: Education Level of respondents by District

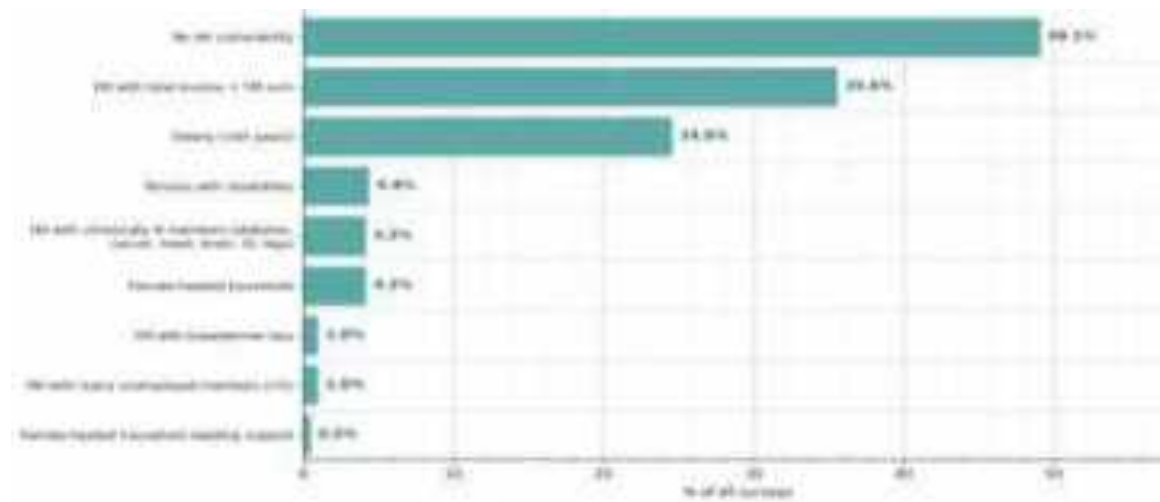


Figure 52: Household Vulnerability Categories

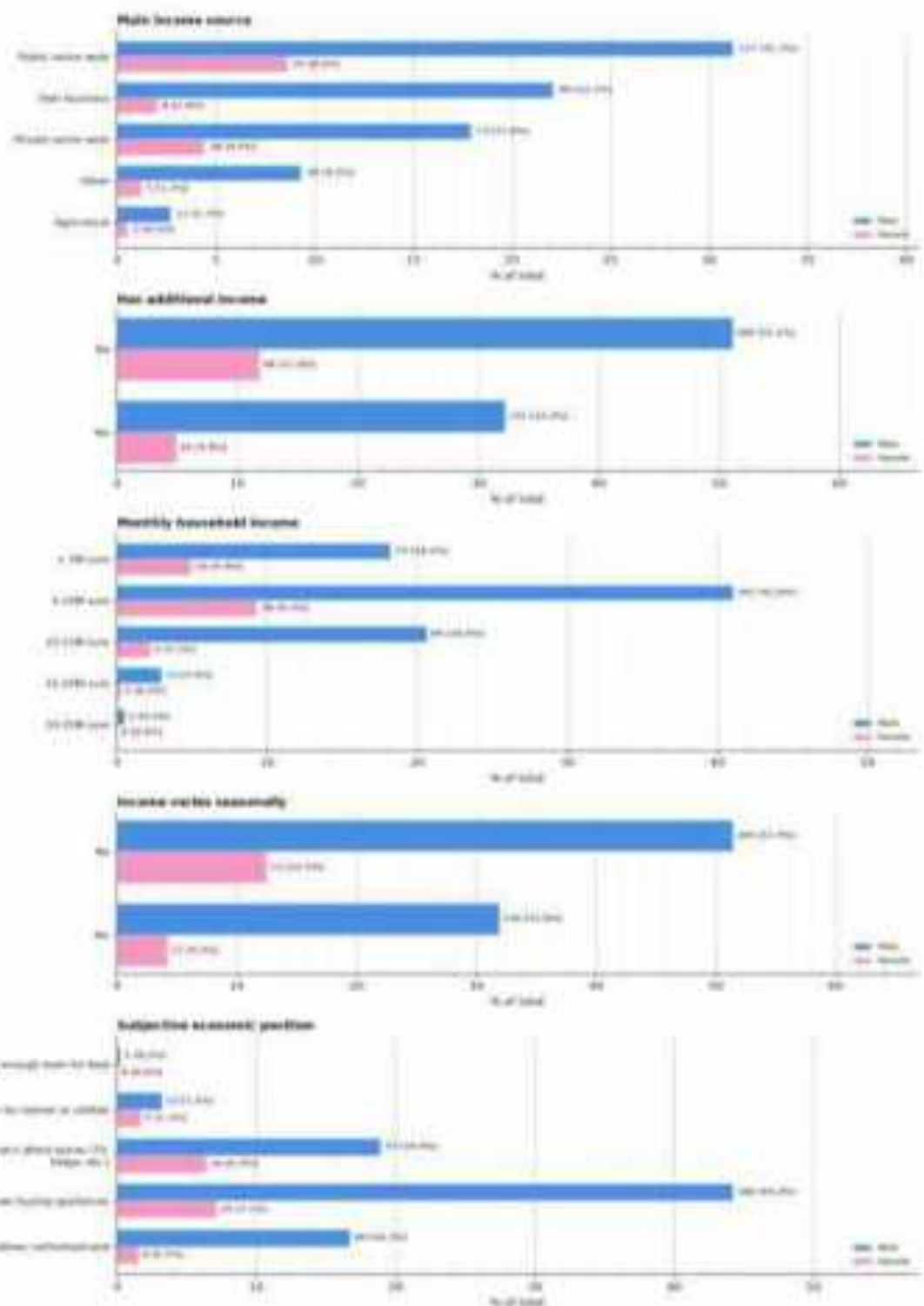


Figure 53: Income and Economic Overview

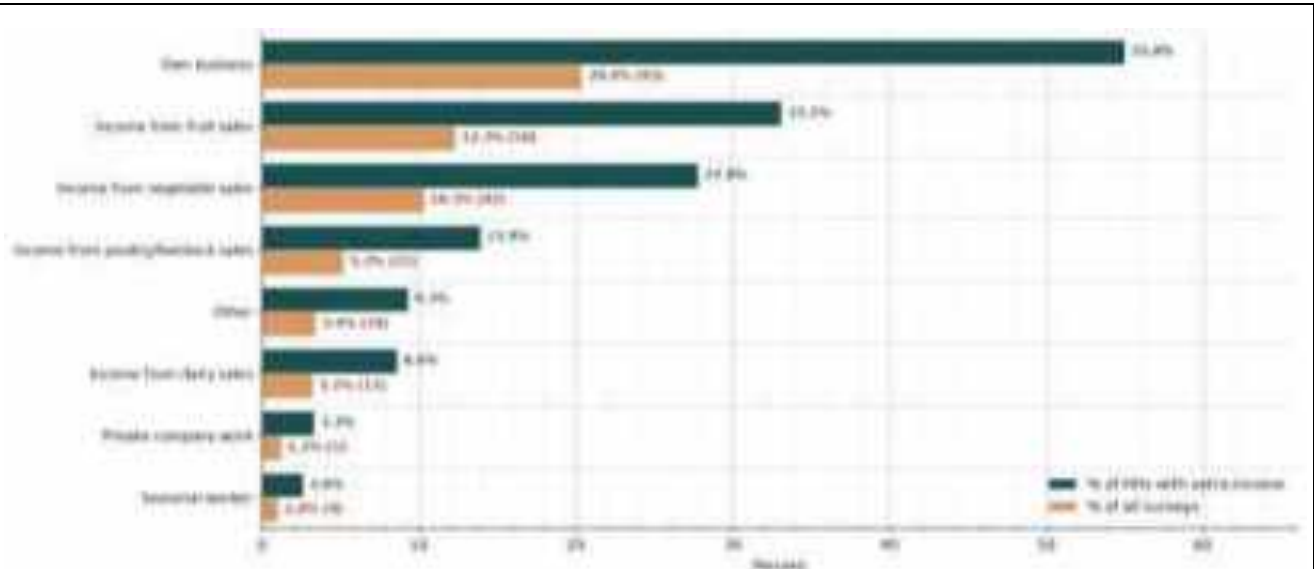


Figure 54: Additional Income Source of Respondents

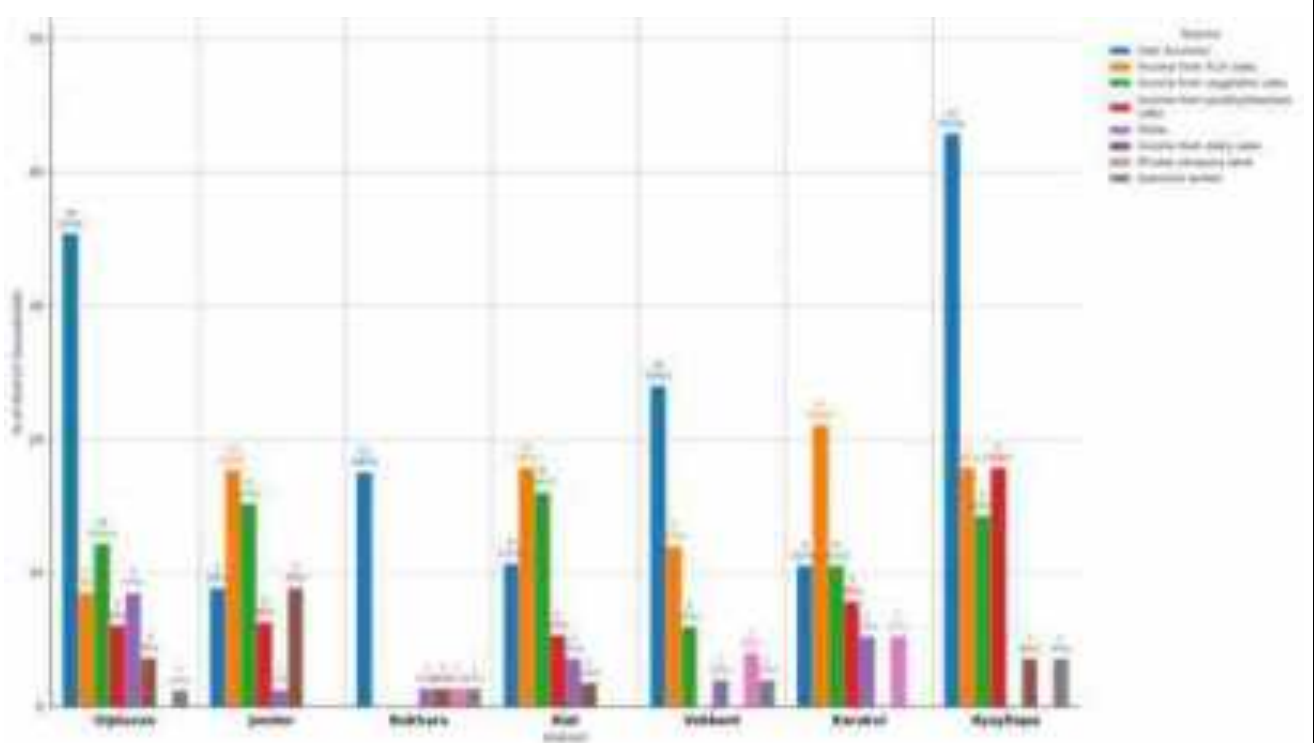


Figure 55: Additional Income Sources by District

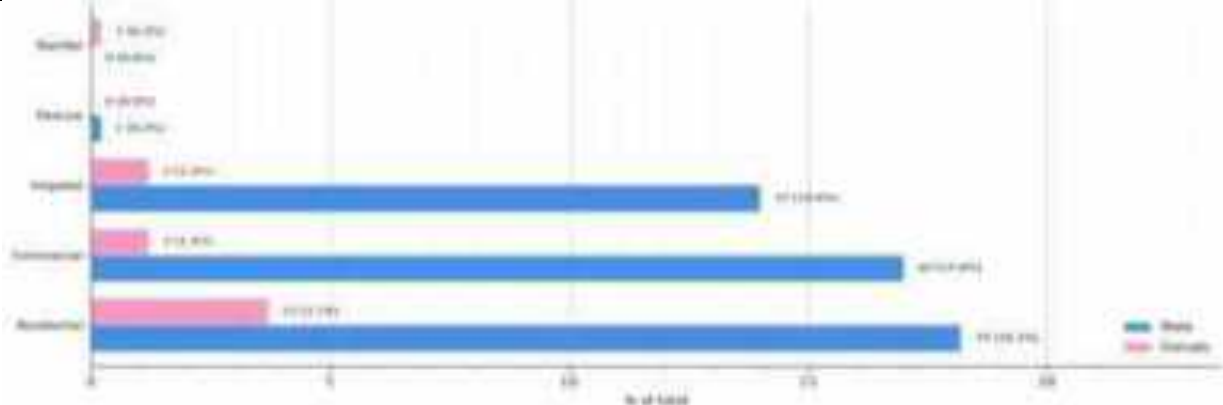


Figure 56: Selected Land Types by Gender

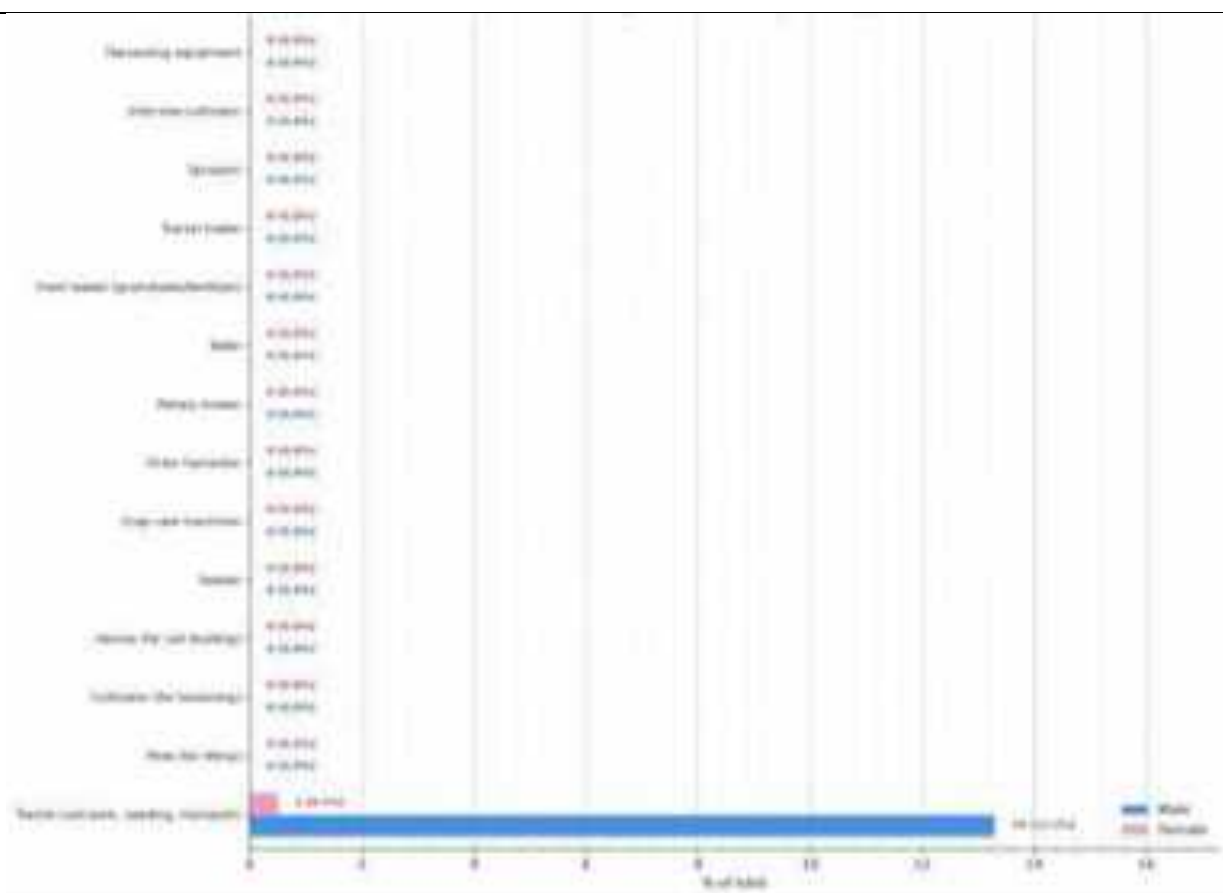


Figure 57: Agricultural Equipment Types

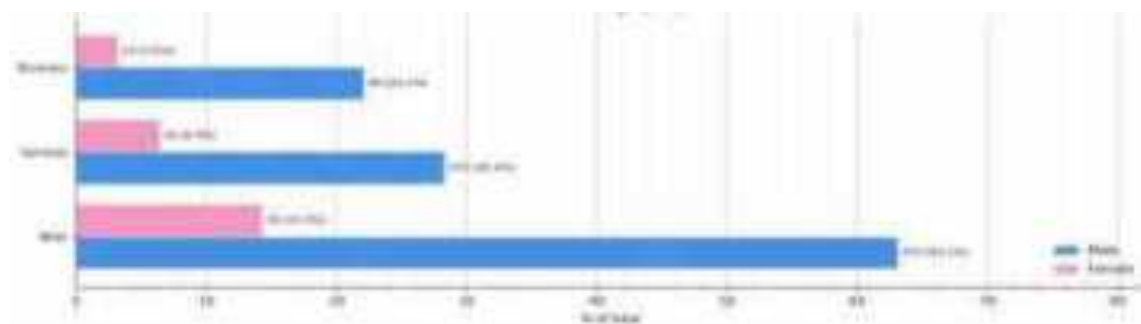


Figure 58: Road Usage Purposes

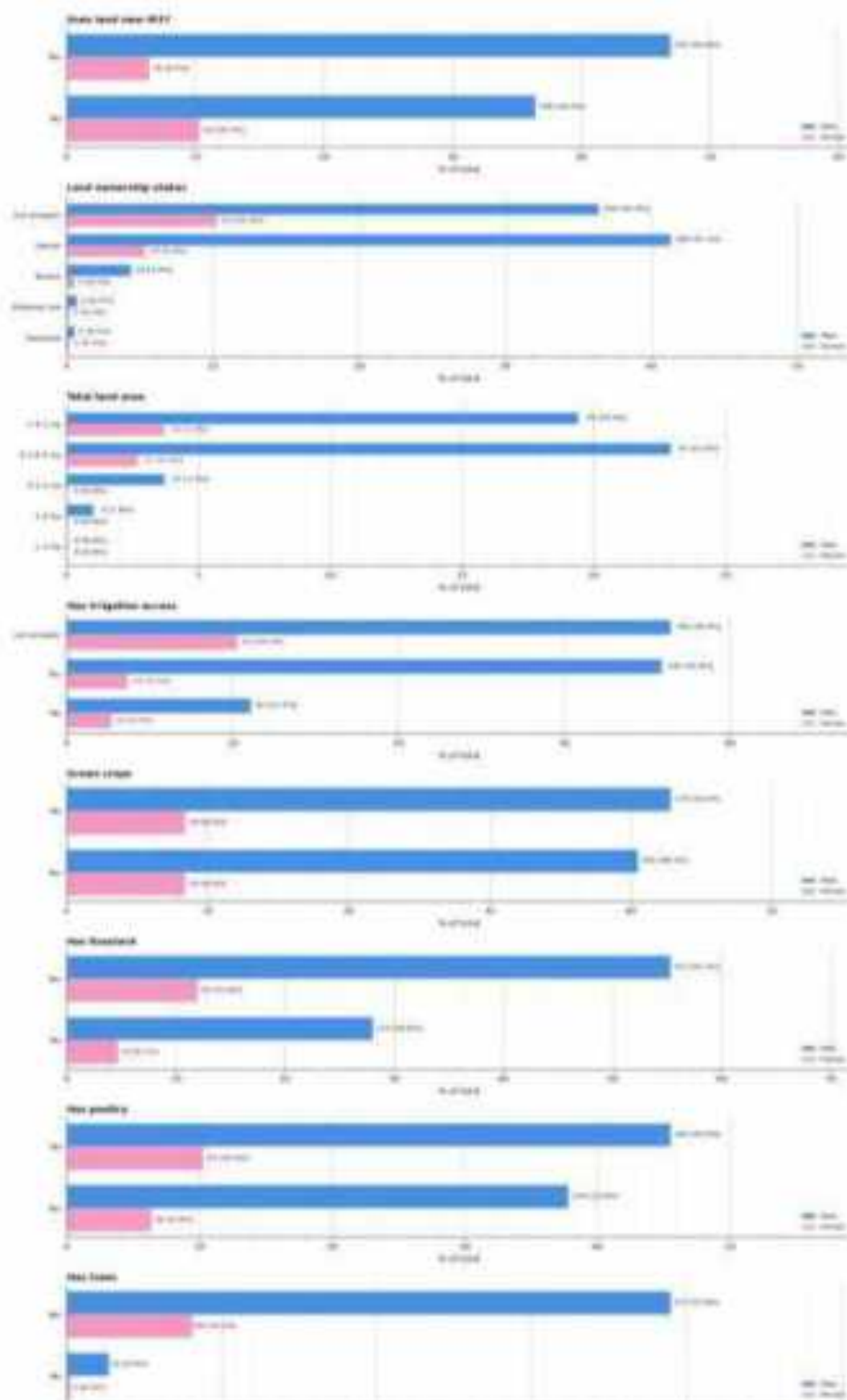


Figure 59: Land and Agriculture Overview – part 1

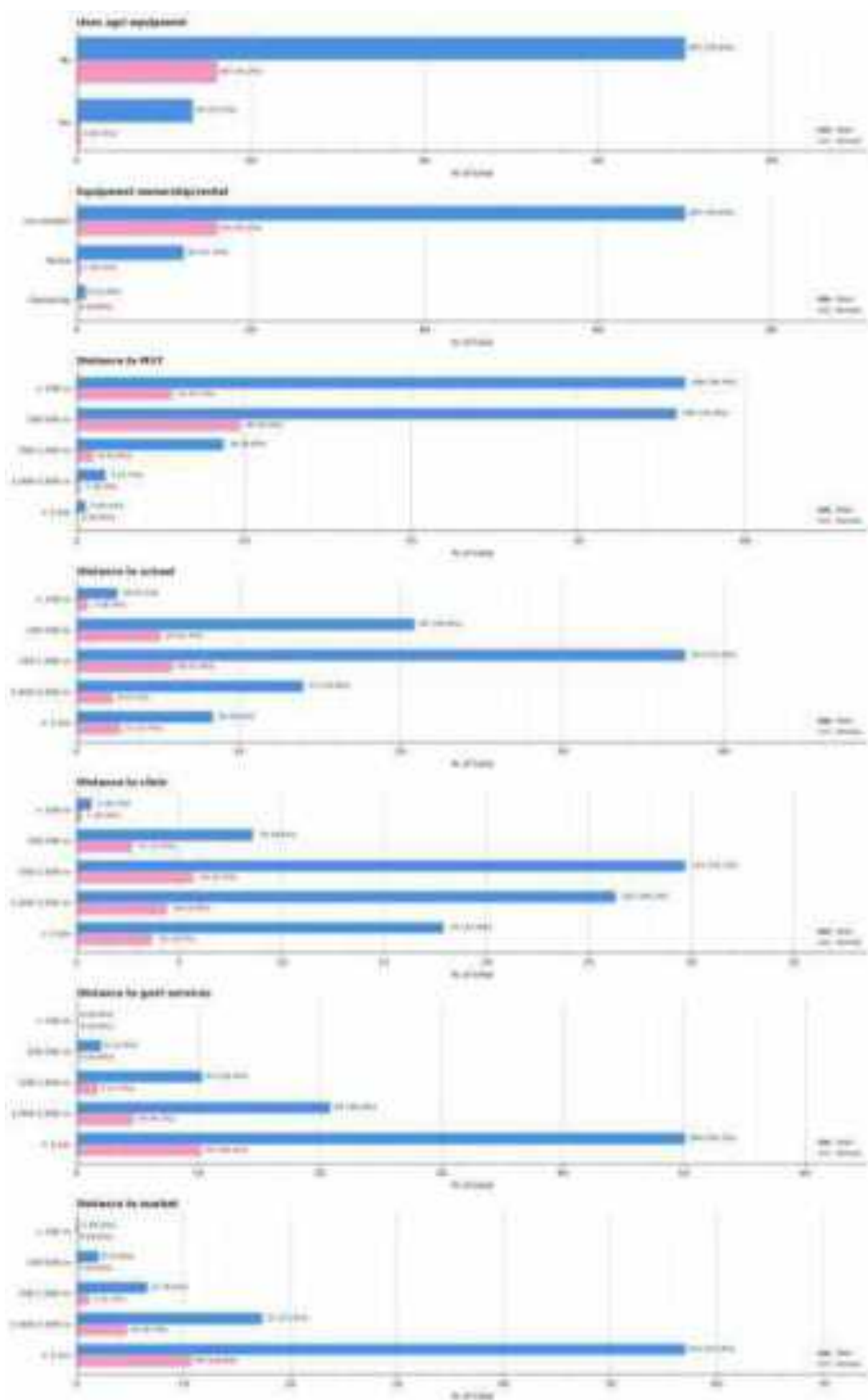


Figure 60: Land and Agriculture Overview – part 2



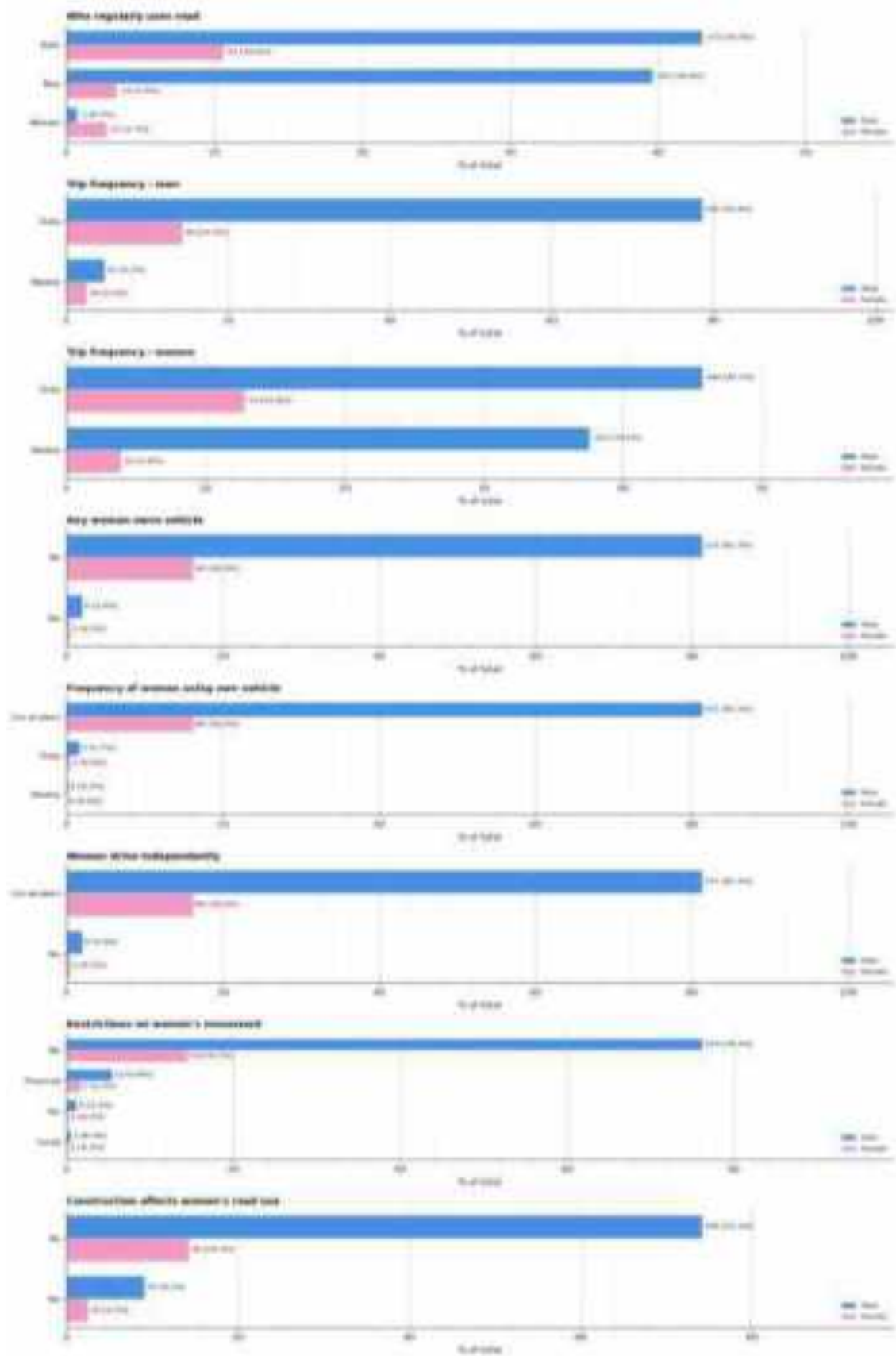


Figure 63: Road Usage and Mobility Overview – Part 1

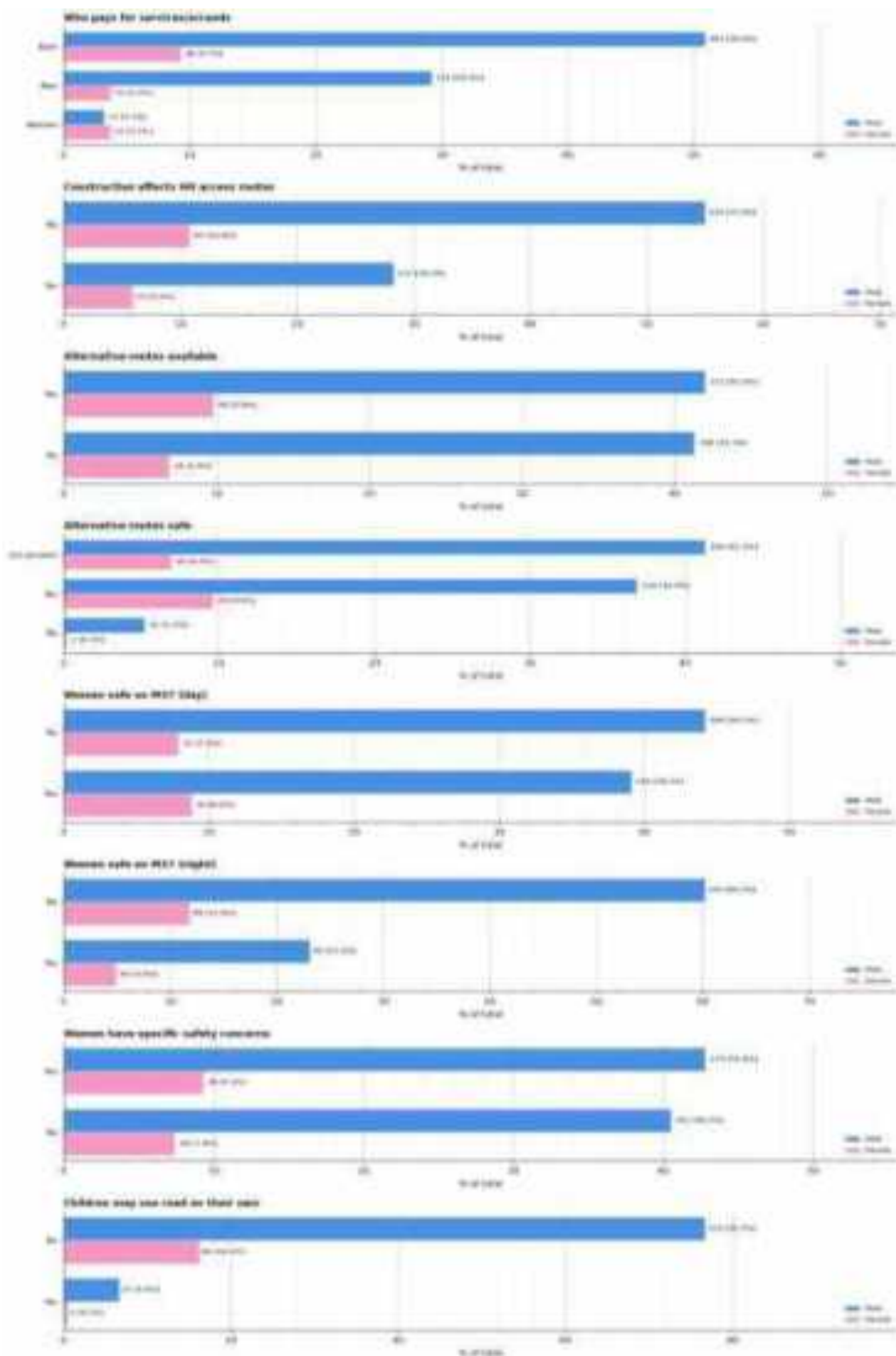


Figure 64: Road Usage and Mobility Overview – Part 2

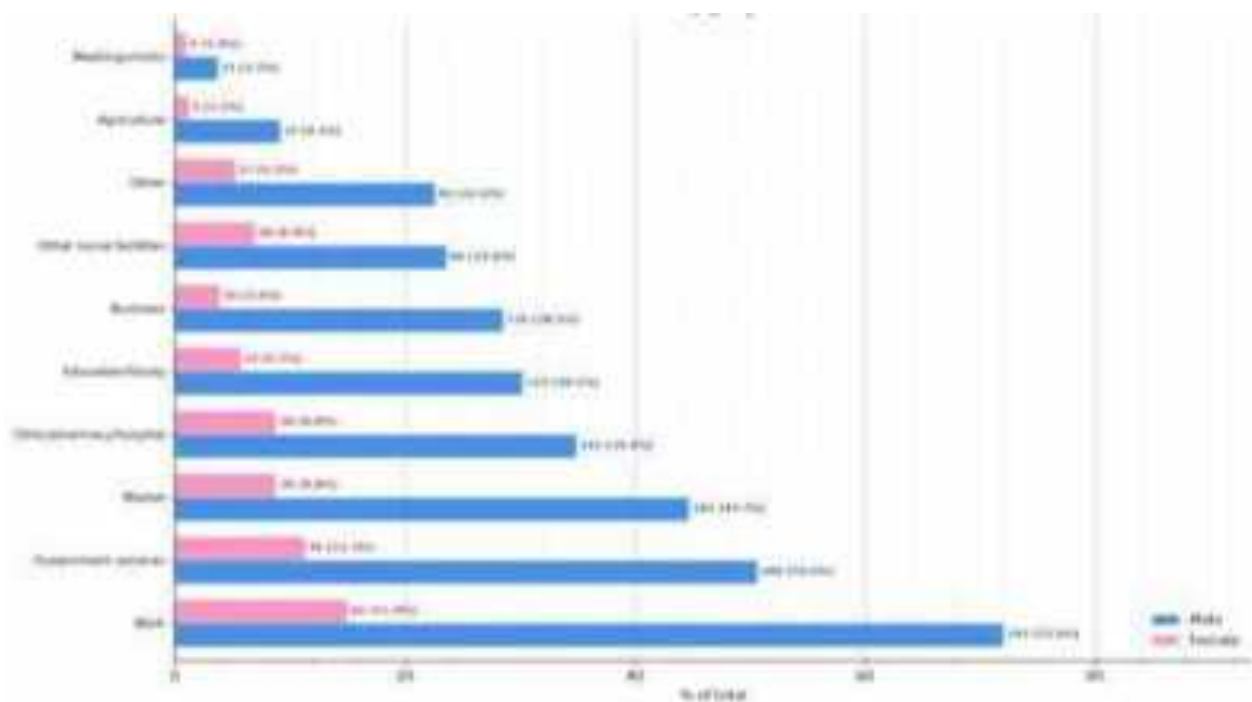


Figure 65: Trip Purposes by Gender

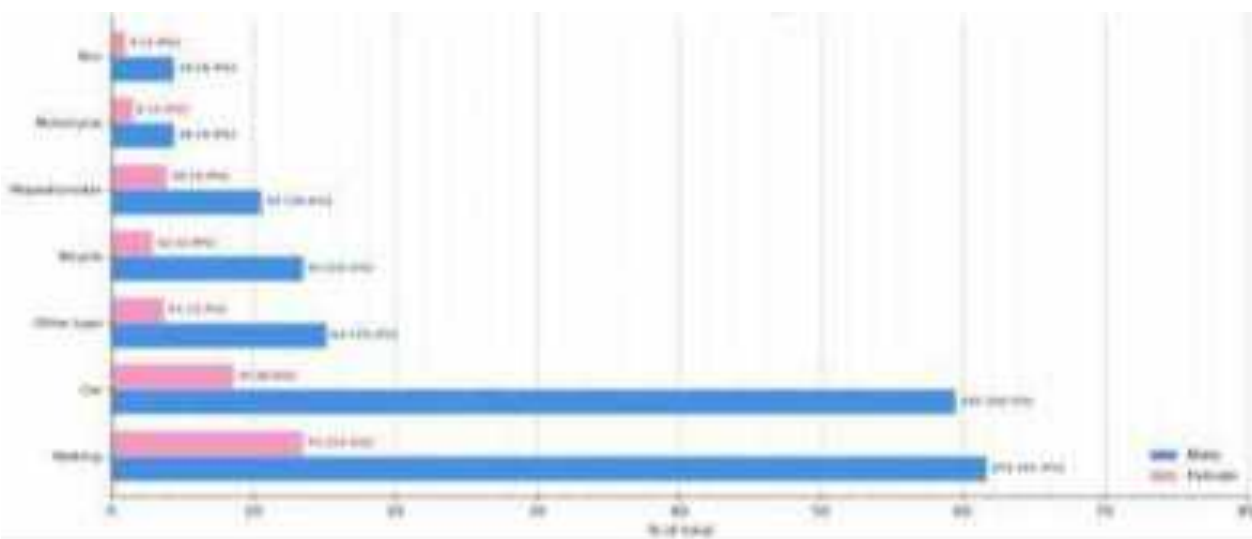


Figure 66: Men's Transport Types

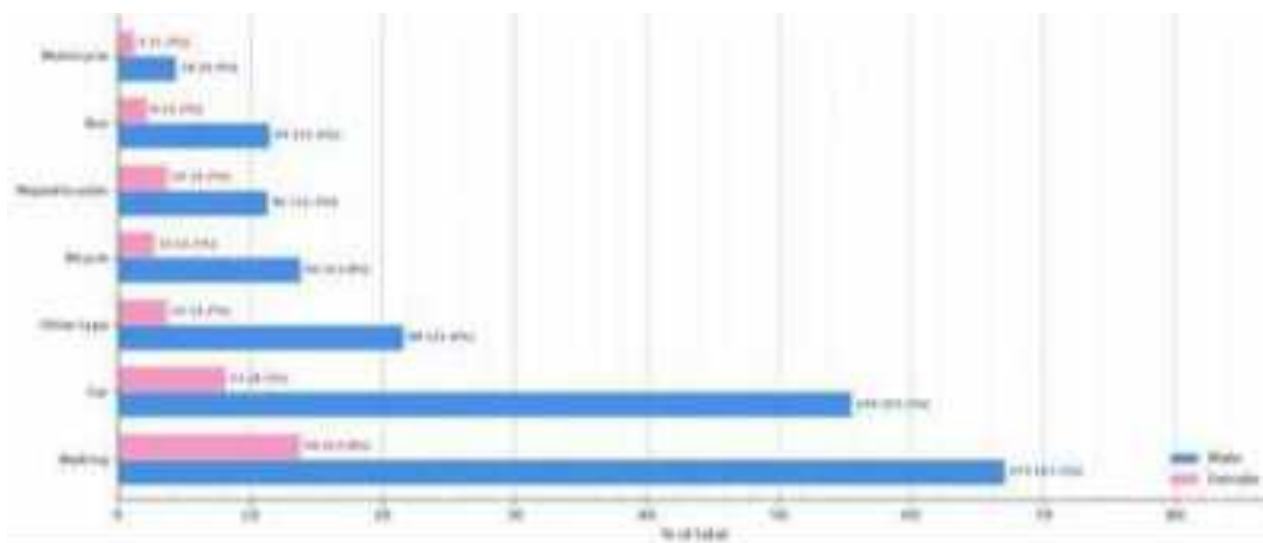


Figure 67: Women's transport Types

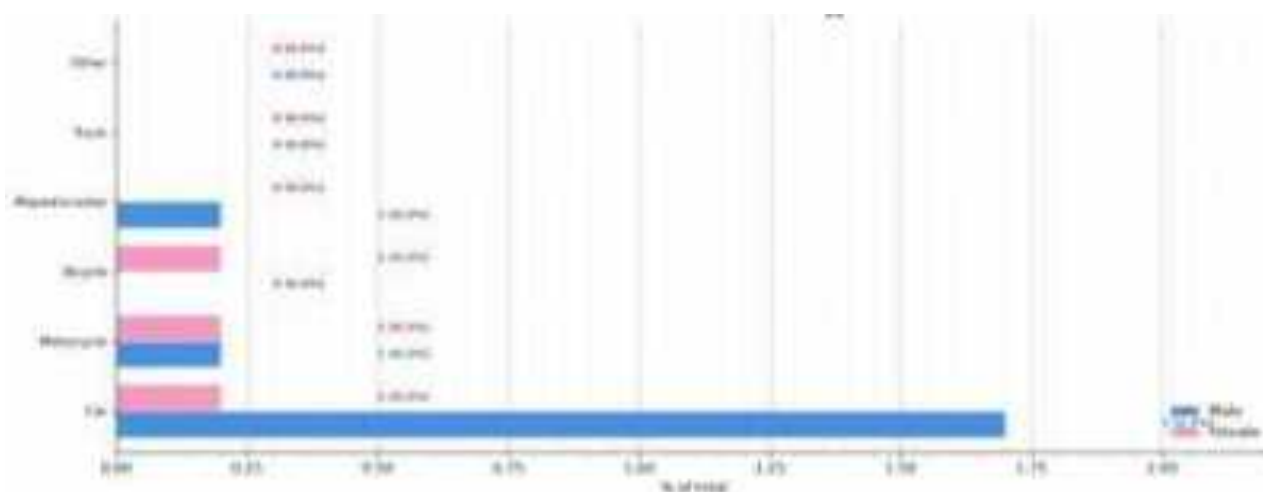


Figure 68: Women's Owned Vehicle types

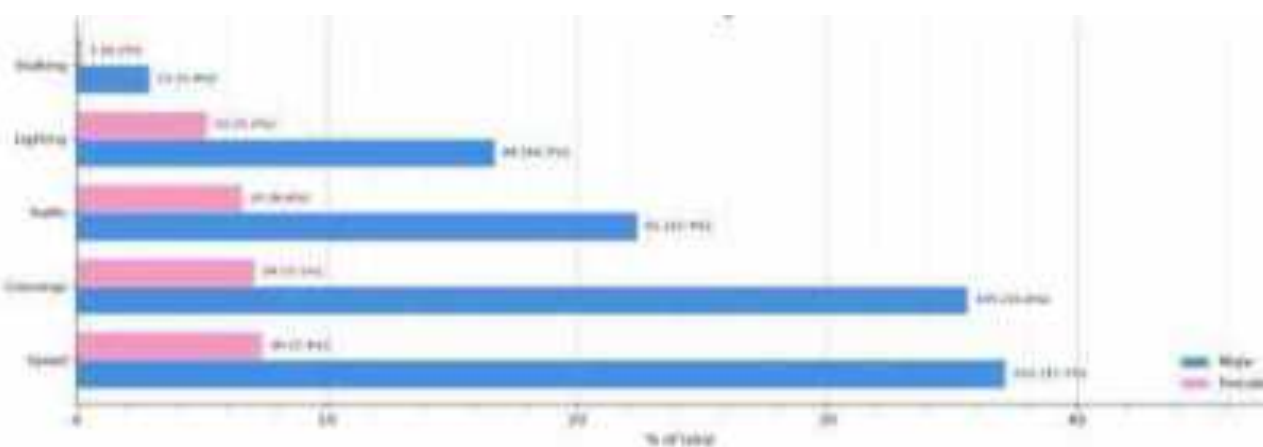


Figure 69: Women's Safety Concerns

