Hagler Bailly Pakistan

DIGBY WELLS ENVIRONMENTAL

Appendix H: Biodiversity – Flora Assessment

Hagler Bailly Pakistan

Environmental and Social Impact Assessment of Reko Diq Mining Project

Biodiversity - Flora

Final Report

HBP Ref.: D4FS6RKG

January 24, 2025

Reko Diq Mining Company

Quetta, Pakistan

Executive Summary

Barrick Gold Corporation (hereafter Barrick) through its subsidiary Reko Diq Mining Company (RDMC), in a Joint Venture partnership with the Government of Pakistan and the Government of Balochistan, is completing a feasibility study for the Reko Diq Mining Project (also referred to as the 'Project') in the western part of Balochistan Province of Pakistan. As part of the feasibility study, an Environmental and Social Impact Assessment (ESIA) has been conducted, including specialist studies. The ESIA will be part of the environmental permitting process and will provide a basis for the integration of environmental and social considerations into the Project design. RDMC appointed Digby Wells Environmental (hereafter Digby Wells) and Hagler Bailly Pakistan Pvt. Ltd (hereafter HBP) to carry out the proposed environmental and social studies and permitting process for the Project.

The Project is a Copper-Gold mining operation with an onsite processing plant to produce a high-quality copper-gold concentrate (the Concentrate) that will be exported for final processing into various products. The current Life-of-Mine (LoM) is 38 years in terms of defined resources with significant exploration upside.

The construction phase is anticipated to take approximately 40 months, including pre-stripping. The mine will be a truck-and-shovel open pit mining operation with processing facilities that include crushing, grinding, and flotation. The final Concentrate will be railed to Port Qasim for final export by ship.

The mine will be developed in two phases, Phase 1 is expected to have a capacity of 45 Mt per annum (Mtpa) and Phase 2 is expected to have a combined processing capacity of 90 Mtpa. Phase 1 operations are anticipated to be in operation in 2028 and Phase 2 operations in 2030.

This Specialist Report has been prepared to present information related to the flora baseline for the project Area of Influence. The Specialist Report also describes potential Project-related impacts on flora, as well as mitigation measures and monitoring that will be carried out by the Project.

Flora Baseline and Impact Assessment

Baseline flora data for the Reko Diq Mining Project was gathered from field surveys and published literature, resulting in comprehensive profiles of flora and habitats potentially affected by the Project. The ecological studies for flora were carried out at the Reko Diq Mine Site and associated Infrastructure and at Port Qasim. Surveys did not identify any floral species of conservation concern in terrestrial and mangrove areas. The vegetation within the mine area is well adapted to dry, arid conditions, providing essential refuge for various faunal species.

Key points include:

- Several national and international laws relevant to conservation and sustainable development apply to the Project, including the Balochistan Environmental

Protection Act (BEPA), 2012, and the International Finance Corporation's (IFC) Environmental and Social Performance Standards.

- Conducted at the Reko Diq Mine Site (incl. Associated Infrastructure), and Port Qasim, these studies identified key habitat types, including mountains/hills, clayey plains, dry streambeds, gravel plains, and sandy plains/sand dunes.
- Ecological studies were not carried out for the Rail Transport Route and Access Road from the Reko Diq Mine Site to Port Qasim, as the biodiversity is already modified along these routes, and the Project impact on ecology will, be negligible, however, an extensive literature review is carried out and included in the report
- Terrestrial vegetation and mangrove surveys were conducted across multiple seasons, with 20 sampling locations at the mine site and additional sites along the Northern Groundwater System, Access Route, and Port Qasim.
- The surveys confirmed the presence of several plant species, with most categorized as Least Concern, Data Deficient, or Not Evaluated on the IUCN Red List. Only one species, the Red-river Gum (*Eucalyptus camaldulensis*), listed as Near Threatened, was observed, but as an introduced species in Pakistan, it does not raise significant conservation concerns.

Acronyms

AIPS	Alien-Invasive Plant Species
AIS	Alien Invasive Species
%	Percentage
ANOVA	Analysis of Variance
BEPA	Balochistan Environmental Protection Act
BAP	Biodiversity Action Plan
C	Construction
CABI	Centre for Agriculture and Biosciences International
CITES	Convention on International Trade in Endangered Species
CMP	Construction Management Plan
DC	During Construction
DO	During Operation
DRC	Decommissioning, Rehabilitation, and Closure
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
EPC	Engineering, Procurement, and Construction
ESIA	Environmental and Social Impact Assessment
GBIF	Global Biodiversity Information Facility
GRM	Grievance Redress Mechanism
HBP	Hagler Bailly Pakistan
IBAT	Integrated Biodiversity Assessment Tool
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
IVI	Importance Value Index
KBA	Key Biodiversity Area
km	Kilometres
m	Metres
O	Operation
PIBT	Pakistan International Bulk Terminal
PQA	Port Qasim Authority

PS	Performance Standard
RDMC	Reko Diq Mining Company
SEPA	Sindh Environmental Protection Act
SFD	Sindh Forest Department
TCC	Tethyan Copper Company Ltd
TM	Trade Mark

Contents

Exhibits

1. Introduction

1.1 Background

Barrick Gold Corporation (hereafter Barrick), through its subsidiary Reko Diq Mining Company (RDMC), in a Joint Venture partnership with the Government of Pakistan and the Government of Balochistan, is completing a feasibility study for the Reko Diq Mining Project (also referred to as the 'Project') in the western part of Balochistan Province of Pakistan. As part of the feasibility study, an Environmental and Social Impact Assessment (ESIA) has been conducted, including specialist studies. The ESIA will be part of the environmental permitting process and will provide a basis for integrating environmental and social considerations into the Project design. RDMC appointed Digby Wells Environmental (hereafter Digby Wells) and Hagler Bailly Pakistan Pvt. Ltd. (hereafter HBP) to carry out the environmental and social studies and permitting process for the Project.

This Specialist Report has been prepared to present information related to the flora baseline for the project Area of Influence. The Specialist Report also describes potential Project-related impacts on flora as well as mitigation measures and monitoring that will be carried out by the Project.

1.2 Objective and Scope

This Floral Baseline has been prepared with the following objectives and scope:

- Carrying out desktop assessments based on the information obtained from published sources, including books and information from different databases such as Integrated Biodiversity Assessment Tool (IBAT),[1] International Union for Conservation of Nature (IUCN),[2] Key Biodiversity Area (KBA),[3] Global Biodiversity Information Facility (GBIF),[4] Centre for Agriculture and Biosciences International (CABI),[5] Flora of Pakistan (eFlora of Pakistan),[6] World Plants (Complete List),[7] previous ESIA studies[8,9] within and around the Ecological Study Area.

1 Integrated Biodiversity Assessment Tool, Available at: https://www.ibat–alliance.org/.

2 International Union for Conservation of Nature (IUCN) Red List of Threatened Species, Available at: https://www.iucnredlist.org/.

3 Key Biodiversity Area, Available at: https://www.keybiodiversityareas.org/.

4 Global Biodiversity Information Facility,

5 Centre for Agriculture and Biosciences International, Available at: https://www.cabi.org/.

6 Flora of Pakistan, Available at: http://www.efloras.org/flora_page.aspx?flora_id=5.

7 World Plants (Complete List) https://www.worldplants.de/world-plants-complete-list/complete-plant-list/?name=Launaea-cornuta#plantUid-367612.

8 Hagler Bailly Pakistan, April 2010, Environmental Impact Assessment of Reko Diq Copper Mining Operations, Tethyan Copper Company Pty Limited (TCC).

9 Hagler Bailly Pakistan, November 2020, Environmental and Social Impact Assessment of Tanjeel Copper Project, National Resource Limited Pakistan.

- Delineation of the Ecological Study Areas and selection of sampling locations using information from previous studies[10,11] and ***Google Earth™*** Satellite Imagery.
- Identification of species of conservation concern based on the IUCN Red List of Threatened Species
- Identification of microhabitats and sensitive ecosystems, if any.
- Identification and mapping of Protected Areas in the vicinity of the Project.
- Qualitative and quantitative assessment of the terrestrial vegetation and mangroves.
- Verification of the information collected from the desktop-based assessment in the field surveys (Post-Monsoon 2022, Spring 2023, and Post-Monsoon 2023 surveys).
- Comparison of the ecological resources of the Ecological Study Areas observed in field surveys with the previous surveys conducted in the mine site area in 2010 and 2020.[12,13]
- Identification of the impacts due to Project activities and the possible mitigation measures for the identified impacts.
- Preparation of the Environmental Management Plan (EMP) to develop the mechanisms for implementing the environmental mitigation measures.
- Mechanism for monitoring and managing environmental changes during various stages of the Project life cycle with respect to baseline conditions.

[10] Hagler Bailly Pakistan, April 2010, Environmental Impact Assessment of Reko Diq Copper Mining Operations, Tethyan Copper Company Pty Limited (TCC).

[11] Hagler Bailly Pakistan, November 2020, Environmental and Social Impact Assessment of Tanjeel Copper Project, National Resource Limited Pakistan.

[12] Hagler Bailly Pakistan, April 2010, Environmental Impact Assessment of Reko Diq Copper Mining Operations, Tethyan Copper Company Pty Limited (TCC).

[13] Hagler Bailly Pakistan, November 2020, Environmental and Social Impact Assessment of Tanjeel Copper Project, National Resource Limited Pakistan.

2. Project Description

The Project is a Copper-Gold mining operation with an onsite processing plant to produce a high-quality copper-gold concentrate (the Concentrate) that will be exported for final processing into various products. The current Life-of-Mine (LoM) is 38 years in terms of defined resources (resources that have been identified already) with significant exploration upside.

The construction phase is anticipated to take approximately 40 months, including pre-stripping. The mine will be a truck-and-shovel open pit mining operation with processing facilities that include crushing, grinding, and flotation. The final Concentrate will be railed to Port Qasim for final export by ship.

The mine will be developed in two phases, Phase 1 is expected to have a capacity of 45 Mt per annum (Mtpa) and Phase 2 is expected to have a combined processing capacity of 90 Mtpa. Phase 1 operations are anticipated to commence in 2028 and Phase 2 operations in 2030.

2.1 Reko Diq Mine Site and Associated Infrastructure

Exhibit 2.1 provides an overview of the RDMS and the major proposed infrastructure.

The core infrastructure that will be established at the RDMS includes:

- Two main pits, Western Porphyry and Tanjeel (**Exhibit 2.1**). The mining method of these pits will be a 24-hour open-pit shovel and truck operation;
- Two designated Waste Rock Dumps (WRD) for the waste rock from the Western Porphyries pit. The Tajeel Pit will have a separate WRD in its proximity.
- Tailings storage facility (TSF).
- A processing plant.

2.1.1 Supporting Infrastructure

The proposed supporting infrastructure at the RDMS includes:

- Several sources for power supply will be utilised for the Project. The Project's estimated peak power requirements will be 183 megawatts (MW) in Phase 1 and 348 MW in Phase 2:
  - Diesel generators during the early works and construction phases until the establishment of the Heavy Fuel Oil (HFO) power station;
  - A Solar Photovoltaic (PV) system with an installed capacity of 183 MW in Phase 1 and 384 MW in Phase 2;
  - It is anticipated that the Project's energy requirements will be met through a grid connection from Year 15 (operational phase).
- Diesel, HFO and other sources of fuel will be railed to the site from Port Qasim and stored in bunded contained atmospheric tanks at the designated storage areas.

- Accommodation Facility to provide on-site accommodation for all employees and contractors;
- Security infrastructure;
- Waste management facilities:

2.1.2 Water Supply and Management

Water for the Construction Phase, Phase 1 and Phase 2 of the Project will be sourced from a sedimentary groundwater system located approximately 70 km to the northwest of the mining area referred to as the Northern Groundwater System (**Exhibit 2.1**). The system represents a small and isolated part of a much larger basin and there are no communities or community water sources located within the proposed borefield and its area of influence.

A 78 km long buried water supply pipeline with a diameter of 250 mm from the Northern Groundwater Borefield to the mine site to provide water for construction. A 900 mm buried, cement lined steel pipe will be constructed between the site and the Northern Groundwater Borefield for piping of operational water requirements.

An overhead transmission line will supply power (33 kV) to the Northern Borefield via a single circuit[14].

2.2 Transport and Marine Port

The Project will use the existing road and rail networks to transport materials during construction and operational phases and utilise the air transportation option for personnel. The main Project transport routes (Road Transport Route and Rail Transport Route) are shown in **Exhibit 2.2**.

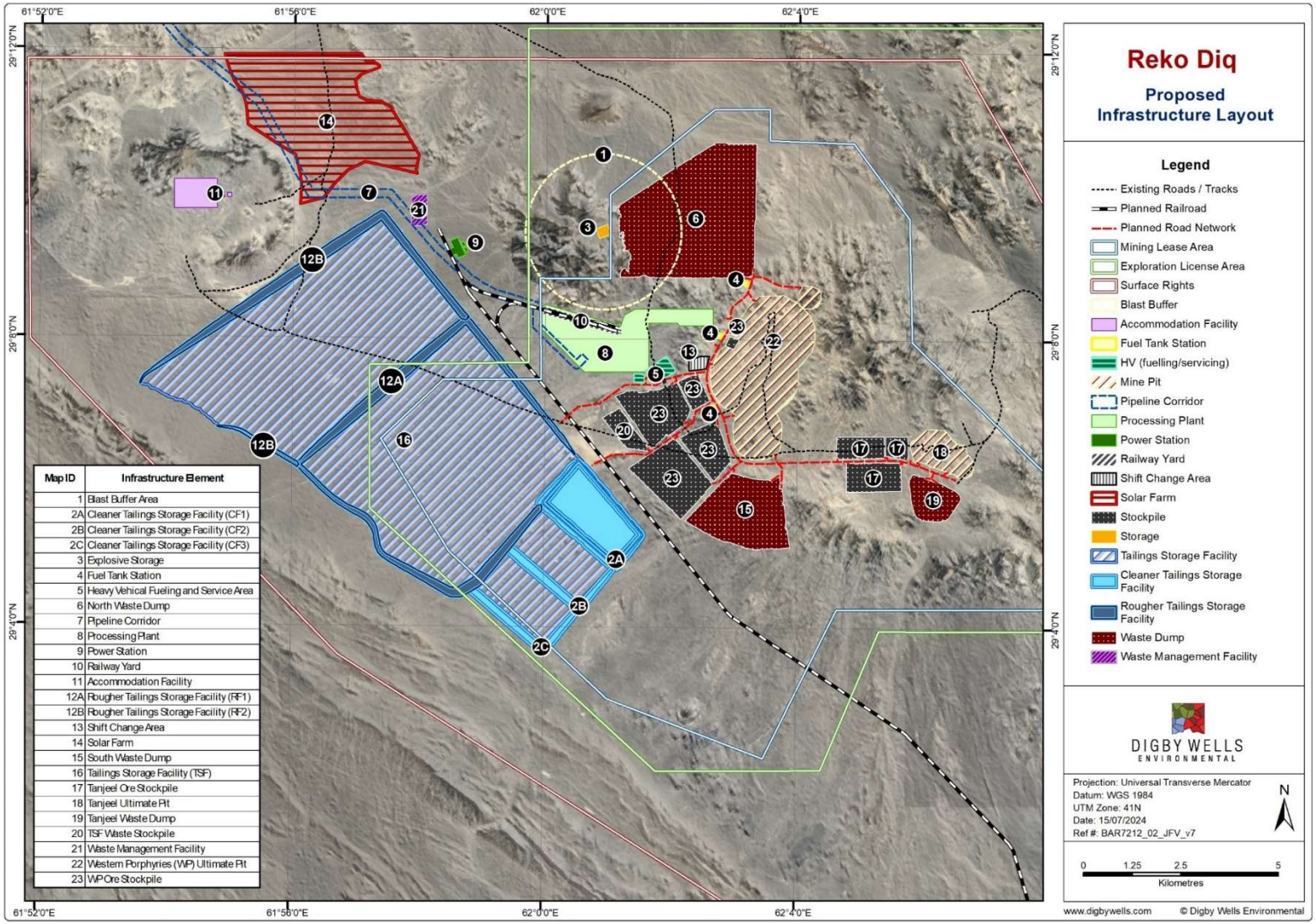
2.2.1 Transport of Concentrate to Port Qasim

The Concentrate will be transported from the RDMS processing plant to Port Qasim via an existing railway line, passing through the Balochistan and Sindh provinces. The existing rail route is approximately 1,350 km in length as outlined in **Exhibit 2.3**.

The Project will make use of the existing PIBT Terminal where all facilities are owned and operated by PIBT. An area will be leased to RDMC for the construction of a Concentrate storage shed. An extract of the onshore and offshore layout is shown in **Exhibit 2.4**.

[14] Detailed design is yet to be finalized, but likely key characteristics of the transmission line include:
- Emplacement of poles of either wood, concrete or steel construction. Poles will be spaced between 100 and 150 m apart with heights of between 9 and 15 m to provide adequate clearance from obstacles, traffic and non-flying fauna.
- AAAC (All Aluminium Alloy Conductor) or ACSR (Aluminium Conductor Steel Reinforced) will be used.
- Use composite insulators to withstand high temperatures, dust, and potential salinity in the region.
- Capacitor banks or voltage regulators installed at strategic points to maintain voltage levels.

Exhibit 2.1: Proposed Reko Diq Mine Site Layout



Map ID	Infrastructure Element
1	Blast Buffer Area
2A	Cleaner Tailings Storage Facility (CF1)
2B	Cleaner Tailings Storage Facility (CF2)
2C	Cleaner Tailings Storage Facility (CF3)
3	Explosive Storage
4	Fuel Tank Station
5	Heavy Vehical Fueling and Service Area
6	North Waste Dump
7	Pipeline Corridor
8	Processing Plant
9	Power Station
10	Railway Yard
11	Accommodation Facility
12A	Rougher Tailings Storage Facility (RF1)
12B	Rougher Tailings Storage Facility (RF2)
13	Shift Change Area
14	Solar Farm
15	South Waste Dump
16	Tailings Storage Facility (TSF)
17	Tanjeel Ore Stockpile
18	Tanjeel Ultimate Pit
19	Tanjeel Waste Dump
20	TSF Waste Stockpile
21	Waste Management Facility
22	Western Porphyries (WP) Ultimate Pit
23	WP Ore Stockpile

Exhibit 2.2: Reko Diq Spatial Extent and Transport Routes (Rail Transport Route and Road Transport Route)

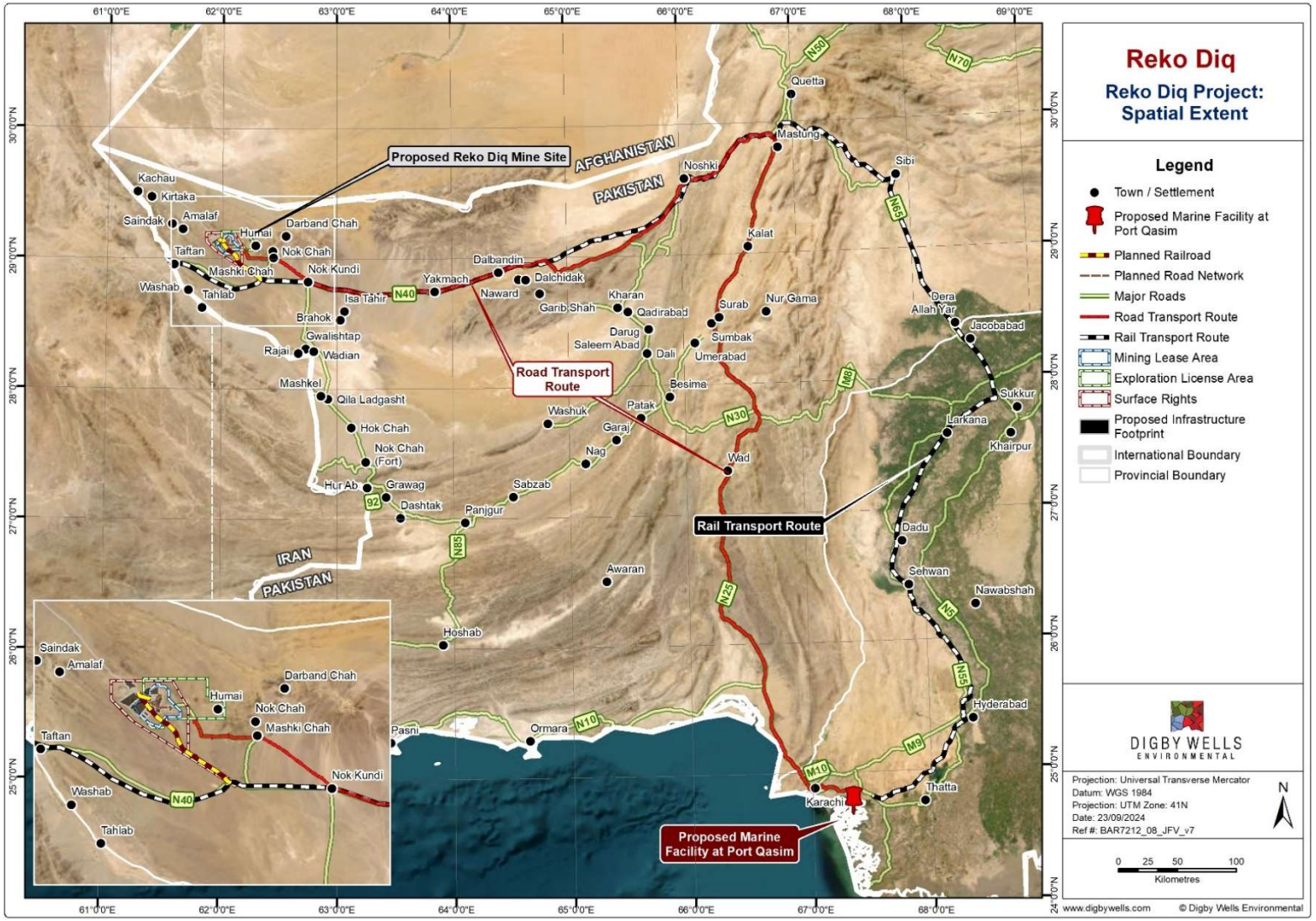


Exhibit 2.3: Proposed Rail Yard Layout at Port Qasim

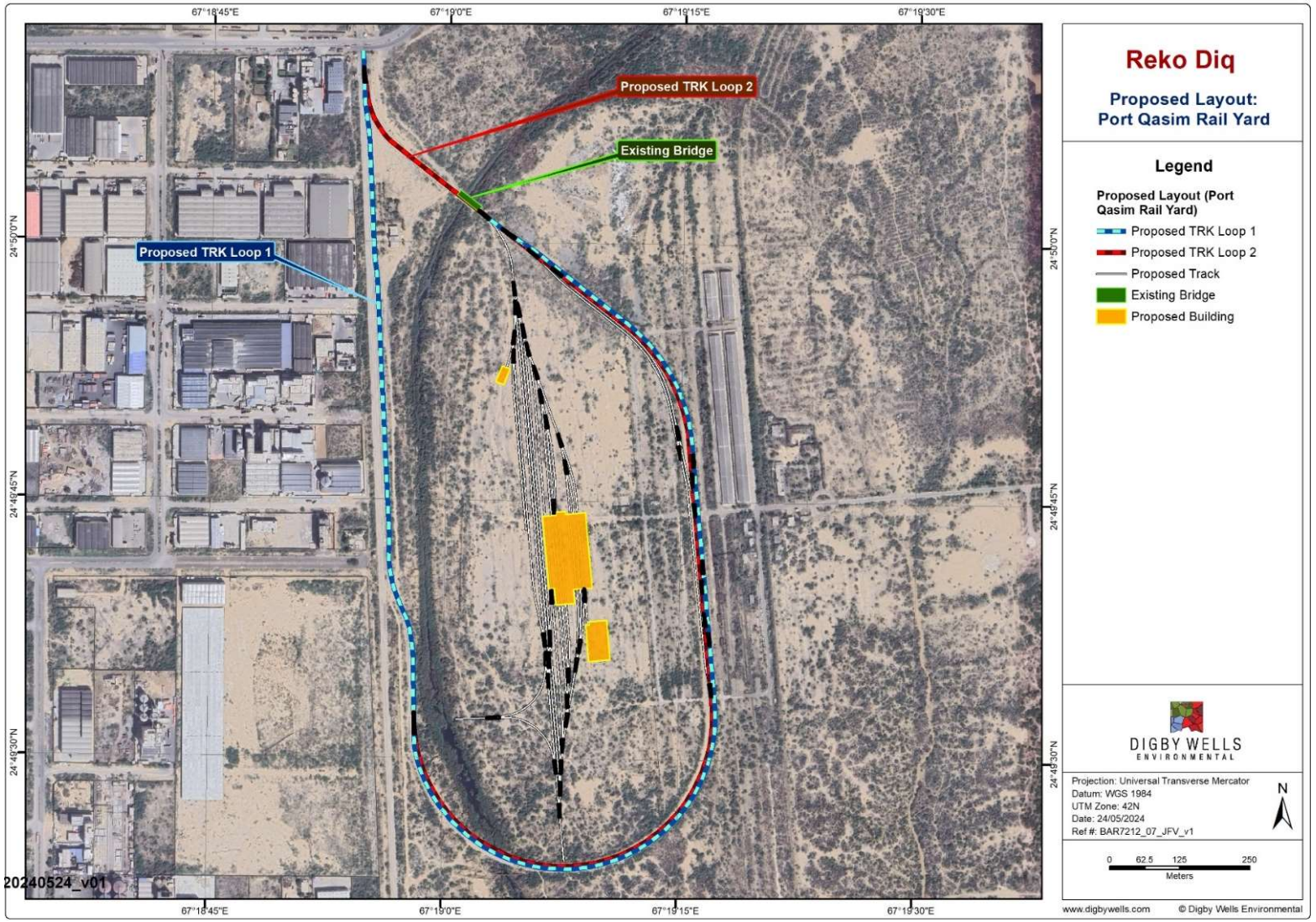
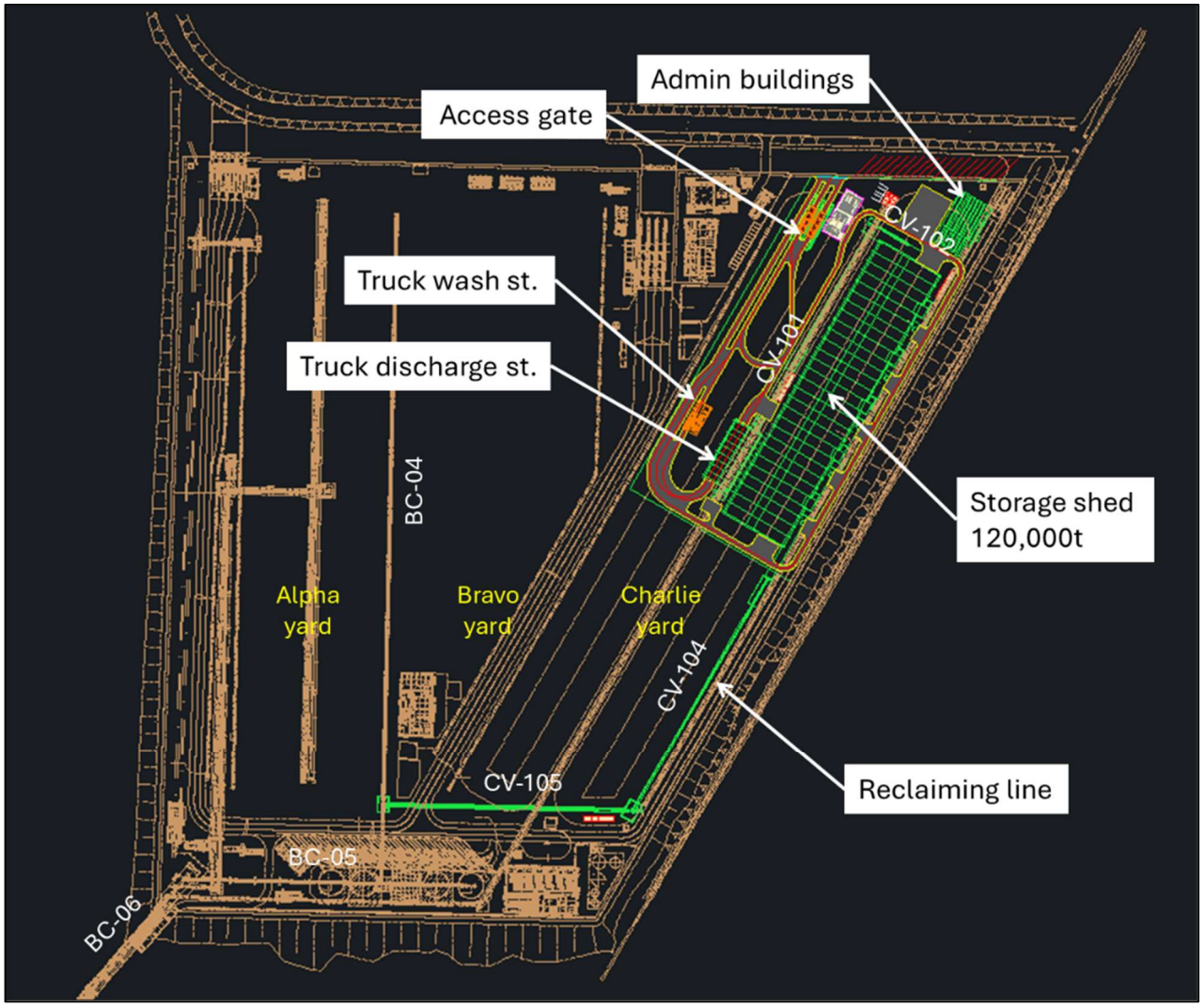


Exhibit 2.4: Layout of Concentrate Facilities at PIBT at Port Qasim



3. Legislative and Regulations Framework

Exhibit 3.1 provides the list of applicable legislations, guidelines, and standards that have been taken as reference for assessing the flora.

Exhibit 3.1: Applicable Legislations and International Guidelines

Legislation or Guideline	*Description and Relevance*
Provincial and National Legislations	
Balochistan Environmental Protection Act (BEPA), 2012	Balochistan Environmental Protection Act, 2012 deals with the protection of the environmental resources in the province of Balochistan. It also deals with the introduction of alien species, living modified organisms and the conservation of native flora.
Sindh Environmental Protection Act, 2014	Sindh Environmental Protection Act, 2014 prohibits actions that can adversely affect the environment. These include adverse environmental impacts, such as dumping waste or hazardous substances into coastal and inland water bodies, etc. It also deals with environmental monitoring and environmental audit reviews.
Forest Act (Sindh Amendment) Act, 1994	Regulates forest resources, empowering the government to declare any forest area reserved or protected.
Pakistan Plant Quarantine Act, 1976	Pakistan Plant Quarantine Act, 1976, is enacted to safeguard the national crop wealth from destructive pests and diseases that are not known to occur in Pakistan. Applicable as the installation of associated infrastructure or transport may introduce Alien Invasive Species (AIS) within the area.
The Ports Act, 1908	Provides rules for the safety of shipping and conservation of ports. These rules restrict the disposal of ballast or any other discharges that may impact the aquatic environment or the shoreline, fire safety, carriage of artifacts, etc. It is applicable during the operations phase of the Project to ensure that the vessels and ships engaged adhere to the rules defined in this Act. The Project will also have to ensure that the wastes are adequately disposed off and do not form the potential of fire at the ship or at the nearest port of Pakistan.
Cutting of Trees (Prohibition) Act, 1992	Aims to protect and conserve forest resources, prevent deforestation, promote sustainable forest management practices, and raise awareness about the importance of trees and forests in maintaining environmental balance and ecological well-being
Forest Act, 1927	Regulates forest resources. Empower the government to declare any forest area reserved or protected.
International Guidelines and Standards	
International Finance Corporation's (IFC) Environmental and Social Performance Standards on Sustainability	IFC PS6, Biodiversity Conservation, and Sustainable Natural Resource Management aims at protecting and conserving biodiversity. This PS addresses how clients can avoid or mitigate threats to biodiversity arising from their operations as well as incorporate sustainable management of renewable natural

Legislation or Guideline	*Description and Relevance*
	resources. It also includes the definition of critical habitat and natural habitat.
Biodiversity and the protection of plants and animals	Pakistan is a party to a number of conventions in relation to biodiversity, including the Convention on Biological Diversity, Bonn Convention on the Conservation of Migratory Species of Wild Animals, Convention on International Trade in Endangered Species of Wild Fauna and Flora, International Plant Protection Convention, Convention on Wetlands of International Importance and International Union for Nature Conservation. All of these conventions focus on the conservation of biological resources and are thus applicable to the Project's activities.

4. Methodology

4.1 Ecological Resources and Survey Seasons

The data for the assessment of ecological resources was collected through field surveys to assess the baseline conditions within the Ecological Study Area. Data was collected for the terrestrial and coastal ecological flora in different seasons for different Project components in the Balochistan and Sindh provinces.

This survey covered terrestrial flora as well as mangroves. The field surveys were carried out in multiple seasons as follows:

- Post-Monsoon 2022 Survey: This survey was carried out between September 13, 2022, and October 13, 2022.[15]
- Spring 2023 Survey: This survey was carried out between April 28, 2023, and May 13, 2023.[16]
- Post-Monsoon 2023 Survey: This survey was carried out between October 12, 2023 to October 26, 2023. [17]

4.2 Terrestrial Vegetation

4.2.1 Selection of Sampling Locations for Terrestrial Vegetation

Sampling locations were selected in various habitat types within the Ecological Study Area to assess the ecological conditions unique to each habitat. Different species of plants are adapted to their surrounding habitats based on the edaphic (soil-related) and climatic conditions of the area. These adaptations ensure that the selected sampling locations provide a comprehensive understanding of the ecological diversity across the different habitats.

Reko Diq Mine Site and Associated Infrastructure

A total of 20 sampling locations (E13-E32) were selected in the Reko Diq Mine Site for terrestrial study area floral survey. Among these sampling locations, seven were located in the Gravel Plains, six in the Dry Streambeds, five in the Mountains/Hills, and one each in the Clayey Plains and Sandy Plains habitat types. (see Error! Reference source not found.).

A total of 13 sampling locations (E1-E12 and MH1) were sampled in the Northern Groundwater System study area in Post-Monsoon 2022 and Spring 2023 surveys. Among these sampling locations, four each were located in the Gravel Plains and Dry Streambeds, two in the Clayey Plains, and one each in the Mountains/Hills, Agricultural

[15] The Post-Monsoon 2022 Survey was carried out at Reko Diq Mine Site, Northern Groundwater System and Access Route to Reko Diq Mine Site.
[16] The Spring 2023 Survey was carried out at Reko Diq Mine Site, Northern Groundwater System and Access Route to Reko Diq Mine Site.
[17] The Spring 2023 Survey was carried out at Reko Diq Mine Site, Northern Groundwater System and Access Route to Reko Diq Mine Site.

Areas/Date Palms, and Sandy Plains habitat types. A patch of Agricultural Areas/Date Palms (MH1), which was considered a microhabitat, was identified in the field and also sampled (see Error! Reference source not found.).

A total of eight sampling locations (E41-E48) were sampled along the Access Route to Reko Diq Mine study area in the Post-Monsoon 2022 Survey and Spring 2023 Survey. Among these sampling locations, four are located in Dry Streambeds, three in the Gravel Plains, and one in the Mountains/Hills habitat types (see Error! Reference source not found.).

The sampling at the Reko Diq Mine Site and Associated Infrastructure study area was conducted between September 13, 2022, to October 13, 2022 (referred hereafter as the Post-Monsoon 2022 Survey), and April 28, 2023, to May 13, 2023 (referred hereafter as Spring 2023 Survey).

Port Qasim Study Area

A total of three sampling locations were selected at the Port Qasim Study Area. One sampling location each was sampled in the Vegetation Cluster, Barren Land/Open Plot, and Industrial Units habitat types. (see Error! Reference source not found.).

The sampling at Port Qasim was conducted between October 12, 2023, to October 26, 2023 (referred to hereafter as Post-Monsoon 2023 Survey).

Exhibit 4.1: Sampling Locations at Reko Diq Mine Site, Post-Monsoon 2022 and Spring 2023 Surveys

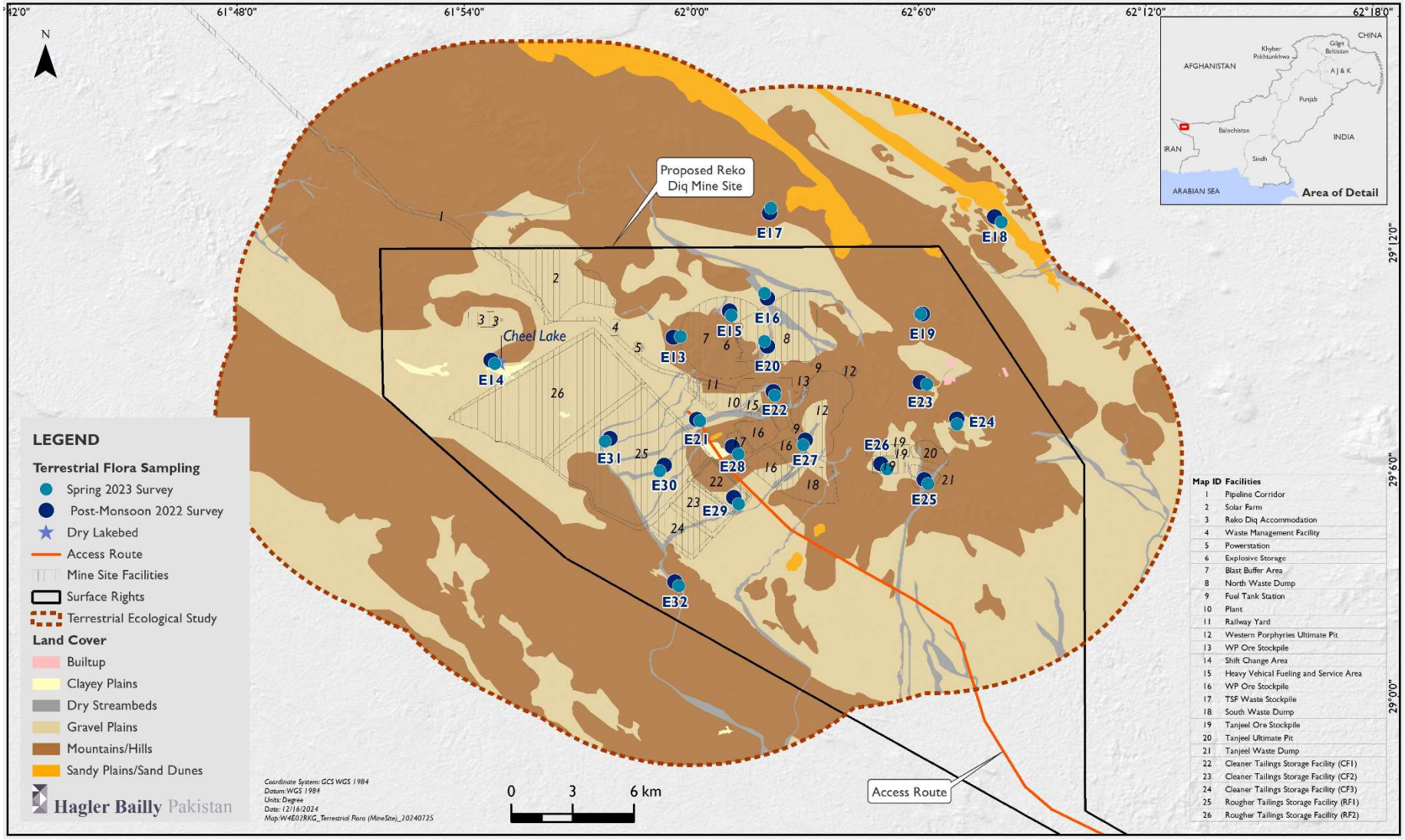


Exhibit 4.2: Sampling Locations along Northern Groundwater System, Post-Monsoon 2022 and Spring 2023 Surveys

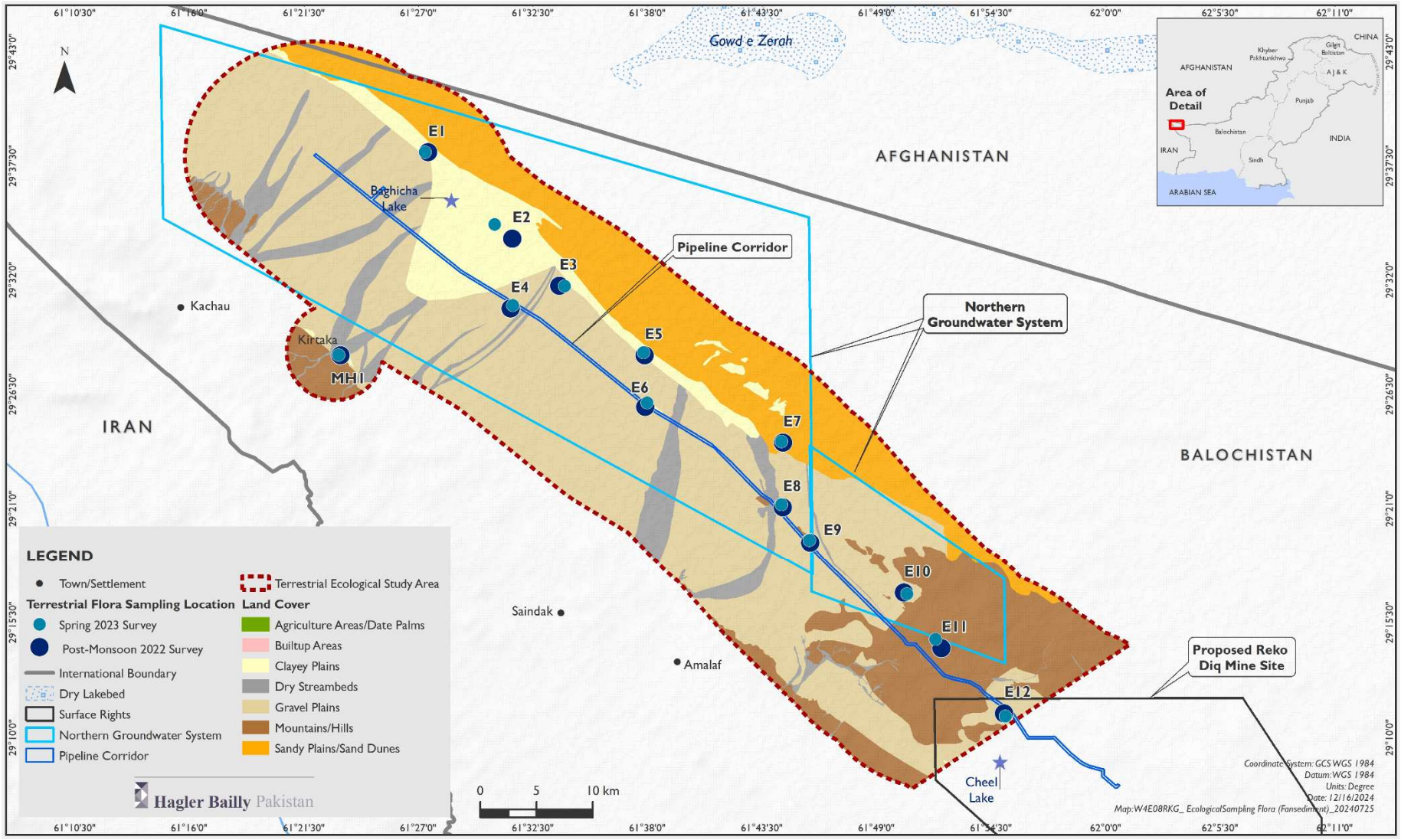


Exhibit 4.3: Sampling Locations along Access Route to Reko Diq Mine Site, Post-Monsoon 2022 and Spring 2023 Surveys

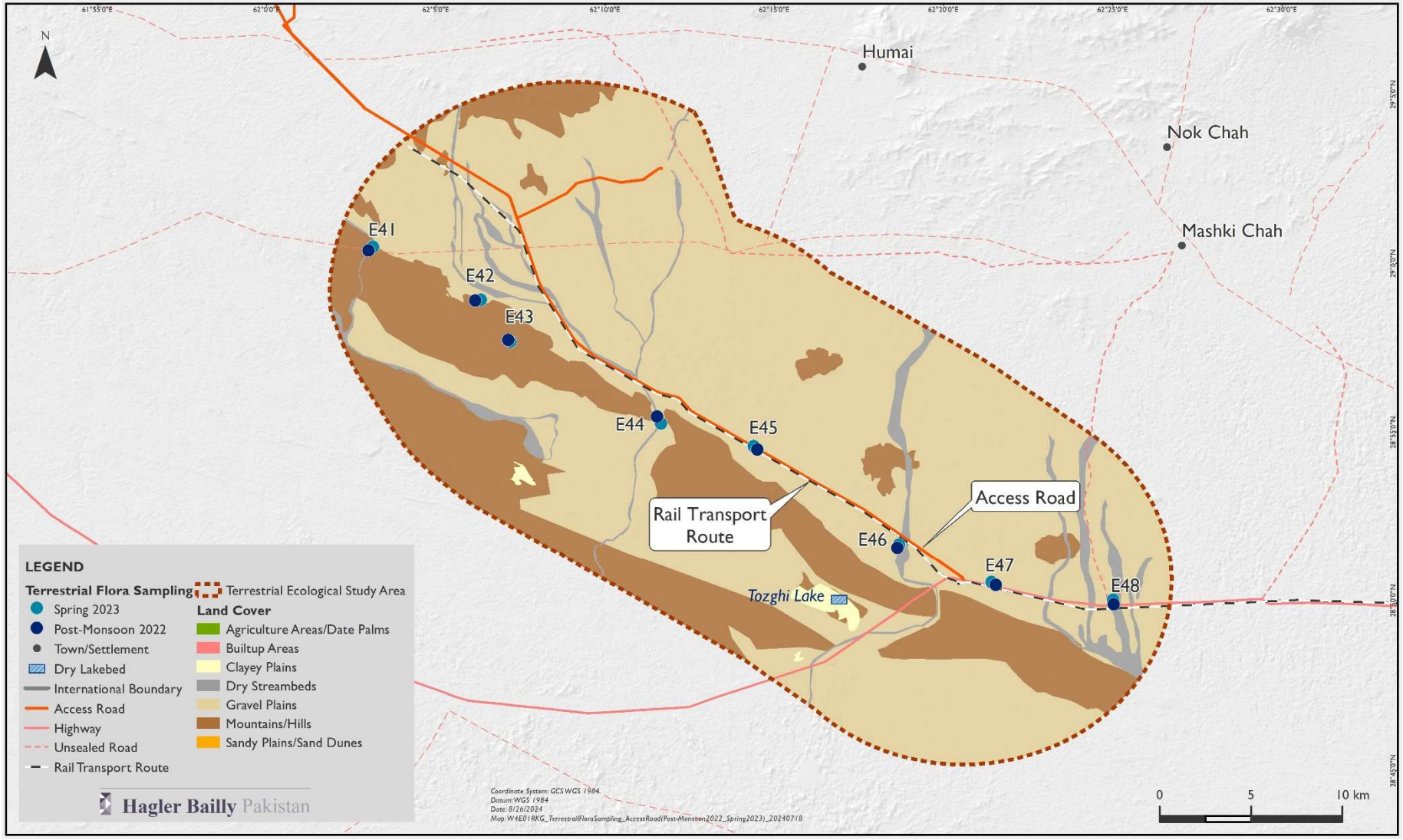


Exhibit 4.4: Sampling Locations along Post Qasim – Coastal Rail Transport Route Study Area, Post-Monsoon 2023 Survey

4.2.2 Methodology for Data Collection for Terrestrial Vegetation

Terrestrial vegetation was sampled using the quadrat method, taking three quadrats of 5 m by 5 m at each sampling location. Depending upon the site condition, the transect was started where vegetation was available. The first quadrat was taken at the beginning of the transect, the second at 250 m distance, and the third at 500 m distance. Plants from each quadrat were noted and collected for identification, where identification was not possible in the field. Plants collected were identified following the nomenclature prescribed by Flora of Pakistan (Nasir and Ali 1972-1994,[18] Ali and Qaiser, 1995-to date).[19]

Visual observations of habitat conditions were recorded at each site. Additional plant species in the area adjacent to the quadrat were noted, and their locations were recorded. Photographs of the species encountered within the Terrestrial Ecological Study Area were taken. The Alien-Invasive Plant Species (AIPS) occurring within the Terrestrial Ecological Study Area were specifically recorded. In addition, local people were consulted to gather information about local plant names, uses, and social and cultural values of the plants of the area. All the data and auxiliary information were recorded in the field on specifically designed survey forms.

Error! Reference source not found. provides photographs of field activities conducted during the sampling of terrestrial vegetation.

4.2.3 Analysis of Data for Terrestrial Vegetation

The field data was analysed for the species richness and other parameters such as cover, relative cover, density, relative density, frequency, relative frequency percentages, and Importance Value Index (IVI).

4.3 Mangroves

4.3.1 Selection of Sampling Locations for Mangroves

A total of seven sampling locations (M1-M7) were selected for mangrove assessment at Port Qasim. Of these, six sampling locations were chosen near the Port Qasim Coastal Area, where mangroves are directly or indirectly impacted by existing industrial activity. One sampling location was designated as a reference point at Keti Bundar, where mangroves are protected and remain unaffected by any Project-related activities.

Error! Reference source not found. provides the map of mangrove sampling locations at Port Qasim.

The photographs of the mangroves at Port Qasim and Keti Bandar are provided in **Exhibit 5.13**.

[18] S. I. and Nasir. 1972–1994. Flora of Pakistan Fascicles. Islamabad

[19] Ali, S. I. and Qaiser, M. 1995 to date. Flora of Pakistan Fascicles. Karachi

Exhibit 4.5: Field Activities for Sampling of Terrestrial Vegetation

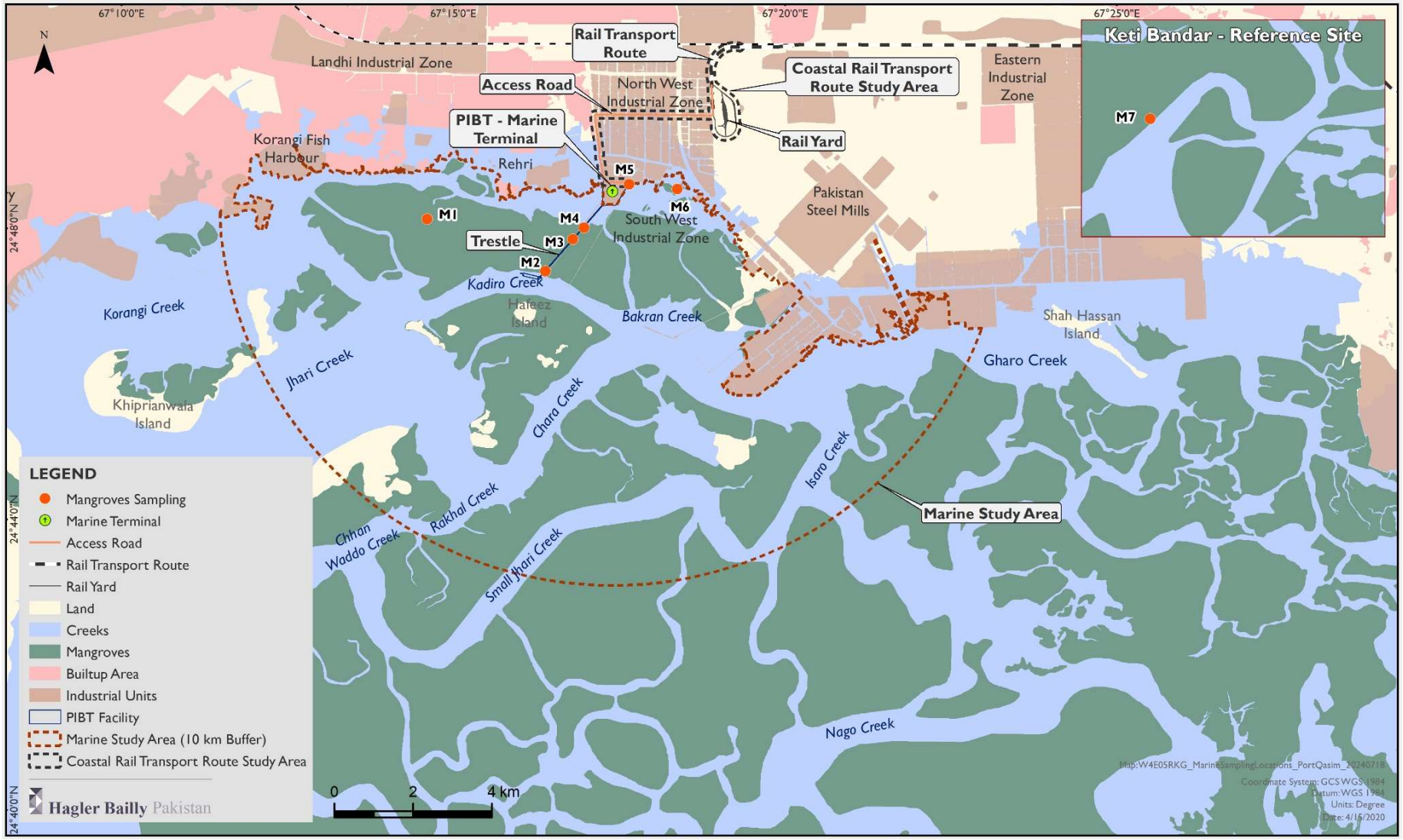
a) Setting of quadrat for vegetation at Reko Diq Mine Site

b) Measuring plant cover at the Northern Groundwater System

c) Identifying species of plants at Port Qasim

d) Identifying species of plants at Northern Groundwater System

Exhibit 4.6: Mangroves Sampling Locations along Port Qasim Marine Terminal



4.3.2 Methodology for Data Collection for Mangroves

Data collection for mangroves was done by determining the starting point of measurement, e.g., a 100 m transect line was drawn perpendicular to saline water/creeks. Quadrats were taken after an interval of 50 m according to mangrove zones, such as tree groups, saplings,[20] and seedlings.[21] The quadrat of 10 m x 10 m was taken for tree groups, 5 m x 5 m for saplings, and 1 m x 1 m for seedlings. The first quadrat was taken at the start of the transect, the second at 50 m, and the third quadrat at the end of the transect.[22]

A graduated telescoping measuring rod was used to measure young tree height. Tree grith was measured from the stem diameter of each young mangrove's diameter at breast height.

In each quadrat, the individuals were counted, and measurements of tree trunk diameter at breast height (dbh) or 1.3 m from the soil surface were taken, and the circumference of the dbh (Error! Reference source not found.) and the names of mangrove species were recorded. For seedlings and saplings, diameter measurements were carried out under the starting part of the origin of the branch.

Seedlings were counted in a 1 m x 1 m quadrat, while saplings were counted in a 5 m x 5 m quadrat, and this count was multiplied by the total area to provide an estimate for the total number of seedlings in 100 m^2.[23]

The canopy cover was calculated by using a percentage view, which is obscured by the mangrove canopy. A total of 16 equidistant grid points within the 10 m x 10 m quadrat were walked, and at each point, the observer looked up to observe the visibility of the sky or the visibility of the sky obscured by the canopy. In case the canopy was too high, then the observer used the same walking pattern but looked down instead of looking up to observe the visibility of the forest floor or if it was obscured by the canopy cover. This observation at each of the 16 points, once completed, provided a quantitative measure of the number of points at which the sky/forest floor is visible and hence the canopy cover of that 10 m x 10 m grid.

In addition, the health condition and epicormic[24] growth of mangroves were measured by leaf color and dormant vegetative buds embedded beneath the bark. Trees within each quadrat showing the yellowish color of the leaf and epicormic growth were recorded.

Error! Reference source not found. provides some photographs of field activities conducted during the sampling of mangroves.

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[20] Saplings are young trees with a diameter of 1 to 5 inches at a point that is 4½ feet from the ground.

[21] Seedlings are young trees with a diameter of up to 1 inch at a point that is 4½ feet from the ground.

[22] Hagler Baily Pakistan (HBP), April 2016, Cumulative Impact Assessment and Ecosystem Services Review for Industrial and Port Development at Port Qasim, International Finance Corporation.

[23] Hagler Baily Pakistan (HBP), April 2016, Cumulative Impact Assessment and Ecosystem Services Review for Industrial and Port Development at Port Qasim, International Finance Corporation.

[24] Epicormic growth means a shoot or branch growing from a previously dormant bud on the trunk or a limb of a tree (Oxford Dictionaries). Epicormic buds are dormant vegetative buds embedded beneath the bark that have a regenerative function after crown destruction, for example by fire (EUCLID, Centre for Plant Biodiversity Research, Contributors: AV Slee, MIH Brooker, SM Duffy, JG West)

Exhibit 4.7: Field Activities for Mangrove Sampling

a) Sampling of mangroves

b) Measuring mangrove cover

c) Measuring the mangrove canopy

d) Quadrat for the sampling of crab hole

Crabs are considered a keystone species and are used as an indicator of productivity and the importance of the site to support marine fauna.[25] Within each 10 m x 10 m quadrat, four smaller 1 m x 1 m sub-quadrats were placed at the four corners and one at the centre of the 10 m x 10 m quadrat. Several crab holes were counted in each 1 m x 1 m sub-quadrat and averaged for the 10 m x 10 m quadrat. Where the exact number of crab holes could not be counted within each sub-quadrat (in most cases), the number counted was rounded off to the nearest 10 or, when possible, the nearest five, to provide as close an approximation as possible.[26]

Error! Reference source not found. provides rules for measuring the breast height of mangroves with unusual shapes.

Error! Reference source not found. provides the categorization of mangrove health.

[25] Department of Employment, Economic Development and Innovation, Queensland Government, Data collection protocol for mapping and monitoring mangrove communities in Queensland, 2011

[26] Hagler Baily Pakistan (HBP), April 2016, Cumulative Impact Assessment and Ecosystem Services Review for Industrial and Port Development at Port Qasim, International Finance Corporation.