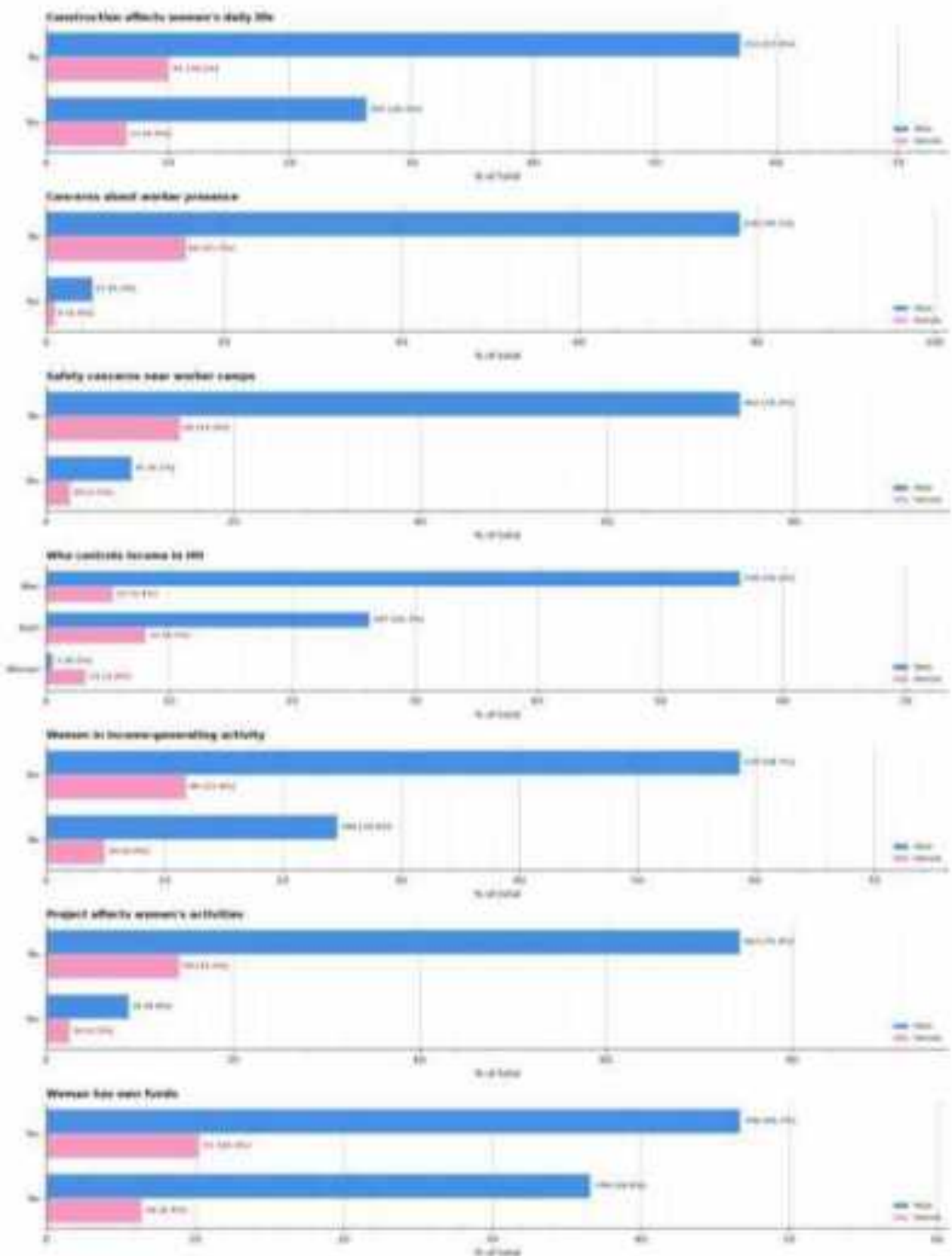


Figure 70: Gender Aspects and Project Impact – Part 1

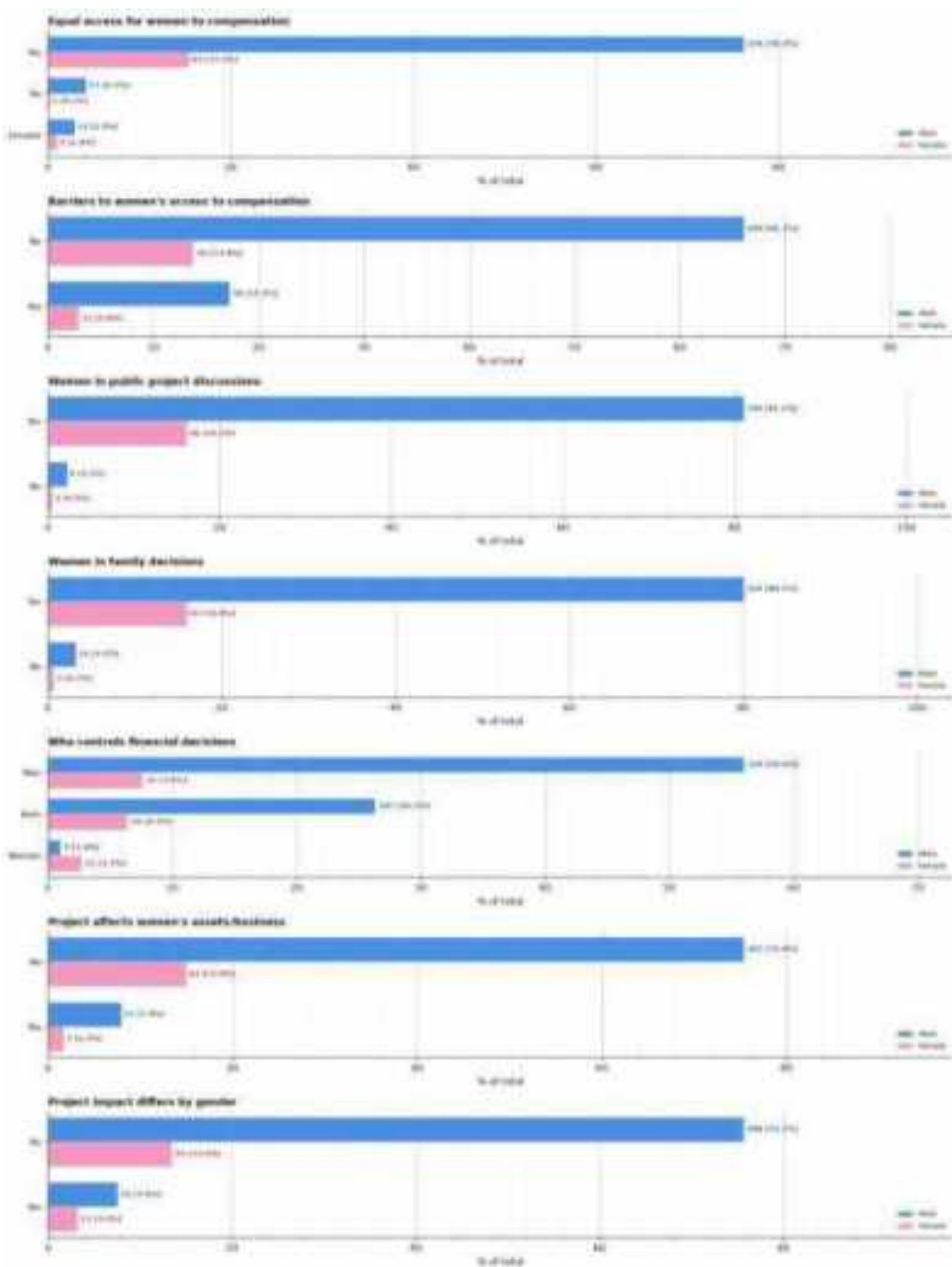


Figure 71: Gender Aspects and Project Impact – Part 2



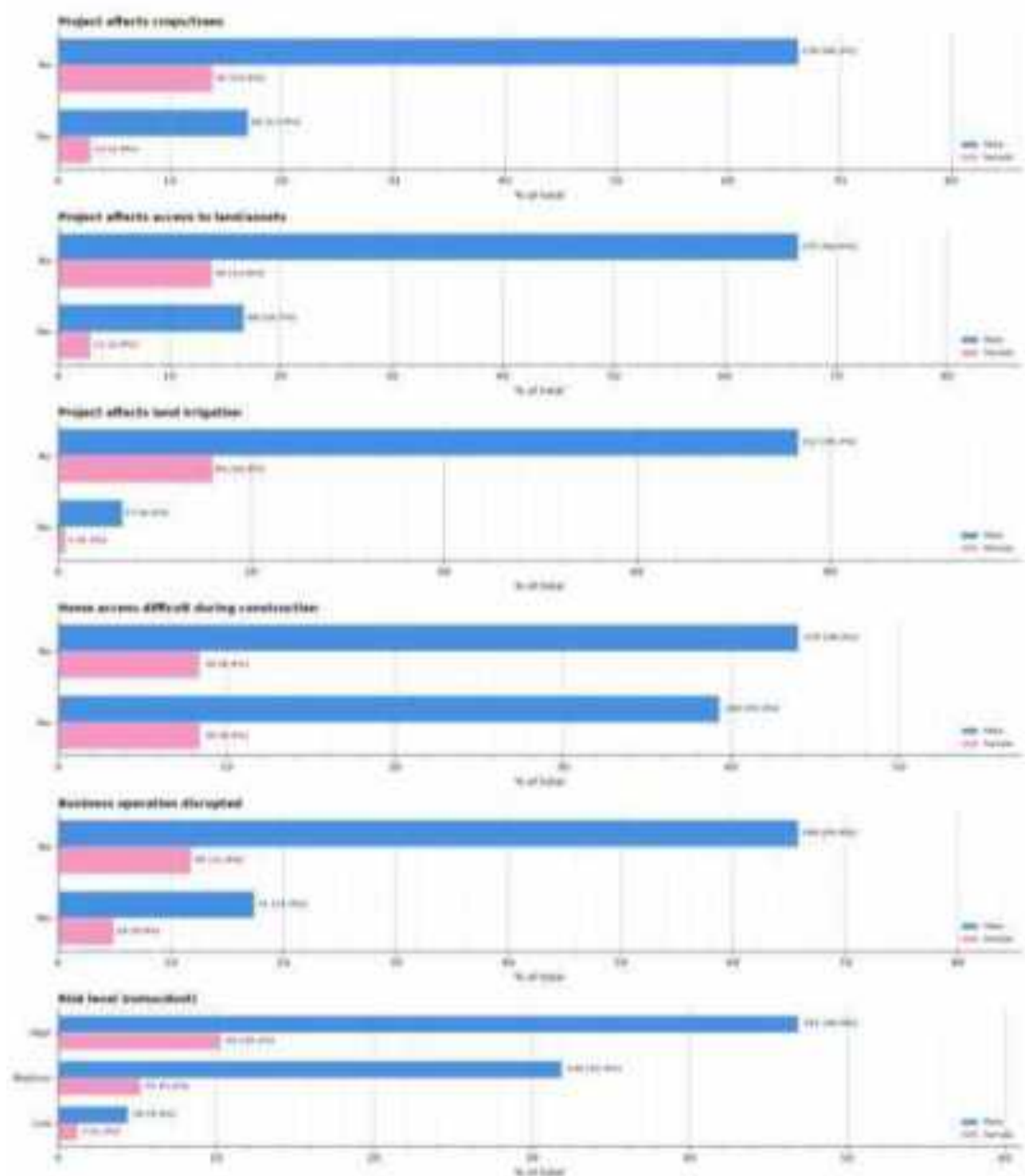


Figure 74: Project Impact on Assets and Access

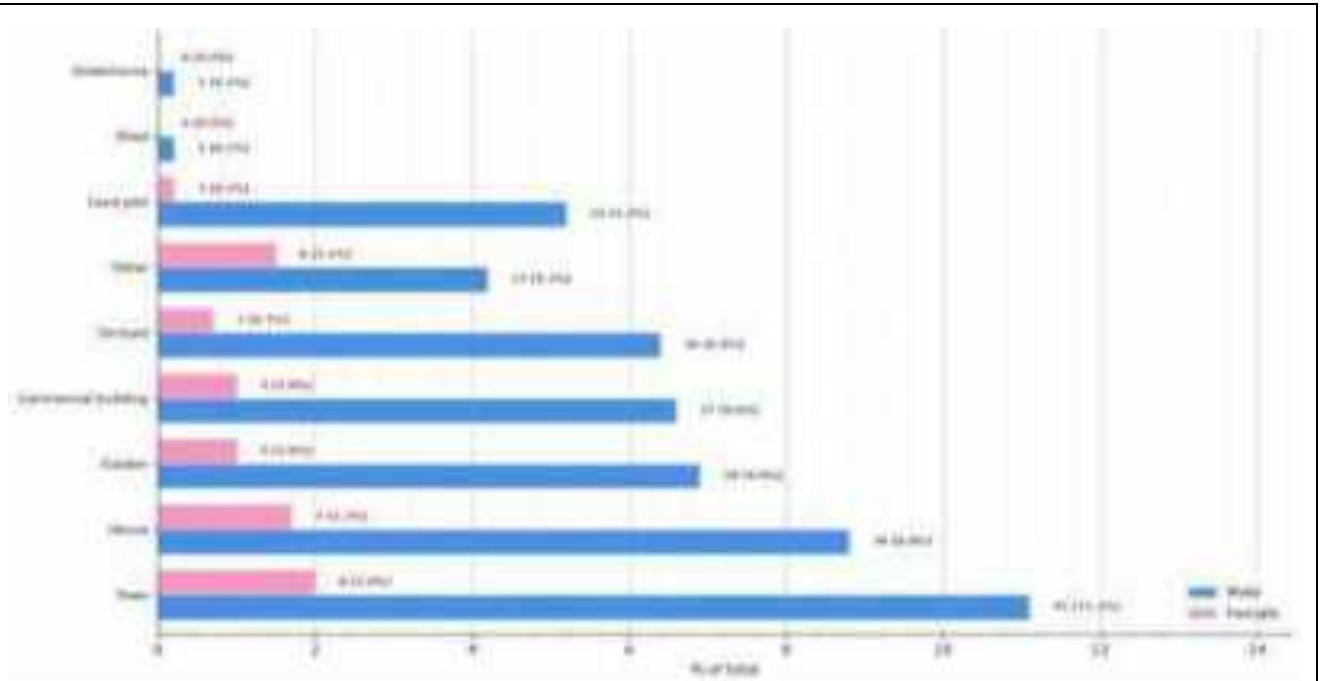


Figure 75: Assets Affected by Project

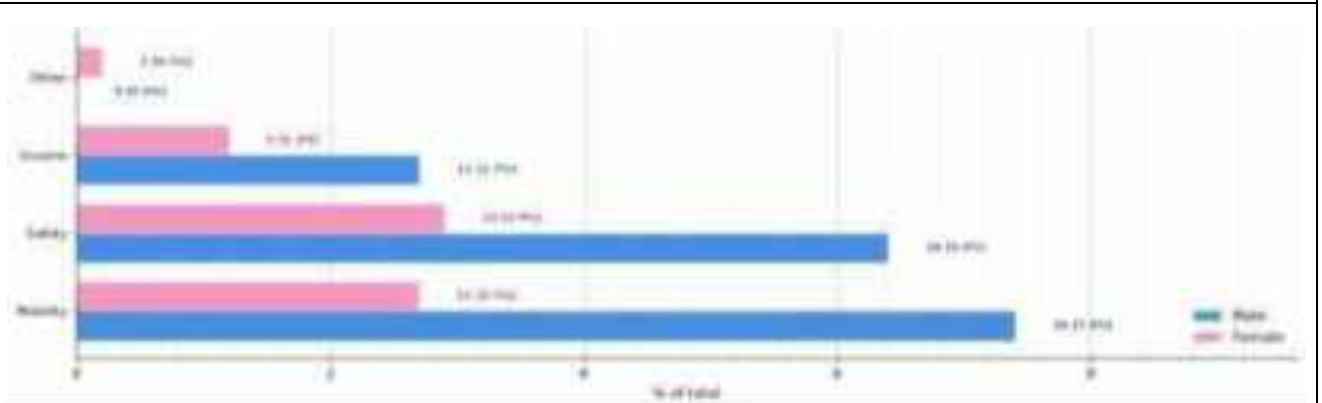


Figure 76: Reasons for Gender-Differentiated Impact

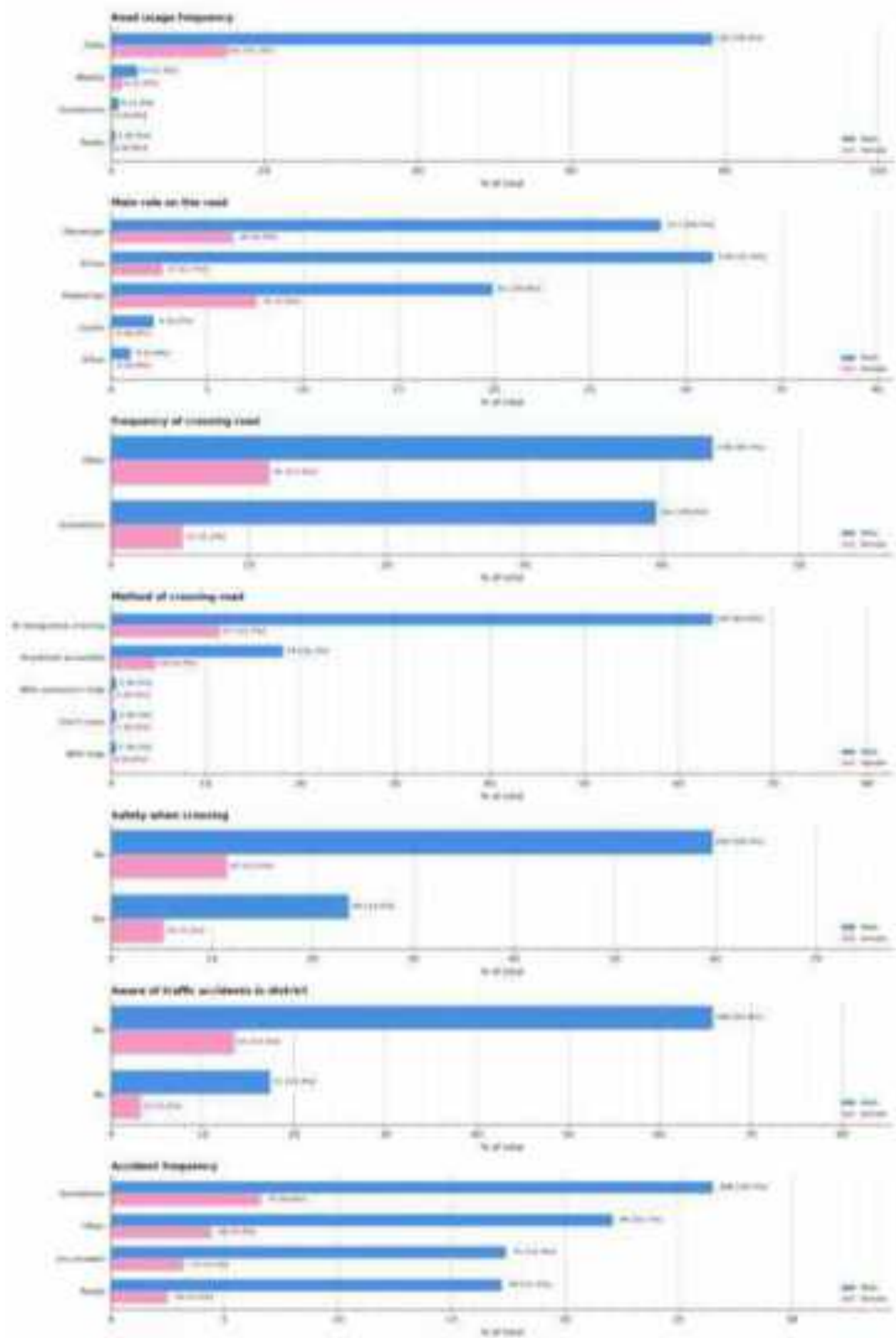


Figure 77: Road Usage and Crossings

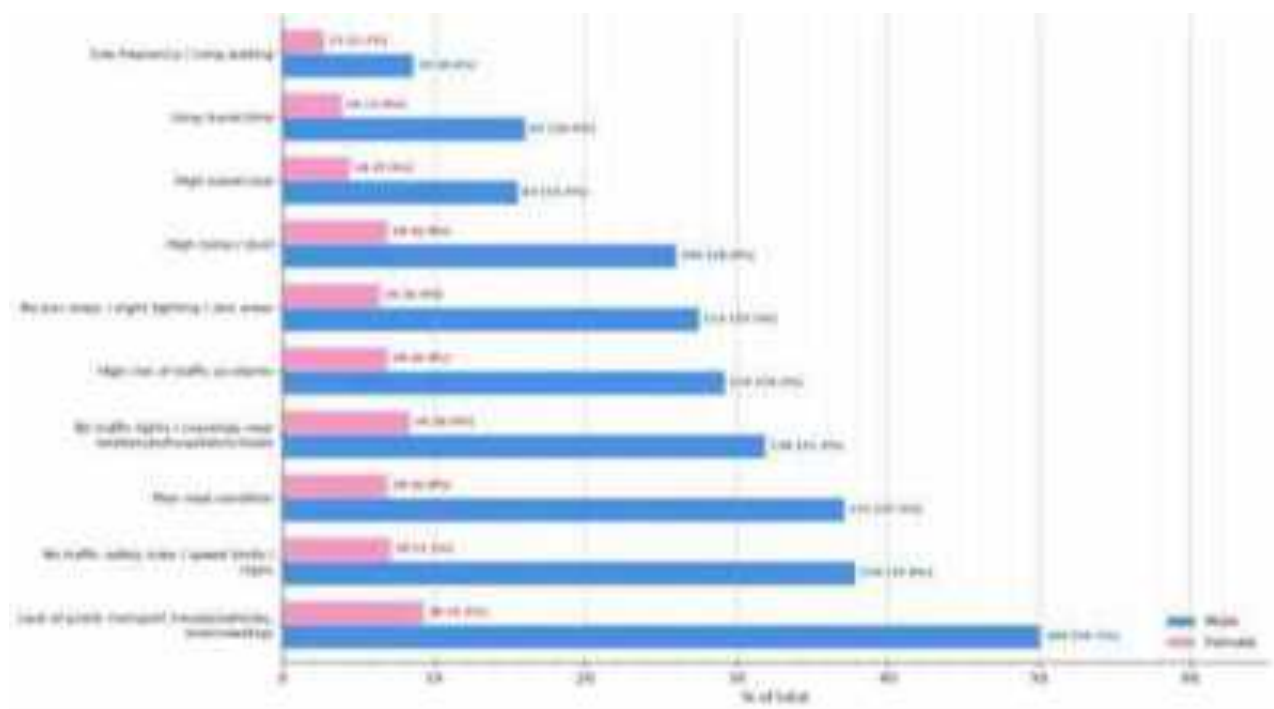


Figure 78: Problems Travelling on M37

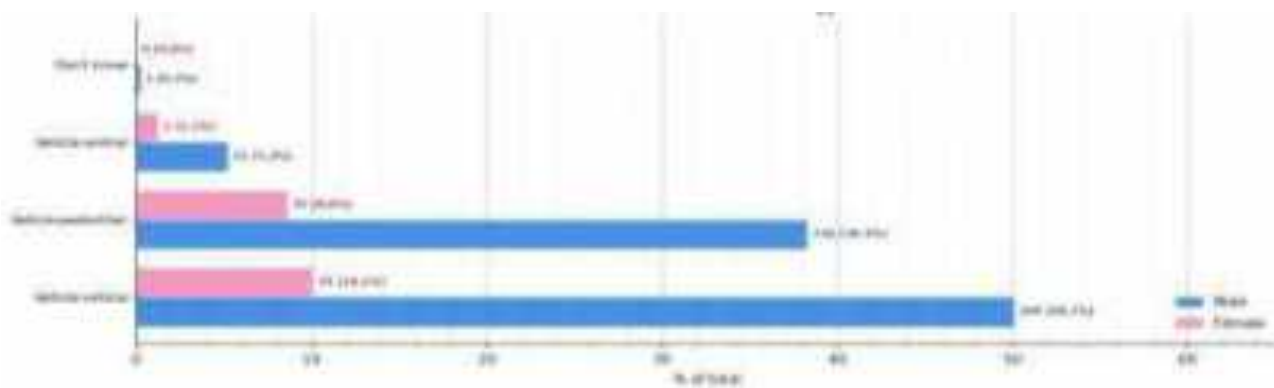


Figure 79: Accident and Incident Types

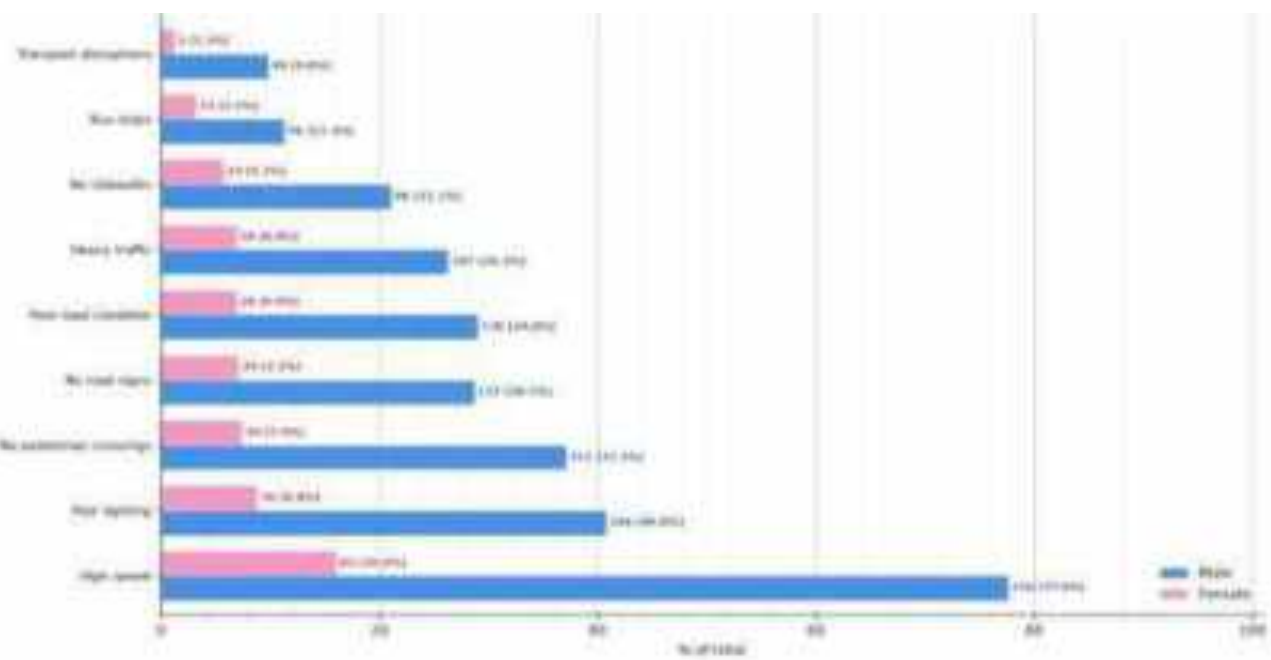


Figure 80: Safety Problems in District

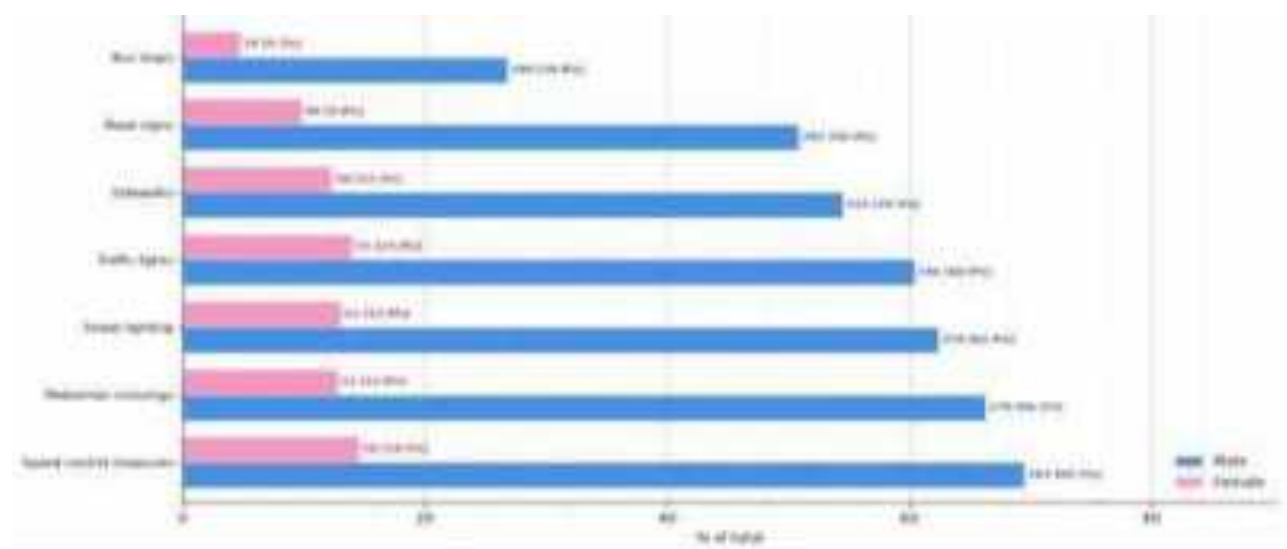


Figure 81: Needed Safety Improvements

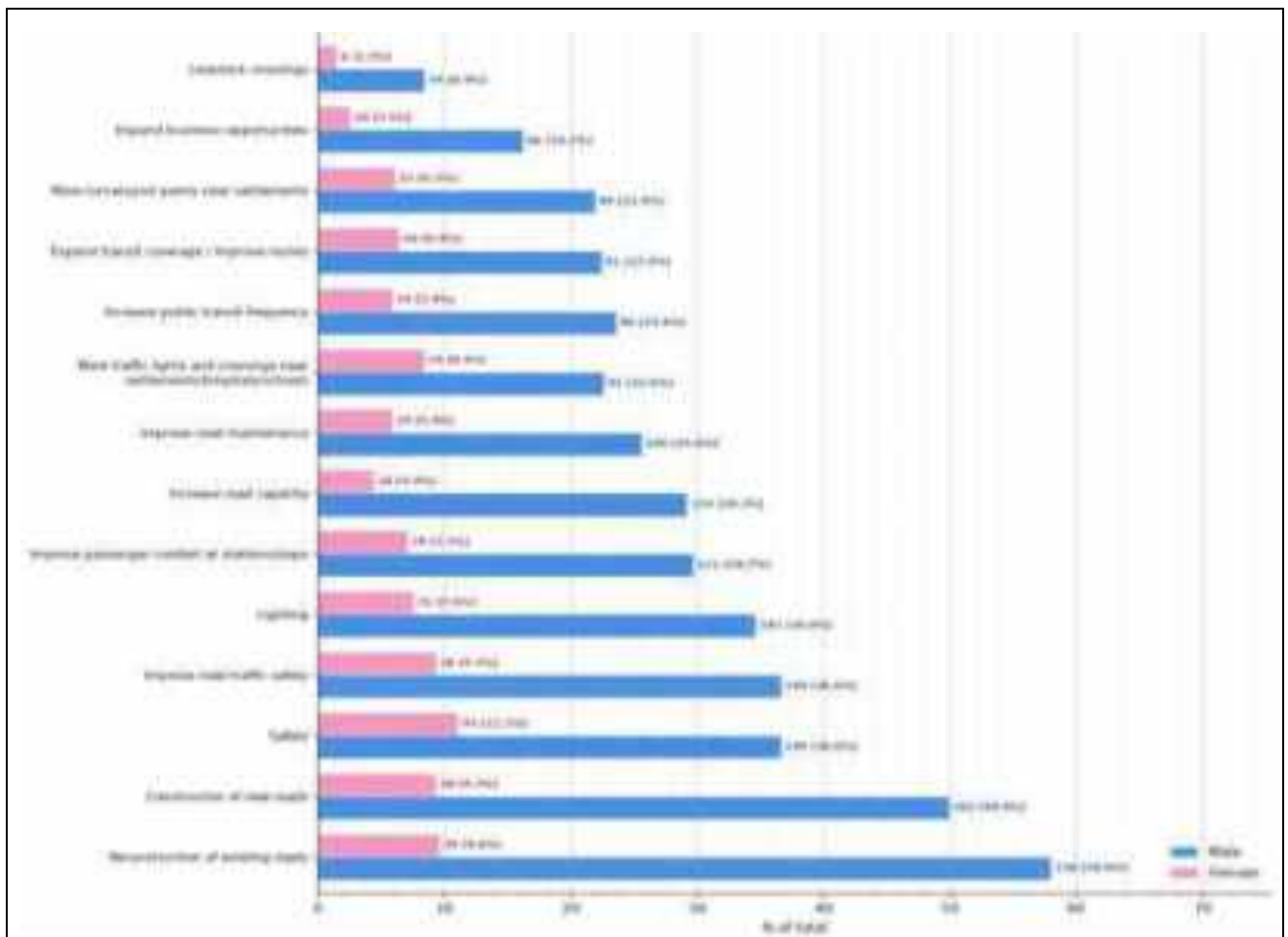


Figure 82: Needed Road Improvements

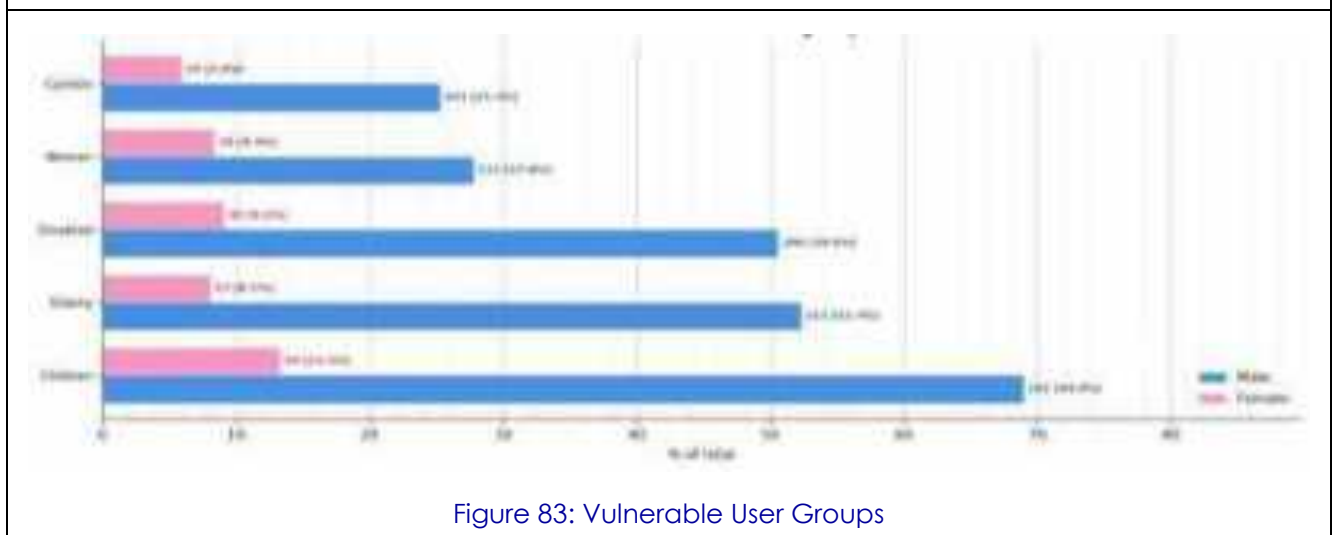


Figure 83: Vulnerable User Groups



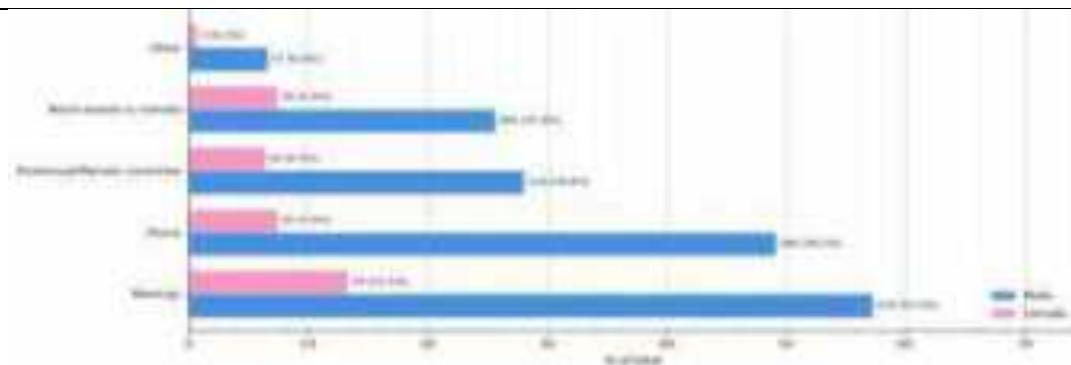


Figure 86: Preferred Project Communication Method

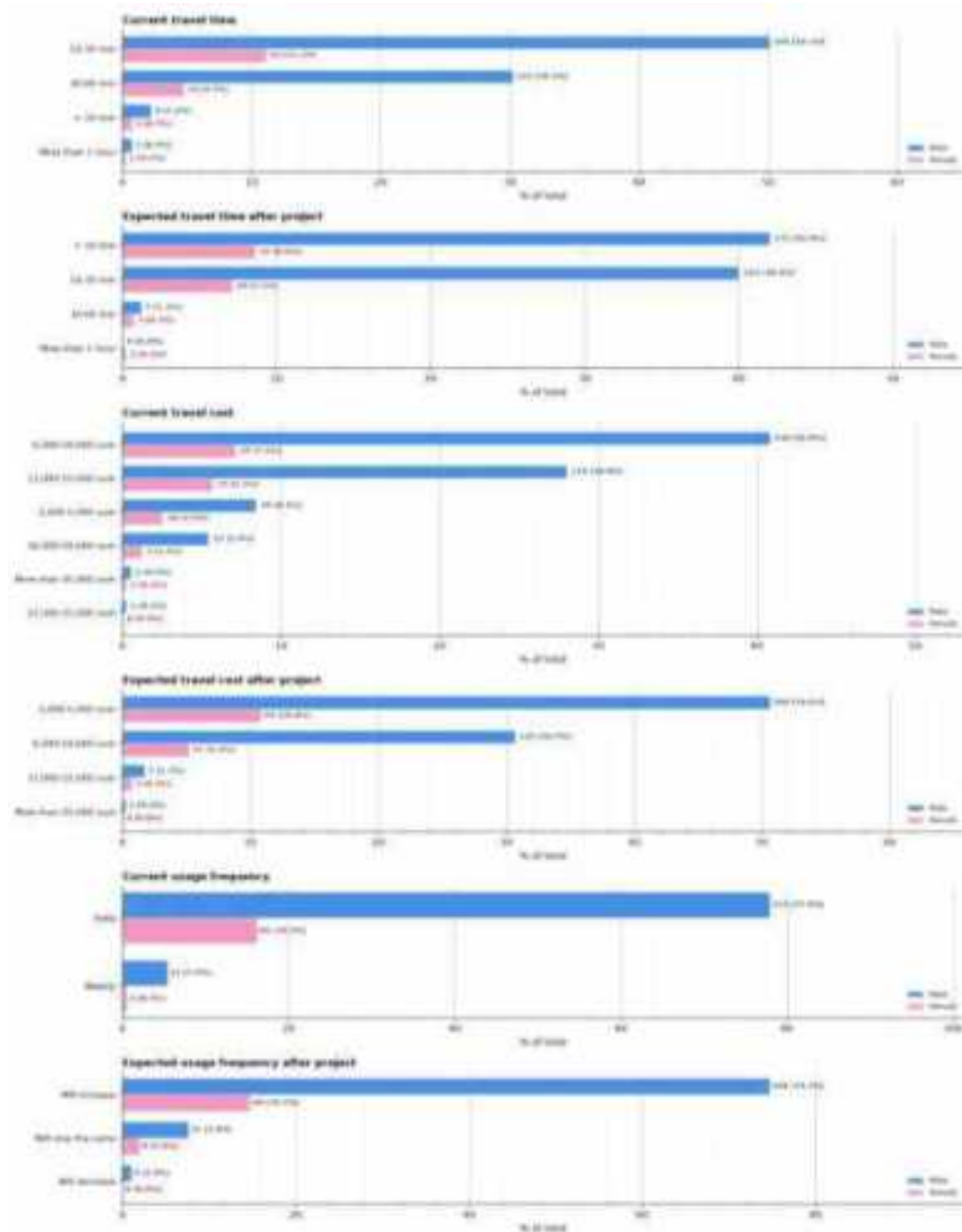


Figure 87: Project Expectations – Part I

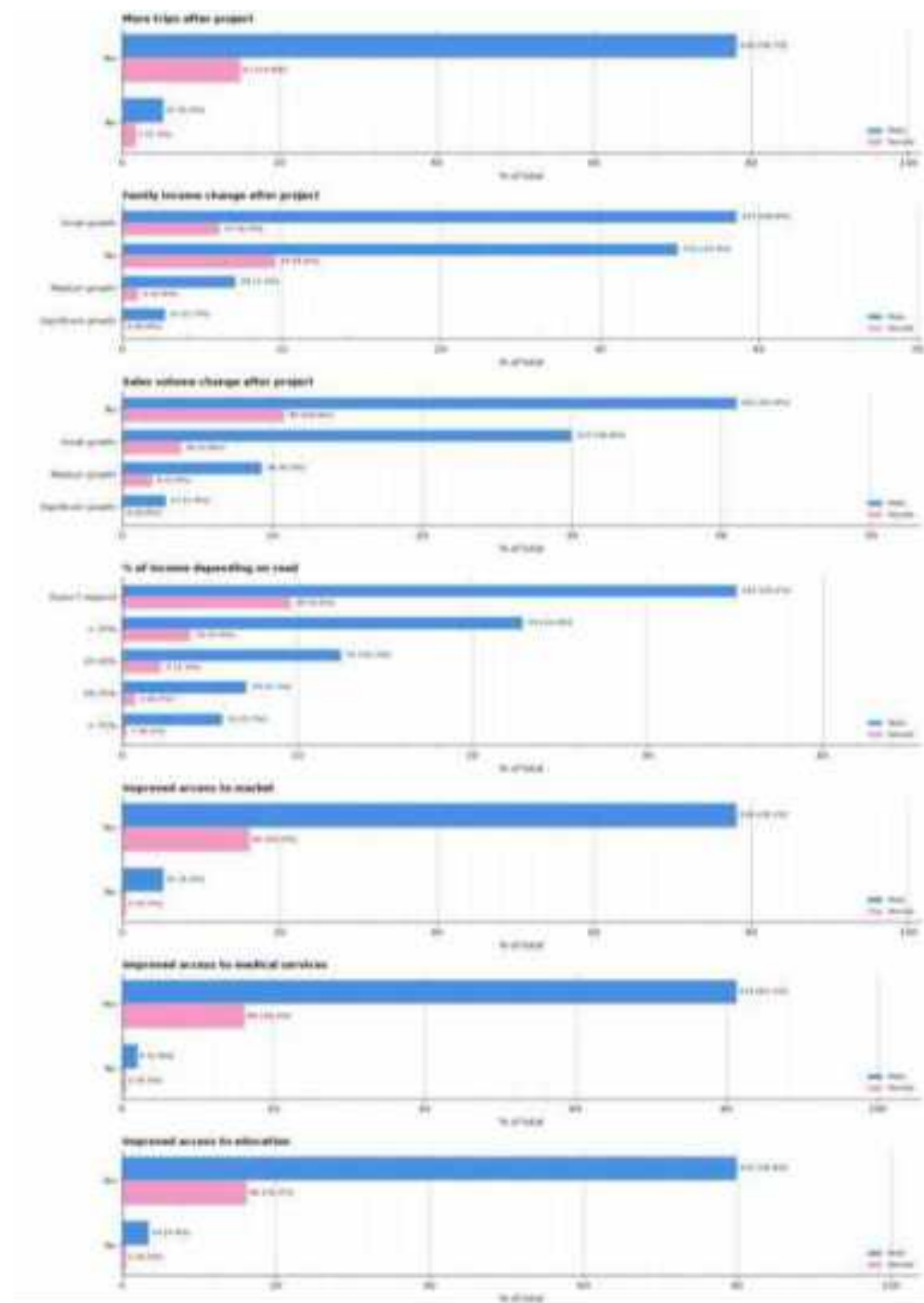


Figure 88: Project Expectations – Part 2

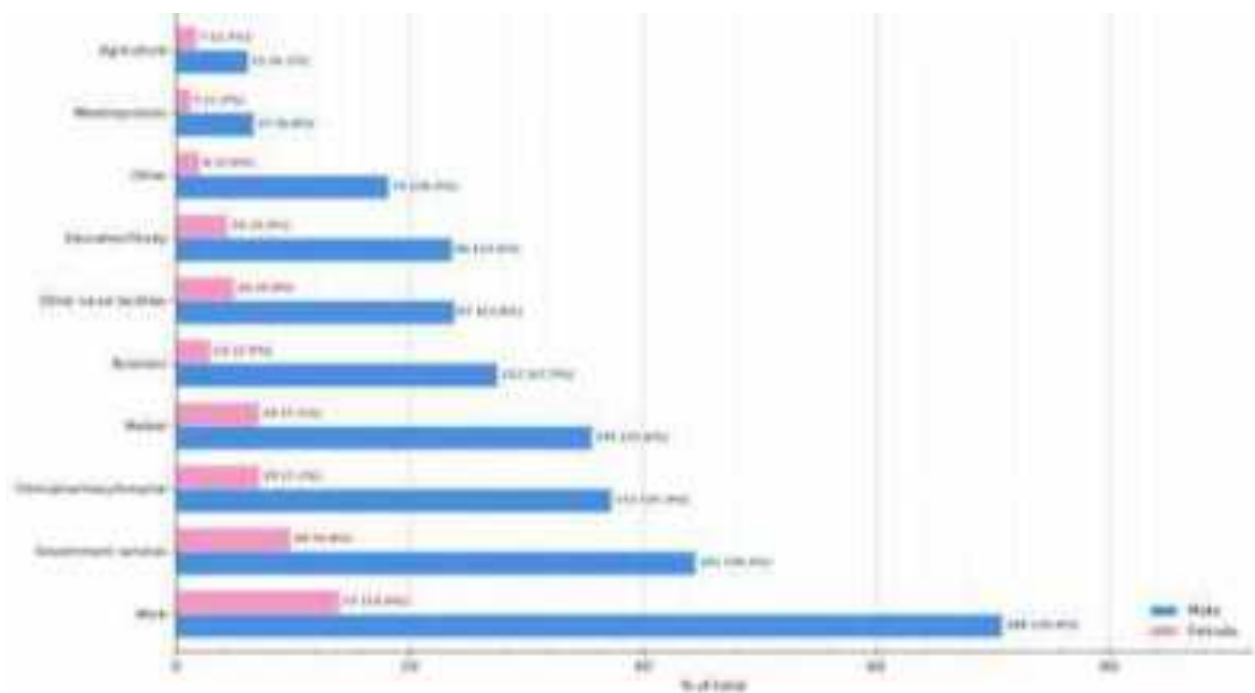


Figure 89: Main Trip Purposes of Respondents

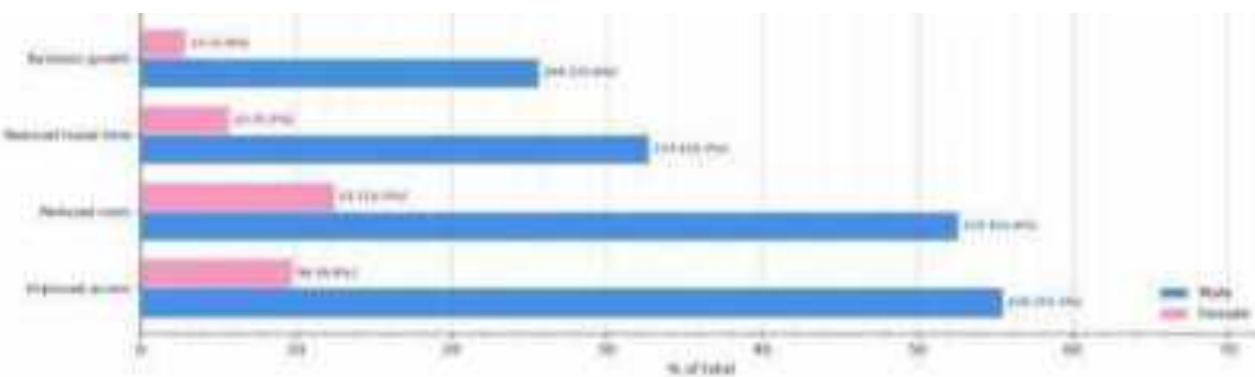