Exhibit 4.8: Rules for Measuring the Breast Height of Mangroves

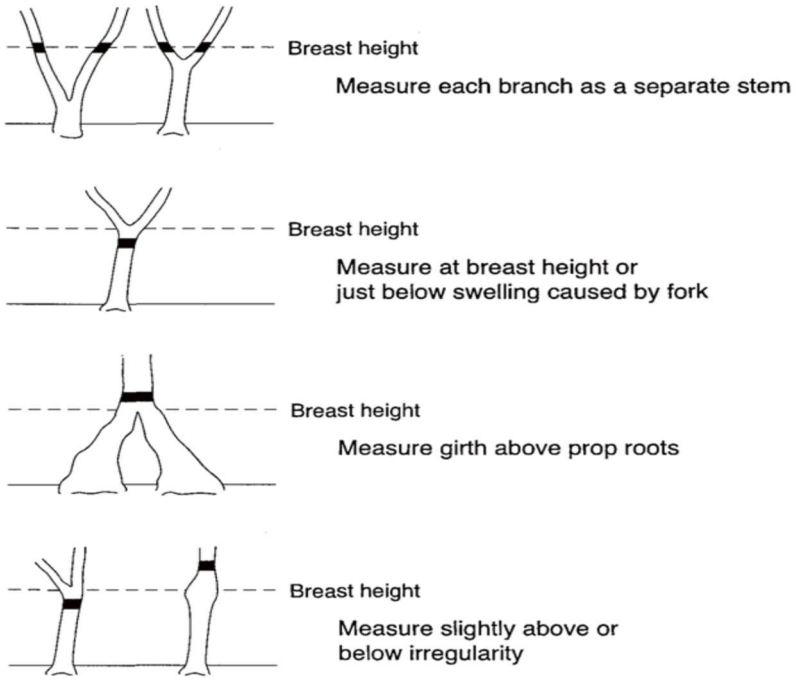

Exhibit 4.9: Categorization of Mangrove Health

Category	*Definition*
Healthy Mangroves	Excellent condition with trees in good health, very tall and large trees, canopy very compact, leaves not yellowing, daily tidal flushing and drainage.
Unhealthy Mangroves	Generally, reasonable health but sparse canopy, leaves not yellowing, trees moderate height, young and/or stunted growth, possibly due to low nutrients and high salinity, moderate or no extensive epicormic[27] growth, daily tidal flushing, and drainage.
Mangroves with Die Back	Very bad condition leaves yellowing or dead, degrading main trunk, canopy very open, lots of broken branches and trees falling, suffering from lack of tidal flushing due to raised ground, extensive epicormic growth.

4.3.3 Analysis of Data for Mangroves

The density of the mangrove species in the area was calculated using the following formula:

$$\text{Density} = \frac{\text{Total number of individuals of a species in all quadrats taken}}{\text{Total number of quadrats taken}}$$

[27] Epicormic growth means a shoot or branch growing from a previously dormant bud on the trunk or a limb of a tree (Oxford Dictionaries). Epicormic buds are dormant vegetative buds embedded beneath the bark that have a regenerative function after crown destruction, for example by fire (EUCLID, Centre for Plant Biodiversity Research, Contributors: AV Slee, MIH Brooker, SM Duffy, JG West)

5. Ecological Study Area and Habitats

The ecological studies were carried out for the following three areas:

- Reko Diq Mine Site and Associated Infrastructure, including the Northern Groundwater System and Access Route connecting the N-40 highway and existing rail route to Reko Diq Mine Site, are referred to as the Reko Diq Mine Site and Associated Infrastructure in this report. The Access Route will also accommodate the proposed railway line from the Mine Site to the existing railway line of Pakistan Railways, extending from Quetta to Taftan.
- Terrestrial areas along Rail Transport Route at Port Qasim connecting the Marine Terminal at Port Qasim to the main railway line of Pakistan Railways for export of copper concentrate
- Areas in the sea around the Marine Terminal at Port Qasim.

The ecological studies were not carried out for the Rail and Road Route Corridor consisting of existing railway lines that will be used for the transportation of the product from the Project to the port for export. The biodiversity along the main railway line has already been impacted over time, and the impacts of additional traffic due to the Project on ecology will, therefore, be marginal.

5.1 Ecoregions and Biomes

5.1.1 Reko Diq Mine Site and Associated Infrastructure

The Project infrastructure, such as the proposed Reko Diq Mine Site, Northern Groundwater System, and Access Route to Reko Diq Mine Site, fall within the desert ecoregion, which contains the dry Sistan Basin of southern Afghanistan and portions of eastern Iran and southwest Pakistan. The region is dominated by dry sandy desert conditions, with some irrigated cropland where water is available. The area is characterized by a desert biome, revealing distinct features typical of an arid environment of scant rainfall leading to limited vegetation. Drought conditions are prevalent as this region experiences low annual precipitation and high temperatures, fostering a landscape with limited vegetation adapted to survive in dry conditions. The terrain consists of sandy or gravelly surfaces, often with dunes or rocky landscapes, and the soil is well-drained, but nutrient levels are typically low. Temperature extremes are common, with hot daytime and cooler nights. The area hosts floral species that have adapted to such extreme conditions.

The Ecological Study Area in the Reko Diq Mine Site and Associated Infrastructure consists of different habitat types which include Gravel Plains, Clayey Plains, Mountains/Hills, Sandy Plains/Sand Dunes, Dry Streambeds, Built-up Areas and Agriculture Areas/Date Palms. Among these habitat types the major habitat type in the Reko Diq Mine Site and Associated Infrastructure is Gravel Plains (52.8%), followed by Mountains/Hills (27.1%) and Sandy Plains/Sand Dunes (10.0%) and the least habitat is Agriculture Areas/Date Palms (0.003%). All the habitat types are largely intact with a

minimal disturbance due to anthropogenic activities and therefore, the habitat at the Reko Diq Mine Site and Associated Infrastructure is categorized as Natural Habitat except for Agriculture Areas/Date Palms and Buil-up Areas which are only fraction of the total habitat at the Reko Diq Mine Site.

The description of these habitat types are as follows:

- **Gravel Plains:** The Gravel Plains represent the largest and most prevalent habitat at the Reko Diq Mine Site and Associated infrastructure. This habitat is characterized by a hard surface and small gravel particles, with very little to no vegetation in the centre of gravel plains which are mostly barren. The sparse vegetation is present at the interface of this habitat with other habitats providing favourable conditions for different species. These species largely consist of *Haloxylon persicum, Haloxylon salicornicum, Aeluropus lagopoides* and *Calligonum comosum*. The Gravel Plains offer limited refugia to herpetofauna, mammals, and avifauna. The Gravel Plains is least to moderate sensitive habitat type and has a least potential to support an important concentration of different biodiversity groups.
- **Mountains/Hills:** This habitat type at the Reko Diq Mine Site and Associated Infrastructure is less represented and primarily consists of low, barren rocky outcrops with sparse vegetation. Dominant plant species include *Haloxylon salicornicum, Haloxylon persicum, Salsola stocksii, Cornulaca monacantha, Anabasis setifera, and Tribulus terrestris*. The Mountains/Hills habitat is moderately to highly sensitive, with a reasonable potential to support diverse ecological resources.
- **Sandy Plains/Sand Dunes:** This habitat type is characterized by various types of wind-blown sand formations, including shifting sand dunes, low tracts of permanent sand dunes, and high tracts of permanent sand dunes. The shifting sand dunes, with very little vegetation, are largely unsuitable for ecological resources due to their active and unstable nature. In contrast, the low tracts of permanent sand dunes, particularly those with vegetation such as *Calligonum spp.* and *Salsola stocksii* and interface with other habitats like Gravel Plains or Clayey Plains which provide essential covers and suitable microhabitats. The shifting sand dunes and high tracts of permanent sand dunes are the least sensitive and offer the least potential for supporting biodiversity. However, the low tracts of sand dunes, particularly at the interface with other habitats and adequate vegetation, are highly sensitive and have significant potential to support diverse biodiversity.
- **Dry Streambeds:** These are seasonal water channels that remain dry for most of the year but play a critical role during rainfall in desert and semi-desert areas by regulating water flow and retaining moisture for extended periods. This retained moisture creates favourable conditions for plant growth, making dry streambeds the most promising and sensitive habitat type for supporting various ecological resources. Dominant vegetation includes *Salsola stocksii, Haloxylon persicum, Haloxylon salicornicum, Calligonum comosum*, *and Panicum turgidum*, which provide essential refugia and shelter for reptiles, small mammals, and bird

species. With minimal anthropogenic disturbance, this habitat type is largely intact and has the high potential to support different biodiversity groups

- **Clayey Plains:** This habitat consists of flat or gently undulating terrains with fine-textured, clay-dominated soils, characteristic of arid and semi-arid regions. These soils retain water effectively but have poor drainage, often forming surface cracks during dry periods. This habitat is dominated by *Alhaji maurorum, Tribulus terrestris,* and *Citrullus colocynthis*, which are well adapted to the harsh conditions. This habitat is classified as moderately to highly sensitive, with modest potential to support biodiversity, especially in less disturbed areas or where it interfaces with other habitat types
- **Agricultural Area/Date Palm**: This unique microhabitat, is characterized by larger Date Palm **(***Phoenix dactylifera***)** trees, along with vegetation such as *Tamarix aphylla, Peganum harmala, Alhagi maurorum, and Vachellia jacquemontii*, which provide essential resources and shelter for various species. This habitat type provides structure diversity due to mixed vegetation to wide array of fauna species. This habitat type is highly sensitive and has high potential to support different biodiversity groups.

5.1.2 Port Qasim

The proposed Project infrastructure such as Rail Transport Route, Rail Yard, Road Transport Route, Access Road and Pakistan International Bulk Marine Terminal (PIBT) at Port Qasim falls within the broader context of the Indus Delta ecoregion, which is situated in the Sindh Province, especially the southeastern coastal areas. The Indus Delta ecoregion is characterized by a complex network of tidal channels, mudflats, and mangrove forests. It is influenced by the freshwater inputs from the Indus River, creating a unique and dynamic ecosystem. The flora of the delta is not as diverse as few plants, including mangroves, i.e., *Avicennia marina* and *Rhizophora mucronata,* and few salt-tolerant plant species can survive the severe conditions of heat and salinity in this region. This area is characterized by high temperatures and high humidity, supporting the growth of mangrove forests in coastal areas.

Port Qasim study area consists of the Barren Land/Open Plot, Industrial Units, Vegetation Cluster, Mangroves, Creeks, Road/Railway Lines, and Drainage. Among these habitat types, Vegetation Cluster is major habitat type consisting of 48.4% of Port Qasim study area followed by Industrial Unit (18.6%) and Barren Land/Open Plot (17.1%). All these habitats are largely modified due to anthropogenic activities and therefore the habitat of Port Qasim study area is categorized as Modified Habitat due to high level of anthropogenic activities and dominance of invasive species.

The description of these habitat types are as follows:

- **Barren Land/Open Plot:** This habitat type is predominantly characterized by sparse vegetation, primarily consisting of plant species such as *Calotropis procera* and *Prosopis juliflora*. The ecological productivity of this habitat is limited, supporting a modest assemblage of fauna. This habitat is least sensitive and has modest potential to support ecological resources.

- **Vegetation Cluster:** This habitat type is defined by a heterogeneous mix of plant species, including native vegetation such as *Abutilon indicum*, *Aerva javanica*, *Calotropis procera*, *Capparis decidua*, *Saccharum munja*, *Salvadora oleoides*, and *Senna italica*, alongside the alien-invasive *Prosopis juliflora*, which dominates much of the area. The diverse vegetation supports various biodiversity groups by offering structural complexity, cover, and essential resources such as food and microhabitats.
- **Industrial Unit:** This habitat type is highly modified by anthropogenic activities and is mainly dominated by alien-invasive plant species such as *Phragmites karka*, *Prosopis juliflora*, and cultivated species like *Sesbania grandiflora*. These plants outcompete native species such as *Calotropis procera* and *Haloxylon salicornicum*, resulting in a loss of native vegetation and changes to the local ecosystem.

5.2 Protected Areas

According to the IUCN, a protected area is defined as "an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means."[28] For the purpose of management objectives, the IUCN has identified seven different protected areas categories which are described below.

- **Category Ia**: Strict nature reserve/wilderness protection area managed mainly for science or wilderness protection.
- **Category Ib**: Wilderness Area: protected area managed mainly for wilderness protection.
- **Category II**: National Park: protected area managed mainly for ecosystem protection and recreation.
- **Category III**: Natural Monument: protected area managed mainly for conservation of specific natural features.
- **Category IV**: Habitat/Species Management Area: protected area managed mainly for conservation through management intervention.
- **Category V**: Protected Landscape/Seascape: protected area managed mainly for landscape/seascape conservation or recreation.
- **Category VI**: Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural resources.

According to the information collected from KBA[29]and IBAT,[30] the proposed Reko Diq Mine Site and Associated Infrastructure lies within the Saindak Community Game Reserve.[31]

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[28] Dudley, N., & Stolton, S. (2008). Defining protected areas: an international conference in Almeria, Spain. *IUCN, Gland*.

[29] Key Biodiversity Areas. Available at https://www.keybiodiversityareas.org/sites/search Assessed on 20–Oct–22

[30] Integrated Biodiversity Assessment Tool https://www.ibat–alliance.org/ Assessed on 20–Oct–22

[31] The status and boundary of the Saindak Game Reserve is under investigation with the concern departments.

The nearest protected areas along the Rail and Road Route Corridor include Kambran Wildlife SanctuaryIn addition, the Ras Koh Wildlife Sanctuary, Shashan Wildlife Sanctuary and Saindak Community Game Reserve.[32]

The nearest protected areas near Port Qasim Coastal Rail Transport Route and Marine Study Area include the Hub Dam and Mahro Kohri wildlife sanctuaries.

Exhibit 5.1 provides the list of protected areas and their distance from Mine Site, Rail and Road Route Corridor. **Exhibit 5.2** provides a map of the protected areas near Project infrastructure.

Exhibit 5.1: Protected Areas and their Distance from Mine Site, Rail and Road Route Corridor

Protected areas	*Categories*	*Distance from the Facilities (km)*		
		Mine Site	*Rail Transport Route*	*Road Transport Route*
Dhoung Block	Wildlife Sanctuary	629	2.8	190
Hadero Lake	Wildlife Sanctuary and IBA	720	5.2	38
Haleji Lake	Wildlife Sanctuary and Ramsar Site	726	5.5	46
Kambran	Wildlife Sanctuary	269	8	0
Zangi Nawar	Game Reserve	352	14.0	15.1
Kinjhar (Kalri) Lake	Wildlife Sanctuary and IBA	730	5	66
Langh (Lungh) Lake	Wildlife Sanctuary	598	10.2	141
Maslakh	Wildlife Sanctuary	432	7	34.5
Shashan	Wildlife Sanctuary	460	140	0
Ras Koh	Wildlife Sanctuary	282	7	0
Chorani	Wildlife Sanctuary	462	140	4
Saindak	Game Reserve	-	-	-
Haleji	Important Bird Area (IBA)	726	5.5	46
Pugri Lake	Important Bird Area (IBA)	605	3.5	146.5
Drigh Lake	Wildlife Sanctuary and Ramsar Site	600	9.8	145

5.3 Ecological Study Area

Exhibit 5.3 shows a map of the Ecological Study Area.

The Ecological Study Area at Reko Diq Mine Site and Associated Infrastructure was demarcated by applying a buffer of 10 km around the proposed Reko Diq Mine Site, Northern Groundwater System and Access Route to Reko Diq Mine Site, where disturbance to flora due to the Project may extend.

The Ecological Study Area along the Port Qaism Area was demarcated by applying a buffer of 100 m along the existing Rail Transport Route, Rail Yard, and Access Road

[32] Ibid

extending from the main railway line to the PIBT at Port Qasim. The proposed Rail Yard will connect these two transport routes, serving multiple functions, including train operations, maintenance, project-related transportation goods, and the management of railway infrastructure. The floral ecology of the Port Qasim industrial area is already extensively disturbed by industrial activities.

A buffer of 10 km extending into the creeks and mangrove areas around the proposed Marine Terminal at Port Qasim was defined to account for possible impacts of the Project on marine flora.

Exhibit 5.2: Protected Areas near Project Infrastructure

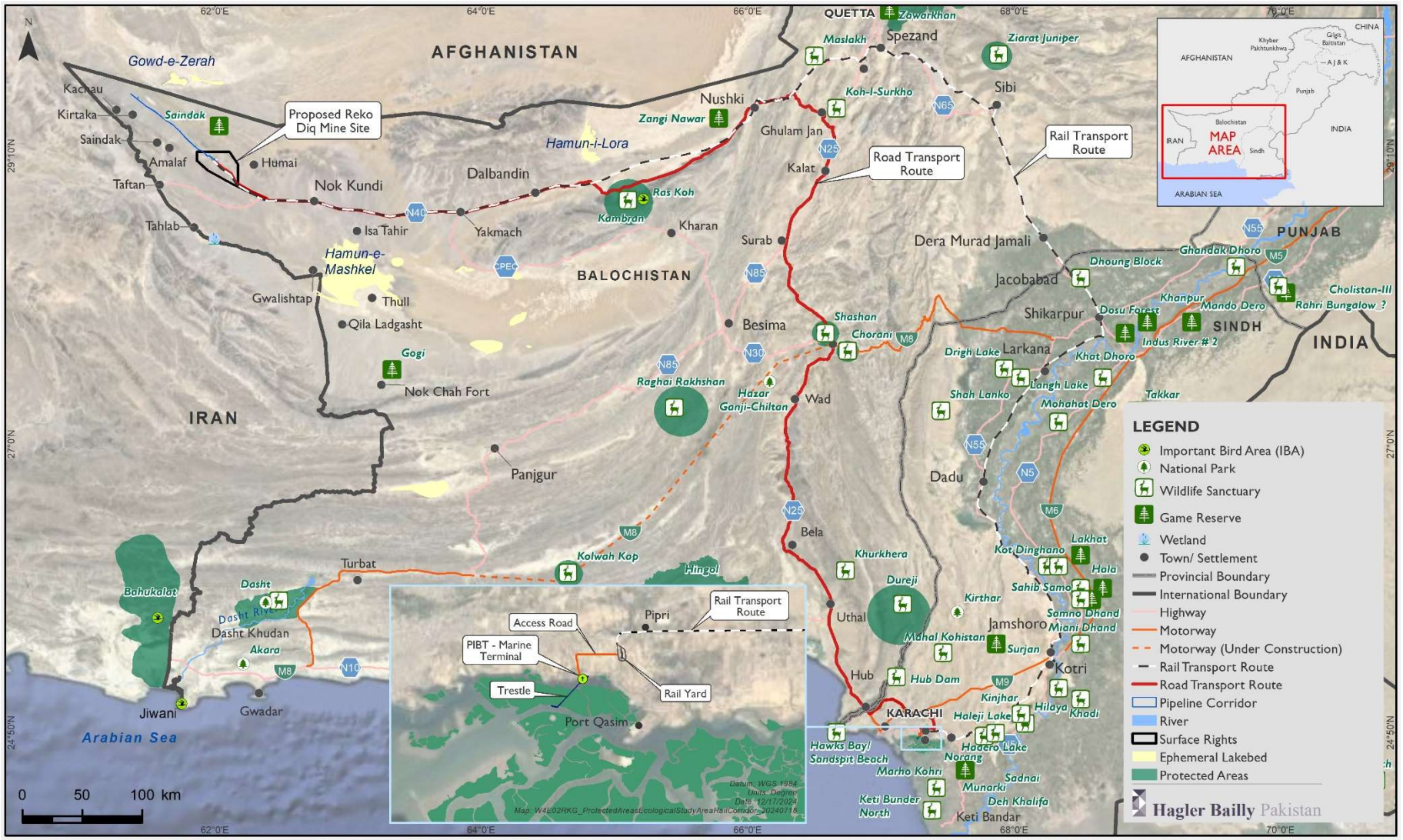
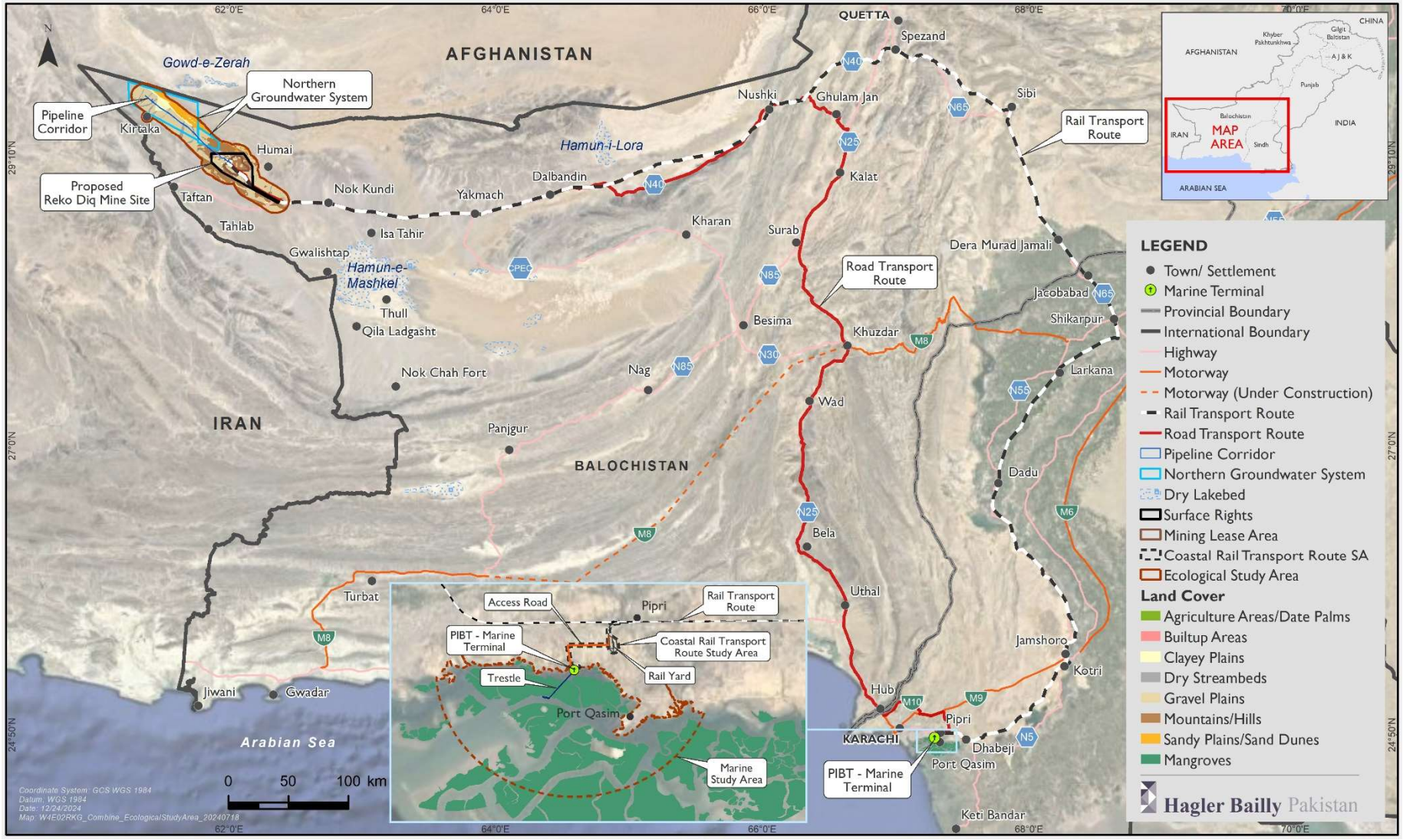


Exhibit 5.3: Ecological Study Area



5.4 Habitat Classification and Distribution in the Ecological Study Area

5.4.1 Reko Diq Mine Site and Associated Infrastructure

The Ecological Study Area was categorized into different habitat types based on Google Earth™ satellite imagery[33] which include the Mountains/Hills, Clayey Plains, Dry Streambeds, Gravel Plains, and Sandy Plains/Sand Dunes. **Exhibit 5.4** provides the Ecological Study Area on a map. Photographs of representative habitats are provided in **Exhibit 5.5**. **Exhibit 5.6** provides habitat types along with the area and percentage of each habitat type. The Gravel Plains and Mountains/Hills habitat types dominate the landscape, with Dry Streambeds running through the Gravel Plains.

5.4.2 Rail and Road Route Corridor

The Rail and Road Route Corridor extends from RDMS to Port Qasim. This is an existing infrastructure that the Project will use. The biodiversity is already modified along these routes, however, the biodiversity is also adapted to these modified habitats. **Exhibit 5.7** provides the index map for desktop-based land use and land cover assessment along the Rail and Road Route Corridor within 1 km buffer on each side, whereas, segment wise landcover is provided in **Appendix A.**

Exhibit 5.8 provides some of the photographs of different habitat types along the Rail and Road Route Corridor retrieved from different online sources.

5.4.3 Port Qasim – Terrestrial and Marine Study Areas

Exhibit 5.9 provides the Terrestrial Study Area at Port Qasim. **Exhibit 5.10** includes photographs of the representative habitats in 1.5 km long Rail Transport Route and 6 km long Access Road. **Exhibit 5.11** lists the habitat types along with the area and percentage of each habitat type in the Ecological Study Area. The habitats in the Study Area at Port Qasim are highly modified; the dominant habitat is Vegetation Clusters, which mostly consist of alien invasive mesquite plant species that may spread in the coastal area following the transportation of project material and reduce the regrowth of indigenous vegetation over time. The remaining land is occupied by industrial units, roads, and other infrastructure, with some land and demarcated industrial plots that are unutilized.

Exhibit 5.12 provides the Marine Ecological Study Area at Port Qasim**. Exhibit 5.13** includes photographs of the representative habitats in the creeks and mangroves extending about 10 km into the sea from the Marine Terminal**. Exhibit 5.14** provides the habitat types along with the area and percentage of each habitat type in the Ecological Study Area. The creeks and excavated channels are used by the ships to access the berths at the port. The land is mostly covered by mangroves.

[33] Google Earth Pro. Free geospatial desktop application Available at: https://google–earth–pro.en.softonic.com/

Exhibit 5.4: Reko Diq Mine Site and Associated Infrastructure

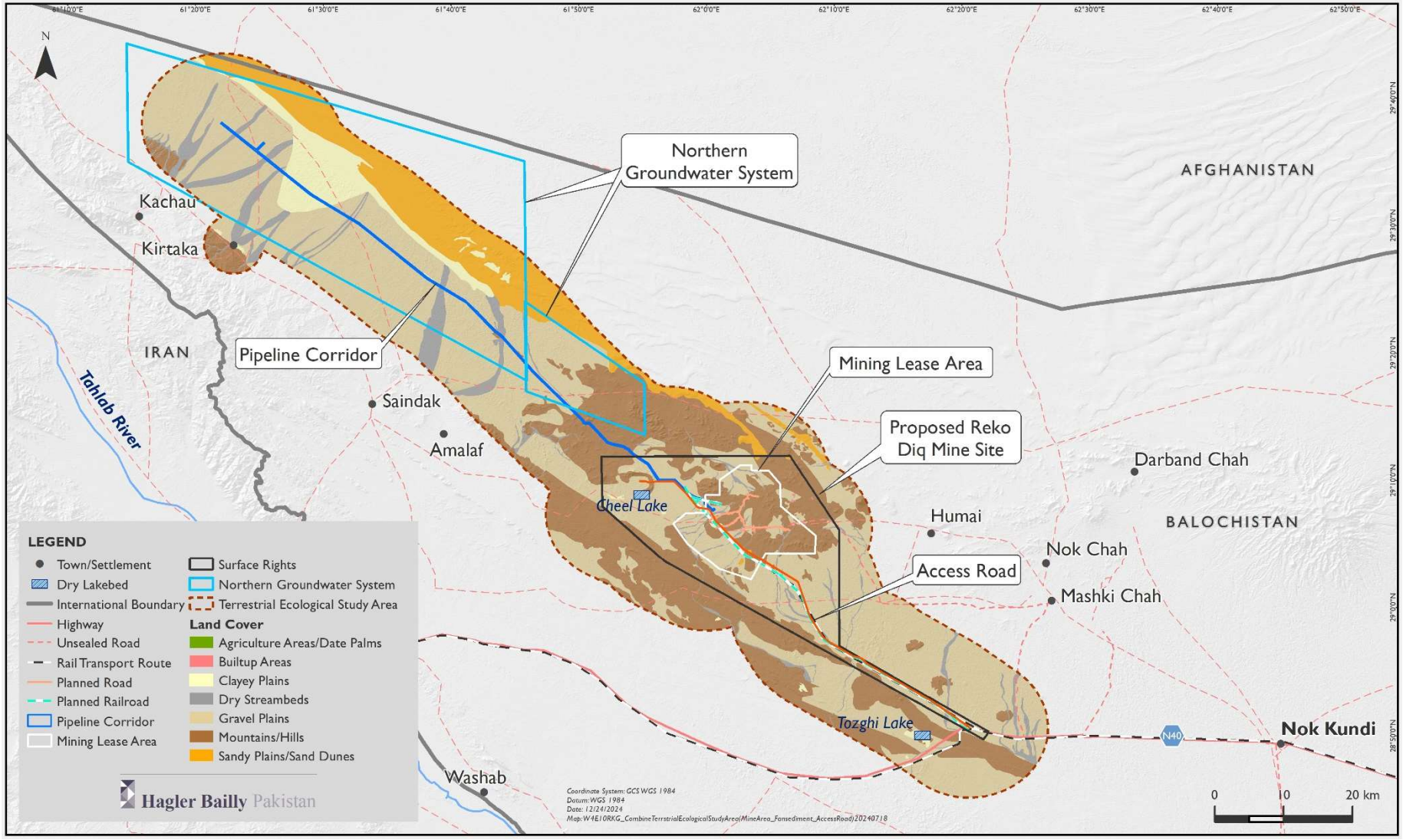


Exhibit 5.5: Photographs of Different Habitats along the Reko Diq Mine Site and Associated Infrastructure

a) Mountains/Hills

b) Sandy Plains/Sand Dunes

c) Dry Streambed

d) Clayey Plains

e) *Gravel Plains*

Exhibit 5.6: Distribution of Habitats in Reko Diq Mine Site and Associated Infrastructure

No.	*Habitat Type*	*Area (km^2)*	*Percentage (%)*
1.	Agriculture Areas/Date Palms	0.1	0.003
2.	Built-up Areas	0.4	0.01
3.	Clayey Plains	142.6	4.3
4.	Dry Streambeds	188.7	5.7
5.	Gravel Plains	1,759.4	52.9
6.	Mountains/Hills	903.7	27.1
7.	Sandy Plains/Sand Dunes	334.5	10.0
Total		**3,329.4**	**100.0**