Figure 90: Expected Project Benefits

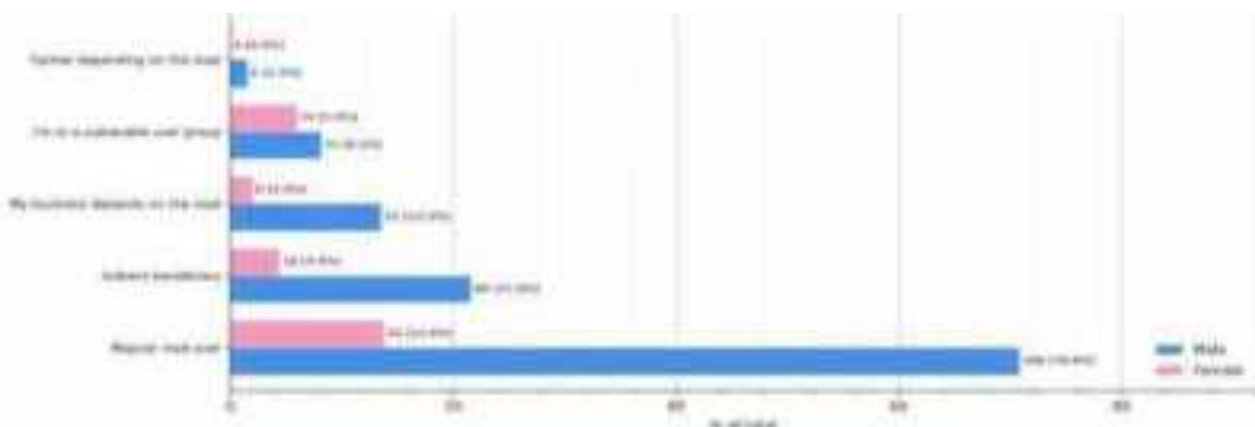


Figure 91: Self-Identification w.r.t. M37

1. Minutes from FGDs and KIIs

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Sl	Subject/Date	Score	Gr	Section	Examination Type/Date	Remarks	DOB
1	Mathematics	85	10	Science	Internal	Good	10/10/2000
2	Science	78	10	Science	Internal	Good	10/10/2000
3	English	92	10	Science	Internal	Excellent	10/10/2000
4	History	65	10	Science	Internal	Good	10/10/2000
5	Geography	70	10	Science	Internal	Good	10/10/2000
6	Art	88	10	Science	Internal	Good	10/10/2000
7	Music	75	10	Science	Internal	Good	10/10/2000
8	Physical Education	90	10	Science	Internal	Excellent	10/10/2000
9	Mathematics	82	10	Science	Internal	Good	10/10/2000
10	Science	75	10	Science	Internal	Good	10/10/2000
11	English	88	10	Science	Internal	Good	10/10/2000
12	History	72	10	Science	Internal	Good	10/10/2000
13	Geography	68	10	Science	Internal	Good	10/10/2000
14	Art	85	10	Science	Internal	Good	10/10/2000
15	Music	78	10	Science	Internal	Good	10/10/2000
16	Physical Education	88	10	Science	Internal	Good	10/10/2000
17	Mathematics	75	10	Science	Internal	Good	10/10/2000
18	Science	82	10	Science	Internal	Good	10/10/2000
19	English	78	10	Science	Internal	Good	10/10/2000
20	History	85	10	Science	Internal	Good	10/10/2000
21	Geography	72	10	Science	Internal	Good	10/10/2000
22	Art	88	10	Science	Internal	Good	10/10/2000
23	Music	75	10	Science	Internal	Good	10/10/2000
24	Physical Education	82	10	Science	Internal	Good	10/10/2000
25	Mathematics	78	10	Science	Internal	Good	10/10/2000
26	Science	85	10	Science	Internal	Good	10/10/2000
27	English	72	10	Science	Internal	Good	10/10/2000
28	History	88	10	Science	Internal	Good	10/10/2000
29	Geography	75	10	Science	Internal	Good	10/10/2000
30	Art	82	10	Science	Internal	Good	10/10/2000
31	Music	78	10	Science	Internal	Good	10/10/2000
32	Physical Education	85	10	Science	Internal	Good	10/10/2000
33	Mathematics	72	10	Science	Internal	Good	10/10/2000
34	Science	88	10	Science	Internal	Good	10/10/2000
35	English	75	10	Science	Internal	Good	10/10/2000
36	History	82	10	Science	Internal	Good	10/10/2000
37	Geography	78	10	Science	Internal	Good	10/10/2000
38	Art	85	10	Science	Internal	Good	10/10/2000
39	Music	72	10	Science	Internal	Good	10/10/2000
40	Physical Education	88	10	Science	Internal	Good	10/10/2000
41	Mathematics	75	10	Science	Internal	Good	10/10/2000
42	Science	82	10	Science	Internal	Good	10/10/2000
43	English	78	10	Science	Internal	Good	10/10/2000
44	History	85	10	Science	Internal	Good	10/10/2000
45	Geography	72	10	Science	Internal	Good	10/10/2000
46	Art	88	10	Science	Internal	Good	10/10/2000
47	Music	75	10	Science	Internal	Good	10/10/2000
48	Physical Education	82	10	Science	Internal	Good	10/10/2000
49	Mathematics	78	10	Science	Internal	Good	10/10/2000
50	Science	85	10	Science	Internal	Good	10/10/2000