Exhibit 5.7: Index Map along the Rail and Road Route Corridor

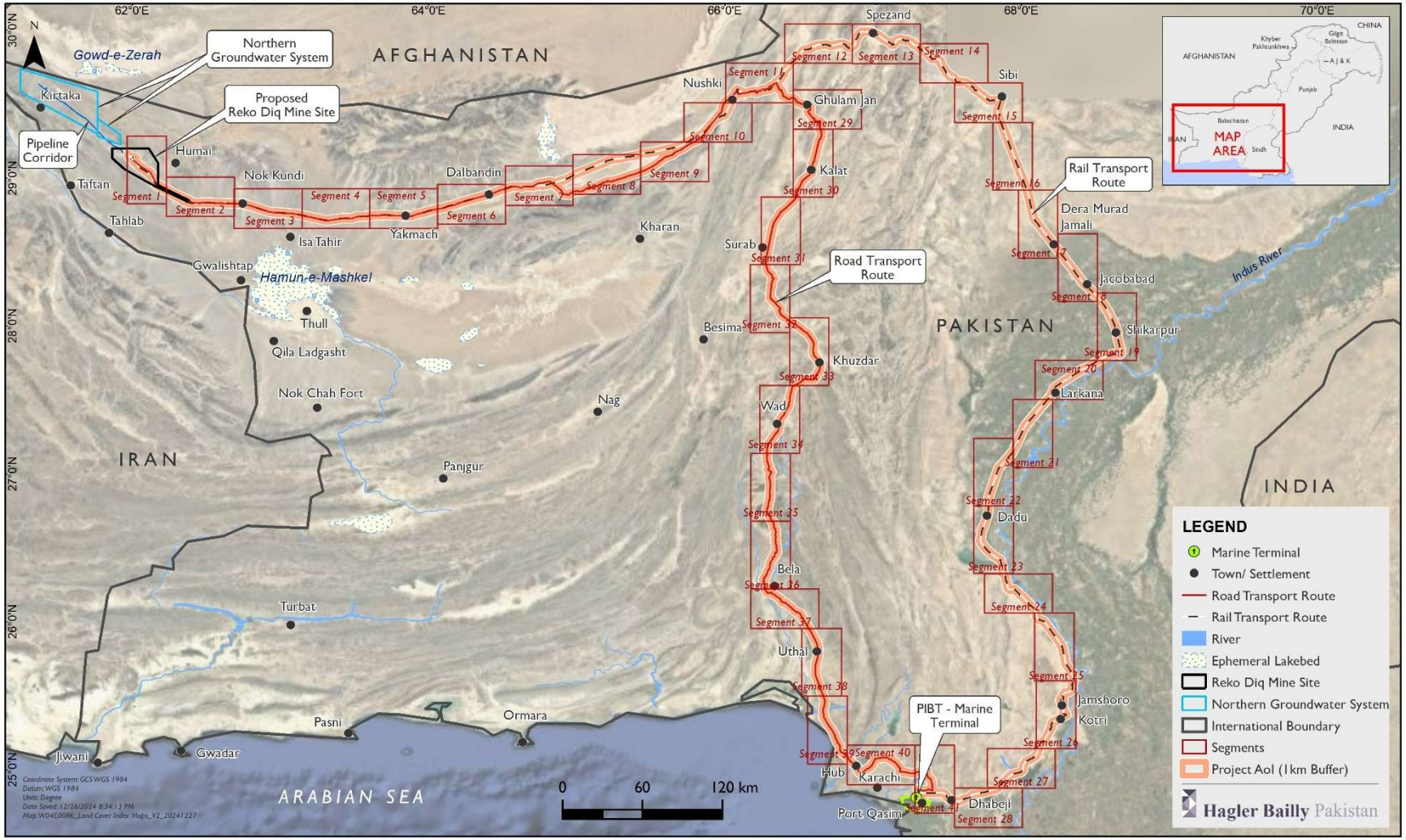


Exhibit 5.8: Habitat Types along the Rail and Road Route Corridor

a) Zangi Nawar Wetland[34]

b) Interface of Clayey Plains and Sand Dunes in Zangi Nawar Game Reserve[35]

c) Vegetation Patches in Charsar in foothills of Ras Koh[36]

d) Gravel Plains on the way to Ghat-e-Baroth near Dalbandin[37]

e) Habitat near Road Route in Kalat District[38] [39]

[34] Source: Hagler Bailly Pakistan, Summer 2024 Survey

[35] Ibid

[36] Ibid

[37] Ibid

[38] Source: https://lh5.googleusercontent.com/p/AF1QipPw-da9rr3NXRW6_-Xrq9Ls5uThWf-j8RS_VZG_=h1440 Accessed on December 13, 2024.

[39] Source: https://lh5.googleusercontent.com/p/AF1QipNZUU7tk941kO_4TUt1KW0nnCzGZXRIRbI43EeO=h1440 Accessed on December 13, 2024.


f) Habitat near Road Route in Kalat District[40] [41]


g) Habitat types in Mastung District [42]


h) Habitat types near Road Route in Khuzdar District[43] [44]

[40] Source: https://lh5.googleusercontent.com/p/AF1QipNa9kDF42ttTHHvI9NsB8n9-8wduWsAriORQAwJ=h1440 Accessed on December 13, 2024

[41] Source: https://lh5.googleusercontent.com/p/AF1QipP8u5rJ0uGU4oOqYXRpUkEDmTnaxhixX75ndcHU=h1440 Accessed on December 13, 2024

[42] Source: https://lh5.googleusercontent.com/p/AF1QipNQNqD037_cR9ve81-lKQ-V-fDzjq45nXWolw90=h1440 Accessed on December 13, 2024.

[43] https://lh5.googleusercontent.com/p/AF1QipM3ufvJDCfIDqnAHhW-jfSNp3k2kN22FwLl9xkx=h1440 Accessed on December 13, 2024.

[44] Source: https://lh5.googleusercontent.com/p/AF1QipNqEKVjvJXdkQB50TEBatr_q8IpmRAZVlcldSX2=h1440 Accessed on December 13, 2024.

i) Habitat types near Road Route in Khuzdar District[45] [46]

j) Hub Dam Water Reservoir[47]

k) Habitat near Gopang Railway Station in Jamshoro District[48]

l) Rail Route passing near Indus River in Jamshoro[49]

m) Habitat near Railway Route in Kachhi District[50]

[45] Source: https://lh5.googleusercontent.com/p/AF1QipM4uDlni0wnavEz64fBDLBDv5e11zBNg8NRLK31=h1440 Accessed on December 13, 2024.

[46] Source: https://lh5.googleusercontent.com/p/AF1QipMfk-y9rhq30LIPqSbYRyxs6UBFSBz7n_LzoFx8=h1440 Accessed on December 13, 2024.

[47] Source: https://lh5.googleusercontent.com/p/AF1QipM8dNgKe1X0h4HwPRJqvLyiAuj2yWwtCQVEXJ7m=h1440 Accessed on December 13, 2024.

[48] Source: https://lh5.googleusercontent.com/p/AF1QipPxY6rX6f81cNa3dMqFRB86vSAsXf7bSs_Kzn4G=h1440 Accessed on December 13, 2024.

[49] Source: https://lh5.googleusercontent.com/p/AF1QipNepIyx4KF-efPTtHbXoN0ZC8X8v_9kE2dsHbNS=h1440 Accessed on December 13, 2024.

[50] Source: https://lh5.googleusercontent.com/p/AF1QipPgIRbdAsnxBedGlg2l5A64Cgi2orf5q4-6qwq_=h1440 Accessed on December 25, 2024.

Exhibit 5.9: Port Qasim – Terrestrial Study Area

Note : The Study Area was initially defined when the project was still evaluating multiple options for port development. While this represents the final layout of the Study Area, further updates will be considered if necessary.

Exhibit 5.10: Photographs of Habitats along Port Qasim - Terrestrial Study Area

a) Vegetation Cluster at Port Qasim

b) Open Plot / Barren Area at Port Qasim

c) Industrial Units in Port Qasim

d) Barren Land near PIBT at Port Qasim

e) Railway Track at Port Qasim

Exhibit 5.11: Distribution of Habitats at the Port Qasim - Terrestrial Study Area

Habitat Types	*Area (km^2)*	*Percentage (%)*
Barren Land/ Open Plot	0.4	17.1
Drainage	0.04	1.9
Industrial Units /Commercial	0.4	18.6
Mangroves	0.1	3.9
Road/Railway Lines	0.2	10.1
Vegetation Cluster	1.1	48.4
Creeks	0.001	0.04
Total	**2.3**	**100.0**

Exhibit 5.12: Marine Ecological Study Area

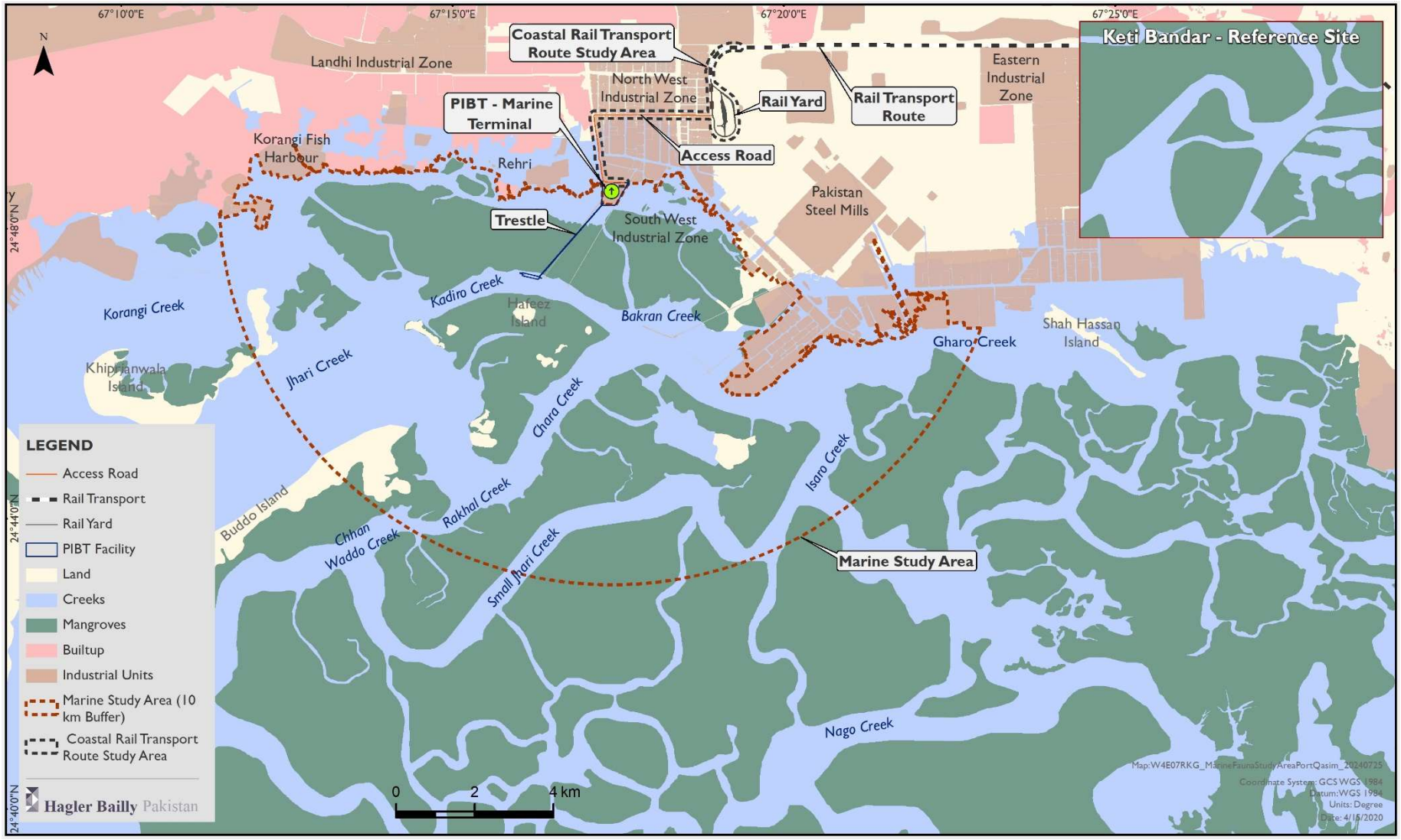


Exhibit 5.13: Mangroves at Port Qasim and Keti Bandar

a) Mangroves near PIBT and Port Qasim

b) Mangroves at Keti Bandar

Exhibit 5.14: Distribution of Habitats in the Marine Ecological Study Area

Habitat Types	*Area (km^2)*	*Percentage (%)*
Creeks	72.0	52.7
Mangroves	64.7	47.3
Total	**136.7**	**100.0**

6. Baseline Description

The Floral Baseline description provides an overview of the flora of the Project infrastructure and their surroundings. This baseline draws on a detailed desktop assessment based on the information obtained from published sources, including books and information from different databases such as the IBAT, IUCN, KBA, Centre for Agriculture and Biosciences International (CABI), Flora of Pakistan (eFlora of Pakistan), World Plants, existing ESIA studies within and around the Ecological Study Area.[51]

6.1 Literature Review for Terrestrial Vegetation

As discussed above in the ***Section 4, Ecological Study Area and Habitats***, the assessment of the terrestrial flora is carried out for the Reko Diq Mine Site, Northern Groundwater System, Access Route to Reko Diq Mine Site, and proposed Project infrastructure at Port Qasim.

6.1.1 Terrestrial Vegetation at Reko Diq Mine Site and Associated Infrastructure

The Reko Diq Mine Site and the other Project infrastructure study area hosts 55 plant species, reflecting the unique botanical diversity of the region. The area is predominantly characterized by xeric plant species, owing to the arid desert environment and limited water availability. Among the dominant species documented within the surveyed area are Date Palm *(Phoenix dactilophera),* Wild Rue *(Peganum harmala),* Puncture Vine *(Tribulus terrestris),* and Bitter Apple *(Citrullus colocynthis*).[52] [53] [54] [55] A complete list of plant species reported within the surveyed area is provided in **Appendix B**.

The desktop assessment features the arid conditions prevailing at the Reko Diq Mine Site and its vicinity, which predominantly support specialized floral species adapted to desert environments. These xeric species exhibit wide distribution across the region, with none falling under the threatened category of the IUCN Red List of Threatened Species, nor do they exhibit restricted ranges.

The assessment also identified one Alien Invasive Species, the Honey Mesquite (*Prosopis glandulosa*), within the Reko Diq Mine Site area. This species is well-suited to harsh conditions and possesses the potential to outcompete other species in the area. However, the presence of this species was not confirmed from the Project infrastructure during the Post-Monsoon 2022 and Spring 2023 surveys.

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[51] The Important Areas or Sites in or near the Project include Proposed Reko Diq Mine Site, Northern Groundwater System, Access Route to Reko Diq Mine Site and Port Qasim – Terrestrial and Marine Study.

[52] Nawaz, M. A., Rafique, M., & Khan, N. K. (2011). Pattern of mammalian distribution in the Chagai Desert, Balochistan, Pakistan. Pakistan J. Zool, 43(5), 841–847.

[53] Virk, A. T. (1991). Management plan for wild ungulates in Balochistan Pakistan.

[54] eFlora of Pakistan http://www.efloras.org/flora_page.aspx?flora_id=5. Assessed on 20–Oct–2022

[55] Nawaz, M. A., Rafique, M., & Khan, N. K. (2011). Pattern of mammalian distribution in the Chagai Desert, Balochistan, Pakistan. Pakistan J. Zool, 43(5), 841–847.

The IBAT reported 78 floral species within a 50 km buffer of the Reko Diq Mine Site and Associated Infrastructure.[56] A complete list of floral species reported within a 50 km buffer of the Reko Diq Mine Site and Associated Infrastructure according to IBAT is provided in **Appendix C**.

Plant Species of Conservation Concern

No species of conservation concern have been identified within the area. Pakistan Red List is not available for the flora. All the species reported by IBAT within a 50 km buffer of the Reko Diq Mine Site and Associated Infrastructure are listed as either Least Concern or Data Deficient according to the IUCN Red List of Threatened Species.

6.1.2 Terrestrial Vegetation along the Rail and Road Route Corridor

From the extensive review of published literature, a total of 530 species of plants were reported along the Rail and Road Corridor. These species include Gum Arabic Tree (*Acacia nilotica*), Gaint Reed (*Arundo donax*), Bohay Madran (*Achillea welhemsii*), Mazhmonk (*Amygdalus brahuica*), Arabian Primrose (*Arnebia hispidissima*), Jowari (*Avena sativa*), Zralga (*Berberis baluchistanica*), Moninga Riza (*Bunium persicum*), Fire Bush (*Calligonum comosum*), Aak (*Calotropis procera*), Bhang (*Cannabis sativa*), Foxtail Buffalo Grass (*Cenchrus ciliaris*), Booch (*Conyza bonariensis*), Mudairi (*Corchorus depressus*), Naromb (*Ephedra ciliata*), Saxaul (*Haloxylon griffithii*), African Rue (*Peganam harmala*), Honey Mesquite (*Prosopis glandulosa*), Mesquite (*Prosopis juliflora*), and Athel Tamarisk (*Tamarix aphylla*).[57] [58] [59] [60]

The desktop assessment also reported the presence of several alien invasive plant species which include *Prosopis juliflora, Eucalyptus camaldulensis, Xanthium strumarium, Cenchrus ciliaris, Cannabis sativa*, and *Conyza canadensis*, which indicate that the area around the Rail and Road Route Corridor is already modified.

The IBAT reported 158 floral species with a 50 km buffer of the Rail and Road Route Corridor.[61] A complete list of floral species reported with a 50 km buffer along the Road and Road Route Corridor is provided in **Appendix B.**

Plant Species of Conservation Concern

Among the plant species reported in desktop assessment and IBAT along the Rail and Road Route corridor, several species of conservation concern based on the IUCN Red List of

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[56] Integrated Biodiversity Assessment Tool, Report ID: 66148, Report Title: Mine Site and Northern Groundwater System, Downloaded on: June 24, 2024, Accessed through: https://www.ibat-alliance.org/sites/934160.

[57] Bibi, T., Ahmad, M., Tareen, R. B., Tareen, N. M., Jabeen, R., Rehman, S. U., ... & Yaseen, G. (2014). Ethnobotany of medicinal plants in district Mastung of Balochistan province-Pakistan. *Journal of ethnopharmacology*, *157*, 79-89.

[58] Qasim, M., Gulzar, S., Shinwari, Z. K., Aziz, I., & Khan, M. A. (2010). Traditional ethnobotanical uses of halophytes from Hub, Balochistan. *Pak. J. Bot*, *42*(3), 1543-1551.

[59] Hussain, F., & Durrani, M. J. (2008). Mineral composition of some range grasses and shrubs from Harboi rangeland Kalat, Pakistan. *Pak. J. Bot*, *40*(6), 2513-2523.

[60] Ullah, U., Umar, H. M., Iqbal, M. A., & Yasmin, G. (2021). Study of ecology, distribution and status of biodiversity of Bin Qasim Industrial Zone Malir, Karachi, Pakistan. *Canadian Journal of Pure and Applied Sciences*, 15(1), 5179–5192

[61] IBAT Proximity Report. Generated under licence 39257-75857 from the Integrated Biodiversity Assessment Tool on 28 November 2024 (GMT). www.ibat-alliance.org

Threatened Species are recorded. These species include *Commiphora wightii* which is listed as Critically Endangered, *Commiphora stocksiana, Tecomella undulata, Dactylorhiza hatagirea* are listed as Endangered, *Conocarpus lancifolius* and *Jacaranda mimosifolia* are listed as Vulnerable and *Dypsis lutescens*, *Eucalyptus camaldulensis*, *Prunus microcarpa* and *Pistacia atlantica* are listed as Near Threatened in the IUCN Red List of Threatened Species.[62] There is a likely presence of *Tecomella undulata* and *Commiphora stocksiana* along the Rail and Road Route Corridor as the distribution ranges and specimens collected of these species overlap with the area, but their presence can only be confirmed through field verification. Although the literature consulted or reviewed includes the detail at district level for all the districts, which come across the Rail and Road Route Corridor. The Project is not going to build any infrastructure instead using the existing one along the Rail and Road Route Corridor and as such, the impact on these plant species is expected to be minimal, and a precautionary approach has been applied in reporting these species.

In addition, 10 plant species along the Rail and Road Route Corridor are found to be endemic. These species include *Abutilon pakistanicum*, *Asparagus gharoensis*, *Asparagus dumosus*, *Atriplex stocksii*, *Berberis balochistanica*, *Caragana ambigua*, *Commiphora stocksiana*, *Heliotropium ophioglossum*, *Heliotropium ulophyllum*, and *Seriphidium quettense*.[63] [64] However, after consulting online datasets of Global Biodiversity Information Facility (GBIF), International Union for Conservation of Nature (IUCN) Red List of Threatened Species, Flora of Pakistan, and Plant of the World Online, it is concluded that only *Heliotropium ulophyllum*, and *Caragana ambigua* are endemic to Pakistan while *Asparagus gharoensis* is likely extinct from the area. However, the distribution of these endemic species is unlikely in the Project Area of Impact along the Rail and Road Route Corridor as discussed below.

The description of the conservation concern floral species reported in the literature as well as IBAT along the Rail and Road Route Corridor is as follows:

- ***Gagea quettica,*** an herbaceous plant in the Liliaceae family, is endemic to Pakistan, specifically found in Balochistan. This species is reported from the surrounding area of Reko Diq Mine Site and Associated Infrastructure. It typically flowers from February to April. As an endemic species, its distribution is limited to this region. Regarding its conservation status, *Gagea quettica* is not currently listed in the IUCN Red List, indicating that its risk of extinction has not been formally assessed. This species is distributed north of Noshki, and its presence within the Project's Area of Influence (AoI) is not anticipated.

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62 IUCN Red List Categories and Criteria https://www.iucnredlist.org/resources/categories-and-criteria Assessed on 01–December–2024

63 Qazi, A. W., Saqib, Z., & Zaman-ul-Haq, M. (2023). Diversity and Distribution of Endemic Flora in Pakistan. Proceedings of the Pakistan Academy of Sciences: B. Life and Environmental Sciences, 60(2), 165-179.

64 Bibi, T., Ahmad, M., Tareen, N. M., Jabeen, R., Sultana, S., Zafar, M., & Zain-ul-Abidin, S. (2015). The endemic medicinal plants of Northern Balochistan, Pakistan and their uses in traditional medicine. Journal of ethnopharmacology, 173, 1-10.

- ***Heliotropium ulophyllum***; This species is reported from district Sibi.[65] The native range of this species is South-Western Pakistan. It is a subshrub and grows primarily in the temperate biome[66]. It is an endemic plant species to Pakistan and is reported from Torkham above Harnai.[67] This species is unlikely present in Area of Impact (AoI) along the Rail and Road Route Corridor.
- ***Caragana ambigua*:** This species is reported from districts of Mastung and Noski.[68] It is distributed in Balochistan and Waziristan and is endemic to Pakistan[69]. This species is reported from Ziarat and its presence in the Project AoI is very unlikely.[70]
- ***Asparagus gharoensis*:** This species is reported from District Dadu.[71] The native range of this species is Southern Pakistan. It is a perennial and grows primarily in the seasonally dry tropical biome. This species is thought to be extinct from the area.[72]
- ***Heliotropium ophioglossum***; This species is reported from District Thatta.[73]The native range of this species is North-Eastern Tropical Africa, South Arabian Peninsula, and Pakistan. It is a subshrub and grows primarily in the desert or dry shrubland biome. The presence of this species in the Project AoI is very unlikely.[74]
- ***Asparagus dumosus*:** This species is reported from Karachi District. [75] The native range of this species is Pakistan to North-Western India. It is a subshrub and

[65] Maria, B., Saeed, S., Ahmed, A., Ahmed, M., & Rehman, A. (2024). The sustainable use of diverse plants accustomed by different ethnic groups in Sibi District, Balochistan, Pakistan. *Plos one*, *19*(2), e0294989.
[66] Plants of the World Online, Available at: https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:117306-1, Accessed on: January 21, 2025.
[67] Flora of Pakistan, Available at: http://www.efloras.org/florataxon.aspx?flora_id=5&taxon_id=250084417
[68] Pakistan Almanac. Available at; https://pakistanalmanac.com/balochistan-mastung/#1633497144852-f0a014d6-aded
[69] Qazi, A. W., Saqib, Z., & Zaman-ul-Haq, M. (2023). Diversity and Distribution of Endemic Flora in Pakistan. *Proceedings of the Pakistan Academy of Sciences: B. Life and Environmental Sciences*, *60*(2), 165-179.
[70] GBIF, https://www.gbif.org/occurrence/map?taxon_key=2943158, Accessed on: January 21, 2025.
[71] Pakistan Almanac. Available at; https://pakistanalmanac.com/sindh-dadu/#1633475278373-199e18e4-f9a1
[72] Alam, J., & Ali, S. I. (2010). Contribution to the red list of the plants of Pakistan.
[73] Akbar, G., Khatoon, S., Imran, M., Rizwan, N., Khan, M. Z., & Islam, S. (2010). Floristic and phyto-sociological assessment of vegetation of Keenjhar Lake and Surrounding Area (Thatta, Sindh), Pakistan. *International Journal of Biology and Biotechnology*, *7*(3), 197.
[74] Global Biodiversity Information Facility, Available at: https://www.gbif.org/species/4063460, Accessed on: January 21, 2025.
[75] Hussain, S. S., Ahmed, M., Siddiqui, M. F., & Wahab, M. (2010). Threatened and endangered native plants of Karachi. *Int J Biol Biotechnol*, *7*(3), 259-266.

grows primarily in the subtropical biome.[76] In Pakistan, it is distributed in the Sindh and Balochistan regions. This species is likely present along the Rail and Road Route Corridor near Port Qasim.[77]

- ***Atriplex stocksii*:** This species is reported from Karachi.[78] The native range of this species is Somalia, Socotra, S. Arabian Peninsula, South-Eastern Pakistan to North-Western India. It is a subshrub and grows primarily in the desert or dry shrubland biome. It has thin leaves, short stems, leafier and oblong-obovate leaves, with entire or lobulate margins. This species is not likely present along the Rail and Road Route Corridor.[79]
- ***Commiphora stocksiana*:** This species is reported from Karachi [80] and it is distributed in west Pakistan and Gujarat (India). This species is common on calcareous rocks and dry river beds of coastal regions of Sind and Baluchistan. During the cold season the plant yields a tasteless and odorless gum. This species is likely [81] to be present along the Rail and Road Route Corridor.
- ***Berberis baluchistanica***: This species is reported from district Mastung, Quetta and northern Baluchistan. [82] The native range of this species is Northern Oman, South-Western Pakistan. It is a shrub and grows primarily in the temperate biome. In Pakistan, it is endemic to the Balochistan province[83] [84], however, as per the IUCN distribution range, this species is native to Central Asia and this species is not likely to be present along the Rail and Road Route Corridor.[85]
- ***Seriphidium quettense***: This species is reported from district Mastung, Quetta and northern Baluchistan. [86] The native range of this species is Southern Iran to South-Western Pakistan. It is a subshrub and grows primarily in the desert or dry

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[76] Plants of the World Online, Available at: https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:531086-1, Accessed on: January 21, 2025.
[77] Global Biodiversity Information Facility, Available at: https://www.gbif.org/species/2768721, Accessed on: January 21, 2025.
[78] IBID
[79] Global Biodiversity Information Facility, Available at: https://www.gbif.org/species/3759555, Accessed on: January 21, 2025.
[80] IBID
[81] IUCN Red List of Threatened Species, Available at: https://www.iucnredlist.org/species/96361107/96362925, Accessed on January 21, 2025.
[82] Bibi, T., Ahmad, M., Tareen, N. M., Jabeen, R., Sultana, S., Zafar, M., & Zain-ul-Abidin, S. (2015). The endemic medicinal plants of Northern Balochistan, Pakistan and their uses in traditional medicine. *Journal of ethnopharmacology*, *173*, 1-10.
[83] Qazi, A. W., Saqib, Z., & Zaman-ul-Haq, M. (2023). Diversity and Distribution of Endemic Flora in Pakistan. *Proceedings of the Pakistan Academy of Sciences: B. Life and Environmental Sciences*, *60*(2), 165-179.
[84] Flora of Pakistan, Available at: http://www.efloras.org/florataxon.aspx?flora_id=5&taxon_id=250064599, Accessed on: January 21, 2025.
[85] IUCN Red List of Threatened Species, Available at: https://www.iucnredlist.org/species/133732509/134708453, Accessed on: January 21, 2025.
[86] Bibi, T., Ahmad, M., Tareen, N. M., Jabeen, R., Sultana, S., Zafar, M., & Zain-ul-Abidin, S. (2015). The endemic medicinal plants of Northern Balochistan, Pakistan and their uses in traditional medicine. *Journal of ethnopharmacology*, *173*, 1-10.

shrubland biome.[87] In Pakistan it is distributed in the Quetta Valley[88] and surrounding arid and semi-arid regions, which provide the dry, well-drained soils and climate conditions suitable for its growth. This species is not likely to be present along the Rail and Road Route Corridor.

- ***Abutilon pakistanicum***: The native range of this species is Pakistan to North-Western India. It is a subshrub or shrub and grows primarily in the seasonally dry tropical biome[89]. It has been reported from Karachi and is found in the arid and semi-arid regions of Sindh province and its presence in the Project AoI is very unlikely.[90]

6.1.3 Terrestrial Vegetation at Port Qasim

A total of 150 plant species are reported from Port Qasim. The dominant species reported from the Port Qasim Area include Prostrate Bindweed (*Convolvulus glomeratus),* Bismarck Palm *(Bismarckia nobilis),* Flase Amaranth *(Digeria muricata),* Lettuce Tree *(Pisonia alba),* Chinese Cinnamon *(Cinnamomum cassia),* Kapok Bush *(Aerva javanica),* Port Royal Senna *(Cassia italica),* Punture Vine *(Tribulus terrestris),* Guava *(Psidium guajava),* Screw Pine *(Pandanus odorifer),* Grey Mangrove *(Avicennia marina),* Pawpaw *(Carica papaya),* Paper Flower *(Bougainvillea glabra),* Peacock Flower *(Caesalpinia pulcherrima),* Rosin Weed *(Cressa cretica),* Senhwar *(Rhazya stricta),* Java Olive *(Sterculia foetida),* Swollen Finger Grass *(Chloris barbata),* Texas Indian Mallow *(Abutilon fruticosum),* Glaucous Glasswort *(Arthrocnemum macrostachyum),* Salt Bush *(Atriplex stocksii),* Cartilage Caper *(Capparis cartilaginea),* Nettle-Leaved Goose Foot *(Chenopodium murale),* Desert Hyacinth *(Cistanche tubulosa),* and Jangi Gobi *(Launaea procumbens).* Several of these species hold medicinal importance but also face local threats due to excessive use and habitat destruction.[91,92] A complete list of plant species reported from the Port Qasim is provided in **Appendix A**. A few Alien-Invasive plant species, like Giant Reed (*Arundo donax)*, Honey Mesquite (*Prosopis glandulosa)*, and Mesquite (*Prosopis juliflor*a), have also been reported from the vicinity of Port Qasim.

Plant Species of Conservation Concern

All plant species reported from the Port Qasim are listed as either Data Deficient, Not Evaluated or Least Concern in the IUCN Red List of Threatened Species with the

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[87] Plants of Online World
[88] Flora of Pakistan, Available at: http://www.efloras.org/florataxon.aspx?flora_id=5&taxon_id=242101186, Accessed on: January 21, 2025.
[89] Plants of World Online, Available at: https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:323558-2, Accessed on: January 21, 2025.
[90] Ali, B., Ibrahim, M., Hussain, I., Hussain, N., Imran, M., Nawaz, H., ... & Akash, M. S. H. (2014). Pakistamide C, a new sphingolipid from Abutilon pakistanicum. *Revista Brasileira de Farmacognosia*, *24*(3), 277-281.
[91] Hagler Bailly Pakistan (HBP), March 2014, Environmental Impact Assessment of PQEPC's 2×660 MW Coal Power Plant, Bin Qasim, Karachi, Port Qasim Electric Power Company, Karachi.
[92] Centre for Agriculture and Bioscience International (CABI). Accessed on: June 02, 2021, Accessed through: https://www.cabi.org/isc/datasheet/13392.

exception of Salt Heliotrope (*Heliotropium bacciferum)* and Blue Jacaranda (*Jacaranda mimosifolia)* which are listed as Vulnerable. The habitat at Port Qasim is largely modified due to industrial activities with barely any suitable habitat for these species available, these species have not been observed in the baseline survey conducted at Port Qasim. Two other species Areca Palm (*Dypsis lutescens)* and Red-river Gum (*Eucalyptus camaldulensis),* are categorized as Near Threatened. The Red-river Gum is an exotic species in Pakistan, not a conservation concern but has significant ecological implications. It is widely planted for erosion control, timber, and shade, and thrives in arid regions. However, its high water consumption and allelopathic[93] effects can lower water tables and suppress native vegetation, impacting local ecosystems.[94]

6.2 Literature Review for Mangroves at Port Qasim

The proposed Marine Terminal is located along Port Qasim, which is part of the Indus Delta. The Indus Delta supports a large mangrove forest system.[95] *Avicennia marina* is the dominant species of the mangroves in the Indus Delta. The other mangrove species in the deltaic region, such as the *Ceriops tagal* and *Rhizophora mucronata* occur in localized patches.[96] All other species are rare and have disappeared from most parts of the delta due to adverse environmental/ecological conditions.[97] About 60 percent of the mangroves are over 3 m in height.[98] Mangrove plantations at Port Qasim have a special legal status under the Forest Act 1927. An area of 344,870 ha of mangroves was transferred to the Sindh Forest Department (SFD) in 1958 and declared "Protected Forest" under the Act. In 1973, an area of 64,400 ha was transferred by SFD to PQA. The areas along Port Qasim are legally designated as "Protected Forests."[99]

Plant Species of Conservation Concern

All mangrove species reported along Port Qasim are listed as Least Concern by the IUCN Red List of Threatened Species.

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93 The allelopathic effect is the chemical interaction between plants or plants and microorganisms that can stimulate or inhibit the growth of nearby plants

94 Khan, I., Marwat, K. B., Khan, I. A., Ali, H., Dawar, K., & Khan, H. (2011). Invasive weeds of southern districts of Khyber Pakhtunkhwa-Pakistan. Pakistan Journal of Weed Science Research, 17(2).

95 World Wide Fund for Nature- Pakistan, official website available at www.panda.org

96 Amjad, S., & Khan, M. A. (2015). Marine ecological assessment for LNG terminal at Port Qasim. *Pakistan Journal of Engineering, Technology & Science*, *1*(2).

97 Altaf A. Memon (May 14–19, 2005). "Devastation of the Indus River Delta". World Water & Environmental Resources Congress 2005. Anchorage, Alaska: World Wide Fund for Nature.

98 Amjad. S., and Moin uddin Ali Khan. 2011. Marine Ecological Assessment for LNG Terminal at Port Qasim. Pak.J.Eng. Technol.Sci Vol 1 No.2 pp 74-85

99 International Union for Conservation of Nature (IUCN) Pakistan. *Mangroves of Pakistan–Status and Management*. IUCN, 2005.

7. Findings of the Study

The findings of the Post-Monsoon 2022 Survey, Spring 2023 Survey, and Post-Monsoon 2023 Survey are discussed in this section. The surveys at the Reko Diq Mine Site, along the Northern Groundwater System and Access Route to the Reko Diq Mine Site were conducted in Post-Monsoon 2022 and Spring 2023. While the survey along Port Qasim for both terrestrial flora and mangroves was conducted only in the Post-Monsoon 2023.

Field data for the flora is provided in **Appendix D**.

7.1 Terrestrial Flora

A total of 53 terrestrial floral species were observed in the Post-Monsoon 2022, Spring 2023, and Post-Monsoon 2023 surveys conducted at the Reko Diq Mine Site and Associated Infrastructure, as well as the Port Qasim study area. Of these, 29 species were observed during the Post-Monsoon 2022 Survey, 31 species in Spring 2023 Survey, and 18 species in Post-Monsoon 2023 Survey.

All the species observed in the baseline surveys were either Not Assessed, Data Deficient, and Least Concern except for *Eucalyptus camaldulensis* which is listed as Near Threatened in the IUCN Red List of Threatened Species, however, this species exotic in Pakistan and is not considered as conservation concern in the Pakistan.

Exhibit 7.1 provides a list of terrestrial flora species observed in Post-Monsoon 2022, Spring 2023 and Post-Monsoon 2023 surveys.

Exhibit 7.1: Plant Species Observed in the Baseline Surveys

No	*Scientific Name*	*Common Name*	*IUCN Status*	*Post-Monsoon 2022 Survey*	*Spring 2023 Survey*	*Post-Monsoon 2023 Survey*
1	*Abutilon indicum*	Thuthi	Not Assessed	–	–	✓
2	*Acanthophyllum sp.*	Spiny Head	Not Assessed	–	✓	–
3	*Aeluropus lagopoides*	Kalar Garh	Not Assessed	✓	–	–
4	*Aerva javanica*	Desert Cotton/ Booh	Not Assessed	–	✓	✓
5	*Alhagi maurorum*	Camelthorn	Not Assessed	✓	✓	–
6	*Anabasis setifera*	Anabasis	Not Assessed	✓	✓	–
7	*Aristida adscensionis*	Sixweeks Threeawn	Not Assessed	✓	✓	–
8	*Aristida pupurea*	Purple Threeawn	Not Assessed	✓	✓	–
9	*Arundo donax*	Giant Reed	Least Concern		–	✓
10	*Avicennia marina*	Mangrove/ Timmer	Least Concern	–	–	✓
11	*Azadirachta indica*	Neem Tree	Least Concern	✓	–	✓
12	*Bromus sp*	Cheat Grasses	Not Assessed	✓	–	–
13	*Calligonum comosum*	Fire Bush	Not Assessed	✓	✓	–

No	Scientific Name	Common Name	IUCN Status	Post-Monsoon 2022 Survey	Spring 2023 Survey	Post-Monsoon 2023 Survey
14	*Calligonum polygonoides*	Phog	Not Assessed	✓	✓	–
15	*Calotropis procera*	Aak	Least Concern		–	✓
16	*Capparis decidua*	Kirar	Least Concern	–	–	✓
17	*Cenchrus biflorus*	Sandbur	Not Assessed	✓	–	–
18	*Cistanche tubulosa*		Not Assessed	✓	–	–
19	*Cithareloma lehmannii*	-	Not Assessed	–	✓	–
20	*Citrullus colocynthis*	Bitter apple	Not Assessed	✓	✓	–
21	*Cornulaca monacantha*	Tahara	Not Assessed	✓	✓	–
22	*Crotalaria burhia*	Burhia Rattlepod	Not Assessed	–	✓	–
23	*Cynodon dactylon*	Bermuda Grass	Not Assessed	✓	–	–
24	*Cynomorium coccineum*	Maltese Fungus	Not Assessed	–	✓	–
25	*Eleusine compressa*	Sandbur	Not Assessed	✓	✓	–
26	*Eucalyptus camaldulensis*	River Red Gum	Near Threatened	–	✓	–
27	*Fagonia cretica*	Virgin's mantle	Not Assessed	–	–	✓
28	*Fagonia ovalifolia*	Showeika	Not Assessed	✓	✓	–
29	*Fortuynia bungei*	-	Not Assessed	–	✓	–
30	*Haloxylon persicum*	White Saxaul	Least Concern	✓	✓	–
31	*Haloxylon salicornicum*	Rimth Saltbush	Not Assessed	✓	✓	✓
32	*Heliotropium crispum*	Cherry Pie Flower	Not Assessed	✓	✓	–
33	*Heliotropium zeylanicum*	Salt Heliotrope	Not Assessed	✓	–	–
34	*Malcolmia scorpioides*	Virginia Stock	Not Assessed	–	✓	–
35	*Panicum turgidum*	Desert Grass	Not Assessed	✓	✓	✓
36	*Peganum harmala*	Syrian rue	Not Assessed	✓	✓	–
37	*Phoenix dactylifera*	Date Palm /Khajoor	Not Assessed	✓	✓	–
38	*Phragmites karka*	Tall Reed	Least Concern	–	–	✓
39	*Physorhynchus chamaerapistrum*	Bladder-seed	Not Assessed	–	✓	–
40	*Prosopis juliflora*	Devi	Least Concern	–	–	✓
41	*Rumex vesicarius*	Bladder Dock	Not Assessed	–	✓	–
42	*Saccharum munja*	Haado	Not Assessed	–	–	✓
43	*Salix tetrasperma*	Indian Willow	Least Concern	–	✓	–
44	*Salsola stocksii*	Saltwort	Not Assessed	✓	✓	–
45	*Salvadora oleoides*	Jar / Peroon	Data Deficient	–	–	✓
46	*Senna italica*	Senegal Senna	Not Assessed	–	–	✓
47	*Sesbania grandiflora*	West Indian Pea Tree	Data Deficient	–	–	✓

No	Scientific Name	Common Name	IUCN Status	Post-Monsoon 2022 Survey	Spring 2023 Survey	Post-Monsoon 2023 Survey
48	*Tamarix aphylla*	Athel Tamarisk	Least Concern	✓	✓	✓
49	*Tamarix stricta*	-	Data Deficient	✓	✓	–
50	*Tribulus terrestris*	Puncture Vine	Least Concern	✓	✓	–
51	*Vachellia jacquemontii*	Bhabri	Least Concern	✓	–	–
52	*Ziziphus jujuba*	Common Jujube	Least Concern	–	–	✓
53	*Zygophyllum fabago*	Syrian Bean-caper	Not Assessed	✓	–	–
Total				**29**	**31**	**18**

7.1.1 Reko Diq Mine Site

A total of 20 plant species were observed in the Post-Monsoon 2022 Survey and Spring 2023 Survey in the area sampled at at the proposed Reko Diq Mine Site. Of these, 18 species were observed in the Post-Monsoon 2022 Survey and 10 in the Spring 2023 Survey.

Exhibit 7.2 provides the list of species observed in the area sampled at the proposed Reko Diq Mine Site in the Post-Monsoon 2022 and Spring 2023 surveys.

Exhibit 7.3 provides photographs of species observed in the area sampled at the proposed Reko Diq Mine Site during the Post-Monsoon 2022 and Spring 2023 surveys.

Exhibit 7.2: List of Plant Species Observed at the Proposed Reko Diq Mine Site Study Area in Post-Monsoon 2022 Survey and Spring 2023 Survey

No.	*Scientific Name*	*Common Name or Local Name*	*IUCN Status*	*CITES Status*	*Native/ Alien Status*	*Fodder or Grazing Value*	*Plant Form*	*Spring 2023 Survey*	*Post-Monsoon 2022 Survey*
1.	*Aeluropus lagopoides*	Mangrove Grass	Not Evaluated	-	Native	High	Herb	-	✓
2.	*Anabasis setifera*	Anabasis	Not Evaluated	-	Native	Low	Shrub	✓	✓
3.	*Aristida adscensionis*	Sixweeks Threeawn	Not Evaluated	-	Native	Medium	Herb	✓	-
4.	*Bromus sp*	Cheat Grasses	Not Evaluated	-	Native	High	Herb		✓
5.	*Calligonum comosum*	Fire Bush	Not Evaluated	-	Native	High	Shrub	✓	✓
6.	*Calligonum polygonoides*	Phog	Not Evaluated	-	Native	Medium	Shrub	✓	✓
7.	*Cenchrus biflorus*	Sandbur	Not Evaluated	-	Native	High	Herb	-	✓
8.	*Citrullus colocynthis*	Bitter Apple	Not Evaluated	-	Native	None	Herb	-	✓
9.	*Cornulaca monacantha*	Djouri	Not Evaluated	-	Native	Low	Shrub	✓	✓
10.	*Cynodon dactylon*	Bermuda Grass	Not Evaluated	-	Native	High	Herb	-	✓
11.	*Eleusine compressa*	Sandbur	Not Evaluated	-	Native	High	Herb	✓	✓
12.	*Fagonia ovalifolia*	Dereima, Shaki, Shoka	Not Evaluated	-	Native	None	Herb	-	✓
13.	*Haloxylon persicum*	White Saxaul	Least Concern	-	Native	High	Shrub	✓	✓
14.	*Haloxylon salicornicum*	Hammada Elegance	Not Evaluated	-	Native	High	Shrub	✓	✓
15.	*Heliotropium zeylanicum*	Salt Heliotrope	Not Evaluated	-	Native	low	Herb	-	✓
16.	*Panicum turgidum*	Desert Grass	Not Evaluated	-	Native	High	Herb	-	✓
17.	*Salsola stocksii*	Saltwort	Not Evaluated	-	Native	Medium	Shrub	✓	✓

No.	*Scientific Name*	*Common Name or Local Name*	*IUCN Status*	*CITES Status*	*Native/ Alien Status*	*Fodder or Grazing Value*	*Plant Form*	*Spring 2023 Survey*	*Post-Monsoon 2022 Survey*
18.	*Tamarix aphylla*	Athel Tamarisk	Least Concern	-	Native	Medium	Tree	-	✓
19.	*Tribulus terrestris*	Puncture Vine	Least Concern	-	Native	Medium	Herb	✓	-
Total								**10**	**17**

Exhibit 7.3: Plant Species Observed at Proposed Reko Diq Mine Site Study Area in Post-Monsoon 2022 Survey and Spring 2023 Survey

a) Shoka *(Fagonia ovalifolia)*

b) Bitter Apple *(Cornulaca monacantha)*

c) White Saxaul *(Haloxylon persicum)*

d) Fire Bush *(Calligonum comosum)*

e) Athel Tamarisk *(Tamarix aphylla)*

f) Sandbur *(Cenchrus biflorus)*

g) Saltwort *(Salsola stocksii)*

h) Hammada Elegance *(Haloxylon salicarnicum)*

i) Phog *(Calligonum polygonoides)*

i) Puncture Vine *(Tribulus terrestris)*

Post-Monsoon 2022 Survey

A total of 17 species of plants were observed at the 20 sampling locations in the Post-Monsoon 2022 Survey. The highest average species diversity was observed in Clayey Plains (5.0), followed by Sandy Plains/Sand Dunes (3.0), Dry Streambeds (2.2), Mountains/Hills (1.8), and Gravel Plains (1.4).

Exhibit 7.4 provides the vegetation cover, plant count, and diversity by habitat type in the area sampled at the proposed Reko Diq Mine Site during the Post-Monsoon 2022 Survey.

Exhibit 7.5 provides the phyto-sociological attributes[100] of the plant species recorded in the different habitat types in the area sampled at the proposed Reko Diq Mine Site during the Post-Monsoon 2022 Survey.

The comparison of Post-Monsoon 2022 Survey and Previous Post-Monsoon Surveys is provided in **Appendix E**.

[100] Phyto-sociological attributes of plant species" refers to the study and analysis of the relationships between plant species within a community, focusing on their composition, structure, and distribution. This field of study examines how different plant species coexist, their abundance, and their interactions within a particular habitat or ecosystem".

Key phyto-sociological attributes often include:

Species Composition: The types of plant species present in a community.

Species Abundance: The number of individuals of each species in a given area.

Species Dominance: The most prominent or influential species in a community, often measured by their relative abundance or coverage.

Frequency: The presence of a species within sample plots or the probability of encountering a species within a study area.

Diversity Indices: Metrics that describe the richness and evenness of species within a community.

Exhibit 7.4: Vegetation Cover, Plant Count, and Diversity by Habitat Type at the Proposed Reko Diq Mine Site in Post-Monsoon 2022 Survey

No.	Habitat Types	Total area sampled in each Habitat – m^2	No of Sampling Locations (Transect) in each Habitat	Plant Cover per Transect (m^2)			Total Cover (m^2)	Plant Count per Transect			Total Count	Diversity (Average No. of Species per Sampling Location)
				Average	Maximum	Minimum		Average	Maximum	Minimum		
1	Mountain/Hills	300	4	7.4	13.4	1.9	**29.6**	9.3	14	6	**37**	1.8
2	Gravel Plains	600	8	2.8	7.5	0.3	**22.4**	9.1	20	4	**73**	1.4
3	Dry Streambeds	450	6	1.6	3.0	0.5	**9.6**	12.8	28	4	**80**	2.2
4	Clayey Plains	75	1	6.4	6.4	6.4	**6.4**	14	14	14	**14**	5.0
5	Sandy Plains/Sand Dunes	75	1	10.6	10.6	10.6	**10.6**	3	3	3	**3**	3.0

Exhibit 7.5: Phyto-sociological Attributes of Plant Species Observed in each Habitat Type at the Proposed Reko Diq Mine Site in Post-Monsoon 2022 Survey

Habitat	Scientific Name	Common Name or Local Name	D1	D3	C1	C3	F1	F3	IVI
Clayey Plains	*Anabasis setifera*	Anabasis	1.3	28.6	0.1	4.4	0.7	28.6	20.5
	Citrullus colocynthis	Bitter Apple	0.3	7.1	0.4	6.5	0.3	14.3	9.3
	Haloxylon stocksii	Salt Tree	0.3	7.1	3.7	58.8	0.3	14.3	26.7
	Panicum turgidum	Desert Grass	2.0	42.9	0.0	1.8	0.3	14.3	19.6
	Tamarix aphylla	Athel Tamarisk	0.7	14.3	0.9	28.5	0.7	28.6	23.8
Gravel Plains	*Anabasis setifera*	Anabasis	0.3	9.0	0.1	2.2	0.2	9.8	7.0
	Bromus sp.	Cheat Grasses	0.1	2.6	0.0	0.1	0.0	2.4	1.7
	Cenchrus biflorus	Sandbur	0.2	6.4	0.0	0.2	0.1	7.3	4.6
	Calligonum comosum	Fire Bush	0.4	11.5	1.0	39.2	0.3	14.6	21.8
	Cenchrus biflorus	Sandbur	0.2	6.4	0.0	0.2	0.1	7.3	4.6

Habitat	*Scientific Name*	*Common Name or Local Name*	*D1*	*D3*	*C1*	*C3*	*F1*	*F3*	*IVI*
	Eleusine compressa	Sandbur	0.2	6.4	0.0	0.1	0.1	7.3	4.6
	Fagonia ovalifolia	Shoka	0.0	1.3	0.1	0.4	0.0	2.4	1.4
	Haloxylon persicum	White Saxaul	0.3	10.3	0.7	25.4	0.2	9.8	15.1
	Haloxylon salcornicom	Hammada Elegance	0.5	15.4	0.2	12.3	0.3	17.1	14.9
	Haloxylon stocksii	Salt Tree	0.4	12.8	0.4	19.5	0.3	14.6	15.7
	Helitropium zeyloncum	Salt Heliotrope	0.0	1.3	0.1	0.3	0.0	2.4	1.3
	Panicum turgidum	Desert Grass	0.5	16.7	0.0	0.2	0.1	4.9	7.2
Mountain/ Hills	*Aeluropus lagopoides*	Mangrove Grass	0.1	2.2	0.1	0.3	0.1	4.3	2.3
	Calligonum comosum	Fire Bush	0.5	13.3	2.0	40.3	0.4	21.7	25.1
	Cornulaca monacantha	Djouri	0.3	8.9	1.6	22.5	0.3	13.0	14.8
	Fagonia ovalifolia	Shoka	0.8	22.2	0.0	0.2	0.1	4.3	8.9
	Haloxylon persicum	White Saxaul	1.7	44.4	0.5	34.5	0.8	39.1	39.4
	Haloxylon salcornicom	Hammada Elegance	0.3	8.9	0.2	2.1	0.3	17.4	9.5
	Haloxylon stocksii	Salt Tree	0.1	2.2	0.3	1.0	0.1	4.3	2.5
Sandy Plains/Sand Dunes	*Calligonum comosum*	Fire Bush	0.3	33.3	9.7	91.7	0.3	33.3	52.8
	Fagonia ovalifolia	Shoka	0.3	33.3	0.0	0.1	0.3	33.3	22.2
	Haloxylon salcornicom	Hammada Elegance	0.3	33.3	0.9	8.2	0.3	33.3	25.0

Habitat	*Scientific Name*	*Common Name or Local Name*	*D1*	*D3*	*C1*	*C3*	*F1*	*F3*	*IVI*
Dry Streambeds	*Aeluropus lagopoides*	Mangrove Grass	0.1	1.9	0.1	1.1	0.1	4.0	2.3
	Calligonum comosum	Fire Bush	0.3	9.4	0.3	15.5	0.3	20.0	15.0
	Cornulaca monacantha	Djouri	0.1	1.9	0.0	0.1	0.1	4.0	2.0
	Fagonia ovalifolia	Shoka	0.1	3.8	0.0	0.7	0.1	8.0	4.2
	Haloxylon persicum	White Saxaul	0.1	3.8	0.2	3.8	0.1	8.0	5.2
	Haloxylon salcornicom	Hammada Elegance	0.6	18.9	0.3	28.3	0.2	16.0	21.1
	Haloxylon stocksii	Salt Tree	1.8	60.4	0.1	50.5	0.6	40.0	50.3

Note:

D1 (Density 1): This generally refers to the density of a particular species in a unit area. It is calculated by counting the number of individuals of a species per unit area (e.g., per square meter).

D3 (Density 3): This may refer to the density of the species within a larger or more inclusive sampling area or a different scale compared to D1. It could also represent the density after some stratification or specific criteria.

C1 (Cover 1): This represents the coverage of a particular species within a unit area, typically expressed as a percentage. It measures the proportion of the ground area that is covered by the canopy of the species.

C3 (Cover 3): Similar to D3, this could refer to the coverage of the species within a larger or more stratified area, or after applying specific criteria. It might be used for comparing different areas or layers of vegetation.

F1 (Frequency 1): Frequency measures how often a particular species appears in a series of sample plots within the study area. F1 could be the frequency of the species within a small or specific plot size.

F3 (Frequency 3): Similar to F1, but possibly representing the frequency within larger or differently stratified plots. It could also be used in different contexts, such as comparing different scales or sampling intensities.

IVI (Importance Value Index): IVI is a composite index that combines measures of relative density, relative frequency, and relative dominance (often represented by basal area or coverage). It gives a single value representing the overall importance of a species within the community. Higher IVI values indicate species that are more ecologically dominant within the community.

Spring 2023 Survey

In Spring 2023 Survey, a total of 10 plant species were observed at 20 sampling locations (E13-E32) in the area sampled in the area sampled at the proposed Reko Diq Mine Site. The highest average species diversity was observed in Clayey Plains (2.0), followed by Mountains/Hills (1.4), Sandy Plains/Sand Dunes (1.0), Dry Streambeds (0.8), and Gravel Plains (0.6).

The most abundant plant species observed at the proposed Reko Diq Mine Site was Saltwort (*Salsola stocksii*), followed by Sixweeks Threeawn (*Aristida adscensionis)* and

White Saxaul (*Haloxylon persicum).* The least abundant plant species were Anabasis (*Anabasis setifera)*, Puncture Vine (*Tribulus terrestris)*, and Phog (*Calligonum polygonide).*

Exhibit 7.6 provides the vegetation cover, plant count, and diversity by habitat type at the proposed Reko Diq Mine Site in the Spring 2023 Survey.

Exhibit 7.7 provides the phyto-sociological attributes[101] for the species in the different habitat types in the area sampled at the proposed Reko Diq Mine Site in the Spring 2023 Survey.

The comparison of Spring 2023 Survey and Previous Spring Survey carried out in 2008-09 is provided in **Appendix E**.

Exhibit 7.6: Vegetation Cover, Plant Count and Diversity by Habitat type at the proposed Reko Diq Mine Site, Spring 2023 Survey

No.	*Habitat Types*	*Total area sampled in each Habitat – m^2*	*No of Sampling Locations (Transects) in each Habitat*	*Plant Cover per Transect (m^2)*			*Total Cover (m^2)*	*Plant Count per Transect*			*Total Count*	*Diversity (Average No. of Species per Sampling Location)*
				Average	*Maximum*	*Minimum*		*Average*	*Maximum*	*Minimum*		
1	Mountains/Hills	375	5	4.8	7.1	0.04	**23.5**	7.4	11	4	**37**	1.4
2	Gravel Plains	525	7	3.0	12.1	0.01	**21.0**	6.6	13	1	**46**	0.6
3	Dry Streambeds	300	6	5.8	11.5	1.6	**34.8**	7.7	11	4	**46**	0.8
4	Clayey Plains	75	1	7.7	7.7	7.7	**7.7**	14	14	14	**14**	2.0
5	Sandy Plains/Sand Dunes	75	1	2.2	2.2	2.2	**2.2**	5	5	5	**5**	1.0

[101] Phyto-sociological attributes of plant species" refers to the study and analysis of the relationships between plant species within a community, focusing on their composition, structure, and distribution. This field of study examines how different plant species coexist, their abundance, and their interactions within a particular habitat or ecosystem".

Key phyto-sociological attributes often include:

Species Composition: The types of plant species present in a community.

Species Abundance: The number of individuals of each species in a given area.

Species Dominance: The most prominent or influential species in a community, often measured by their relative abundance or coverage.

Frequency: The presence of a species within sample plots or the probability of encountering a species within a study area.

Diversity Indices: Metrics that describe the richness and evenness of species within a community.

Exhibit 7.7: Phyto-sociological Attributes of Plant Species Observed in each Habitat Type at the Proposed Reko Diq Mine Site in Spring 2023 Survey

Habitat	*Scientific Name*	*Common Name or Local Name*	*D1*	*D3*	*C1*	*C3*	*F1*	*F3*	*IVI*
Clayey Plains	*Haloxylon salicornicum*	Hammada Elegance	0.7	14.3	1.6	40.8	0.3	25.0	26.7
	Salsola stocksii	Saltwort	4.0	85.7	0.4	59.2	1.0	75.0	73.3
Gravel Plains	*Aristida adscensionis*	Sixweeks Threeawn	1.8	47.7	0.0	0.2	0.3	23.5	23.8
	Haloxylon persicum	White Saxaul	0.1	2.3	4.3	20.4	0.1	5.9	9.5
	Salsola stocksii	Saltwort	1.8	50.0	0.8	79.4	0.9	64.7	64.7
	Eleusine compressa	Sandbur	0.2	4.5	0.0	0.0	0.1	5.9	3.5
Mountains/ Hills	*Anabasis setifera*	Anabasis	0.1	2.7	0.0	0.0	0.1	5.3	2.7
	Calligonum polygonoides	Phog	0.1	2.7	0.1	0.3	0.1	5.3	2.7
	Cornulaca monacantha	Djouri	0.3	8.1	0.0	0.1	0.2	10.5	6.2
	Haloxylon persicum	White Saxaul	1.4	45.9	1.4	97.3	0.8	47.4	63.5
	Haloxylon salicornicum	Hammada Elegance	0.5	16.2	0.0	0.9	0.2	10.5	9.2
	Salsola stocksii	Saltwort	0.7	21.6	0.0	1.4	0.3	15.8	12.9
	Tribulus terrestris	Punture Vine	0.1	2.7	0.0	0.0	0.1	5.3	2.7
Sandy Plains	*Calligonum comosum*	Fire Bush	1.7	100.0	0.4	100.0	0.3	100.0	100.0
Dry Streambeds	*Aristida adscensionis*	Sixweeks Threeawn	1.1	21.7	0.0	0.1	0.3	15.0	12.3
	Calligonum polygonoides	Phog	0.1	2.2	6.7	19.3	0.1	5.0	8.8
	Haloxylon persicum	White Saxaul	0.1	2.2	0.6	1.8	0.1	5.0	3.0
	Salsola stocksii	Salt Tree	3.7	71.7	0.8	73.6	1.6	70.0	71.8
	Calligonum comosum	Fire Bush	0.1	2.2	1.8	5.3	0.1	5.0	4.2

Note:

D1 (Density 1): This generally refers to the density of a particular species in a unit area. It is calculated by counting the number of individuals of a species per unit area (e.g., per square meter).