<u>Species name</u> - <i>Stenopus hispidus</i> <u>Locality</u> - <i>St. Vincent</i> <u>Date</u> - <i>1 Oct 1971</i>						
No.	Specimen Part	Sex	Age	Measurements	Measurements (mm)	Remarks
1	Carapace, Dorsal	♂	AD	GL 20.0, WL 10.0	GL 20.0, WL 10.0	Good specimen
2	Carapace, Ventral	♂	AD	GL 20.0, WL 10.0	GL 20.0, WL 10.0	Good specimen
3	Chela, Right	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
4	Chela, Left	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
5	Abdomen, Dorsal	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
6	Abdomen, Ventral	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
7	Chela, Right	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
8	Chela, Left	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
9	Abdomen, Dorsal	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
10	Abdomen, Ventral	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
11	Chela, Right	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
12	Chela, Left	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
13	Abdomen, Dorsal	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
14	Abdomen, Ventral	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
15	Chela, Right	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
16	Chela, Left	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
17	Abdomen, Dorsal	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
18	Abdomen, Ventral	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
19	Chela, Right	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
20	Chela, Left	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
21	Abdomen, Dorsal	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
22	Abdomen, Ventral	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
23	Chela, Right	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
24	Chela, Left	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
25	Abdomen, Dorsal	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
26	Abdomen, Ventral	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
27	Chela, Right	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
28	Chela, Left	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
29	Abdomen, Dorsal	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
30	Abdomen, Ventral	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
31	Chela, Right	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
32	Chela, Left	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
33	Abdomen, Dorsal	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
34	Abdomen, Ventral	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
35	Chela, Right	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
36	Chela, Left	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
37	Abdomen, Dorsal	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
38	Abdomen, Ventral	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
39	Chela, Right	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
40	Chela, Left	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
41	Abdomen, Dorsal	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
42	Abdomen, Ventral	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
43	Chela, Right	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
44	Chela, Left	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
45	Abdomen, Dorsal	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
46	Abdomen, Ventral	♂	AD	GL 10.0, WL 5.0	GL 10.0, WL 5.0	Good specimen
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[illegible]

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2. Photographs from Focus Group Discussions

This appendix presents photographic records of conducted focus group discussions with women of project districts living in communities located along bypass road and rehabilitation corridor.

(a) Focus Group Discussions (FGD) with women of project districts





Gijduvon District, Bukhara Province (June 1, 2026)



Vobkent District, Bukhara Province (June 2, 2026)



Bukhara District, Bukhara Province (June 2, 2026)





Karakul District, Bukhara Province (June 3, 2026)



Alat District, Bukhara province (June 2, 2026)

[illegible]



3. Photographs from Key Informant Interviews

This appendix presents photographic records of conducted key informant interviews with institutional stakeholders and representatives of District Khokimiyats of project districts.

(a) Key Informant Interviews with Institutional Stakeholders

Meeting with representatives of the State Committee for Roads Bukhara Region Automobile Roads Head Office (July 1, 2026)	
Meeting with representatives of Department of Ecology and Climate Change of Bukhara Region (July 1, 2026)	
Kyzyltepa District, Navoi Province (June 29, 2026)	



Gijduvon District, Bukhara Province (June 29, 2026)



Vobkent District, Bukhara Province (June 29, 2026)



Bukhara District, Bukhara Province (July 2, 2026)



Jondor District, Bukhara Province (July 1, 2026)



Karakul District, Bukhara Province (June 30, 2026)



Alat District, Bukhara province (June 30, 2026)



(b) Presentation for Meetings with Institutional Stakeholders







Appendix 15. Road Safety Audit Results

1. Road Physical Condition

This subsection presents the findings of the road safety audit (RSA) conducted along the M37 highway corridor between km 207 (Kyzyltepa district, Navoi Province) and km 365 (Alat district, Bukhara Province).

1.1. Road Geometry and Cross-Section

Throughout the surveyed corridor, the M37 functions as a dual carriageway with two lanes in each direction, separated by a continuous concrete median. The carriageway width appears consistent with a national highway classification, with each direction accommodating two traffic lanes. The alignment is predominantly straight and flat, traversing irrigated agricultural land and desert steppe terrain across the Navoi and Bukhara provinces, with no significant horizontal or vertical curves observed along the surveyed sections.

The median treatment varies along the corridor. In rural inter-settlement sections, the median consists of precast concrete Jersey-type barriers placed in-line, typically without reflective delineators on most segments. In recently rehabilitated sections, particularly observed in Vobkent district and the Alat district approaches, the median kerb has been upgraded to a cast-in-place concrete profile with red reflective studs mounted at intervals. In the urban section, a permanent cast concrete wall median replaces the Jersey barrier, reflecting a more durable urban treatment. In Jondor district, the median barrier is interrupted at the at-grade railway level crossing, where concrete blocks are placed ad hoc without structured channelization.

A notable finding is that at several locations, most visibly in Kyzyltepa district at approximately km 211 and in Jondor district, ornamental gateway structures and district entry monuments have been erected within or immediately adjacent to the road reserve. These structures effectively narrow the available clear zone and, in some cases, redirect the median barrier alignment, creating a pinch-point hazard on a high-speed highway without adequate advance warning or delineation.

1.2. Pavement Surface Condition

Pavement conditions across the corridor are highly variable and reflect an ongoing, piecemeal rehabilitation programme rather than a systematic overlay of the full corridor. Field observations identified the following distress types across multiple districts:

- **Alligator (map) cracking:** Extensive fatigue cracking covering significant portions of lane width was observed in the Vobkent district, the Kyzyltepa district, and the Jondor district roundabout area. This distress type indicates structural failure of the pavement layers under accumulated traffic loading and is typically associated with subgrade weakness or inadequate pavement thickness.



- **Longitudinal and transverse cracking:** Hairline to medium-width longitudinal cracks were observed along the carriageway edges and near the median in multiple sections across Gijduvon, Kyzyltepa, Alat, and Karakul districts. Transverse cracks were particularly evident at bridge approach joints, consistent with differential settlement between the bridge deck and embankment fill.
- **Surface raveling and aggregate loss:** Multiple sections showed loss of bituminous binder and surface aggregate, leaving a grey, coarse, low-skid-resistance surface. This was especially pronounced in the Kyzyltepa district near km 211 and in sections of the Gijduvon district.
- **Potholes and spot failures:** Isolated potholes were documented in the Vobkent and Jondor districts (e.g., km 297), and the Karakul district. Some potholes had been addressed through bituminous patching, though the quality of patching was inconsistent.
- **Asymmetric rehabilitation:** A distinctive pattern observed in the Alat district is the resurfacing of one carriageway while the opposing carriageway remains in its original deteriorated condition. This creates a significant skid resistance differential between directions and results in an extended period with no lane markings on the newly laid surface.

In contrast, several sections, particularly in Vobkent district, parts of Jondor district, and near Alat town, showed recently completed resurfacing in good condition, with clean black asphalt and freshly applied lane markings. These sections demonstrated that where rehabilitation has occurred, the road surface meets an adequate standard. However, the absence of a systematic maintenance programme means that deteriorated sections persist alongside newly rehabilitated ones, and the corridor as a whole cannot be characterized as in a uniform condition.

During the field survey conducted in heavy rainfall conditions across Vobkent and Bukhara districts, significant surface water sheeting was observed across the full carriageway width, with water pooling rather than draining. This indicates inadequate cross-fall gradients and/or blocked or absent drainage infrastructure, and creates aquaplaning risk for all vehicle types, particularly laden heavy goods vehicles.

1.3. Roadside and Shoulder Conditions

Along most of the corridor, the carriageway edge is defined by a raised concrete kerb or a flush edge line, beyond which an unpaved dirt or gravel shoulder extends for a variable width of approximately one to three meters before transitioning to agricultural land, scrubland, or roadside development. The shoulders are unimproved and in most sections are unsuitable as emergency stopping areas for heavy vehicles due to their loose, uncompacted surface.

In multiple locations, active utility works were observed within the road reserve without adequate safety provision. In Kyzyltepa district, an open excavation trench was noted immediately behind the carriageway edge kerb with no protective barriers, advance



warning signs, or delineation. Construction materials and debris from adjacent building activity were observed encroaching into the road reserve at km 309 in Jondor district. These conditions represent a secondary hazard for vehicles that leave the travel lane, and a direct hazard to maintenance workers and pedestrians using the roadside.

Roadside commercial and service development fronts directly onto the highway without a service road along most of the settled sections, observed in Gijduvon, Kyzyltepa, Vobkent, and Jondor districts. Fuel stations, markets, workshops, and car dealerships are accessed directly from the travel lanes, with vehicles decelerating and turning across the adjacent lane without deceleration bays or defined access points. This generates frequent speed differentials and crossing conflicts between traffic and accessing vehicles.

1.4. Pedestrian and Non-Motorized User Infrastructure

The provision of pedestrian infrastructure along the M37 corridor is highly deficient and represents one of the most significant road safety concerns identified. Along the vast majority of the surveyed corridor, no formal footpath, sidewalk, or pedestrian crossing facility exists. Where pedestrian warning signs are present, observed in Gijduvon district and Vobkent district, they are not accompanied by marked crossings, raised crossing platforms, or any traffic calming measures.

The single documented exception is a short section in Vobkent district where a concrete-paved footpath runs parallel to the carriageway, separated by a narrow buffer strip. This isolated provision stands in contrast to the broader absence of pedestrian facilities and suggests that the standard has not been applied consistently across the corridor.

Field observations confirmed that pedestrians routinely walk along the carriageway edge, use the dirt shoulder as a footpath, and cross the highway at uncontrolled locations throughout the corridor. In Karakul district, the survey team directly observed two adults standing on top of the concrete median barrier while waiting to cross the carriageway, a behavior that reflects the complete absence of safe crossing alternatives. A separate observation in the same district captured adults and a child attempting to cross through a gap in the broken median barrier. These observations are consistent with the accident record, which shows pedestrian strike events as the most frequent accident type along the M37 corridor in 2025.

Passengers are dropped off and collected by vehicles stopping on the shoulder or travel lane throughout the corridor, including by minibuses and shared taxis operating between settlements. No formal bus lay-bys or passenger waiting areas were identified along the rural sections of the corridor.



1.5. Road Lighting

Road lighting along the M37 corridor is intermittent and absent over significant stretches. Street lighting columns were observed in the peri-urban sections of Gijduvon, Vobkent district, and the Jondor district center, and near the Alat/Turkmen border crossing area. In Vobkent district, double-arm streetlight poles with what appear to be functioning luminaires were documented along a recently rehabilitated section. Solar-powered lighting panels were observed in Karakul district, representing an alternative energy approach in this lower-traffic-density section.

The rural corridor between settlements is entirely unilluminated at night, with no road markings visible in the absence of artificial lighting. The accident record, which includes incidents recorded at 23:00, 21:40, 21:00, and 0:23, confirms that nighttime travel on unlit sections of the M37 is a significant contributing factor to road crash risk.

1.6. Bridges, Grade Separations, and Structures

Several bridge structures crossing irrigation canals were documented along the corridor. In Gijduvon district, a reinforced concrete multi-span bridge with decorative metal railing over a canal was observed in visually adequate condition. In Vobkent district, a concrete bridge with precast balustrade railing over an irrigation channel showed surface staining on pier caps and beams, along with a large-diameter utility pipeline routed across the bridge deck alongside the carriageway, a common feature on rural highways in Central Asia. In Jondor district, a further bridge structure showed transverse cracking at the approach abutment joint, consistent with differential settlement, and a pipeline was again present on the bridge deck.

Two grade-separated crossings were documented. In Bukhara district, an overpass structure carries a local road over the M37, with a steel balustrade railing that showed visible surface corrosion indicating neglect of maintenance. A further slip road alongside the overpass maintains an at-grade merge point, which partially negates the safety benefit of grade separation. In Alat district, a more substantial modern reinforced concrete flyover with chevron-painted abutments was documented in good condition, representing the best-standard structure observed on the corridor.

1.7. Traffic Management, Signage, and Junctions

Traffic management along the M37 corridor is minimal. Regulatory and warning signage, where present, consists of standard vertical signs, observed at pedestrian crossing locations, lane merge points, and bridge approaches. Overhead gantry signs carrying distance information to regional and international destinations (Bukhara, Tashkent, Nukus, Dushanbe, Bishkek, Almaty, Ashgabat) are present near the Turkmen border (end of the Alat district) crossing section, reflecting the corridor's role as a primary Central Asian transit route. No speed limit signs, speed cameras, or speed control measures were identified during the survey.



Two at-grade roundabouts were documented within the surveyed corridor at the Kyzyltepa district center and at Jondor district center. Both are located on a national highway that elsewhere operates as a high-speed dual carriageway, and neither appears to be equipped with adequate approach speed reduction measures or pedestrian crossing facilities. At the Jondor roundabout, a hazardous goods vehicle (fuel tanker, marked flammable) was observed mixing with general traffic, and pavement conditions across the roundabout surface was severely deteriorated.

Lane markings are absent or heavily faded over extensive sections of the corridor, particularly on carriageways that have not been recently resurfaced. On sections currently undergoing one-sided rehabilitation, the newly laid asphalt carriageway has no lane markings at all, leaving drivers to self-select lane positions on an unmarked surface. Edge line markings, where present, show significant wear.

1.8. Border Crossing Area – Turkmenistan (Farap)

The western end of the surveyed corridor approaches the Uzbekistan–Turkmenistan border crossing at Turkmenistan/Farap (km ~363). At the time of the field survey, an extensive queue of international heavy goods vehicles, predominantly European and Turkish-registered semi-trailers, extended several kilometers back along the M37 carriageway. Vehicles were queued on the shoulder and partially blocking the travel lane, with truck drivers and other people walking between stationary vehicles on the live carriageway. No traffic management measures, temporary signage, or law enforcement presence was observed managing the queue or protecting road users from the associated hazard. This situation represents a recurring operational condition at border crossings in the region and constitutes a serious safety risk for through-traffic approaching the stationary queue at speed.

1.9. Road Traffic Accident Observed During Survey

During the field survey in Karakul district, the survey team directly observed the immediate aftermath of a road traffic accident involving at least two vehicles – a Daewoo Damas microvan with severe roof collapse and windscreen destruction consistent with a rollover or high-speed impact, and a minibus with wheel/axle damage. Road workers in high-visibility vests and police officers were attending the scene on the live carriageway. The incident underscores the real-time crash risk present on the corridor and is consistent with the broader accident record documented in secondary data sources, which recorded 30 road traffic incidents on the M37 between km 212 and km 277, during 2025 alone, resulting in four (4) fatalities and 30 injuries.

Table 48 summarizes the principal road physical condition findings by theme and their associated road safety implications.



Table 62: Summary of Key Physical Condition Findings

Theme	Key Observation	Road Safety Implication
Pavement condition	Extensive alligator cracking, raveling, potholes, and surface water retention across multiple districts; asymmetric rehabilitation ongoing.	Reduced skid resistance, aquaplaning risk, vehicle instability, particularly for heavy vehicles.
Pedestrian infrastructure	Virtually absent along the rural corridor; one isolated sidewalk in Vobkent district; pedestrians observed on carriageway and median throughout.	Highest risk factor; pedestrian strikes are the most frequent accident type on the corridor.
Road lighting	Present only in peri-urban sections and near border crossing; rural inter-settlement sections entirely unlit.	Night accidents documented; unlit sections increase collision and pedestrian strike risk.
Railway level crossing	At-grade crossing in Jondor district with severe pavement deterioration at approach; no advance warning signs or rumble strips.	High-priority hazard; inadequate approach warning for high-speed vehicles.
Junctions and roundabouts	Two at-grade roundabouts on a high-speed corridor; no speed reduction measures; direct access from travel lanes to commercial premises throughout.	Speed-conflict risk at junctions; rear-end and right-angle collisions.
Border crossing queue	Multi-kilometer truck queue on live carriageway near Turkmenistan border crossing; pedestrians walking between stationary vehicles; no traffic management.	Rear-end collision risk; pedestrian-vehicle conflict; high-speed vehicles approaching stationary queue.
Roadside works and encroachment	Active utility excavations and construction debris within road reserve without protective measures; observed in Kyzyltepa and Jondor districts.	Hazard to errant vehicles and roadside workers; lane obstruction risk.

(Source: ESIA, Field observations from road safety audit, April–May 2026)

2. Traffic Volume and Composition

This subsection presents the findings of the traffic count survey conducted along the M37 Samarkand–Bukhara–Turkmenabat highway corridor. Two complementary data sources are used: primary traffic counts obtained through video-based survey conducted in April–May 2026 at thirteen designated kilometer posts between km 212 and km 360, and secondary traffic data from official classified traffic counts carried out by the Roads Department of Uzbekistan in January–March 2026 for the project corridor.

The primary traffic count survey was conducted on 27 April 2026 – 20 May 2026 using video-based vehicle detection. Several stationary video sources were also obtained from a police checkpoint, providing footage of two-way traffic at a fixed location. An additional eleven survey segments were recorded using dashcam video from a moving vehicle travelling the corridor between Kyzyltepa and Alat districts, as well as a



stationary hand-held camera at one location in Gijduvon district. Vehicle detection and classification were carried out using a machine learning pipeline comprising:

- PyTorch YOLOv8L model for vehicle detection
- BoT-SORT for multi-object tracking
- SparseOptFlow for ground motion compensation.

The model was configured to minimize false positives (ghost detections), which increased the likelihood of false negatives, vehicles present in the frame that were not detected, particularly under adverse conditions. Factors reducing detection accuracy included heavy rainfall (recorded at multiple locations on 20 May 2026), out-of-focus dashcam video, windshield wiper interference, fisheye lens distortion at the police checkpoint, and nighttime conditions at the Alat segment. Actual vehicle volumes should be considered conservative estimates; true counts are likely marginally higher than reported.

Vehicles were classified into three categories:

- light vehicles (passenger cars and small vans)
- heavy vehicles (buses, minibuses, trucks, and semi-trailers)
- bicycles/motorcycles/mopeds.

Table 49 presents the vehicle counts recorded at each survey location during the primary video-based traffic count.

Table 63: Video-Based Traffic Count Results by Survey Location (M37 Corridor, April–May 2026)

Survey Location	Survey Window	Total Vehicles	Light Vehicles	Heavy Vehicles	Bicycles/Mopeds	Light (%)	Heavy (%)
Police checkpoint – Kyzyltepa district	12:07–13:00	1,111	972	138	1	87.5%	12.4%
Police checkpoint – Gijduvon district	07:00–08:00	925	798	123	4	86.3%	13.3%
Police checkpoint – Vobkent district	18:00–19:00	1,578	1,212	366	0	76.8%	23.2%
Kyzyltepa (site 1)	14:16–14:53	736	628	103	5	85.3%	14.0%
Gijduvon (site 1)	14:30–15:07	624	484	134	6	77.6%	21.5%
Gijduvon (site 2)	14:34–15:08	431	368	60	3	85.4%	13.9%
Vobkent (site 1)	14:52–15:29	579	465	111	3	80.3%	19.2%
Vobkent (site 2)	14:43–15:20	554	457	94	3	82.5%	17.0%
Galaosiyο	14:48–15:25	1,252	1,089	161	2	87.0%	12.9%
Jondor (site 1)	15:21–15:58	649	592	56	1	91.2%	8.6%
Jondor (site 2)	15:18–15:55	650	558	91	1	85.8%	14.0%
Karakul district	15:26–16:03	266	236	30	0	88.7%	11.3%
Alat district	15:31–16:08	219	206	13	0	94.1%	5.9%



Survey Location	Survey Window	Total Vehicles	Light Vehicles	Heavy Vehicles	Bicycles/Mopeds	Light (%)	Heavy (%)
Bukhara district	14:39–15:16	450	347	102	1	77.1%	22.7%

(Source: Video-based traffic count survey, April–May 2026)

Secondary traffic data were obtained from official average daily traffic (ADT) counts conducted by the Roads Department at thirteen-kilometer posts along the M37 between km 212 and km 360, carried out between 14 January and 3 March 2026. Counts were conducted over a four-hour observation window (08:00–12:00) and extrapolated to a 24-hour ADT figure in accordance with MQN 45-2007 (Annex F-G). A reduced traffic intensity figure was also calculated per SHNQ 2.05.02-23 (Table 4), which applies vehicle equivalency factors to convert mixed traffic to a standardized passenger car unit (PCU) basis. The classified count distinguished between light cars (passenger vehicles), buses, minibuses, trucks by load capacity (up to 3.5 t; 3.5–12.0 t; over 12.0 t), semi-trailers, tractors/agricultural vehicles, and motorcycles/bicycles.

The police checkpoint recordings, covering the same fixed location at three-time windows on 27 April 2026, provide the most reliable directional count data and allow a time-of-day comparison. The evening session (18:00–19:00) recorded the highest single-segment count of 1,578 vehicles, with a notably higher heavy vehicle share of 23.2% compared to 12.4% and 13.3% in the morning sessions. This pattern is consistent with heavy freight vehicles completing daytime journeys and entering the corridor in the late afternoon.

Among the dashcam survey locations, Galaosiyo recorded the highest count at 1,252 vehicles, reflecting its position near the Bukhara urban fringe where multiple local and regional trip generators converge. Counts decline progressively westward toward Alat (219 vehicles) and Karakul (266 vehicles), consistent with the secondary data showing lower traffic intensities in the western portion of the corridor approaching the Turkmenistan border.

Across all primary survey locations, light vehicles (passenger cars and small vans) consistently dominate the traffic stream, accounting for between 76.8% and 94.1% of all vehicles observed. Heavy vehicles, including trucks, semi-trailers, and buses, represent between 5.9% and 23.2%, with the highest heavy vehicle shares recorded at the police checkpoint evening session and at Gijduvon site 1 and Bukhara district. Bicycles, motorcycles, and mopeds are present in very small proportions (0%–1.0%) but their presence on a high-speed dual carriageway without dedicated infrastructure is a road safety concern.