D3 (Density 3): This may refer to the density of the species within a larger or more inclusive sampling area or a different scale compared to D1. It could also represent the density after some stratification or specific criteria.

C1 (Cover 1): This represents the coverage of a particular species within a unit area, typically expressed as a percentage. It measures the proportion of the ground area that is covered by the canopy of the species.

C3 (Cover 3): Similar to D3, this could refer to the coverage of the species within a larger or more stratified area, or after applying specific criteria. It might be used for comparing different areas or layers of vegetation.

F1 (Frequency 1): Frequency measures how often a particular species appears in a series of sample plots within the study area. F1 could be the frequency of the species within a small or specific plot size.

F3 (Frequency 3): Similar to F1, but possibly representing the frequency within larger or differently stratified plots. It could also be used in different contexts, such as comparing different scales or sampling intensities.

IVI (Importance Value Index): IVI is a composite index that combines measures of relative density, relative frequency, and relative dominance (often represented by basal area or coverage). It gives a single value representing the overall importance of a species within the community. Higher IVI values indicate species that are more ecologically dominant within the community.

Alien Invasive Plant Species (AIPS) Observed in the Surveys

None of the AIPS were observed in the Post-Monsoon 2022 and Spring 2023 Survey.

7.1.2 Northern Groundwater System

A total of 33 plant species were observed in the Northern Groundwater System study area in the Post-Monsoon 2022 and Spring 2023 surveys. Of these, 20 species were observed in the Post-Monsoon 2022 Survey, and 28 species were observed in the Spring 2023 Survey.

Exhibit 7.8 provides the list of species observed in the area sampled at the Northern Groundwater System study area in the Post-Monsoon 2022 Survey and Spring 2023 Survey.

Exhibit 7.9 provides photographs of some of the species observed in the area sampled at the Northern Groundwater System study area in the Post-Monsoon 2022 Survey and Spring 2023 Survey.

Exhibit 7.8: Plant Species Observed in the Northern Groundwater System Study Area in Post-Monsoon 2022 and Spring 2023 Surveys

No.	*Scientific Name*	*Common Name or Local Name*[102]	*IUCN Status*	*CITES Status*	*Post-Monsoon 2022 Survey*	*Spring 2023 Survey*
1.	*Acanthophyllum sp.*	-	Not Evaluated	-	-	✓
2.	*Aeluropus lagopoides*	Mangrove Grass	Not Evaluated	-	✓	-
3.	*Aerva javanica*	Kapok Bush	Not Evaluated	-	-	✓
4.	*Alhagi maurorum*	Camel Thorn	Not Evaluated	-	✓	✓
5.	*Anabasis setifera*	Anabasis	Not Evaluated	-	✓	-
6.	*Aristida adscensionis*	Sixweeks Threeawn	Not Evaluated	-	-	✓
7.	*Aristida pupurea*	Purple Three-awn	Not Evaluated	-	✓	✓
8.	*Azadirachta indica*	Neem	Least Concern	-	✓	-

[102] Local names were given for the species where common names were not present while, symbol (-) indicates where both common and locals name are not available.

No.	*Scientific Name*	*Common Name or Local Name*[102]	*IUCN Status*	*CITES Status*	*Post-Monsoon 2022 Survey*	*Spring 2023 Survey*
9.	*Calligonum comosum*	Fire Bush	Not Evaluated	-	✓	✓
10.	*Calligonum polygonoides*	Phog	Not Evaluated	-	✓	✓
11.	*Citharelоma lehmannii*	Ice Plant	Not Evaluated	-	-	✓
12.	*Citrullus colocynthis*	Bitter Apple	Not Evaluated	-	✓	✓
13.	*Cornulaca monacantha*	Djouri	Not Evaluated	-	-	✓
14.	*Crotalaria burhia*	Kharshan	Not Evaluated	-	-	✓
15.	*Cynomorium coccineum*	Maltese Fungus	Not Evaluated	-	-	✓
16.	*Eucalyptus camaldulensis*	Red-river Gum	Near Threatened	-	-	✓
17.	*Fagonia ovalifolia*	Dereima or Shaki	Not Evaluated	-	✓	✓
18.	*Fortuynia bungei*	-	Not Evaluated	-	-	✓
19.	*Haloxylon persicum*	White Saxaul	Not Evaluated	-	✓	✓
20.	*Haloxylon salicornicum*	Hammada Elegance	Not Evaluated	-	✓	✓
21.	*Haloxylon stocksii*	Saltwort	Least Concern	-	✓	✓
22.	*Heliotropium crispum*	Salt Heliotrope	Least Concern	-	✓	✓
23.	*Malcolmia scorpioides*	-	Not Evaluated	-	-	✓
24.	*Panicum turgidum*	Desert Grass	Not Evaluated	-	✓	✓
25.	*Peganum harmala*	African Rue	Not Evaluated	-	✓	✓
26.	*Phoenix dactylifera*	Date Palm	Least Concern	-	✓	✓
27.	*Physorhynchus chamaerapistrum*	-	Not Evaluated	-	-	✓
28.	*Rumex vesicarius*	Bladder Dock	Not Evaluated	-	-	✓
29.	*Salix tetrasperma*	Indian Willow	Least Concern	-	-	✓
30.	*Tamarix aphylla*	Athel Tamarisk	Not Evaluated	-	✓	✓
31.	*Tribulus terrestris*	Puncture Vine	Least Concern	-	✓	✓
32.	*Vachellia jacquemontii*	-	Least Concern	-	✓	-
33.	*Zygophyllum fabago*	Syrian Caper-bean	Not Evaluated	-	✓	-
Total					**20**	**28**

Exhibit 7.9: Plant Species Observed in the Northern Groundwater System Study Area in Post-Monsoon 2022 Survey and Spring 2023 Survey

a) Puncture Vine *(Tribulus terrestis)*

b) Anabasis *(Anabesis setifera)*

c) Hammada Elegance *(Haloxylon salicornicum)*

d) Saltwort *(Salsola stocksii)*

e) Camel Thorn *(Alhaji mauroram)*

f) Salt Heliotrope *(Heliotropium crispum)*

g) African-Rue *(Peganum harmala)*

h) Date Plam *(Phoenix dactylifera)*

i) Desert Grass *(Panicum turgidum)*

j) Bladder Dock *(Rumex vasicarius)*

k) Shaki *(Fagonia ovalifolia)*

l) Bitter Apple *(Citrullus colocynthis)*

Post-Monsoon 2022 Survey

In the Post-Monsoon 2022 Survey, a total of 20 plant species were observed from the 13 sampling locations along the Northern Groundwater System study area. Agricultural Areas/Date Palms microhabitat (in the Majawa Hills area) showed relatively higher productivity, with the highest average diversity of 6.0, followed by Dry Streambeds and Mountains/Hills (3.0 each), Sandy Plains (2.5), Gravel Plains (2.5) and Clayey Plains (2.5).

Date Palms thrive in desert areas due to their ability to efficiently utilize water, withstand high temperatures, and access shallow groundwater. Cultivation practices such as irrigation and wind protection also contribute to their productivity in these harsh environments.

The most abundant plant species observed in the Northern Groundwater System study area was Saltwort *(Salsola stocksii)* followed by Puncture Vine *(Tribulus terrestis)* whereas the least abundant plant species were Bitter Apple *(Citrullus colocynthis)* and Neem *(Azadirachta indica).* Species like Saltwort *(Salsola stocksii)* and Puncture Vine *(Tribulus terrestis)* are specialized xerophytic plants well adapted to dry and arid conditions.

Exhibit 7.10 provides the vegetation cover, plant count, and diversity by habitat type in the Northern Groundwater System study area in Post-Monsoon 2022 Survey.

Exhibit 7.11 provides the phyto-sociological attributes[103] of the species in the different habitat types in the Northern Groundwater System study area in Post-Monsoon 2022 Survey.

The comparison of Post-Monsoon 2022 Survey and Previous Post-Monsoon Surveys is provided in **Appendix E**.

Exhibit 7.10: Vegetation Cover, Plant Count and Diversity by Habitat Type in the Northern Groundwater System study area in Post-Monsoon 2022 Survey

No.	*Habitat Types*	*Total area sampled in each Habitat – m^2*	*No of Sampling Locations (Transects) in each Habitat*	*Plant Cover per Transect (m^2)*			*Total Cover (m^2)*	*Plant Count per Transect*			*Total Count*	*Diversity (Average No. of Species per Sampling Location)*
				Average	*Maximum*	*Minimum*		*Average*	*Maximum*	*Minimum*		
1	Mountain/Hills	75	1	2.3	2.3	2.3	2.3	16.0	16.0	16.0	16.0	3.0
2	Gravel Plains	300	4	3.2	8.3	0.2	12.8	11.8	21.0	4.0	47.0	2.5
3	Dry Streambeds	225	3	2.0	4.2	0.9	6.0	15.3	22.0	6.0	46.0	3.0
4	Clayey Plains	150	2	2.7	5.1	0.2	5.4	26.0	33.0	19.0	52.0	2.5
5	Agricultural Areas/Date Palms	75	1	35.3	35.3	35.3	35.3	26.0	26.0	26.0	26.0	6.0
6	Sandy Plains/Sand Dunes	150	2	5.6	5.6	5.6	11.2	9.5	10.0	9.0	19.0	1.5

Exhibit 7.11: Phyto-sociological Attributes of Plant Species Observed in each Habitat Types in the Northern Groundwater System Study Area in Post-Monsoon 2022 Survey

Habitat	*Scientific Name*	*Common or Local Name*	*D1*	*D3*	*C1*	*C3*	*F1*	*F3*	*IVI*
Clayey Plains	*Alhagi maurorum*	Camel Thorn	0.8	9.6	0.0	0.3	0.3	16.7	8.9
	Calligonum polygonide	Phog	0.7	7.7	0.0	3.4	0.3	16.7	9.3

[103] Phyto-sociological attributes of plant species" refers to the study and analysis of the relationships between plant species within a community, focusing on their composition, structure, and distribution. This field of study examines how different plant species coexist, their abundance, and their interactions within a particular habitat or ecosystem".

Key phyto-sociological attributes often include:

Species Composition: The types of plant species present in a community.

Species Abundance: The number of individuals of each species in a given area.

Species Dominance: The most prominent or influential species in a community, often measured by their relative abundance or coverage.

Frequency: The presence of a species within sample plots or the probability of encountering a species within a study area.

Diversity Indices: Metrics that describe the richness and evenness of species within a community.

Habitat	*Scientific Name*	*Common or Local Name*	*D1*	*D3*	*C1*	*C3*	*F1*	*F3*	*IVI*
	Citrullus colocynthis	Bitter Apple	0.8	9.6	1.0	93.1	0.3	16.7	39.8
	Helitropium crispum	Salt Heliotrope	0.3	3.8	0.0	0.3	0.2	8.3	4.2
	Tribulus terrestris	Puncture Vine	6.0	69.2	0.0	2.8	0.8	41.7	37.9
Gravel Plains	*Aeluropus lapopoides*	Mangrove Grass	0.1	2.1	0.0	0.0	0.1	4.5	2.2
	Aristida purpurea	Purple Three-awn	0.2	4.3	0.0	0.4	0.1	4.5	3.1
	Fagonia ovalifolia	Shaki	0.3	6.4	0.1	1.7	0.3	13.6	7.2
	Haloxylon persicum	White Saxaul	0.2	4.3	3.9	61.6	0.2	9.1	25.0
	Haloxylon salcornicum	Hammada Elegance	0.6	14.9	0.1	7.6	0.3	13.6	12.0
	Haloxylon stocksii	Saltwort	1.4	36.2	0.2	26.6	0.5	27.3	30.0
	Helitropium crispum	Salt Heliotrope	0.1	2.1	0.0	0.1	0.1	4.5	2.3
	Panicum turgidum	Desert Grass	0.7	17.0	0.0	0.6	0.2	9.1	8.9
	Tribulus terrestris	Punture Vine	0.3	6.4	0.0	0.1	0.1	4.5	3.7
	Zygophyllum fabago	Syrian Caper Bean	0.3	6.4	0.1	1.2	0.2	9.1	5.6
Mountain/ Hills	*Anabasis setifera*	Anabasis	2.3	43.8	0.1	43.3	1.0	42.9	43.3
	Haloxylon salcornicum	Hammada Elegance	2.3	43.8	0.2	55.3	1.0	42.9	47.3
	Panicum turgidum	Desert Grass	0.7	12.5	0.0	1.4	0.3	14.3	9.4
Sandy Plains/ Sand Dunes	*Calligonum comosum*	Fire Bush	0.3	10.5	2.4	42.3	0.3	18.2	23.7
	Haloxylon persicum	White Saxaul	0.8	26.3	1.0	43.1	0.5	27.3	32.2
	Haloxylon salcornicum	Hammada Elegance	0.2	5.3	0.1	1.1	0.2	9.1	5.1
	Haloxylon stocksii	Saltwort	1.5	47.4	0.2	12.2	0.7	36.4	32.0
	Tribulus terrestris	Puncture Vine	0.3	10.5	0.1	1.3	0.2	9.1	7.0
Dry Streambeds	*Haloxylon stocksii*	Saltwort	2.6	57.5	0.1	94.8	0.7	54.6	69.0
	Aeluropus lapopoides	Mangrove Grass	0.8	17.5	0.0	0.9	0.2	18.2	12.2
	Alhagi maurorum	Camel Thorn	0.1	2.5	0.0	0.7	0.1	9.1	4.1
	Fagonia ovalifolia	Shaki	0.3	7.5	0.0	2.7	0.1	9.1	6.4
	Panicum turgidum	Desert Grass	0.7	15.0	0.0	1.0	0.1	9.1	8.3

Habitat	*Scientific Name*	*Common or Local Name*	*D1*	*D3*	*C1*	*C3*	*F1*	*F3*	*IVI*
Agricultural Areas/ Date Palms	*Tamarix aphylla*	Athel Tamarisk	1.3	15.4	1.1	12.5	0.7	20.0	16.0
	Aristida purpurea	Three-awn	0.7	7.7	0.0	0.2	0.3	10.0	6.0
	Phoenix dactylifera	Date Palm	0.7	7.7	14.8	83.7	0.7	20.0	37.1
	Peganum harmala	African-Rue	2.0	23.1	0.1	2.4	0.7	20.0	15.2
	Alhagi maurorum	Camel Thorn	2.0	23.1	0.1	0.8	0.7	20.0	14.6
	Vachellia jacquemontii	-	2.0	23.1	0.0	0.5	0.3	10.0	11.2

Note:

D1 (Density 1): This generally refers to the density of a particular species in a unit area. It is calculated by counting the number of individuals of a species per unit area (e.g., per square meter).

D3 (Density 3): This may refer to the density of the species within a larger or more inclusive sampling area or a different scale compared to D1. It could also represent the density after some stratification or specific criteria.

C1 (Cover 1): This represents the coverage of a particular species within a unit area, typically expressed as a percentage. It measures the proportion of the ground area that is covered by the canopy of the species.

C3 (Cover 3): Similar to D3, this could refer to the coverage of the species within a larger or more stratified area, or after applying specific criteria. It might be used for comparing different areas or layers of vegetation.

F1 (Frequency 1): Frequency measures how often a particular species appears in a series of sample plots within the area. F1 could be the frequency of the species within a small or specific plot size.

F3 (Frequency 3): Similar to F1, but possibly representing the frequency within larger or differently stratified plots. It could also be used in different contexts, such as comparing different scales or sampling intensities.

IVI (Importance Value Index): IVI is a composite index that combines measures of relative density, relative frequency, and relative dominance (often represented by basal area or coverage). It gives a single value representing the overall importance of a species within the community. Higher IVI values indicate species that are more ecologically dominant within the community.

Spring 2023 Survey

A total of 28 plant species were observed from the 13 sampling locations sampled in the Northern Groundwater System study area in the Spring 2023 Survey. The highest average diversity of 13.0 was observed in Mountains/Hills followed by Agricultural Areas/Date Palms microhabitat (8.0), Clayey Plains (3.5), Gravel Plains (1.5), Dry Streambeds (1.5) and Sandy Plains/Sand Dunes (1.0).

The most abundant plant species observed was Saltwort *(Salsola stocksii)* followed by Camel Thorn *(Alhagi maurorum),* whereas the least abundant plant species were Burhia Rattlepod *(Crotalaria burhia)* and Indian Willow *(Salix tetrasperma).*

Exhibit 7.12 provides the vegetation cover, plant count, and diversity by habitat types observed in the Northern Groundwater System study area in the Spring 2023 Survey.

Exhibit 7.13 provides the phytosociological attributes[104] of the species in the different habitat types observed in the Northern Groundwater System study area in the Spring 2023 Survey.

The comparison of Spring 2023 Survey and Previous Spring Survey is provided in **Appendix E**.

Exhibit 7.12: Vegetation Cover, Plant Count, and Diversity by Habitat Type in the Northern Groundwater System study area in Spring 2023 Survey

No.	*Habitat Types*	*Total area sampled in each Habitat – m^2*	*No of Sampling Locations (Transects) in each Habitat*	*Plant Cover per Transect (m^2)*			*Total Cover (m^2)*	*Plant Count per Transect*			*Total Count*	*Diversity (Average No. of Species per Sampling Location)*
				Average	Maximum	Minimum		Average	Maximum	Minimum		
1	Mountain/Hills	75	1	11.8	11.8	11.8	**11.8**	24.0	24.0	24.0	**24.0**	13.0
2	Gravel Plains	300	4	6.6	16.2	0.0	**26.4**	5.0	10.0	1.0	**20.0**	1.5
3	Dry Streambeds	225	3	10.6	20.3	0.2	**31.8**	8.2	13.0	5.0	**33.0**	1.5
4	Clayey Plains	150	2	2.0	3.8	0.2	**4.0**	20.5	26.0	15.0	**41.0**	3.5
5	Agricultural Areas/Date Palms	75	1	58.8	58.8	58.8	**58.8**	30.0	30.0	30.0	**30.0**	8.0
6	Sandy Plains/ Sand Dunes	150	2	9.5	9.5	9.5	**19.0**	9.0	9.0	9.0	**9.0**	1.0

Exhibit 7.13: Phyto-sociological Attributes of Plant Species Observed in each Habitat Types in the Northern Groundwater System Study Area in Spring 2023 Survey

Habitat	*Scientific Name*	*Common or Local Namee*	*D1*	*D3*	*C1*	*C3*	*F1*	*F3*	*IVI*
Clayey Plains	*Alhaji maurorum*	Camel Thorn	2.0	29.3	0.0	5.4	0.3	14.3	16.3
	Calligonum polygonoides	Phog	0.2	2.4	0.0	0.2	0.2	7.1	3.2

[104] Phyto-sociological attributes of plant species" refers to the study and analysis of the relationships between plant species within a community, focusing on their composition, structure, and distribution. This field of study examines how different plant species coexist, their abundance, and their interactions within a particular habitat or ecosystem".

Key phyto-sociological attributes often include:

Species Composition: The types of plant species present in a community.

Species Abundance: The number of individuals of each species in a given area.

Species Dominance: The most prominent or influential species in a community, often measured by their relative abundance or coverage.

Frequency: The presence of a species within sample plots or the probability of encountering a species within a study area.

Diversity Indices: Metrics that describe the richness and evenness of species within a community.

Habitat	*Scientific Name*	*Common or Local Namee*	*D1*	*D3*	*C1*	*C3*	*F1*	*F3*	*IVI*
	Citrullus colocynthis	Bitter Apple	1.3	19.5	0.4	79.4	0.5	21.4	40.1
	Fagonia ovalifolia	Shaki	0.2	2.4	0.0	0.2	0.2	7.1	3.2
	Heliotropium crispum	Salt Heliotrope	0.7	9.8	0.0	0.3	0.3	14.3	8.1
	Peganum harmala	African-Rue	1.0	14.6	0.1	13.2	0.5	21.4	16.4
	Tribulus terrestris	Puncture Vine	1.5	22.0	0.0	1.4	0.3	14.3	12.5
Gravel Plains	*Aristida pupurea*	Purple Three awn	0.2	10.0	0.0	0.0	0.2	14.3	8.1
	Calligonum comosum	Fire Bush	0.2	10.0	7.7	58.1	0.2	14.3	27.5
	Aerva javanica	Kapok Bush	0.5	30.0	0.1	1.9	0.3	21.4	17.8
	Haloxylon salicornicum	Hammada Elegance	0.3	20.0	0.1	0.8	0.2	14.3	11.7
	Heliotropium crispum	Salt Heliotrope	0.1	5.0	0.0	0.0	0.1	7.1	4.0
	Salsola stocksii	Saltwort	0.4	25.0	2.1	39.1	0.3	28.6	30.9
Mountain/ Hills	*Haloxylon salicornicum*	Hammada Elegance	2.3	29.2	0.6	34.1	1.0	18.8	27.3
	Fagonia ovalifolia	Shaki	0.7	8.3	0.0	0.4	0.3	6.3	5.0
	Calligonum polygonoides	Phog	0.3	4.2	0.1	1.3	0.3	6.3	3.9
	Aristida adscensionis	Sixweeks Three-awn	0.3	4.2	0.0	0.0	0.3	6.3	3.5
	Acanthophyllum spp	-	0.3	4.2	0.0	0.1	0.3	6.3	3.5
	Malcolmia scorpioides	-	0.3	4.2	0.0	0.1	0.3	6.3	3.5
	Calligonum comosum	Fire Bush	1.3	16.7	1.9	62.7	0.7	12.5	30.6
	Cornulaca monacantha	Djouri	0.7	8.3	0.0	0.2	0.3	6.3	4.9
	Rumex vasicarius	Bladder Dock	0.3	4.2	0.0	0.2	0.3	6.3	3.5
	Cithareloma lehmannii	Ice Plant	0.3	4.2	0.0	0.1	0.3	6.3	3.5
	Cynomorium coccineum	Maltese Fungus	0.3	4.2	0.0	0.3	0.3	6.3	3.6
	Fortuynia bungei	-	0.3	4.2	0.0	0.4	0.3	6.3	3.6
	Physorhynchus chamaerapistrum	-	0.3	4.2	0.0	0.1	0.3	6.3	3.5

Habitat	*Scientific Name*	*Common or Local Namee*	*D1*	*D3*	*C1*	*C3*	*F1*	*F3*	*IVI*
Dry Streambeds	*Aristida adscensionis*	Sixweeks Three-awn	0.1	3.0	0.0	0.0	0.1	6.7	3.2
	Calligonum comosum	Fire Bush	0.3	12.1	2.4	22.7	0.2	13.3	16.1
	Haloxylon persicum	White Saxaul	0.2	6.1	2.1	9.8	0.1	6.7	7.5
	Heliotropium crispum	Salt Heliotrope	0.3	9.1	0.0	0.1	0.2	13.3	7.5
	Crotalaria burhia	Kharshan	0.1	3.0	0.1	0.1	0.1	6.7	3.3
	Salsola stocksii		1.8	66.7	1.3	67.2	0.7	53.3	62.4
Sandy Plains/ Sand Dunes	*Salsola stocksii*	Saltwort	3.0	100.0	1.1	100.0	1.0	100.0	100.0
Agricultural Areas/ Date Palms	*Tamarix aphylla*	Saltwort	1.7	16.7	0.5	4.1	0.3	10.0	10.3
	Eucalyptus camaldulensis	Red-river Gum	0.7	6.7	3.1	10.7	0.3	10.0	9.1
	Salix tetrasperma	Indian Willow	0.3	3.3	0.6	1.1	0.3	10.0	4.8
	Phoenix dactylifera	Date Plam	1.0	10.0	15.7	80.3	0.7	20.0	36.8
	Alhaji maurorum	Camel Thorn	4.0	40.0	0.1	1.2	0.7	20.0	20.4
	Peganum harmala	African-rue	0.7	6.7	0.1	0.2	0.3	10.0	5.6
	Calligonum polygonoides	Phog	0.3	3.3	0.4	0.7	0.3	10.0	4.7
	Penicum turgidum	Desert Grass	1.3	13.3	0.3	1.7	0.3	10.0	8.4

Note:

D1 (Density 1): This generally refers to the density of a particular species in a unit area. It is calculated by counting the number of individuals of a species per unit area (e.g., per square meter).

D3 (Density 3): This may refer to the density of the species within a larger or more inclusive sampling area or a different scale compared to D1. It could also represent the density after some stratification or specific criteria.

C1 (Cover 1): This represents the coverage of a particular species within a unit area, typically expressed as a percentage. It measures the proportion of the ground area that is covered by the canopy of the species.

C3 (Cover 3): Similar to D3, this could refer to the coverage of the species within a larger or more stratified area, or after applying specific criteria. It might be used for comparing different areas or layers of vegetation.

F1 (Frequency 1): Frequency measures how often a particular species appears in a series of sample plots within the study area. F1 could be the frequency of the species within a small or specific plot size.

F3 (Frequency 3): Similar to F1, but possibly representing the frequency within larger or differently stratified plots. It could also be used in different contexts, such as comparing different scales or sampling intensities.

IVI (Importance Value Index): IVI is a composite index that combines measures of relative density, relative frequency, and relative dominance (often represented by basal area or coverage). It gives a single value representing the overall importance of a species within the community. Higher IVI values indicate species are more ecologically dominant within the community.

Alien Invasive Plant Species (AIPS)

In the Post-Monsoon 2022 Survey, only one Alien Invasive Plant species (AIPS), namely *Aristida purpurea*, was observed in the Northern Groundwater System study area. However, during the Spring 2023 Survey, two AIPS were observed, including i.e., Red-river Gum (*Eucalyptus camaldulensis*) and Purple Threeawn (*Aristida purpurea*) along the Northern Groundwater System.

7.1.3 Access Route to Reko Diq Mine Site

A total of 12 plant species were observed in the Post-Monsoon 2022 and Spring 2023 surveys. Of these, 10 species were observed in the Post-Monsoon 2022 Survey and seven species were observed in the Spring 2023 Survey.

Exhibit 7.14 provides the list of species observed along the Access Route to Reko Diq Mine Site in the Post-Monsoon 2022 Survey and Spring 2023 Survey.

Exhibit 7.14: Plant Species Observed along Access Route to Reko Diq Mine Site in Post-Monsoon 2022 and Spring 2023 Surveys

No.	*Scientific Name*	*Common Name or Local Name*	*IUCN Status*	*CITES Status*	*Post-Monsoon 2022 Survey*	*Spring 2023 Survey*
1.	*Aristida adsecensionis*	Sixweeks Threeawn	Not Evaluated	-	✓	✓
2.	*Aeluropus lagopoides*	Mangrove Grass	Not Evaluated		✓	-
3.	*Anabasis setifera*	Anabasis	Not Evaluated	-	✓	-
4.	*Calligonium comosum*	Fire Bush	Not Evaluated	-	✓	-
5.	*Calligonum polygonides*	Phog	Not Evaluated	-	✓	✓
6.	*Cistanche tubulosa*		Not Evaluated		✓	-
7.	*Cornulaca monacanta*	Djouri	Not Evaluated	-	✓	-
8.	*Fagonia ovalifolia*	Dereima or Shaki	Not Evaluated	-	✓	-
9.	*Haloxylon persicum*	White Saxaul	Not Evaluated	-	✓	✓
10.	*Haloxylon salicornicum*	Hammada Elegance	Not Evaluated	-	✓	✓
11.	*Salsola stocksii*	Saltwort	Not Evaluated	-	✓	✓
12	*Tamarix aphylla*	Athel Tamarisk	Not Evaluated	-	✓	✓
13	*Tamarix stricta*	Athel Tamarisk	Not Evaluated		✓	✓
Total					**13**	**7**

Post-Monsoon 2023 Survey

The Access Route to the Reko Diq Mine Site passes through different habitats including Mountains/Hills, Gravel Plains, and Dry Streambeds. A total of 13 species were observed from eight sampling locations (E41-E48) in the Post-Monsoon 2022 Survey. Among

these habitats, Mountains/Hills were recorded as the most diverse habitat regarding floral species with the highest average diversity (5.0), followed by Gravel Plains (2.3) and Dry Streambeds (2.0). The highest average density was observed in Gravel Plains (16.0) followed by Dry Streambeds (13.8) and Mountain/Hills (11.0).

The most abundant plant species observed include *Salsola stocksii* followed by *Calligonum polygonoides,* whereas the least abundant plant species was *Cistanche tubulosa.* Species like *Salsola stocksii* are specialized xerophytic plants that are well adapted to dry conditions and provide food refugia to other wildlife species.

Exhibit 7.15 provides the vegetation cover, plant count, and diversity by habitat type in the Access Route to the Reko Diq Mine Site study area.

Exhibit 7.16 provides the phyto-sociological attributes[105] for the species in the different habitat types in the Post-Monsoon 2022 Survey in the Access Route to the Reko Diq Mine Site study area.

Exhibit 7.17 provides photographs of plant species observed in the Access Route to the Reko Diq Mine Site study area.

The comparison of Post-Monsoon 2022 Survey and Previous Post-Monsoon Surveys is provided in **Appendix E**.

Exhibit 7.15: Vegetation Cover, Plant Count, and Diversity by Habitat Type Observed in Access Route to Reko Diq Mine Site Study Area, Post-Monsoon 2022 Survey

No.	*Habitat Types*	*Total area sampled in each Habitat – m^2*	*No of Sampling Locations in each Habitat*	*Plant Cover (m^2)*			*Total Cover (m^2)*	*Plant Count*			*Total Count*	*Diversity (Average No. of species per Sampling Location)*
				Average	*Maximum*	*Minimum*		*Average*	*Maximum*	*Minimum*		
1.	Mountain/Hills	75	1	2	2	2	**2**	11.0	11	11	**13**	5.0
2.	Gravel Plains	225	3	3	4	1	**9**	11.5	16	7	**23**	2.3
3.	Dry Streambeds	300	4	5	7	3	**20**	13.8	15	12	**47**	2.0

[105] Phyto-sociological attributes of plant species" refers to the study and analysis of the relationships between plant species within a community, focusing on their composition, structure, and distribution. This field of study examines how different plant species coexist, their abundance, and their interactions within a particular habitat or ecosystem".Key phyto-sociological attributes often include:

Species Composition: The types of plant species present in a community.

Species Abundance: The number of individuals of each species in a given area.

Species Dominance: The most prominent or influential species in a community, often measured by their relative abundance or coverage.

Frequency: The presence of a species within sample plots or the probability of encountering a species within a study area.

Diversity Indices: Metrics that describe the richness and evenness of species within a community.

Exhibit 7.16: Phyto-sociological Attributes of Plant Species Observed in the Access Route to Reko Diq Mine Site Study Area, Post-Monsoon 2022 Survey

Habitat	*Species*	*D1*	*D3*	*C1*	*C3*	*F1*	*F3*	*IVI*
Dry Streambeds	*Calligonium comosum*	0.2	4.3	1.2	12.5	0.2	11.1	9.3
	Calligonum polygonides	0.3	6.4	0.2	3.2	0.1	5.6	5.1
	Fagonia ovalifolia	0.3	6.4	0.1	0.9	0.3	16.7	8.0
	Haloxylon persicum	0.1	2.1	0.3	1.5	0.1	5.6	3.0
	Salsola stocksii	3.2	80.9	0.4	82.0	0.9	61.1	74.6
Gravel Plains	*Aristida adscensionis*	0.3	13.0	0.0	0.5	0.1	10.0	7.8
	Calligonum comosum	0.8	30.4	0.4	48.0	0.3	30.0	36.1
	Cistanche tubulosa	0.1	4.3	0.0	0.6	0.1	10.0	5.0
	Fagonia ovalifolia	0.1	4.3	0.1	1.4	0.1	10.0	5.2
	Salsola stocksii	1.2	47.8	0.3	49.5	0.4	40.0	45.8
Mountain/Hills	*Anabasis setifera*	0.7	15.4	0.1	8.1	0.3	16.7	13.4
	Aristida adsecensions	0.7	15.4	0.0	0.7	0.3	16.7	10.9
	Calligonum polygonides	0.3	7.7	0.2	8.6	0.3	16.7	11.0
	Cornulaca monacanta	1.0	23.1	0.2	26.4	0.3	16.7	22.1
	Haloxylon salicornicum	0.7	15.4	0.3	31.6	0.3	16.7	21.2
	Salsola stocksii	1.0	23.1	0.2	24.6	0.3	16.7	21.4

Note:

D1 (Density 1): This generally refers to the density of a particular species in a unit area. It is calculated by counting the number of individuals of a species per unit area (e.g., per square meter).

D3 (Density 3): This may refer to the density of the species within a larger or more inclusive sampling area or a different scale compared to D1. It could also represent the density after some stratification or specific criteria.

C1 (Cover 1): This represents the coverage of a particular species within a unit area, typically expressed as a percentage. It measures the proportion of the ground area that is covered by the canopy of the species.

C3 (Cover 3): Similar to D3, this could refer to the coverage of the species within a larger or more stratified area, or after applying specific criteria. It might be used for comparing different areas or layers of vegetation.

F1 (Frequency 1): Frequency measures how often a particular species appears in a series of sample plots within the study area. F1 could be the frequency of the species within a small or specific plot size.

F3 (Frequency 3): Similar to F1, but possibly representing the frequency within larger or differently stratified plots. It could also be used in different contexts, such as comparing different scales or sampling intensities.

IVI (Importance Value Index): IVI is a composite index that combines measures of relative density, relative frequency, and relative dominance (often represented by basal area or coverage). It gives a single value representing the overall importance of a species within the community. Higher IVI values indicate species that are more ecologically dominant within the community.

Exhibit 7.17: Plant Species Observed in the Access Route to Reko Diq Mine Site Study area, Post-Monsoon 2022 Survey

a) Cistanche tubulosa

b) Aristida adscensionis

Spring 2023 Survey

A total of seven species were observed from eight sampling locations located along Access Route to Reko Diq Mine Site in the Spring 2023 Survey. Among these habitats, Mountain/Hills was recorded as the most diverse habitat due to the presence of abundant floral species with the highest average diversity (5.0), followed by Dry Streambeds (1.5), and Gravel Plains (1.0). The highest average density was observed in Mountain/Hills (13.0) followed by Dry Streambeds (10.5) and Gravel Plains (4.0).

The most abundant plant species observed were *Salsola stocksii* followed by *Calligonum polygonoides* whereas the least abundant plant species was *Tamarix aphylla.*

Exhibit 7.18 provides the vegetation cover, plant count, and diversity by habitat type.

Exhibit 7.19 provides the phyto-sociological attributes[106] for the species in the different habitat types in the Spring 2023 Survey.

The comparison of Spring 2023 Survey and Previous Spring Survey is provided in **Appendix E**.

[106] Phyto-sociological attributes of plant species" refers to the study and analysis of the relationships between plant species within a community, focusing on their composition, structure, and distribution. This field of study examines how different plant species coexist, their abundance, and their interactions within a particular habitat or ecosystem".

Key phyto-sociological attributes often include:

Species Composition: The types of plant species present in a community.

Species Abundance: The number of individuals of each species in a given area.

Species Dominance: The most prominent or influential species in a community, often measured by their relative abundance or coverage.

Frequency: The presence of a species within sample plots or the probability of encountering a species within a study area.

Diversity Indices: Metrics that describe the richness and evenness of species within a community.

Exhibit 7.18: Vegetation Cover, Plant Count, and Diversity by Habitat Type Observed in Access Route to Reko Diq Mine Site Study Area Spring 2023 Survey

No.	Habitat Types	Total area sampled in each Habitat – m^2	No of Sampling Locations (Transects) in each Habitat	Plant Cover per Transect (m^2)			Total Cover (m^2)	Plant Count per Transect			Total Count	Diversity (Average No. of species per Sampling Location)
				Average	Maximum	Minimum		Average	Maximum	Minimum		
1	Mountain/Hills	75	1	19.8	19.8	19.8	**19.8**	13	13	13	**13**	5.00
2	Gravel Plains	225	3	3.6	10.0	0.1	**10.9**	4	5	2	**12**	1.00
3	Dry Streambeds	300	4	23.1	30.1	18.3	**92.5**	11	12	8	**42**	1.50

Exhibit 7.19: Phyto-sociological Attributes of Plant Species Observed in each Habitat Type in the Access Route to Reko Diq Mine Site Study Area, Spring 2023 Survey

Habitat	Species Name	D1	D3	C1	C3	F1	F3	IVI
Dry Streambeds	*Aristida adsecensionis*	0.1	2.4	0.0	0.0	0.1	5.6	2.6
	Calligonum polygonoides	0.3	9.5	1.0	4.3	0.3	22.2	12.0
	Haloxylon salicornicum	0.3	9.5	0.7	3.1	0.1	5.6	6.1
	Salsola stocksii	2.3	64.3	2.2	63.2	0.8	50.0	59.1
	Tamarix aphylla	0.1	2.4	3.9	4.2	0.1	5.6	4.0
	Tamarix stricta	0.4	11.9	4.7	25.2	0.2	11.1	16.1
Gravel Plains	*Calligonum polygonoides*	0.2	16.7	0.2	4.1	0.2	25.0	15.3
	Tamarix stricta	0.3	25.0	3.1	85.1	0.1	12.5	40.9
	Salsola stocksii	0.8	58.3	0.2	10.7	0.6	62.5	43.9
Mountain/Hills	*Haloxylon persicum*	0.7	15.4	3.1	30.9	0.3	11.1	19.1
	Calligonum polygonoides	1.3	30.8	2.6	51.7	1.0	33.3	38.6
	Salsola stocksii	1.0	23.1	0.7	10.9	1.0	33.3	22.4
	Aristida adsecensionis	1.0	23.1	0.0	0.0	0.3	11.1	11.4
	Haloxylon salicornicum	0.3	7.7	1.3	6.5	0.3	11.1	8.4

Note: D1 (Density 1): This generally refers to the density of a particular species in a unit area. It is calculated by counting the number of individuals of a species per unit area (e.g., per square meter).

D3 (Density 3): This may refer to the density of the species within a larger or more inclusive sampling area or a different scale compared to D1. It could also represent the density after some stratification or specific criteria.

C1 (Cover 1): This represents the coverage of a particular species within a unit area, typically expressed as a percentage. It measures the proportion of the ground area that is covered by the canopy of the species.

C3 (Cover 3): Similar to D3, this could refer to the coverage of the species within a larger or more stratified area, or after applying specific criteria. It might be used for comparing different areas or layers of vegetation.

F1 (Frequency 1): Frequency measures how often a particular species appears in a series of sample plots within the study area. F1 could be the frequency of the species within a small or specific plot size.

F3 (Frequency 3): Similar to F1, but possibly representing the frequency within larger or differently stratified plots. It could also be used in different contexts, such as comparing different scales or sampling intensities.

IVI (Importance Value Index): IVI is a composite index that combines measures of relative density, relative frequency, and relative dominance (often represented by basal area or coverage). It gives a single value representing the overall importance of a species within the community. Higher IVI values indicate species that are more ecologically dominant within the community.

Alien Invasive Plant Species (AIPS)

The plant species observed during the Post-Monsoon 2022 Survey and Spring 2023 Survey along the Access Route to Reko Diq Mine Site are all indigenous. None of the species observed during these surveys exhibit characteristics of alien invasiveness within the region.

7.1.4 Port Qasim – Terrestrial and Marine Study Areas

Terrestrial vegetation survey was carried out only in the Post-Monsoon 2023 Survey. A brief description of the Post-Monsoon 2023 Survey is provided below.

Post-Monsoon 2023 Survey

A total of 18 plant species were observed from three sampling locations (T1, T2 and T3) during the Post-Monsoon 2023 Survey.

The highest average species diversity was observed in the Industrial Units (10.0), followed by the Barren Land/Open Plot and Vegetation Cluster (8.0 at each habitat). The highest average species density was observed in the Industrial Units (53.0), followed by the Vegetation Cluster (32.0) and Barren Land (31.0). The most abundant plant species observed was Mesquite (*Prosopis juliflora)*, followed by Cotton of Sodom (*Calotropis procera*) and Tail Reed (*Phragmites karka)*.

Exhibit 7.20 provides a list of plant species along with their IUCN status, native/alien status, endemic plant species, medicinal uses, and plant form observed along Port Qasim.

Exhibit 7.21 provides the vegetation cover, plant count, and diversity by habitat type observed at the Port Qasim study area in the Post-Monsoon 2023 Survey.

Exhibit 7.22 provides the phytosociological attributes[107]of the species in the different habitat types observed at the Port Qasim study area in the Post-Monsoon 2023 Survey.

Exhibit 7.23 provides photographs of plant species observed at the Port Qasim study area in the Post-Monsoon 2023 Survey.

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[107] Phyto-sociological attributes of plant species" refers to the study and analysis of the relationships between plant species within a community, focusing on their composition, structure, and distribution. It examines how different plant species coexist, their abundance, and their interactions within ecosystem".

Key phyto-sociological attributes often include:

Species Composition: The types of plant species present in a community.

Species Abundance: The number of individuals of each species in a given area.

Species Dominance: The most prominent or influential species in a community, often measured by their relative abundance or coverage.

Frequency: The presence of a species within sample plots or the probability of encountering a species within a study area.

Diversity Indices: Metrics that describe the richness and evenness of species within a community.

Exhibit 7.20: Plant Species Observed along with Fodder/Grazing Value, IUCN Status, Native/Alien Status, and Plant Form at Port Qasim in Post-Monsoon 2023 Survey

No	*Scientific Name*	*Common Name*	*Fodder or Grazing Value (High, Medium, Low, None)*	*IUCN Status*	*CITES Status*	*Native/ Alien/ Alien-Invasive*	*Herb/ Shrub/ Tree*
1.	*Abutilon indicum*	Indian Abutilon	High	Not Evaluated	-	Native	Shrub
2.	*Aerva javanica*	Kapok Bush	Medium	Not Evaluated	-	Native	Herb
3.	*Arundo donex*	Elephant Grass	Medium	Not Evaluated	-	Alien-Invasive	Herb
4.	*Azadirachta indica*	Neem	High	Least Concern	-	Native	Tree
5.	*Avicennia marina*	Grey Mangrove	High	Least Concern	-	Native	Tree
6.	*Calotropis procera*	Cotton of Sodom	None	Not Evaluated	-	Alien	Shrub
7.	*Capparis decidua*	Karira	High	Least Concern	-	Native	Tree
8.	*Fogonia cretica*	Khorasan	None	Not Evaluated	-	Native	Herb
9.	*Haloxylon salicornicum*	Rimth Saltbush	High	Not Evaluated	-	Native	Shrub
10.	*Panicum turgidum*	Desert Grass	High	Not Evaluated	-	Native	Herb
11.	*Pharagmitis karka*	Tall Reed	None	Not Evaluated	-	Native	Herb
12.	*Prosopis juliflora*	Mesquite	High	Not Evaluated	-	Alien-Invasive	Shrub/Tree
13.	*Saccharum munja*	Haado	Medium	Not Evaluated	-	Native	Herb
14.	*Salvadora oleoides*	Toothbrush	Medium	Not Evaluated	-	Native	Tree
15.	*Senna italica*	Senegal Senna	None	Not Evaluated	-	Native	Tree
16.	*Sesbania grandiflora*	West Indian Pea Tree	Medium	Not Evaluated	-	Native	Tree
17.	*Tamarix aphylla*	Athel Tree	Medium	Not Evaluated	-	Native	Tree
18.	*Ziziphus jujuba*	Jujube	High	Least Concern	-	Native	Tree

Exhibit 7.21: Vegetation Cover, Plant Count, and Diversity by Habitat Type at Port Qasim in Post-Monsoon 2023 Survey

No.	Habitat Types	Total area sampled in each Habitat – m^2	No of Sampling Locations (Transects) in each Habitat	Plant Cover per Transect (m^2)			Total Cover (m^2)	Plant Count per Transect			Total Count	Diversity (Average No. of species per Sampling Location)
				Average	Maximum	Minimum		Average	Maximum	Minimum		
1.	Barren Land	75	1	3.04	3.04	3.04	**3.04**	32.7	32.7	32.7	**32.7**	8.0
2.	Industrial Units	75	1	11.8	11.8	11.8	**11.8**	110.7	110.7	110.7	**110.7**	10.0
3.	Vegetation Cluster	75	1	11.7	11.7	11.7	**11.7**	53.6	53.6	53.6	**53.6**	8.0

Exhibit 7.22: Phytosociological Attributes of Plant Species Observed in each Habitat Type at Port Qasim in Post-Monsoon 2023 Survey

Habitat	Scientific Name	Common Name	D1	D3	C1	C3	F1	F3	IVI
Barren Land	*Abutilon indicum*	Indian Abutilon	0.3	3.2	1.6	4.9	0.3	8.3	5.5
	Aerva javanica	Kapok	0.7	6.5	0.0	0.1	0.3	8.3	5.0
	Azadirachta indica	Neem	1.0	9.7	8.6	79.2	0.3	8.3	32.4
	Calotropis procera	Cotton of Sodom	1.7	16.1	0.1	0.8	0.7	16.7	11.2
	Fogonia cretica	Khorasan Thorn	1.3	12.9	0.2	2.2	0.3	8.3	7.8
	Prosopis juliflora	Mesquite	3.7	35.5	0.3	11.2	1.0	25.0	23.9
	Senna Italica	Senegal Senna	0.7	6.5	0.0	0.0	0.3	8.3	4.9
	Ziziphus jujuba	Common Jujube	1.0	9.7	0.2	1.6	0.7	16.7	9.3
Industrial Units	*Arundo donax*	Giant Reed	1.3	7.5	4.2	15.4	0.3	7.1	10.0
	Avicennia marina	Grey Mangrove	2.7	15.1	1.0	7.1	0.7	14.3	12.2
	Calotropis procera	Cotton of Sodom	1.0	5.7	0.0	0.0	0.3	7.1	4.3
	Fogonia cretica	Khorasan Thorn	0.3	1.9	0.0	0.0	0.3	7.1	3.0
	Haloxylon salicornicum	Rimth Saltbush	1.7	9.4	7.1	31.9	0.7	14.3	18.5
	Panicum turgidum	Desert Grass	1.3	7.5	0.0	0.1	0.3	7.1	4.9
	Phragmites karka	Tall Reed	3.3	18.9	0.0	0.2	0.3	7.1	8.7
	Prosopis juliflora	Mesquite	2.3	13.2	7.0	44.1	1.0	21.4	26.2
	Sesbania grandiflora	West Indian Pea Tree	3.3	18.9	0.0	0.2	0.3	7.1	8.7
	Tamarix aphylla	Athel Tamarisk	0.3	1.9	1.0	0.9	0.3	7.1	3.3
Vegetation Cluster	*Abutilon indicum*	Indian Abutilon	0.7	6.3	0.3	1.0	0.3	7.7	5.0
	Aerva javanica	Kapok	0.3	3.1	0.0	0.0	0.3	7.7	3.6

Habitat	*Scientific Name*	*Common Name*	*D1*	*D3*	*C1*	*C3*	*F1*	*F3*	*IVI*
	Calotropis procera	Cotton of Seldom	2.7	25.0	0.2	3.4	1.0	23.1	17.2
	Capparis decidua	Karira	1.3	12.5	1.5	11.4	0.7	15.4	13.1
	Prosopis juliflora	Mesquite	4.0	37.5	3.4	76.4	1.0	23.1	45.7
	Saccharum munja	Haado	1.0	9.4	1.1	6.4	0.3	7.7	7.8
	Salvadora oliodes	Toothbrush	0.3	3.1	0.6	1.2	0.3	7.7	4.0
	Senna Italica	Senegal Senna	0.3	3.1	0.1	0.2	0.3	7.7	3.7

Note:

D1 (Density 1): This generally refers to the density of a particular species in a unit area. It is calculated by counting the number of individuals of a species per unit area (e.g., per square meter).

D3 (Density 3): This may refer to the density of the species within a larger or more inclusive sampling area or a different scale compared to D1. It could also represent the density after some stratification or specific criteria.

C1 (Cover 1): This represents the coverage of a particular species within a unit area, typically expressed as a percentage. It measures the proportion of the ground area that is covered by the canopy of the species.

C3 (Cover 3): Similar to D3, this could refer to the coverage of the species within a larger or more stratified area, or after applying specific criteria. It might be used for comparing different areas or layers of vegetation.

F1 (Frequency 1): Frequency measures how often a particular species appears in a series of sample plots within the study area. F1 could be the frequency of the species within a small or specific plot size.

F3 (Frequency 3): Similar to F1, but possibly representing the frequency within larger or differently stratified plots. It could also be used in different contexts, such as comparing different scales or sampling intensities.

IVI (Importance Value Index): IVI is a composite index that combines measures of relative density, relative frequency, and relative dominance (often represented by basal area or coverage). It gives a single value representing the overall importance of a species within the community. Higher IVI values indicate species that are more ecologically dominant within the community.

Exhibit 7.23: Plant Species Observed at Port Qasim, Post-Monsoon 2023 Survey

a) Indian Abutilon *(Abutilon indicum)*

b) Cotton of Sodom *(Calotropis procera)*

c) Tail Reed *(Phragmites karka)*

d) Kapok *(Aerva javanica)*

e) Athel Tamarisk *(Tamarix aphylla)*

f) Mesquite *(Prosopis juliflora)*

Alien Invasive Plant Species (AIPS) Observed at Port Qasim in the Post-Monsoon 2023 Survey

In the Post-Monsoon 2023 Survey, one AIPS Mesquite (*Prosopis juliflora*), one Alien Giant Reed (*Arundo donax*) and one invasive plant species Cotton of Seldom (*Calotropis procera*) were observed.

7.1.5 Conservation Concern Terrestrial Flora

All the plant species observed at the Reko Diq Mine Site and along the Access Route to the Reko Diq Mine Site are listed as Least Concern, Data Deficient, or Not Evaluated in the IUCN Red List of Threatened Species. Only one conservation concern species i.e., Red-river Gum *Eucalyptus camaldulensis,* which is listed as Near Threatened according to the IUCN Red List of Threatened Species, was observed along the Northern Groundwater System. This is an introduced species in Pakistan; therefore, it does not raise conservation concerns within Pakistan.

Most of the terrestrial plant species observed in Port Qasim are listed as Least Concern or Not Evaluated and have a wide distribution range. The National Red List is not available for flora in Pakistan; therefore, national status is not provided for the plant species.

7.2 Mangroves

7.2.1 Post-Monsoon 2023 Survey

A total of 24 specimens belonging to two species of mangroves were observed at Port Qasim. These species include Grey Mangrove (*Avicennia marina)* and Red Mangrove (*Rhizophora mucronata).* The Grey Mangrove *(Avicennia marina)* was observed in dense patches at all sampling locations, ranging from 1 to 4 plants per 10 m^2 while *Rhizophora mucronata* densities ranged from 0 to 2 per 10 m^2. Sampling Location M7 located at Keti Bandar was observed to have higher (*A. marina)* density per unit area. Sampling locations M1, M3, and M4 have 3 plants of 3 m height per 10 m^2. Mangrove vegetation was sparse at location M2, and the mangrove growth appeared stunted due to the presence of abundant pollutants at this location.

Exhibit 7.24 provides a pictorial view of mangroves, while **Exhibit 7.25** provides densities of mangroves observed along Port Qasim in the Post-Monsoon 2023 Survey.

Exhibit 7.24: Mangrove Species Observed along Port Qasim in the Post-Monsoon 2023 Survey

a) Grey Mangrove *(Avicennia marina)* at Sampling Location M3

b) Red Mangrove *(Rhizophora mucronata)* at Sampling Location M3

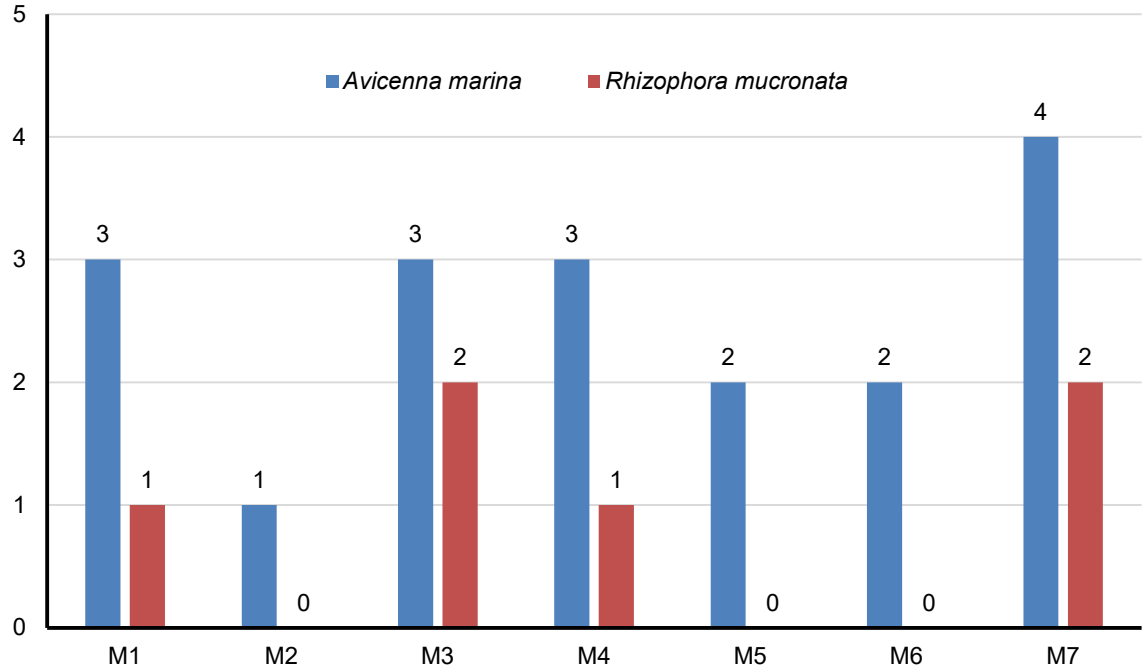
c) Dense growth of (*A. marina*) at Sampling Location M4

d) Dense growth of (*A. marina*) at Sampling Location M1

e) *(A. marina*) observed at Sampling Location M5

f) *(A. marina)* observed at Sampling Location M7

Exhibit 7.25: Mangroves Densities Observed at Port Qasim, Post-Monsoon 2023 Survey



Mangrove Heights

Heights of mangrove species, i.e., Grey Mangrove (*Avicennia marina)* and Red Mangrove (*Rhizophora mucronata*) were measured at the seven sampling locations. The heights of (*Avicennia marina)* ranged from 2 m - 12 m while (*Rhizophora mucronata)* heights ranged from 1 m - 4 m. (*Rhizophora mucronata)* was not observed at sampling locations M5 and M6. The maximum height of (*Avicennia marina)* was observed at location M7, while the maximum height of (*Rhizophora mucronata)* was observed at location M1.

Exhibit 7.26 provides photographs of mangrove height while **Exhibit 7.27** provides a graph of mangrove height observed along Port Qasim in the Post-Monsoon 2023 Survey.

The Analysis of Variance (ANOVA) was used to calculate the height of mangroves. ANOVA is a statistical tool that helps compare means among multiple groups. The F-

statistic of 23.736 was obtained, and a p-value less than 0.05 indicates that there's a statistically significant difference in mangrove height among the seven sampling locations. This suggests that the growth and height of *Avicennia marina* mangroves vary significantly across the seven sampling locations. *Rhizophora mucronata* mangroves were only observed at four out of seven sampling locations. It introduces a potential issue for using traditional one-way ANOVA, as ANOVA assumes that the groups being compared have similar variances. In this case, the uneven distribution of *Rhizophora mucronata* across locations may violate the assumption of homogeneity of variances. Therefore, the height comparison for *Rhizophora mucronata* was not conducted. A one-way analysis of variance for mangrove growth and sampled locations is provided in above section.

Exhibit 7.28 shows a significant F-statistic of 23.736, associated with a p-value less than 0.05, which indicates that there is a statistically significant difference in mangrove heights among the seven sampling locations. The "Between Groups" variation (differences among sampling locations) is significant compared to the "Within Groups" variation (variation within each sampling location).

After performing ANOVA and finding a significant result of mangroves abundance, richness and tree heights, Tukey's test was used to compare all possible pairs of group to evaluate differences in mangrove growth across locations. Tukey's test showed significant differences between the groups and locations. Specifically, the one-way ANOVA calculated an F-statistic, which compares the variation between group means to the variation within each group. A high F-statistic indicates that the differences between group means are greater than what might be expected by random chance.

Exhibit 7.29 shows pairwise comparisons of mangrove height in terms of growth between different locations (M1 to M7). In the comparison between Location M1 and Location M2, the mean difference was 6.88, and the p-value was .0001 (less than the typical significance level of 0.05), indicating a significant difference in the growth (height) of mangroves. Entries without an asterisk (*) suggest non-significant differences in the mangrove growth where the p-value is greater than 0.05.

Exhibit 7.26: Heights of Mangroves Observed along Port Qasim in Post-Monsoon 2023 Survey

a) *A. marina* observed at Sampling Location M1

b) *A. marina* observed at Sampling Location M5

c) *R. mucronata* observed at Sampling Location M3

d) *R. mucronata* observed at Sampling Location M7

Exhibit 7.27: Mangroves Heights Observed at Port Qasim in Post-Monsoon 2023 Survey

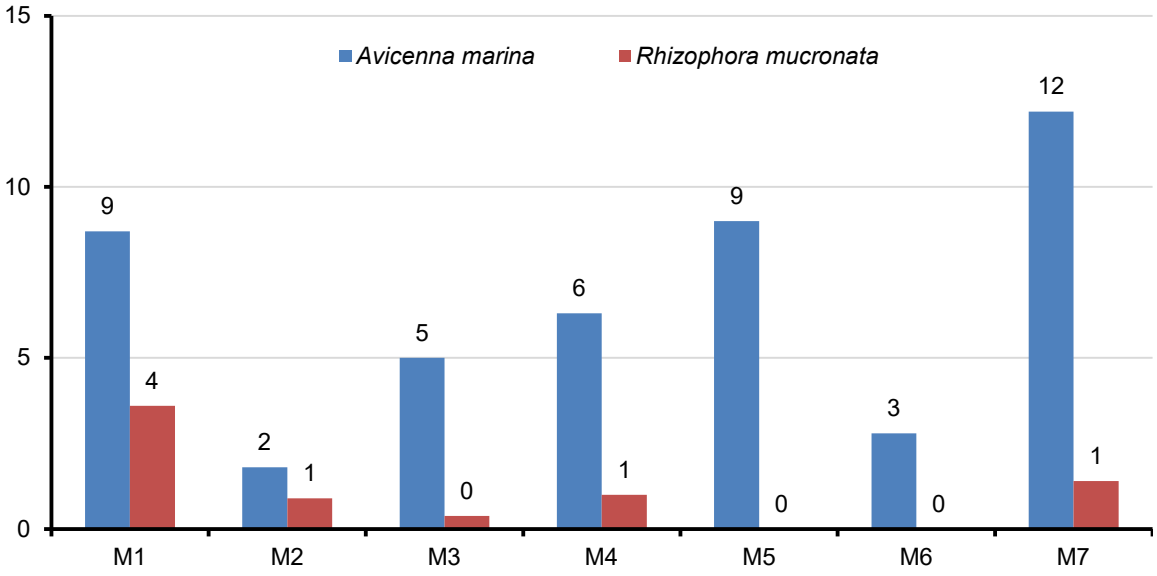


Exhibit 7.28: One-Way Analysis of Variance (ANOVA) for Mangroves Height Observed at Port Qasim in Post-Monsoon 2023 Survey

Mangrove Heights	*Sum of Squares*	*df*	*Mean Square*	*F*	*p-value (Sig.)*
Between Groups[108]	403.4	6	67.2	23.7	0.000
Within Groups[109]	79.3	28	2.8	-	-
Total	**482.8**	**34**	**-**	**-**	**-**

[108] The variability between mangrove heights and seven sampling locations.