Table 50 presents the official ADT data from the Roads Department counts conducted at thirteen-kilometer posts along the M37 between January and March 2026. The 4-hour count totals (08:00–12:00) and the extrapolated 24-hour ADT figures are presented alongside the reduced traffic intensity calculated per SHNQ 2.05.02-23.



Table 64: Average Daily Traffic at Designated Posts, M37 Corridor (January–March 2026)

Km Post	4-Hour Count (08:00–12:00)	ADT — Daily Total (MQN 45-2007)	Reduced Traffic Intensity (SHNQ 2.05.02-23, Table 4)
km 212	12,076	46,251	49,313
km 230	14,339	54,918	57,507
km 245	13,712	52,517	56,060
km 252	11,370	43,547	46,038
km 265	16,917	64,792	66,890
km 275	11,358	43,501	45,213
km 280	11,662	44,665	47,398
km 290	12,056	46,174	48,645
km 305	13,020	49,867	52,207
km 327	10,152	38,882	41,012
km 340	10,357	39,667	41,173
km 350	8,136	31,161	33,175
km 360	7,275	27,863	30,334
Range	7,275 – 16,917	27,863 – 64,792	30,334 – 66,890

(Source: Roads Department of Uzbekistan, official classified traffic count survey, January–March 2026. Extrapolation per MQN 45-2007, Annex F-G. Reduced intensity per SHNQ 2.05.02-23, Table 4.)

The secondary data reveal a clear spatial gradient in traffic intensity along the M37 corridor. Traffic volumes are highest in the eastern sections of the corridor, with ADT peaking at km 265 (64,792 vehicles/day), the highest-volume point recorded, which corresponds to the approach to the Gijduvon and Bukhara agglomeration area. Other high-volume sections include km 230 (54,918 vehicles/day) and km 245 (52,517 vehicles/day), reflecting the concentration of population, commercial activity, and trip generation in the Gijduvon and Vobkent districts.

Traffic volumes decline progressively westward beyond the Bukhara urban area. At km 327 and km 340, ADT falls to approximately 38,882–39,667 vehicles/day and continues declining to 27,863 vehicles/day at km 360 – the lowest recorded point, corresponding to the more sparsely populated Karakul–Alat corridor approaching the Turkmenistan border. Despite this decline, even the western end of the corridor carries traffic volumes that substantially exceed those typically associated with two-lane undivided highways, confirming the M37 road's function as an inter-regional and international transit corridor throughout its length.

The four-hour peak window (08:00–12:00) accounts for approximately 15–26% of the daily traffic at different kilometer posts, with higher proportions at the western, lower-volume sections. This suggests a more pronounced morning peaking pattern in the lower-traffic sections, while the high-volume eastern sections show a more distributed daily pattern.



Vehicle Fleet Composition

The classified secondary count data provides a detailed breakdown of vehicle types across the corridor. Light passenger vehicles (private cars) dominate at all locations, representing the largest single category in terms of vehicle numbers. However, the heavy vehicle component, comprising trucks of all load categories, semi-trailers, and buses, contributes a disproportionate share of traffic loading on the pavement structure and poses the greatest risk in collision events.

Semi-trailers are consistently present at all kilometer posts, reflecting the corridor's role as an international freight transit route connecting Uzbekistan with Turkmenistan and onward to Iran. Their presence is most pronounced at the higher-volume eastern sections. Trucks in the medium load category (3.5–12.0 tones) and heavy load category (over 12.0 tones) are also recorded throughout. Buses and minibuses are present at all locations, serving inter-city and inter-regional passenger movements. Tractors and agricultural vehicles appear in small numbers at most locations, consistent with the predominantly agricultural land use flanking the corridor. Motorcycles and bicycles are recorded in very small numbers in the secondary data, as expected on a high-speed national highway.

Taken together, the primary and secondary traffic count data establish the M37 corridor as a high-volume, mixed-use arterial carrying between approximately 28,000 and 65,000 vehicles per day across different sections, with consistent presence of heavy freight vehicles accounting for roughly 10–25% of the traffic stream depending on location and time of day. This traffic character has direct road safety implications:

- The sustained presence of heavy semi-trailers and loaded trucks at high speeds on a corridor with significant pavement deterioration increases the risk of loss-of-control events and severe collision outcomes when crashes occur.
- The mix of heavy freight vehicles with light passenger cars and motorcycles/bicycles on a non-grade-separated, non-access-controlled corridor creates significant speed differential conflicts, particularly at the numerous at-grade access points to commercial premises documented along the route.
- The evening peaking of heavy vehicle share (23.2% in the 18:00–19:00 window at the police checkpoint, compared to approximately 12–13% during morning hours) coincides with declining natural light and the onset of the unilluminated night-time conditions documented on the rural sections of the corridor, a compounding risk factor.
- The high traffic volumes in the km 230–265 section (exceeding 50,000 vehicles/day) place particular pressure on the at-grade roundabouts documented in Kyzyltepa and Jondor districts, which were not designed to safely manage such volumes on a high-speed intercity corridor.



- The presence of bicycles and mopeds, though small in absolute numbers, on a corridor with no dedicated cycling or non-motorized infrastructure, represents a disproportionate safety risk for those users.

3. Road Safety Performance

This section presents the road safety baseline for the M37 Samarkand–Bukhara–Turkmenabat highway corridor, based on the official road traffic accident (RTA) register provided by the traffic police authorities in Bukhara and Navoi Provinces. The register covers all recorded incidents on the M37 between km 212 and km 276 during January–December 2025, comprising 30 road traffic incidents, 4 fatalities, and 30 injured persons.

It should be noted that the accident register covers only the eastern 64 km of the full project corridor (km 212–276). Accident data for the western sections, km 277 onwards through Jondor, Karakul, and Alat districts, were not available in the secondary data provided. This represents a gap in the safety baseline that should be addressed through additional data collection from the relevant traffic police authorities before finalizing the safety impact assessment.

Table 65: Road Safety Headline Indicators, M37 km 212–276 (January–December 2025)

Safety Indicator	Value — 2025
Total road traffic incidents recorded	30
Fatalities (persons killed)	4
Persons injured	30
Average incidents per month	2.5
Incidents involving fatalities	3 events (4 fatalities)
Fatality rate (per 100 incidents)	13.3%
Corridor section covered	km 212–276 (64 km)

(Source: Official RTA register, Traffic Police of Uzbekistan, 2025)

Table 106 shows that over the twelve-month study period, an average of 2.5 incidents per month were recorded in the surveyed section, with a fatality rate of 13.3 per 100 incidents, a rate significantly above international benchmarks for comparable highway corridors. Three separate events resulted in fatalities: a rollover at km 249 on 10 May 2025 (1 killed, 3 injured), a collision at km 226 on 25 August 2025 (2 killed), and a pedestrian strike at km 226 on 20 October 2025 (1 killed).



Table 66: Road Traffic Incidents by Accident Type, M37 km 212–276 (2025)

Accident Type	Incidents	% of Total	Fatalities	Injuries	Key Safety Implication
Pedestrian strike	14	46.7%	4	10	Absent crossing facilities; pedestrians on carriageway
Collision	10	33.3%	2	8	Speed differentials; uncontrolled access points
Cyclist involved	3	10.0%	0	3	Cyclists on high-speed carriageways without infrastructure
Rollover	2	6.7%	1	4	High speed; pavement deterioration; possible overloading
Struck obstacle	1	3.3%	0	1	Limited clear zone; roadside hazards
TOTAL:	30	100%	4	30	---

(Source: Official RTA register, Traffic Police of Uzbekistan, 2025)

Pedestrian strikes are by far the most prevalent accident type, accounting for 14 of 30 incidents (46.7%) and all 4 recorded fatalities. Every person killed on the M37 in 2025 was a pedestrian struck by a vehicle. This finding directly corroborates the infrastructure deficiencies, where the near-total absence of pedestrian crossing facilities and sidewalks was identified as the primary road safety concern along the corridor.

Collisions between vehicles are the second most frequent type (10 incidents, 33.3%), contributing 2 fatalities. These are consistent with speed differential conflicts arising from the numerous uncontrolled access points and at-grade junctions. Three incidents involving cyclists reflect the presence of these vulnerable road users on a high-speed carriageway without dedicated infrastructure. The single highest-casualty event was the rollover at km 249 (10 May 2025), resulting in 1 fatality and 3 injured persons.

Table 67: Road Traffic Incidents by District, M37 km 212–276 (2025)

District (km Range)	Incidents	Fatalities	Injuries	Predominant Accident Types
Gijduvon (km 212–234)	12	3	9	Pedestrian strikes (7), collisions (3), rollover (1), cyclist (1)
Vobkent (km 240–249)	6	1	8	Collisions (3), rollover (1), pedestrian strike (1), struck obstacle (1)
Bukhara (km 255–277)	12	0	12	Pedestrian strikes (5), collisions (5), cyclists (2)
TOTAL:	30	4	30	---

(Source: Official RTA register, Traffic Police of Uzbekistan, 2025)



Gijduvon district (km 212–234) and Bukhara district (km 255–277) each account for 12 incidents – 40% of all recorded RTAs. Gijduvon district concentrates all three fatal events and the highest absolute casualty count, consistent with the high traffic volumes recorded at km 212 and km 230 (ADT 46,251 and 54,918), the ribbon commercial development observed along the roadside, and the density of pedestrian activity documented in the road safety audit. Bukhara district, while recording zero fatalities, accounts for 12 injuries across 12 incidents, with pedestrian strikes and vehicle collisions distributed through the urban fringe sections.

Black spot analysis identifies four-kilometer posts with multiple recorded incidents: km 216 (3 incidents, pedestrian strikes in April, September, and October 2025), km 226 (2 incidents, the fatal collision of August 2025 and the fatal pedestrian strike of October 2025, together accounting for 3 of the 4 deaths), km 242 (2 incidents in Vobkent district), and km 249 (2 incidents in Vobkent district, including the fatal rollover). These four locations account for 9 of 30 incidents and all 4 fatalities and should be prioritized for targeted safety interventions.

Table 68: Road Traffic Incidents by Time of Day, M37 km 212–276 (2025)

Time Period	Incidents	% of Total	Notes
Morning (06:00–12:00)	10	33.3%	Coincides with peak traffic volumes (08:00–12:00 survey window)
Afternoon (12:00–18:00)	7	23.3%	Incidents at 13:00, 14:30, 15:30, 16:00, 17:20, 17:30, 17:50
Evening (18:00–20:00)	5	16.7%	Incidents at 18:11, 18:25, 18:30 (×2), 19:20 – declining natural light
Night (20:00–06:00)	8	26.7%	Incidents at 00:23, 05:50, 06:30, 21:00, 21:40, 23:00, 23:10, 23:50 – unlit corridor
TOTAL:	30	100%	---

(Source: Official RTA register, Traffic Police of Uzbekistan, 2025)

The morning period (06:00–12:00) records the highest incident count (10, or 33.3%), corresponding to the peak traffic volumes. However, the combined evening and night period (18:00–06:00) accounts for 13 incidents, 43.4% of all RTAs, which is disproportionately high relative to expected traffic volumes in those hours. This pattern strongly implicates reduced visibility as a contributing factor, consistent with the documented absence of road lighting across the rural sections of the corridor and the absence of effective road markings on multiple sections. Incidents at 23:00, 23:10, 23:50, 21:00, and 21:40 all occurred in conditions of darkness on a corridor documented to be unilluminated, with absent or faded lane markings and no retroreflective delineation on median barriers.

Seasonally, incidents are distributed across all twelve months of 2025 with no single month recording more than three events. The absence of a pronounced seasonal peak



confirms that the road safety risk is chronic and structural, attributable to persistent infrastructure deficiencies, rather than weather-driven.

Rows shaded red in Table 55 indicate incidents involving one or more fatalities.

Table 69: Full Road Traffic Accident Register, M37 km 212–276 (January–December 2025)

No.	Km	District	Date	Time	Accident Type	Killed	Injured
1	212	Gijduvon	13.01.2025	08:00	Pedestrian strike	0	1
2	257	Bukhara	11.01.2025	18:30	Pedestrian strike	0	1
3	247	Vobkent	23.01.2025	11:30	Collision	0	1
4	219	Gijduvon	12.03.2025	10:00	Pedestrian strike	0	1
5	215	Gijduvon	31.03.2025	13:00	Collision	0	1
6	216	Gijduvon	22.04.2025	10:55	Pedestrian strike	0	1
7	274	Bukhara	03.04.2025	08:00	Pedestrian strike	0	1
8	234	Gijduvon	07.04.2025	00:23	Rollover	0	1
9	249	Vobkent	10.05.2025	18:25	Rollover	1	3
10	275	Bukhara	15.05.2025	14:30	Pedestrian strike	0	1
11	276	Bukhara	16.03.2025	06:30	Cyclist involved	0	1
12	244	Vobkent	07.06.2025	05:50	Struck obstacle	0	1
13	258	Bukhara	17.07.2025	18:11	Cyclist involved	0	1
14	242	Vobkent	11.08.2025	07:30	Collision	0	1
15	232	Gijduvon	06.09.2025	12:00	Collision	0	1
16	216	Gijduvon	15.09.2025	23:00	Pedestrian strike	0	1
17	255	Bukhara	23.08.2025	15:30	Collision	0	1
18	277	Bukhara	23.09.2025	21:40	Pedestrian strike	0	1
19	226	Gijduvon	25.08.2025	17:50	Collision	2	0
20	273	Bukhara	29.07.2025	18:30	Pedestrian strike	0	1
21	216	Gijduvon	28.09.2025	11:00	Pedestrian strike	0	1
22	240	Vobkent	22.09.2025	08:05	Collision	0	1
23	226	Gijduvon	20.10.2025	19:20	Pedestrian strike	1	0
24	242	Vobkent	06.10.2025	23:10	Collision	0	1
25	220	Gijduvon	07.11.2025	21:00	Pedestrian strike	0	1
26	262	Bukhara	13.10.2025	16:00	Collision	0	1
27	256	Bukhara	13.11.2025	17:30	Cyclist involved	0	1
28	260	Bukhara	30.11.2025	18:30	Pedestrian strike	0	1
29	220	Gijduvon	29.11.2025	23:50	Collision	0	1
30	249	Vobkent	09.12.2025	17:20	Pedestrian strike	0	1
TOTAL:						4	30

(Source: Official RTA register, Traffic Police of Uzbekistan, 2025)

The 2025 accident record for the M37 corridor reveals a chronic and systemic pattern attributable to identifiable infrastructure and traffic management deficiencies. The following observations synthesize the safety performance findings with the physical and traffic conditions:



- **Pedestrian fatality dominance:** All four 2025 fatalities involved pedestrians struck by vehicles. The complete absence of pedestrian crossings, footpaths, and safe refuges forces pedestrians onto the carriageway and to cross at uncontrolled locations, directly producing this outcome. The four-kilometer posts with pedestrian fatalities (km 216, km 226, km 249, km 257) are all located in sections where no pedestrian infrastructure was observed during the field survey.
- **Black spot concentration:** Four-kilometer posts (km 216, km 226, km 242, km 249) account for 9 of 30 incidents and all 4 fatalities. Targeted infrastructure interventions at these locations, including pedestrian crossings, lighting, speed reduction measures, and median gap management, would address a disproportionate share of the corridor's casualty burden.
- **Night-time risk:** The 43.4% share of incidents occurring during evening and nighttime hours, on a corridor documented to be entirely unlit across its rural sections, confirms that the absence of road lighting is a direct and measurable contributor to crash risk. The incidents at 00:23, 05:50, 21:00, 21:40, 23:00, 23:10, and 23:50 all occurred in darkness with no artificial illumination.
- **Heavy vehicle severity amplifier:** The high heavy vehicle share documented in the traffic count survey, up to 23% at peak times with consistent semi-trailer presence throughout, amplifies collision severity when crashes occur. The fatal collision at km 226 (2 killed) and the fatal rollover at km 249 (1 killed, 3 injured) are consistent with high-energy events on a mixed-traffic corridor without service roads or speed management.
- **Data gap for western corridor:** No accident data are available for km 277–365, covering Jondor, Karakul, and Alat districts. Given the physical conditions identified in these sections, including the at-grade railway level crossing in Jondor district, the multi-kilometer border truck queue near the Farap crossing (Turkmen border), unlit sections, and the road traffic accident directly observed by the survey team in the Karakul district, this data gap should be urgently addressed before the safety impact assessment is finalized.



Appendix 16. Architectural and Cultural Heritage Sites

Table 70: Architectural and Cultural Heritage Sites within the Project Communities

No	Object Name	Category	Construction Period	Located Community
Kyzyltepa District, Navoi Province				
1	Shakhrivayron	Architectural monument	Ancient period	"Bolakrabo" community, Durmon rural settlement
2	Emakatepa	Architectural monument	VI–VIII centuries	"Gumbaz" community, Qarnab rural settlement
3	Boyazid Bastomiy Mosque	Architectural monument	XIX century	"Buston" community
4	Emakti Mosque	Architectural monument	XX century	"Gumbaz" community
Gijduvon District, Bukhara Province				
No ACHS sites are located in Project Communities				
Vobkent District, Bukhara Province				
5	Panobtepa	Archeological object	III–IV centuries	"Panob" community, Ponob village
6	Regdamintepa 1	Archeological object	Undetermined	"Panob" community, Regdamin village
7	Rigmadontepa 2	Archeological object	XIX–XX centuries	"Panob" community, Regdamin village
Bukhara District, Bukhara Province				
No ACHS sites are located in Project Communities				
Jondor District, Bukhara Province				
8	Talipochtepa	Archeological object	Middle centuries	Yangiobod community, Varakhsho village
9	Demuntepa	Archeological object	II–IV centuries	Demun community, Demun village
10	Dukkitepa	Archeological object	VII–VIII centuries	Puloti community, Dukki village
11	Chortoktepa	Archeological object	Middle centuries	Yangiobod community, Varakhsho village
12	Abdurahmon Safo Mosque	Architectural monument	XVI century	Karoli community, Bolin village
13	Yakkatut Mosque	Architectural monument	XIX century	Karoli community, Yakkatut village
Karakul District, Bukhara Province				
14	Poykent Fortress	Archeological object	IV century BC – XII century AD	"Shurabod" community, Yangiobod area
15	Poykend Shahrison	Archeological object	Middle Ages	"Shurabod" community, Yangiobod area
16	Badosiyo	Archeological object	Middle Ages	"Shurabod" community, Yangiobod area
Alat District, Bukhara Province				
No ACHS sites in Alat District registered in National List of Tangible Cultural Heritage Sites				



Appendix 17. Tree Management and Planting Plan

This is the outline of Tree Management and Planting Plan (TMP), which is to be developed by the Contractor(s) into a full, Lot-specific TMP as part of the *Site-Specific Environmental and Social Management Plan (SSESMP)/Construction Environmental and Social Management Plan (C-ESMP)*, once the detailed engineering design is approved.

1. Introduction

1.1. Purpose and Scope

This TMP sets out the framework for avoiding, minimizing, permitting, compensating, and monitoring the removal and relocation of trees and shrubs affected by rehabilitation of the M37 corridor and construction of the greenfield bypass, connection segment, and grade-separated junctions. The TMP applies to all five procurement Lots. Its objectives are to:

- (i) ensure avoidance and minimization opportunities are applied before any tree is authorized for removal;
- (ii) ensure all felling and relocation occur under valid permits (and, where applicable, government-level authorization);
- (iii) secure compensatory planting at the legally required ratio, with appropriate species and locations;
- (iv) protect retained trees within or adjacent to the works area;
- (v) monitor the survival and effectiveness of replacement planting;
- (vi) maintain continuous coordination with local government and environmental authorities throughout implementation.

Without a documented TMP, felling and replanting could proceed inconsistently across the five Lots, with no assurance that legal obligations, ecological considerations, or community expectations regarding roadside greenery are being met. This outline will be superseded by a full, Lot-specific TMP prepared by the Contractor once the detailed tree inventory for that Lot is complete and will not be considered final until endorsed by the PIU, PMC, and AIB.

1.2. Project Overview

The M37 Road Rehabilitation Project comprises rehabilitation of the existing 158 km M37 corridor between Kyzyltepa district (Navoi Province) and the Turkmenistan border, together with a greenfield western bypass (approximately 7.5 km) and a connecting link (approximately 4.5 km) to the Bukhara ring road, both in Lot 2.

The project is divided into five procurement Lots. Engineering design has been completed for Lots 1 and 2, including approximately 14 grade-separated junctions; for Lots 3–5, the confirmed scope is rehabilitation of the existing corridor, with several further



grade-separated junctions anticipated in Lots 3 and 4, and detailed engineering parameters still to be finalized.

Vegetation and tree loss along the corridor arises primarily from: (i) widening of the existing carriageway in settlement and peri-urban areas; (ii) construction of grade-separated interchanges and junctions; (iii) geometric improvements (curve realignment, embankment widening); and (iv) the greenfield bypass and ring-road connection in Lot 2. Based on the confirmed design for Lots 1–2, an estimated 11,351 plants are anticipated to be removed or transplanted. Comparable figures for Lots 3–5 will be available once detailed design and the corresponding tree inventory for those Lots are complete.

1.3. Applicable Regulations and Guidelines

The TMP is governed by a set of national legal instruments, including the following:

- *Presidential Decree No. UP-46*¹² “On measures to accelerate greening work and further effective organization of tree protection” – establishes an indefinite moratorium on felling of valuable species of trees and shrubs not part of the state forest fund, sets enhanced penalties during the moratorium, and makes design institutes accountable for project documentation involving felling of valuable species.
- *Presidential Decree No. UP-217*¹³ “On measures for organizing the activities of the National Committee of the Republic of Uzbekistan for Ecology and Climate Change” – reorganizes the former Ministry of Ecology into a National Committee reporting directly to the President, establishes an Ecological Police (“Ecopolice”) inspection service with enforcement powers, and introduces a new community land-protection mechanism relevant to settlement sections of the corridor.
- *Cabinet of Ministers Resolution No. 342*¹⁴ “On further improving the procedure for regulating the use of trees and shrubs not part of the state forest fund and granting permits for their use” – most recent amendment, updating the permit fee schedule, expanding the valuable species list, and introducing the government-authorization requirement specific to relocation of large trees within transport and infrastructure projects.
- Where applicable, the TMP will also refer to AIIB ESSs.

Cabinet of Ministers Resolution No. 464 (22 August 2022) and *Resolution No. 86 (22 February 2022)* remain in force, as amended by *Cabinet of Ministers Resolution No. 342*.

¹² Presidential Decree No. UP-46, On measures to accelerate greening work and further effective organization of tree protection, 30.12.2021, <https://lex.uz/docs/5801449>, (accessed July 2026)

¹³ Presidential Decree No. UP-217, On measures for organizing the activities of the National Committee of Uzbekistan for Ecology and Climate Change, <https://lex.uz/ru/docs/7847356>, (accessed July 2026).

¹⁴ Cabinet of Ministers Resolution No. 342, On further improving the procedure for regulating the use of trees and shrubs not part of the state forest fund and granting permits for their use, 30 June 2026, effective 1 July 2026, <https://lex.uz/ru/pdfs/8298612> (accessed July 2026).



Resolution No. 464's felling/relocation permitting procedure is set out in Section 1.3.2 below; *Resolution No. 86's* permit application template is specified in Section 2.5.

1.3.1. Moratorium on Valuable Species

According to *Presidential Decree No. UP-46*¹⁵, felling of trees and shrubs not part of the state forest fund is permitted for construction, reconstruction, and communications works – except for valuable species, which are subject to an indefinite moratorium on felling. This moratorium applies specifically to the species named in the valuable-species list enclosed as Annex to *Cabinet of Ministers Resolution No. 342*¹⁶, several of these species were confirmed present along the M37 corridor during the project's biodiversity field surveys.

In practice, this means valuable species identified in the corridor – most significantly mulberry (*Morus alba*) and elm (*Ulmus pumila*), given their numerical dominance in the shelterbelt network, together with Paulownia (*Paulownia tomentosa*) recorded in managed plantation plots in Lots 1–2 – cannot simply be felled under a standard construction-related permit; they may generally only be relocated. Pine (*Pinus sp.*), recorded at public institution frontages along the corridor, may also fall within this category if confirmed at the species level as *Pinus sylvestris*. By contrast, juniper (*Juniperus sp.*), also recorded at public institution frontages, is named in the Resolution's low-value species list rather than the valuable-species list, and is therefore not subject to the felling moratorium.

Enhanced consequences apply during the moratorium period:

- Administrative fines for violations are increased five-fold.
- Damages payable for illegal felling or damage to valuable species are increased two-fold.
- Construction/contractor organizations found to have violated the moratorium are downgraded one level in the national "transparent construction" electronic rating system, are barred from improving their rating for one year, or, where a downgrade is not possible, are excluded from the rating system entirely for one year.
- The Design Institute is accountable for project documentation that addresses felling, uprooting, damage, or destruction of valuable species; this is directly relevant to the design Institute's role in confirming the construction footprint at locations with valuable shelterbelt trees along the project corridor.
- Issuance of any government decision, protocol, written instruction, or local executive authority act mandating or authorizing felling of valuable species without following the legal procedure is categorically prohibited.

¹⁵ [FOOTNOTE #1](#)

¹⁶ [FOOTNOTE #3](#)



This moratorium is the primary reason the government-authorization pathway for large, valuable trees exists. It is, in effect, the mechanism by which felling/relocation of valuable species can lawfully proceed for a state-significant infrastructure project despite the general moratorium.

1.3.2. Base Permitting Procedure

Base permitting procedure is provided in *Cabinet of Ministers Resolution No. 464, 22 August 2022, "On the procedure for planting, care, and use of trees and shrubs not part of the state forest fund"* (as amended by *Cabinet of Ministers Resolution No. 342¹⁷*). Under this resolution:

- Felling of non-forest-fund trees and shrubs is permitted only for sanitary purposes or in connection with construction or reconstruction of buildings, structures, and communications, and (except for sanitary felling) is carried out on a paid basis.
- The felling permit process requires the territorial environmental authorities to verify documents, inspect the trees and shrubs on site, consider preservation/relocation options before authorizing felling, and determine the number, species, timing, and location of compensatory planting.
- Standard (legal) compensatory planting obligation: not less than 10 large-caliper saplings (5-year-old trees and 3-year-old shrubs) per tree or shrub felled or relocated under permit, maintained for at least 2 years; payment of the permit fee does not waive this planting obligation.
- Illegal felling, damage, destruction, or unauthorized relocation carries a substantially higher penalty: not less than 100 saplings planted per tree or shrub as compensation, maintained for at least 3 years, in addition to confiscation of the illegally obtained product (timber, etc.) and payment of assessed damages. Non-compliance with territorial environmental authorities binding instruction is separately subject to administrative liability.
- Administrative fines for illegal felling, pruning, damage, destruction, or relocation of trees, shrubs, and other plants/saplings: 25–50 base calculation units¹⁸ for citizens; 50–75 base calculation units for officials (before the five-fold moratorium multiplier, where applicable).

This establishes the important distinction between the standard 10:1 legal compensatory ratio applicable to properly permitted felling/relocation and the substantially more severe 100:1 ratio, 3-year care obligation, and confiscation/fines that

¹⁷ [FOOTNOTE #3](#)

¹⁸ The base calculation unit is a standard reference amount used throughout Uzbek legislation to denominate fines, fees, and thresholds instead of stating a fixed sum in UZS directly. Its value in Uzbek Soum is set and periodically revised by Presidential Decree or Resolution, so a fine expressed as "25–50 base calculation units" scales automatically whenever that reference value is updated, rather than requiring every law that cites it to be amended. Based on Presidential Decree No. UP-91, dated 02 June 2025 (<https://lex.uz/docs/7553336>, accessed July 2026), sets the base calculation unit at UZS 412,000, effective from 01 August 2025, and remains the applicable value as of July 2026.



apply to unauthorized felling – reinforcing why permit compliance is treated as a non-negotiable element of this TMP.

1.3.3. National Committee on Ecology and Climate Change and the Community Land-Protection Mechanism

According to *Presidential Decree No. UP-217*¹⁹, the former Ministry of Ecology, Environmental Protection and Climate Change has been restructured into a National Committee for Ecology and Climate Change, reporting directly to the President, with an Ecological Police (*Ecopolice*) inspection service empowered to use physical force, special means, and service weapons (non-lethal) in enforcement. Of relevance to the M37 road rehabilitation project, effective 01 April 2026 a new community mechanism allows residents to petition, through public service centers or the unified e-government portal, to prohibit withdrawal or reallocation of settlement land on which non-forest-fund trees grow. Where at least 10% of the population of the mahalla in which the land is located supports the petition, the Ecology and Climate Change Committee imposes a formal prohibition on withdrawal/reallocation of that land, which is then registered by the Cadaster Agency (provided the land is not private property). This introduces a newly available community-level mechanism that could delay or complicate land acquisition and tree removal in settlement sections of the corridor (particularly Gijduvon, Vobkent, and Bukhara district centers) if not proactively managed through early, transparent consultation.

1.3.4. Cabinet of Ministers Resolution No. 342

Table 1 summarizes the specific parameters updated by the *Cabinet of Ministers Resolution No. 342*²⁰, which operates within the framework of the instruments above rather than replacing them.

Table 71: Summary of Key Requirements Governing Non-Forest-Fund Trees and Shrubs (Cabinet of Ministers Resolution No. 342 and Related Instruments)

Requirement	Provisions	Article
Permitting Authority	The permitting authority is the territorial subdivision of the National Committee for Ecology and Climate Change of the relevant province, or the corresponding committee of the Republic of Karakalpakstan or Tashkent city.	Annex, Item 2 (amended Annex 15 to Resolution No. 86), passport field 4
Scope of Relocation Permit (standard)	Trees up to 15 cm trunk diameter (measured at 1.3 m height) and shrubs up to 10 cm root-collar diameter may be relocated under a standard permit.	Point 2, para. 1
Scope Requiring Government Authorization	Relocation of trees and shrubs exceeding the above thresholds, within transport and road infrastructure objects, large investment projects, state programs, or other projects of state significance, requires government-level	Point 2, para. 5; corresponding amendment at Annex, Item 3(b) (new para. 5 of clause 8, Resolution No. 464)

¹⁹ [FOOTNOTE #2](#)

²⁰ [FOOTNOTE #3](#)



Requirement	Provisions	Article
	authorization based on documents of the President of the Republic of Uzbekistan. This is the operative mechanism enabling lawful relocation of larger valuable-species specimens despite the moratorium under <i>Presidential Decree No. UP-46</i> ²¹ .	
Tree Felling (general)	Felling is permitted where trees and shrubs hinder construction, reconstruction, or engineering survey works. The competent authority must first consider relocating the tree elsewhere; felling permits are issued only where relocation is not feasible.	Annex, Item 2 (amended Annex 15 to Resolution No. 86), Note V
Compensatory Planting Ratio for Legal, Permitted Felling or Relocation	Not less than 10 large-caliper saplings planted for every 1 tree or shrub felled or relocated under permit.	Resolution No. 464, Point 1(a); consistent with Annex, Item 2 (amended Annex 15 to Resolution No. 86), passport field 9(b)
Compensatory Planting Ratio for Illegal Felling	Not less than 100 saplings planted per tree or shrub as compensation, together with a 3-year care obligation, confiscation of the illegally obtained product, and payment of assessed damages.	Resolution No. 464, Point 1(a)
Sapling Specification	Compensatory saplings must be large-caliper stock: minimum 5-year-old trees or 3-year-old shrubs.	Annex, Item 2 (amended Annex 15 to Resolution No. 86), passport field 9(b)
Aftercare Obligation	A minimum 2-year aftercare obligation applies to felled trees replaced under the compensatory planting requirement; a minimum 3-year aftercare obligation applies to relocated trees and shrubs.	Annex, Item 2 (amended Annex 15 to Resolution No. 86), passport field 9(b)
Compensatory Planting Site Selection	Compensatory planting sites are, as a rule, selected from designated "Yashil Bog'lar" (Green Gardens) and "Yashil Jamoat Parklari" (Green Public Parks), or other areas designated for landscaping and greening.	Resolution No. 464, Point 2, para. 2
Permitted Felling or Relocation Season (sanitary purposes, shaping, size-limited works)	Permitted from autumn, after the end of the vegetation period, to 1 April of the following year, for both deciduous and coniferous species.	Point 2, para. 2; corresponding amendment at Annex, Item 3(j) (new para. 2 of clause 37, Resolution No. 464)
Application Processing Time	Applications are processed within 10 working days.	Annex, Item 2 (amended Annex 15 to Resolution No. 86), passport field 8
Valuable Species List	The valuable species list comprises four categories, 130 species in total: (i) valuable timber species (ii) valuable ornamental species (iii) Red Book-listed species (iv) valuable shrub species. This list supersedes the list previously set out under the now-invalid Resolution No. 93 of 2020.	Annex, Item 1

²¹ [FOOTNOTE #1](#)



Requirement	Provisions	Article
Exclusions from Scope	This framework does not apply to: - trees on individual homestead plots - nursery- and plantation-grown seedlings - trees owned by legal entities or individuals and planted for construction material or fruit production on their own land.	Annex, Item 2 (amended Annex 15 to Resolution No. 86), Note II

1.4. Baseline Data

1.4.1. Biodiversity Baseline

The project's biodiversity baseline study confirms that all habitat units along both the bypass and rehabilitation corridors are classified as Modified Habitat under IFC PS6; no Natural Habitat or Critical Habitat was identified. The dominant woody vegetation along the corridor consists of shelterbelt and roadside tree-line plantings (mulberry, elm, poplar, with occasional pine/juniper at public institution frontages), orchard and vineyard habitat (apricot, apple, plum, sweet cherry, peach, grapevine), and canal-margin reed vegetation (*Phragmites australis*).

1.4.2. Cross-reference of Vegetation Baseline vs. Valuable Species List

Cross-checking tree species recorded during biodiversity field surveys against the four categories of the Annex to the *Cabinet of Ministers Resolution No. 342*²² (valuable timber, valuable ornamental, Red Book, valuable shrub) identifies the following:

- *Mulberry (Morus alba / M. bombycis)* is listed in Annex I (*Valuable Timber Species*). This is the single most numerous species recorded along the corridor (e.g., up to 1,153 individuals in one bypass section alone, and a major component of the Lot 1–2 shelterbelt network). As a valuable species, mature mulberry specimens within the footprint should be assumed to require relocation rather than felling wherever feasible. Those exceeding 15 cm trunk diameter will require government-level authorization to relocate.
- *Elm (Ulmus pumila / U. minor)* is listed in Annex I to the *Cabinet of Ministers Resolution No. 342*. Also a dominant shelterbelt species along Lots 1–2 and several bypass sections. The same felling-restriction and permitting implications apply as for mulberry.
- *Paulownia sp.* (recorded in managed plantation plots in Lots 1–2) is listed in Annex I (*Valuable Timber Species*) as *Paulownia tomentosa*. Although the ESIA biodiversity baseline treats *Paulownia* primarily as an introduced species to monitor for naturalization, it is formally a valuable species under *Cabinet of Ministers Resolution No. 342* and subject to the same felling restriction.
- *Pine (Pinus sp.,* recorded at public institution frontages) potentially corresponds to *Pinus sylvestris*, listed in Annex I (*Valuable Timber Species*); other pine species are not listed.

²² FOOTNOTE #3



- *Juniper* (*Juniperus sp.*, recorded at public institution frontages, often alongside pine) is named in the *Cabinet of Ministers Resolution No. 342*'s low-value species list rather than the *Valuable Species List*, and is, therefore, not subject to the felling moratorium.
- Poplar (*Populus alba* / *P. nigra*), apricot (*Prunus armeniaca*), and apple (*Malus domestica*) are all fall within the *Cabinet of Ministers Resolution No. 342*'s *Low-Value Species List* and are not subject to the valuable-species felling moratorium. These species may be felled under a standard construction-related permit where relocation is not feasible, but in coordination with territorial environmental authorities. In practice, environmental authorities may require, in addition to the payment of a fee for cutting down low-value tree species, the planting of new trees in a certain area with the provision of transplantation plan.
- No overlap was identified between species recorded within the construction footprint and the *Annex III list (Red Book-listed Tree Species) of Cabinet of Ministers Resolution No. 342*, which is restricted to species found in the mountainous districts of Kashkadarya, Surkhandarya, and Tashkent Provinces and does not correspond to the flat desert/oasis landscape of the M37 corridor in Bukhara and Navoi Provinces. This is a distinct list from the project's own Red Book flora screening, which identified non-tree Red Book species (e.g., *Ferula kyzylkumica*, *Zygophyllum bucharicum*).

1.4.3. Species of Conservation Significance

The biodiversity baseline identifies two nationally protected Red Book fauna subspecies directly associated with the shelterbelt/orchard tree resource that is the subject of this TMP:

- The *Bukhara Tit* (*Parus bokharensis*) recorded foraging in orchard and shelterbelt habitats in multiple bypass sections and in the Lots 1–2 rehabilitation corridor, and the *Zarafshan Pheasant* (*Phasianus colchicus ssp. zerafschanicus*), recorded as a transient user of orchard/mulberry habitat in bypass section.
- The asset inventory identifies an apple plantation cluster of approximately 220 trees at PK 72+50 (Lot 1) as structurally consistent with *Bukhara Tit* foraging habitat; this and comparable orchard/shelterbelt clusters should be flagged for ecological supervision during felling.
- No plant species of conservation significance (*Red Book or IUCN-listed*) was confirmed within the construction footprint; however, a mandatory pre-construction botanical re-survey for *Zygophyllum bucharicum* (*IUCN Critically Endangered*) is required in the saline sections of Lots 3–5 prior to earthworks, consistent with the biodiversity study. Associated protective measures are addressed in the project's ESMP and fall outside the tree/shrub-specific scope of this TMP.



1.4.4. Preliminary Tree and Structure Count (Lots 1–2)

Given the 158 km length of the corridor and the limited timeframe available for ESIA preparation, the Design Institute and ESIA survey team undertook a count of affected trees and structures by chainage (PK) location across Lots 1 and 2 (24–30 April 2026). This count recorded the number and general category (orchard/agricultural asset versus ornamental tree) of affected plants at each location:

- In Lot 1, a total of 5,920 plants were counted, comprising 1,522 orchard/agricultural assets and 4,398 ornamental trees.
- In Lot 2, 5,431 plants were counted, comprising 1,326 orchard/agricultural assets and 4,105 ornamental trees.

This brings the combined total of counted plants to 11,351. The largest concentrations of affected ornamental and shelterbelt trees were found at overpass locations, with approximately 1,200 trees at PK 604+50, approximately 1,000 trees at PK 305+00–320+50, and approximately 900 trees at PK 147+00–158+00.

Significant numbers of affected trees were also recorded at major junctions, including approximately 220 apple trees at PK 72+50 and approximately 398 trees, including vineyard species, at PK 247+00. This tree count establishes the overall scale and spatial distribution of anticipated impacts and provides the starting point for the detailed, geo-referenced tree inventory to be conducted by the Contractor for each Lot, which will supply the species-level, condition, and diameter data needed for permitting, and any further information the local or national environmental authorities may request.

1.5. Structure of TMP

This TMP is organized as follows:

- Chapter 1 provides an introduction to the TMP, detailing its purpose and scope, a review of the project, the requirements of applicable Uzbek regulations, and findings from the baseline study related to tree surveys.
- Chapter 2 outlines the TMP itself, which includes the scope of application (covering baseline data, avoidance measures, tree protection, permitting, and compensatory planting), management actions to be taken during implementation, a monitoring and evaluation framework, roles and responsibilities, and provisions for the review and update of the plan.
- Chapter 3 describes the record-keeping and reporting arrangements.
- Chapter 4 addresses capacity building and training.
- Chapter 5 outlines the framework for estimating implementation costs.
- Annexes 1 and 2 provide supporting templates.



2. Tree Management Plan

2.1. Application

This TMP applies to activities during the preconstruction, during construction, and operation of the road alignment within the project right-of-way.

2.2. Mitigation Hierarchy and Step-by-Step Workflow

Consistent with standard biodiversity management planning practice, this TMP follows the mitigation hierarchy – avoid, minimize, restore/compensate, monitor – and translates it into a practical sequence of steps for the Contractor, PIU, and PMC at the start of each Lot. Where avoidance is not feasible, relocation will be considered ahead of felling for viable specimens, consistent with the requirement that the competent authority first consider relocation before authorizing felling. Step-by-step workflow is as follows:

- Step 1. Obtain the approved detailed engineering design and construction footprint for the Lot.
- Step 2. Commission the detailed, geo-referenced tree inventory for the Lot (species, condition, trunk diameter, GPS location).
- Step 3. Cross-check every inventoried tree against the Valuable Species List²³ (Chapter 1.3, Table 1) to classify it as valuable (felling-restricted) or low-value (standard permit).
- Step 4. Confirm, with the Design Institute, whether any trees can still be avoided through micro-siting adjustments before proceeding to permitting.
- Step 5. For trees that cannot be avoided, determine whether relocation or felling applies, and submit the corresponding permit – or, for valuable species exceeding 15 cm trunk diameter, the government-authorization application – well ahead of the construction schedule.
- Step 6. Undertake felling/relocation only within the permitted season and under ecological supervision.
- Step 7. Implement compensatory planting at the required ratio, at agreed sites, with aftercare.
- Step 8. Monitor, report, and update the plan as new information becomes available.

²³ [FOOTNOTE #3](#)



2.3. Tree and Vegetation Inventory

2.3.1. Data to be Collected

For every tree and shrub within the confirmed construction footprint and the adjacent buffer/protection zone, the Contractor's inventory must record, at minimum:

- a unique reference number for each tree/shrub, geo-referenced by GPS coordinate;
- scientific and common name;
- valuable or low-value species status, determined by reference to the Annex to Resolution No. 342²⁴ and, where relevant, the Red Book of Uzbekistan;
- trunk diameter at 1.3 m height (cm) for trees, or root-collar diameter for shrubs;
- general condition/health, including any indication of disease, damage, or structural instability;
- whether the tree/shrub falls within the construction footprint (subject to removal) or the buffer zone (to be protected in place); and
- whether felling or relocation is proposed, and the corresponding permit pathway (standard permit or government authorization).

A standardized log template for recording this data in the field is provided at Annex 1.

2.3.2. Inventory Methodology

The Contractor will commission this inventory during the detailed design and pre-construction stage for each Lot, once the confirmed construction footprint is available, and before any felling/relocation permit application is submitted. The inventory should be conducted by, or under the direct supervision of, a qualified arborist, forester, or ecologist, using geo-referenced field survey methods:

- Visual inspection from ground level, without dissection, probing or coring.
- GPS-tagged tree marking to confirm the tree/shrub location.
- Structured data collection paper-form or mobile data-entry tool.
- Photographic documentation of trees of valuable-species status or conservation concern).

Results will be compiled into a tree register (database and/or GIS layer) covering the full Lot, organized by chainage (PK) to allow direct comparison with the preliminary count (Chapter 1.4). Given the extensive scale of the shelterbelt network, including mature plantings of mulberry and elm established over several decades, a significant proportion of trees at the highest-concentration locations identified during baseline survey should be assumed likely to exceed 15 cm diameter for planning purposes, pending confirmation through this inventory.

²⁴ [FOOTNOTE #3](#)



2.3.3. Tree/Shrubs Classification per Valuable Species List

Once the inventory is complete, the Contractor must check every recorded species against the [Valuable Species List](#) (Table 1) and proceed as follows for specific Lot:

- Confirm the species-level identity of any *Pinus* sp. present in the Lot before submitting any felling or relocation permit application involving that species.
- Record trunk diameter for every valuable-species tree identified, to determine whether the standard permit (≤ 15 cm) or the government-authorization pathway (> 15 cm) applies.
- For valuable species, consider relocation instead of felling for mature specimens wherever feasible and share the inventory details with the relevant territorial environmental authorities. For specimens exceeding 15 cm trunk diameter requiring relocation, prepare an inventory report and submit it to the national environmental authorities through the Committee for Roads (Avtoyulinvest), given the longer lead time this pathway may require.
- For low-value species, compile a list of affected trees with inventory details and submit it to the territorial environmental authorities. If the environmental authority requires planting of new seedlings as a condition of the felling permit, the Contractor shall prepare a corresponding budget and planting plan.
- Confirm sapling availability for the anticipated compensatory planting requirement with the relevant nurseries before finalizing the felling/relocation schedule.

This classification exercise applies to every Lot. Cross-reference and classification exercise against [Valuable Species List](#) should be applied once the corresponding construction footprint is confirmed for each Lot.

2.3.4. Role of PIU and PMC

The PMC will verify the Contractor's inventory methodology and results, including spot-checks of a representative sample of recorded trees against field conditions, before the inventory is used as the basis for permit applications. The PIU will review the consolidated, Lot-specific inventory, confirm classification of valuable-species specimens requiring government authorization, and coordinate submission of the corresponding inventory report to the national environmental authorities through the Committee for Roads (Avtoyulinvest). The full, Lot-specific TMP incorporating this inventory is not considered final until endorsed by the PIU, PMC, and AIB.

2.4. Tree Protection: Footprint and Buffer Zone

The TMP will distinguish between trees within the confirmed construction footprint (subject to removal) and trees within an adjacent buffer/root-protection zone that may be indirectly affected by root disturbance, soil compaction, dust, or machinery movement without requiring removal. Retained trees within or near the works area will be protected through delineation, fencing, or hoarding of tree protection zones prior



to the start of works in each Lot, based on the geo-referenced tree inventory. Lot-specific footprint and buffer zone widths to be confirmed with the Design Institute during detailed design.

2.5. Felling and Relocation Permitting Procedure

No tree or shrub will be felled or relocated without a valid permit from the competent territorial subdivision of the National Committee for Ecology and Climate Change, or, where relocation of a valuable species exceeding the diameter threshold is proposed within this state-significant infrastructure project, the required government-level authorization.

For valuable species, the default legal pathway is relocation, not felling, given the indefinite moratorium on felling of valuable species. Felling of a valuable species will only be pursued where relocation has been assessed as not feasible by the competent authority.

For low-value species, felling under a standard construction-related permit remains available where relocation is not practicable, subject to any replanting condition the territorial authority may impose.

Permit applications will include applicant details, species and number of trees/shrubs to be felled/relocated, location, and purpose, consistent with the application template set out in Annex 15 to the Unified Regulation approved by [Cabinet of Ministers Resolution No. 86](#), as updated by [Cabinet of Ministers Resolution No. 342](#).

Given standard processing timelines (10 working days) and the potentially much longer lead time for government-level authorization of large valuable-tree relocation, permit applications will be initiated during the detailed design and pre-construction stage for each Lot, prioritizing locations with the largest concentrations of valuable species (mulberry, elm) at the largest diameter (e.g., interchange, junction, and overpass sites identified in Chapter 1.4.4).

Felling/relocation for sanitary purposes, shaping, or size-limited works will be scheduled within the permitted season (from the end of the vegetation period to 1 April), where feasible, in coordination with the overall construction schedule.

2.6. Compensatory Planting

2.6.1. Planting replacement

Planting replacement will be carried out at a ratio of not less than 10 trees/shrubs planted for every 1 felled or relocated under permit, using large-caliper saplings (minimum 5-year-old trees or 3-year-old shrubs), consistent with [Cabinet of Ministers Resolution No. 342](#).



Compensatory planting will be maintained for a minimum of 2 years (felled trees) or 3 years (relocated trees/shrubs), including watering, pest/disease control, and replacement of failed plantings.

Species selection will prioritize native and locally appropriate species suited to the corridor's semi-arid conditions, coordinated with the project's green landscape design, and will avoid species that could create future conflicts with road safety sightlines, utilities, or maintenance access.

Where roadside space within the right-of-way is insufficient to accommodate all required replacement planting, off-site compensatory planting locations will be identified and formally agreed with local authorities, drawing where possible on designated "Yashil Bog'lar" (Green Gardens) and "Yashil Jamoat Parklari" (Green Public Parks) (Chapter 1.3).

Compensation for trees within productive orchards, vineyards, or other agricultural land will be addressed separately through the Resettlement Action Plan (RAP) entitlement matrix for Lots 1–2, and the Resettlement Policy Framework (RPF) for Lots 3–5, as an economic-displacement impact, distinct from the roadside/public tree replacement planting addressed here.

A standardized log template for tracking each planted sapling through its aftercare period is provided at Annex 2.

2.6.2. Sapling Supply

Compensatory planting at the required 10:1 ratio implies a substantial sapling requirement (potentially more than 110,000 saplings across Lots 1–2 alone, before Lots 3–5 are confirmed).

Regional supply capacity to be provided primarily through the Bukhara and Navoi Province Forestry Departments and their district-level nurseries. The Contractor will confirm availability of specific species (particularly large-caliper mulberry and elm saplings meeting the minimum 5-year-old specification) directly with these nurseries during detailed design, and before finalizing the felling/relocation schedule for the Lot (Chapter 2.3.3). This is supported by national policy direction under the "[Yashil Makon](#)" program, which mandates increased production of climate-adapted seedlings and a doubling of state forestry nursery seedling supply capacity; however, actual availability of the specific species and calipers required for this project's compensatory planting should not be assumed and must be verified directly with the relevant nurseries.

2.7. Management Actions

2.7.1. Ecological Supervision and Biodiversity Considerations

Tree clearance activities will be carried out under the supervision of a qualified ecologist or arborist, who will confirm the absence of nesting birds or other protected species prior



to felling, verify correct felling and root-protection techniques, and authorize any deviation from the approved felling schedule. Particular attention will be given to orchard and shelterbelt clusters identified as structurally consistent with Bukhara Tit foraging habitat and comparable clusters identified during the detailed tree inventory.

Removal of any tree or shrub species of conservation concern will be avoided where possible; where unavoidable, such removal will be coordinated with the relevant environmental authorities, and seed collection or salvage will be undertaken only by trained specialists.

Vegetation clearance in orchard/shelterbelt clusters known to support the Bukhara Tit or the Zarafshan Pheasant will be avoided during the bird breeding season (March–June inclusive) where feasible.

Beyond the legally required 10:1 numeric ratio, the TMP will consider the ecological value of affected vegetation (species composition, habitat function, connectivity) with a view to achieving no net loss, and where feasible a net gain, of ecological value along the corridor.

2.7.2. Other Provisions

Handling, reuse, or disposal of felled timber and vegetation debris will be addressed in accordance with the Contractor's waste management plan. Felling and relocation will be timed, where feasible, to avoid bird breeding seasons, consistent with the permitted season under *Cabinet of Ministers Resolution No. 342*.

2.7.3. Monitoring and Evaluation

Monitoring activities will track:

- (i) Survival rates of compensatory planting at defined post-planting intervals (e.g., 6 months, 1 year, 2 years, and 3 years where applicable).
- (ii) Condition and effectiveness of tree protection measures for retained trees.
- (iii) Compliance with permit conditions and aftercare obligations.

Evaluation criteria will include species-specific survival-rate thresholds to be confirmed by the Contractor's ecologist/arborist and the PIU/PMC based on local nursery experience. Where survival falls below the agreed threshold, replacement planting and, where relevant, a review of species selection or planting site suitability will be triggered as an adaptive management response.

Monitoring will also track the number and outcome of felling/relocation permit applications, including any government-authorization applications, to identify emerging permitting bottlenecks early.

Monitoring elements of the TMP will be documented and controlled by PMC and communicated to PIU. Records demonstrating compliance with legal requirements and



conformance with the TMP will also be maintained. PIU and PMC will supervise, establish, implement, and maintain reporting procedures.

The monitoring requirements will be fulfilled by maintaining the proper documentation records of the Contractor, inspection and audits by PMC, and quarterly monitoring missions by PIU.

2.8. Roles and Responsibilities

2.8.1. Institutional Roles and Responsibilities

Table 26 sets out the roles and responsibilities of each party involved in implementation of this TMP.

Table 72: Institutional Roles and Responsibilities

Party	Key Responsibilities under this TMP
PIU (Committee for Roads/ Avtoyulinvest)	- Overall coordination and liaison with national authorities, including routing and follow-up of government-level authorization applications for vegetation/tree felling or relocation. - Provision of oversight of TMP implementation, TMP update, ensure alignment with lender requirements, and review monitoring reports.
PMC	- General contract supervision by Lot. - Supervision of TMP implementation general oversight and verification of the Contractor's felling/relocation activities, compensatory planting, and monitoring results. - Delivery of training sessions, capacity building, and guidance to contractors on the requirements of the TMP. - Technical assistance to PIU and contractors with the TMP implementation. - Environmental inspections and audits. - Verification of TMP compliance and provision of recommend corrective actions. - Preparation of reports focusing on TMP compliance, monitoring, evaluation, and adaptive management.
Design Institute	- Confirmation of construction footprint and buffer zones. - Accountability under <i>Presidential Decree No. UP-46</i> for project documentation involving felling of valuable species.
Contractor	- Implementation of all TMP mitigation and monitoring measures, including inventory, tree/shrubs felling, relocation, compensatory planting, and aftercare. - Ensuring TMP compliance by subcontractors, if involved. - Maintenance of the tree register and submission of felling/relocation permit applications - Preparation and submission of government-authorization inventory reports through the Committee for Roads. - Delivery of training and awareness programs for all workers involved in TMP implementation on: tree protection zones, felling/relocation procedure awareness, protected tree species recognition. - Application of appropriate materials, equipment, machinery and vehicles to minimize environment, health, and safety and biodiversity risks. - Maintaining records and report incidents. - Preparation of corrective action plans, if needed.
National Committee for Ecology and Climate	- Provide regulatory oversight - Permitting authority for standard felling/relocation permits. - Conducts site inspections and issues permits.



Party	Key Responsibilities under this TMP
Change (territorial departments)	
District Khokimiyat	Coordination on identification and agreement of compensatory planting sites.

In addition, a dedicated technical specialist (ecologist/botanist/arborist) will be engaged under the PMC/PIU contract. This specialist will supervise the Contractor's tree inventory, confirm species identification, conduct pre-felling inspections for nesting birds/fauna, and verify the tree register prepared by the Contractor.

2.8.2. Coordination with Local Government and Environmental Authorities

Coordination with district khokimiyats, the provincial departments of National Committee for Ecology and Climate Change, and other relevant authorities is a continuing requirement throughout implementation, not a one-time step. This includes:

- (i) Obtaining felling/relocation permits, and government-level authorization where applicable, prior to any tree removal or relocation in each Lot.
- (ii) Formally identifying and securing agreement on compensatory/replacement planting locations, particularly where roadside space is insufficient and off-site public land is required.
- (iii) Confirming compliance of the replacement planting program with local authorities prior to closing-out of works in each Lot.
- (iv) Maintaining a channel for local authorities and communities to raise concerns about tree loss or replacement planting through the project Grievance Redress Mechanism.

During ESIA consultations, representatives of district khokimiyats and district departments of Ecology and Climate Change Committee raised concerns regarding the scale of anticipated tree removal, reinforcing the importance of transparent, documented coordination throughout implementation, including periodic briefings to local authorities on felling/replanting progress.

A community land-protection mechanism became available from 1 April 2026 (Chapter 1.3.3), under which residents of a mahalla may petition to block withdrawal or reallocation of settlement land on which non-forest-fund trees grow; if at least 10% of the mahalla's population supports the petition, the Ecology and Climate Change Committee may impose a formal prohibition on reallocating that land. This is a genuine risk to the project schedule in settlement sections with dense shelterbelt/orchard cover (particularly Gijduvon, Vobkent, and Bukhara district centers) if potentially affected mahallas are not engaged early and transparently on the RAP/RPF process, the rationale for tree removal, and the compensatory planting commitments under this TMP. Early, proactive consultation in these areas, ahead of any permit application, is treated as a priority risk-mitigation measure, not merely good practice.



2.9. Plan Review and Update

This TMP outline will be reviewed and updated by the Contractor(s), in coordination with the PIU/PMC, at the following trigger points, at a minimum:

- (i) upon completion of the detailed, geo-referenced tree inventory for each Lot
- (ii) upon completion of detailed engineering design for each Lot
- (iii) following any monitoring finding indicating survival rates below agreed thresholds or emerging permitting delays
- (iv) following any amendment to the legal framework.
- (v) following any incident of unauthorized felling or non-compliance identified through the reporting arrangements.

Each update will be documented, dated, and disclosed to the PIU/PMC and AIB.

2.10. Mitigation Measures

The table below consolidates the mitigation measures set out in this Chapter 2 into a single summary, mapping each measure to the activity that triggers it, the tree/vegetation and associated biodiversity values it protects, the KPI against which it is assessed, the responsible and supervising parties, the means of verification, and the timeframe for completion.



Table 73: Tree Management and Planting Plan – Mitigation Measures

Activity	Potential Impact	Vegetation Values Impacted	Mitigation Measure	KPI	Footprint/ Relevant Area	Responsibility	Verification Means	Timeframe for Completion
Design-stage avoidance and micro-siting	Unnecessary tree/vegetation loss from unoptimized alignment	Shelterbelt, orchard, and canal-margin vegetation corridor-wide	Micro-site alignment, junctions, and drainage structures to avoid mature or valuable trees identified	Number of trees avoided relative to preliminary count Design deviation log maintained	Full corridor, all Lots	Implementation by the Design Institute Supervision by PIU	Design review records, updated tree count vs. baseline data	Detailed design stage, each Lot
Tree and vegetation inventory	Incomplete or inaccurate basis for permitting and compensation if inventory is deficient	All trees/shrubs within confirmed footprint and buffer zone	Geo-referenced tree register recording species, valuable/low-value status, diameter, and condition	Inventory completeness (% of footprint surveyed); PMC spot-check pass rate	Confirmed construction footprint, each Lot	Implementation by the Contractor Supervision by qualified arborist/ecologist and PIU/PMC	Tree register/ GIS layer photographic documentation by the Contractor, PMC verification report	Detailed design/ pre-construction stage, each Lot
Felling and relocation permitting	Unauthorized felling; legal and schedule risk from moratorium on valuable species	Mulberry, elm, Paulownia (valuable, felling-restricted); low-value species	No felling/ relocation without valid permit or, where applicable, government authorization; relocation preferred over felling for valuable species	Zero unauthorized felling incidents; permits/ authorizations obtained prior to works	Sites with valuable-species concentrations (interchanges, junctions, overpasses)	Implementation by the Contractor Supervision by PIU/PMC and Ecology and Climate Change Committee (permitting authority)	Permit/ authorization documentation, tree register cross-check	Pre-construction stage, prior to felling/ relocation, each Lot
Ecological supervision of felling	Disturbance to nesting Bukhara Tit, Zarafshan Pheasant, or other fauna during clearance	Bukhara Tit (Red Book), Zarafshan Pheasant (Red Book), orchard/ shelterbelt-	PMC and Arborist/Ecologist supervises felling and confirms absence of nesting birds; clearance in flagged clusters	Zero felling in flagged clusters during breeding season without specialist sign-off	Orchard/ shelterbelt clusters identified as bird habitat, each Lot	Implementation by the Contractor Supervision by qualified arborist/ecologist and PIU/PMC	Pre-felling inspection records, photographic documentation	Pre-felling, and during breeding season (March–June), each Lot



Activity	Potential Impact	Vegetation Values Impacted	Mitigation Measure	KPI	Footprint/ Relevant Area	Responsibility	Verification Means	Timeframe for Completion
		dependent fauna	(e.g., PK 72+50) avoided during breeding season (March–June)					
Tree protection zones	Indirect damage to retained trees from root disturbance, compaction, or machinery	Retained shelterbelt and orchard trees adjacent to works area	Delineation, fencing, or hoarding of tree protection/buffer zones prior to start of works	100% of retained trees within buffer zones fenced prior to works commencing	Works area margins, each Lot	Implementation by the Contractor Supervision by PIU/PMC	Site inspection records	Prior to start of works, each Lot
Compensatory planting and aftercare	Net loss of vegetation and associated ecological/ microclimate function if not replaced	Shelterbelt and roadside vegetation corridor-wide	Replacement planting at 10:1 ratio (100:1 if unauthorized felling), large-caliper saplings, 2–3 years aftercare	Saplings planted vs. required ratio; survival rate at 6 months, 1, 2, and 3 years	Right-of-way and, where required, off-site Green Gardens/ Public Parks	Implementation by the Contractor Supervision by PIU/PMC	Planting records, survival monitoring reports	Following felling/ relocation, with aftercare through the following monitoring intervals: 6 months, 1 year, 2 years, and 3 years where applicable
Community and authority coordination	Community grievance or mahalla land-protection petition delaying tree removal/ land acquisition	Settlement-adjacent shelterbelt and orchard vegetation	Early, transparent consultation with district khokimiyats and communities ahead of permit application	Consultation completed and documented before permit application in settlement sections	Gijduvon, Vobkent, Bukhara district centers, and other dense settlement sections	Implementation by the Contractor Supervision by PIU/PMC	Consultation records/minutes, GRM records	Pre-construction, ahead of permit application, each Lot

KPI = Key Performance Indicator; PIU = Project Implementation Unit; PMC = Project Management Consultant; GRM = Grievance Redress Mechanism



3. Record Keeping and Reporting

All records will be stored safely and be readily accessible for auditing. E&S Specialists of the PIU and PMC will be designated to oversee and ensure the proper maintenance of all TMP-related documentation. If a review of records identifies that a required mitigation measure has remained incomplete for one month, the issue must be escalated to the senior management of the Committee for Roads and to AIB.

The Contractor will maintain records of:

- tree register and all felling/relocation permit applications and their outcomes (including government-authorization applications submitted)
- compensatory planting completed, by location, species, and date
- aftercare/monitoring results, including survival rates
- any incidents of non-compliance, including unauthorized felling, together with corrective actions taken (including grievance received and addressed)
- written communication with environmental and government authorities
- reporting to PIU/PMC and other project stakeholders.

The Contractor will report this information to the PMC at a frequency to be confirmed in the Construction – Environmental and Social Management Plan (C-ESMP).

The PMC will verify and consolidate Contractor reports through own frequent monitoring, inspection, and compliance, and provide reporting to the PIU following TMP and ESMP. In addition to the TMP supervision and implementation records, induction and training records will also be included in the PMC reports.

The PIU will report to AIB in accordance with the project's loan/financing agreement reporting requirements, incorporating TMP implementation status, compensatory planting progress, and any material non-compliance or permitting delays (including government-authorization applications still pending) as a standing item. Any incident of unauthorized felling, or any petition under the community land-protection mechanism affecting the project, will be reported to the PIU and AIB.

Reporting under this TMP will be coordinated with, and where appropriate consolidated into, the project's Grievance Redress Mechanism reporting to avoid duplicate or inconsistent records where a tree-related grievance is raised.



4. Capacity Building

The PMC, including the dedicated technical specialist (ecologist/botanist/arborist) engaged under the PMC/PIU contract, will deliver induction training to Contractor personnel prior to mobilization in each Lot. Training will cover the following topics:

- Tree/vegetation inventory
- Tree protection zone boundaries
- Felling/relocation authorization procedure (including the distinction between valuable and low-value species and the government-authorization pathway)
- Recognition of protected species
- Cross-checking against the [Valuable Species List](#)
- Consequences of unauthorized felling.

Refresher training will be delivered quarterly by the PMC. Routine toolbox talks reinforcing this training will be conducted by the Contractor's environmental specialist, using materials and content provided by the PMC.

The Contractor's dedicated staff will also receive specific training, delivered by the PMC's dedicated technical specialist, on species identification (particularly distinguishing valuable species such as mulberry, elm, and Paulownia from low-value species such as poplar, apricot, apple, and juniper), diameter measurement consistent with the 15 cm threshold, and the tree register, permit application, and record-keeping requirements set out in this TMP.

Capacity building will also extend to:

- Coordination briefings for district khokimiyat and local environmental authority representatives, to support the transparent and coordination of project activities.
- Engagement with the Bukhara and Navoi Province Forestry Departments and district nurseries on sapling specification and supply planning.

Training completion and attendance will be recorded by the Contractor and reported in accordance with Chapter 3, TMP.



5. Implementation Cost

Costs associated with TMP implementation, monitoring, and compliance are to be incorporated within the Contractor, PIU, and PMC's respective contractual obligations, rather than treated as a separate, stand-alone budget outside those contracts. A fully costed TMP budget cannot be finalized at this stage, given data gaps in the confirmed species mix, tree diameter class, and sapling pricing that will only be resolved once the detailed tree inventory for each Lot is complete. Table 28 sets out the cost categories the Contractor(s) and PIU/PMC will use to develop this costed budget, together with an illustrative order-of-magnitude estimate for Lots 1–2 based on the preliminary tree count, to give an initial indication of scale. These illustrative figures rely on stated simplifying assumptions and are not a substitute for the actual, Lot-specific costed budget to be prepared once the detailed inventory data is available.

Table 74: TMP Cost Estimate

Cost Item	Description	Approximate Calculation (for Lot 1 and 2)	Cost Estimate
Permit application and fee costs	Each felling/relocation permit application is subject to a review fee equivalent to 30% of the base calculation unit (BCU), plus a permit value fee calculated as a coefficient of the base calculation unit, varying by trunk diameter class and by whether the species is valuable or low-value. The base calculation unit is periodically revised by presidential decree; the current value should be confirmed with competent authority at the time each Lot's applications are prepared. The following established figures are considered when calculating felling/relocation permit: - BCU = UZS 412,000 as per Presidential Decree No. UP-91 (2 June 2025) - BCU = UZS 440,000 effective 1 September 2026 as per Presidential Decree No. UP-115²⁵ (23 June 2026)	Low-value permit fees: 2,848 (used as a low-value proxy) x 0.6 x 412,000	≈ UZS 704,025,600 = US\$58,668.8 ²⁷
		Valuable-species permit fees: 8,503 (used as a valuable proxy) x 1.3 x 412,000	≈ UZS 4,554,206,800 = US\$ 379,517.23 ²⁸
		Review fees (≈74 applications, one per chainage location): 74 x (0.3 x 412,000), If the Contractor would submit one felling/relocation permit application per chainage location (e.g., one for the junction at PK 39+50, one for the overpass at PK 147+00–158+00, one for the linear corridor segment at PK 119+00–128+00, etc.); 74 applications = 38 chainage locations in Lot 1 and 36 chainage locations in Lot 2.	≈ UZS 9,146,400 = US\$762.2 ²⁹

²⁵ Presidential Decree No. UP-115 (23 June 2026), On increasing wages, pensions, scholarships and benefits, <https://lex.uz/ru/docs/8283680> (accessed July 2026)

²⁷ US\$1 = UZS 12,000, www.cbu.uz

²⁸ FOOTNOTE #16

²⁹ FOOTNOTE #16



Cost Item	Description	Approximate Calculation (for Lot 1 and 2)	Cost Estimate
	Fee coefficients (0.6 low-value / 1.3 valuable at 12.1–16 cm diameter bracket)²⁶ Actual costs depend entirely on the real diameter and species distribution from the detailed tree inventory and the BCU value in force at the time of application.	Total illustrative permit-fee cost: 704,025,600 + 4,554,206,800 + 9,146,400	≈ UZ\$5,267,378,800 = US\$438,948³⁰
Government-authorization costs	Costs (and time) associated with obtaining government-level authorization for relocation of large valuable-species trees are not yet quantifiable and should be tracked as a distinct cost and schedule risk line item once the diameter-class inventory identifies the number of trees requiring this pathway.	Not quantifiable at this stage. The Cabinet of Ministers Resolution No. 342 does not specify a distinct fee for this pathway beyond the standard permit fee; the primary cost driver is schedule risk (processing time) rather than a defined monetary cost. Should be tracked as a distinct schedule risk line item once the diameter-class inventory identifies the number of trees requiring this pathway.	
Compensatory planting costs	Costs include sapling procurement (minimum 5-year-old trees / 3-year-old shrubs, large-caliper stock) at the 10:1 ratio, transportation, planting labor, and a minimum 2–3 years aftercare/ maintenance program. Given the potential requirement for over 110,000 saplings across Lots 1–2 alone, unit sapling costs and nursery capacity should be confirmed directly with the Bukhara and Navoi Province Forestry Departments and district nurseries before this line item is finalized.	At the mandatory 10:1 ratio, the Lots 1–2 preliminary count (11,351 plants) implies approximately 113,510 saplings. Considering unit procurement cost per sapling as ≈ UZ\$20,000 (as illustrative), sapling procurement (without transportation, planting labor, and the 2–3 years aftercare/maintenance program): 113,510 saplings x UZ\$ 20,000 = UZ\$ 2,270,200,000 ≈ UZ\$ 2.27 billion ≈ USD 189,000³¹ Unit procurement cost could not be reliably sourced (available nursery pricing data found was retail/decorative, not bulk forestry-grade stock) and must be confirmed directly with the Bukhara and Navoi Province Forestry Departments and district nurseries before a monetary total can be estimated.	
Low-value species replanting condition	Where a territorial environmental authority conditions a low-value-species felling permit on submission of a replanting plan, the associated planting and budget should be included as a separate line item, distinct from the 10:1 valuable-species compensatory planting requirement.	Not quantifiable; contingent on individual territorial authority conditions, to be confirmed per Lot.	
Ecological supervision costs	Costs include the dedicated technical specialist (ecologist/botanist/arborist) engaged under the PMC/PIU contract for Lot inventory supervision, pre-felling inspections, tree register spot-checks.	≈ US\$ 50,000 (for 5 Lots with approximately 50 man-days per Lot) for national ecologist services	

²⁶ FOOTNOTE #3

³⁰ FOOTNOTE #16

³¹ FOOTNOTE #16



Cost Item	Description	Approximate Calculation (for Lot 1 and 2)	Cost Estimate
Training and capacity building costs	Costs include Contractor personnel induction/toolbox talks, specialized training for environmental supervision staff, and coordination briefings for local authorities	≈ US\$ 50,000 (for all five Lots) Training activities included in the contractor's and PMC's contracts and forms part of the PMC's overall training	



6. Annexes

6.1. Annex 1: Tree/Shrub Inventory Log Template

Field	Entry
Tree/Shrub ID (unique reference number)	
Lot	
Chainage (PK)	
GPS Coordinates (Latitude/Longitude)	
Scientific Name	
Common Name	
Valuable or Low-Value Status (per Annex to Resolution No. 342, Table 1)	
Red Book of Uzbekistan Status	
Trunk Diameter at 1.3 m Height / Root-Collar Diameter (cm)	
Height (m)	
Canopy Spread E–W / N–S (m)	
Life Stage (Young / Semi-mature / Mature / Over-mature)	
Health/Condition (Good / Fair / Poor / Dead)	
Structural Condition (Good / Fair / Poor, noting any defects)	
Location Classification (Within Construction Footprint / Within Buffer Zone)	
Evidence of Nesting Birds or Other Fauna (Yes/No; if “Yes,” describe species in detail)	
Proposed Action (Felling / Relocation / Retain and Protect)	
Permit Pathway (Standard Permit / Government Authorization / Not Applicable)	
Photograph Reference (file name/ID)	
Surveyor Name and Date	
Notes / Special Instructions (e.g., flagged for ecological supervision, Bukhara Tit habitat, conservation-significant species)	

6.2. Annex 2: Compensatory Planting Monitoring Log Template

Field	Entry
Planting ID	



Linked Tree/Shrub ID (felled or relocated, from Annex 1)	
Species Planted	
Sapling Age/Caliper (minimum 5-year-old tree / 3-year-old shrub)	
Planting Location (GPS/PK or named Green Garden/Public Park)	
Planting Date	
Nursery/Supplier	
Aftercare Obligation (2 years – felled trees replaced; 3 years – relocated trees/shrubs)	
Monitoring Check 1 (6 months): Survival Status / Notes	
Monitoring Check 2 (1 year): Survival Status / Notes	
Monitoring Check 3 (2 years): Survival Status / Notes	
Monitoring Check 4 (3 years, where applicable): Survival Status / Notes	
Replacement Action Taken (if failed)	
Verified By (PMC) / Date	