[109] The variation in height within each of the seven sampling locations.

Exhibit 7.29: Pairwise Comparison of Mangrove Growth with Sampled Locations Observed at Port Qasim in Post-Monsoon 2023 Survey

Location (ID)	*Heights (J)*	*Mean Difference (I-J)*	*Std. Error*	*p-value (Sig.)*
Location M1	Location M2	6.88000*	1.06449	0.000
	Location M3	3.68000*	1.06449	0.026
	Location M4	2.42000	1.06449	0.291
	Location M5	-.26000	1.06449	1.000
	Location M6	5.80000*	1.06449	0.000
	Location M7	-3.52000*	1.06449	0.037
Location M2	Location M1	-6.88000*	1.06449	0.000
	Location M3	-3.20000	1.06449	0.072
	Location M4	-4.46000*	1.06449	0.004
	Location M5	-7.14000*	1.06449	0.000
	Location M6	-1.08000	1.06449	0.946
	Location M7	-10.40000*	1.06449	0.000
Location M3	Location M1	-3.68000*	1.06449	0.026
	Location M2	3.20000	1.06449	0.072
	Location M4	-1.26000	1.06449	0.894
	Location M5	-3.94000*	1.06449	0.014
	Location M6	2.12000	1.06449	0.442
	Location M7	-7.20000*	1.06449	0.000
Location M4	Location M1	-2.42000	1.06449	0.291
	Location M2	4.46000*	1.06449	0.004
	Location M3	1.26000	1.06449	0.894
	Location M5	-2.68000	1.06449	0.191
	Location M6	3.38000*	1.06449	0.050
	Location M7	-5.94000*	1.06449	0.000
Location M5	Location M1	.26000	1.06449	1.000
	Location M2	7.14000*	1.06449	0.000
	Location M3	3.94000*	1.06449	0.014
	Location M4	2.68000	1.06449	0.191
	Location M6	6.06000*	1.06449	0.000
	Location M7	-3.26000	1.06449	0.064
Location M6	Location M1	-5.80000*	1.06449	0.000
	Location M2	1.08000	1.06449	0.946
	Location M3	-2.12000	1.06449	0.442
	Location M4	-3.38000*	1.06449	0.050
	Location M5	-6.06000*	1.06449	0.000
	Location M7	-9.32000*	1.06449	0.000

Location (ID)	*Heights (J)*	*Mean Difference (I-J)*	*Std. Error*	*p-value (Sig.)*
Location M7	Location M1	3.52000*	1.06449	0.037
	Location M2	10.40000*	1.06449	0.000
	Location M3	7.20000*	1.06449	0.000
	Location M4	5.94000*	1.06449	0.000
	Location M5	3.26000	1.06449	0.064
	Location M6	9.32000*	1.06449	0.000

Note: *The mean difference is significant at the 0.05 level.

Mangrove Health

The health of the mangrove was observed and categorized into healthy mangroves,[110] unhealthy mangroves,[111] and dieback mangroves.[112]

Exhibit 7.30 provides a pictorial view of mangrove categories observed along Port Qasim in the Post-Monsoon 2023 Survey.

Exhibit 7.31 provides an observation of mangrove health observed along Port Qasim in the Post-Monsoon 2023 Survey.

7.2.2 Conservation Concern Species

All the mangrove species are listed as Least Concern in the IUCN Red List of Threatened Species. The mangrove ecosystem at Port Qasim is a unique ecosystem in view of diversity they support and their importance as breeding areas for fish which are of socioeconomic value and according the IUCN Red List of Threatened Ecosystem, it is listed as Vulnerable.[113]

Exhibit 7.30: Mangroves Observed at Port Qasim in Post-Monsoon 2023 Survey

a) *(A. marina)* in flowering state at Sampling Location M1

b) Seedling of (*A. marina)* collected at Sampling Location M2

[110] Excellent condition with trees in good health, very tall and large trees, canopy very compact, leaves not yellowing, daily tidal flushing and drainage

[111] Generally reasonable health but sparse canopy, leaves not yellowing, trees moderate height, young and/or stunted growth, possibly due to low nutrients and high salinity moderate or no extensive epicormic growth, daily tidal flushing and drainage

[112] Very bad condition, leaves yellowing or dead, degrading main trunk, canopy very open, lots of broken branches and trees falling, suffering from lack of tidal flushing due to raised ground, extensive epicormic growth

[113] Red List of Mangrove Ecosystem, Available at: Red List of Mangrove Ecosystems | IUCN, Accessed on December 18, 2024.

c) Salt encrustation on leaves of (*A. marina*) at Sampling Location M3

d) Tall trees of (*A. marina)* with poor canopy cover at Sampling Location M4

e) Land reclamation and mangrove die-backs at Sampling Location M4

f) *A. marina* growing along with other halophytic vegetation at Sampling Location M5

g) Healthy mangroves of (*A. marina)* at Sampling Location M7

h) Healthy Mangroves (*R. mucronata)* at Sampling Location M7

Exhibit 7.31: Mangrove Health Categorized at Sampled Locations along with Canopy, Leaves Health, Flowering, Seedling, Epicormic Growth, and Daily Tidal Flushing Observed at Port Qaim in Post-Monsoon 2023 Survey

Sampling Location	*Mangrove Species*	*Category*	*Tree and Leaves Condition*	*Flowering/Seeds*	*Epicormic Growth*[114]	*Daily Tidal flushing*
M1	*Avicennia marina* (dominant) and *Rhizophora mucronata*	Healthy mangrove	No noticeable yellowing of leaves, trees moderate height. No dry twigs	Some flowers visible	No epicormic growth was observed	Daily diurnal flushing
M2	*A. marina* (dominant sp) and *R. mucronata* (planted)	Healthy mangrove	Some noticeable patchiness in the yellowing of leaves, trees' moderate height	No flowering. Seeds of *A. marina* was observed in the water	No epicormic growth was observed	Tidal flushing during spring tides
M3	*A. marina* (dominant) and *R. mucronata* (planted)	Healthy mangrove	Small patches of yellowing of leaves are noticeable, and moderate tree height	No flowering	No epicormic growth was observed	Tidal flushing during spring and neap tides[115]
M4	*A. marina* (dominant) and *R. mucronata* (planted)	Healthy mangrove	Some noticeable yellowing of leaves was observed locally. trees moderate height	No flowering	No epicormic growth was observed. Some broken branches and trees fell due to land reclamation.	Tidal flushing during spring and neap tides
M5	*A. marina* (dominant). Other halophytic vegetative plant species also growing	Unhealthy mangrove	Noticeable yellowing of leaves	No flowering	Broken branches and trees falling observed	Higher ground. flushing during spring and neap tides

[114] Epicormic growth is a plant response to damage or stress. It is the growth of new shoots from epicormic buds that lie dormant beneath the bark.

[115] A neap tide—seven days after a spring tide—refers to a period of moderate tides when the sun and moon are at right angles to each other. A spring tide is a common historical term that has nothing to do with the season of spring.

Sampling Location	*Mangrove Species*	*Category*	*Tree and Leaves Condition*	*Flowering/Seeds*	*Epicormic Growth*[114]	*Daily Tidal flushing*
M6	*A. marina* (dominant). Other halophytic vegetative plant species also growing	Healthy mangroves	Small patches of yellowing leaves were observed. Natural prorogation of small sapling *A. marina*	No flowering	No epicormic growth was observed	Tidal flushing during spring tides
M7	*A. marina* (dominant) and *R. mucronata*	Healthy mangroves	No noticeable yellowing of leaves, and trees of moderate height.	Some flowering and saplings were visible.	No epicormic growth was observed.	Daily diurnal flushing

8. Conclusions and Recommendations

Baseline floral information was collected from a variety of sources, including field surveys and published literature. The information collected was used to compose profiles of the flora and habitats likely to be affected by the Project. No floral species of conservation concern were observed in the terrestrial and mangrove surveys. The vegetation in the mine area is adapted to very dry and arid conditions. The diverse vegetation in this ecosystem provides refuge for several faunal species.

8.1 Summary of Flora Baseline

- The flora baseline has been prepared to provide an overview of baseline floral conditions for the Reko Diq Mining Project and also assess the potential Project-related impacts on flora, as well as mitigation and monitoring measures to manage the impacts.
- Several national and international laws applicable to the conservation and sustainable development include the Balochistan Environmental Protection Act (BEPA), 2012; Sindh Environmental Protection Act (SEPA), 2014; Forest Act (Sindh Amendment) Act, 1994; Pakistan Plant Quarantine Act, 1976; The Ports Act, 1908; Cutting of Trees (Prohibition) Act, 1992; Forest Act, 1927; International Finance Corporation's (IFC) Environmental and Social Performance Standards on Sustainability and Biodiversity and the protection of plants and animals.
- The ecological studies for flora were carried out at the Reko Diq Mine Site and Associated Infrastructure and at Port Qasim.
- Ecological studies were not carried out for the Rail Transport Route and Access Road from the Reko Diq Mine Site to Port Qasim, as the biodiversity is already modified along these routes, and the Project impact on ecology will, be negligible.
- Reko Diq Mine Site and Associated Infrastructure fall within a desert ecoregion that contains the dry Sistan Basin of southern Afghanistan and portions of eastern Iran and southwest Pakistan. The region is dominated by dry sandy desert conditions. The proposed Marine Terminal at Port Qasim, fall within the broader context of the Indus Delta ecoregion, which is characterized by a complex Associated Infrastructure network of tidal channels, mudflats, and mangrove forests.
- The Ecological Study Area at Reko Diq Mine Site and Associated Infrastructure was demarcated by applying a buffer of 10 km around these Associated Infrastructure.
- A buffer of 10 km extending into the creeks and mangrove areas around the proposed Marine Terminal at Port Qasim was defined to account for possible impacts of the Project on marine flora.

- The Ecological Study Area is also delineated as an Area of Influence for assessing the impacts of the Project.
- The Ecological Study Area was categorized into different habitat types based on **Google Earth™** satellite imagery which include the Mountains/Hills, Clayey Plains, Dry Streambeds, Gravel Plains, and Sandy Plains/Sand Dunes. The Gravel Plains and Mountains/Hills habitat types dominate the landscape, with Dry Streambeds running through the Gravel Plains.
- Data was collected for the terrestrial vegetation and mangroves in different seasons for different Project components.
- Three baseline surveys have been conducted, including the Post-Monsoon 2022 and Spring 2023 surveys, which were conducted only at the Reko Diq Mine Site and Associated Infrastructure, and the Post-Monsoon 2023 Survey, which was conducted only at Port Qasim.
- A total of 20 sampling locations were sampled at the Reko Diq Mine Site, 13 along the Northern Groundwater System, eight along the Access Route to the Reko Diq Mine Site, and 11 at Port Qasim for sampling terrestrial vegetation. Sampling for the mangroves was conducted at seven sampling locations within creeks at Port Qasim and Keti Bandar (reference site).
- The quadrat sampling method was used to sample terrestrial vegetation and mangroves.
- According to the literature review, 58 plant species are reported from the Reko Diq Mine Site, Northern Groundwater System, and Access Route to the Reko Diq Mine Site. IBAT reported 78 plant species within a 50 km buffer of the Reko Diq Mine Site and Associated Infrastructure.
- Baseline surveys at the Reko Diq Mine Site confirmed the presence of 20 plant species from the Reko Diq Mine Site, 33 at the Northern Groundwater System, and 12 along the Access Route to the Reko Diq Mine Site.
- All the plant species observed at the Reko Diq Mine Site and along the Access Route to the Reko Diq Mine Site are listed as Least Concern, Data Deficient, or Not Evaluated in the IUCN Red List of Threatened Species. Only one conservation concern species i.e., Red-river Gum *Eucalyptus camaldulensis,* which is listed as Near Threatened according to the IUCN Red List of Threatened Species, was observed at the Northern Groundwater System. This is an introduced species in Pakistan; therefore, it does not raise conservation concerns within Pakistan.
- According to literature review, 530 plant species are reported along the Rail and Road Route Corridor and IBAT reported 158 plant species along the Rail and Road Route Corridor. Several conservation concern species are reported which include *Commiphora wightii* listed as Critically Endangered, *Commiphora stocksiana, Tecomella undulata, Dactylorhiza hatagirea* listed as Endangered, *Conocarpus lancifolius* and *Jacaranda mimosifolia* listed as Vulnerable and *Dypsis lutescens*, *Eucalyptus camaldulensis*, *Prunus microcarpa* and *Pistacia*

atlantica are listed as Near Threatened in the IUCN Red List of Threatened Species. In addition, 10 endemic plant species are also reported along the Rail and Road Route Corridor.

- According to the literature review, a total of 150 plant species are reported from the Port Qasim. The baseline survey confirmed the presence of 18 plant species.
- Most of the terrestrial plant species observed in Port Qasim are listed as Least Concern or Not Evaluated and have a wide distribution range.
- National Red List is not available for flora in Pakistan; therefore, national status is not provided for the plant species.
- According to the literature review, three mangrove species are reported from Port Qasim.
- Baseline surveys at Port Qasim confirmed the presence of two out of three species. Both of these species are listed as Least Concern according to the IUCN Red List of Threatened Species.

Appendix A: Desktop Based Land Cover Assessment along the Rail and Road Route Corridor

See the following pages.

Exhibit A.1: Land Cover for Segment 1

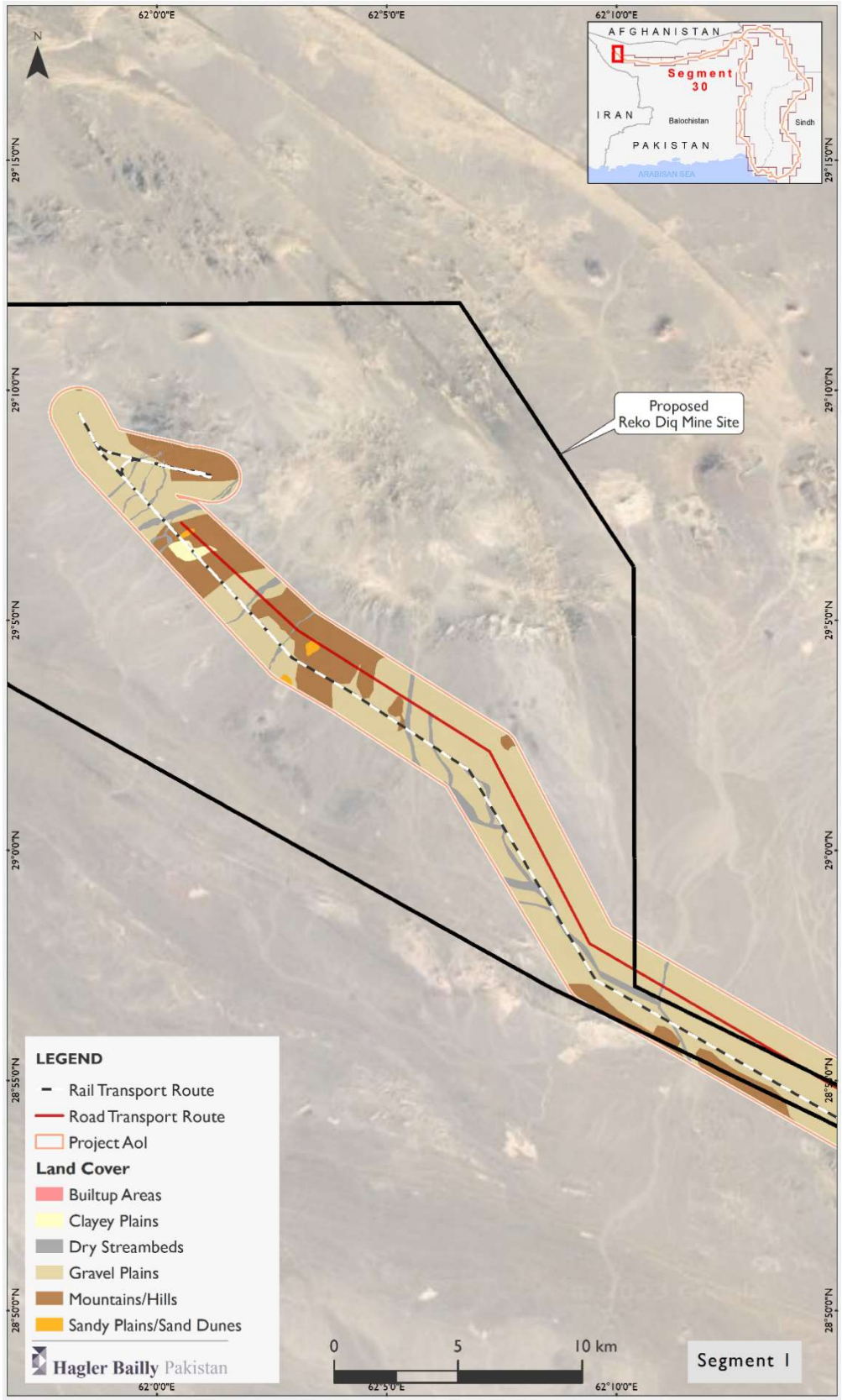


Exhibit A.2: Land Cover for Segment 2

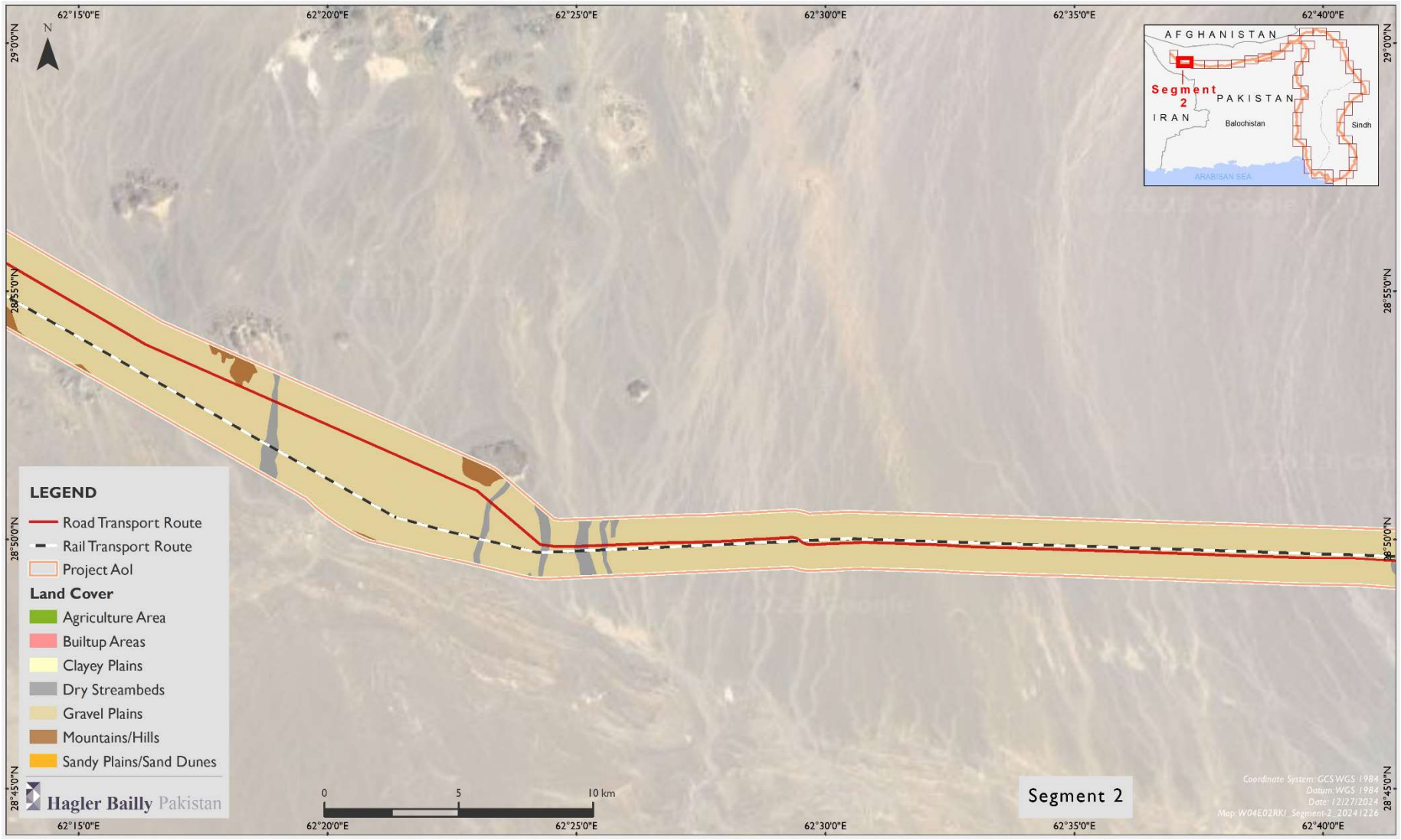


Exhibit A.3: Land Cover for Segment 3

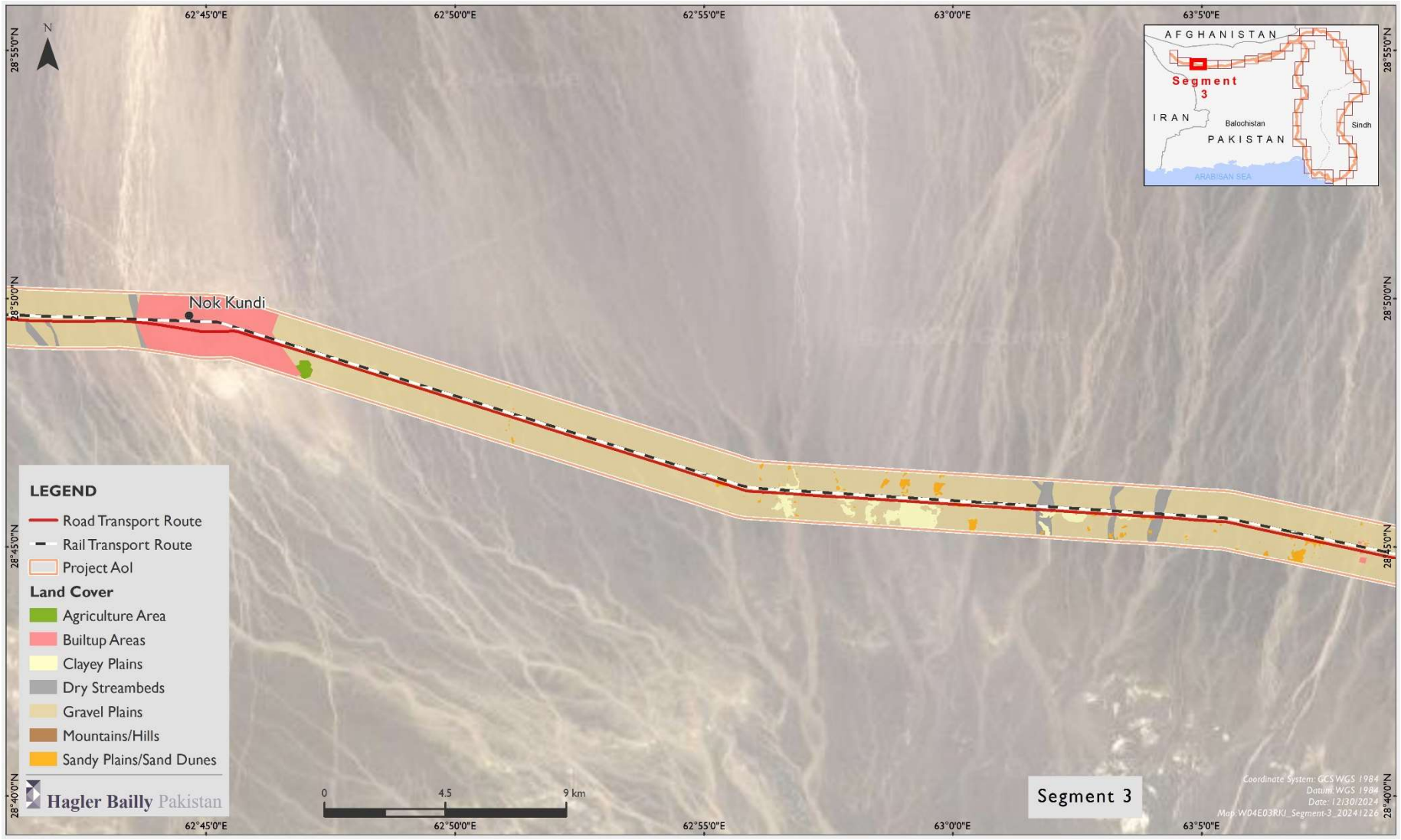


Exhibit A.4: Land Cover for Segment 4

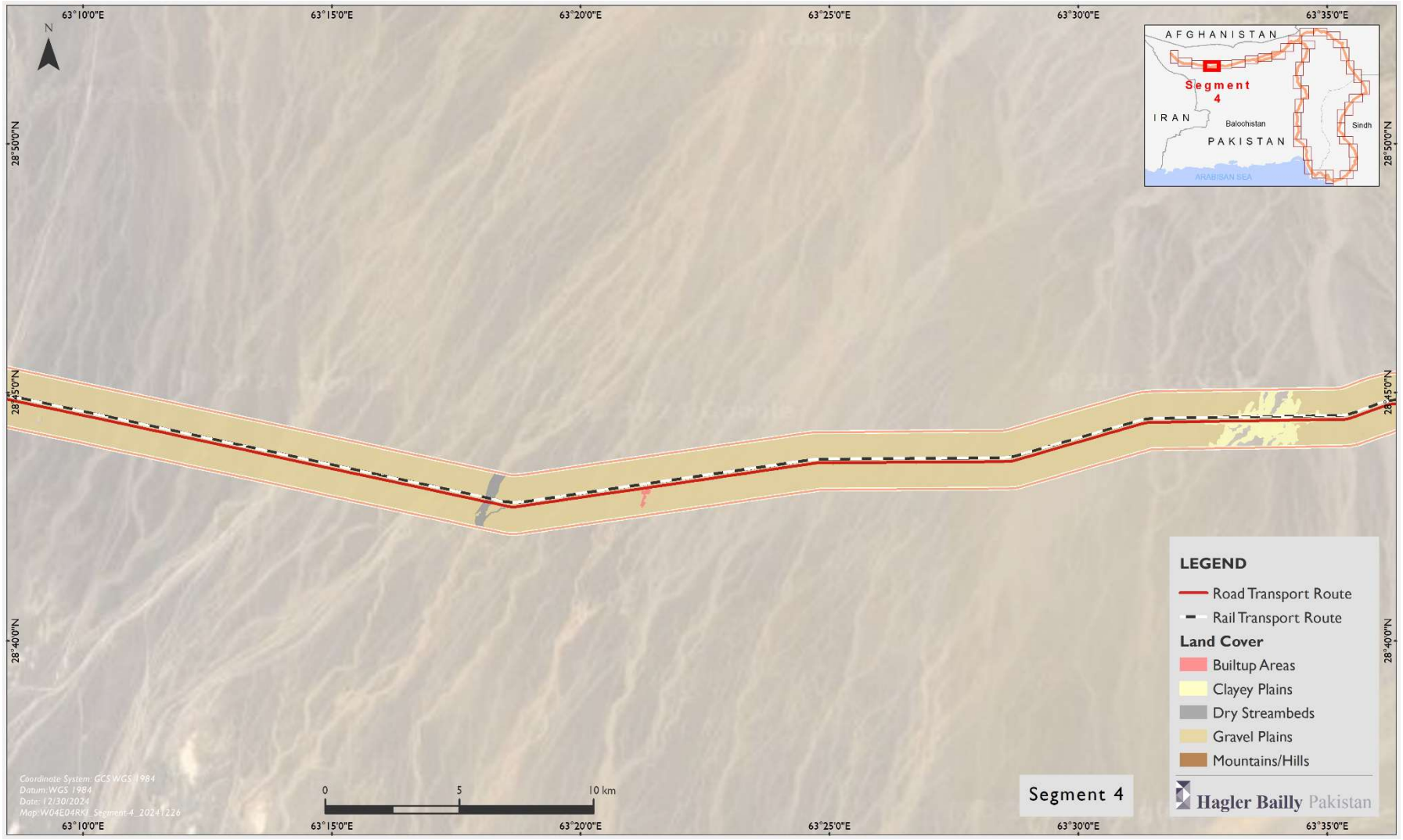


Exhibit A.5: Land Cover for Segment 5

Exhibit A.6: Land Cover for Segment 6

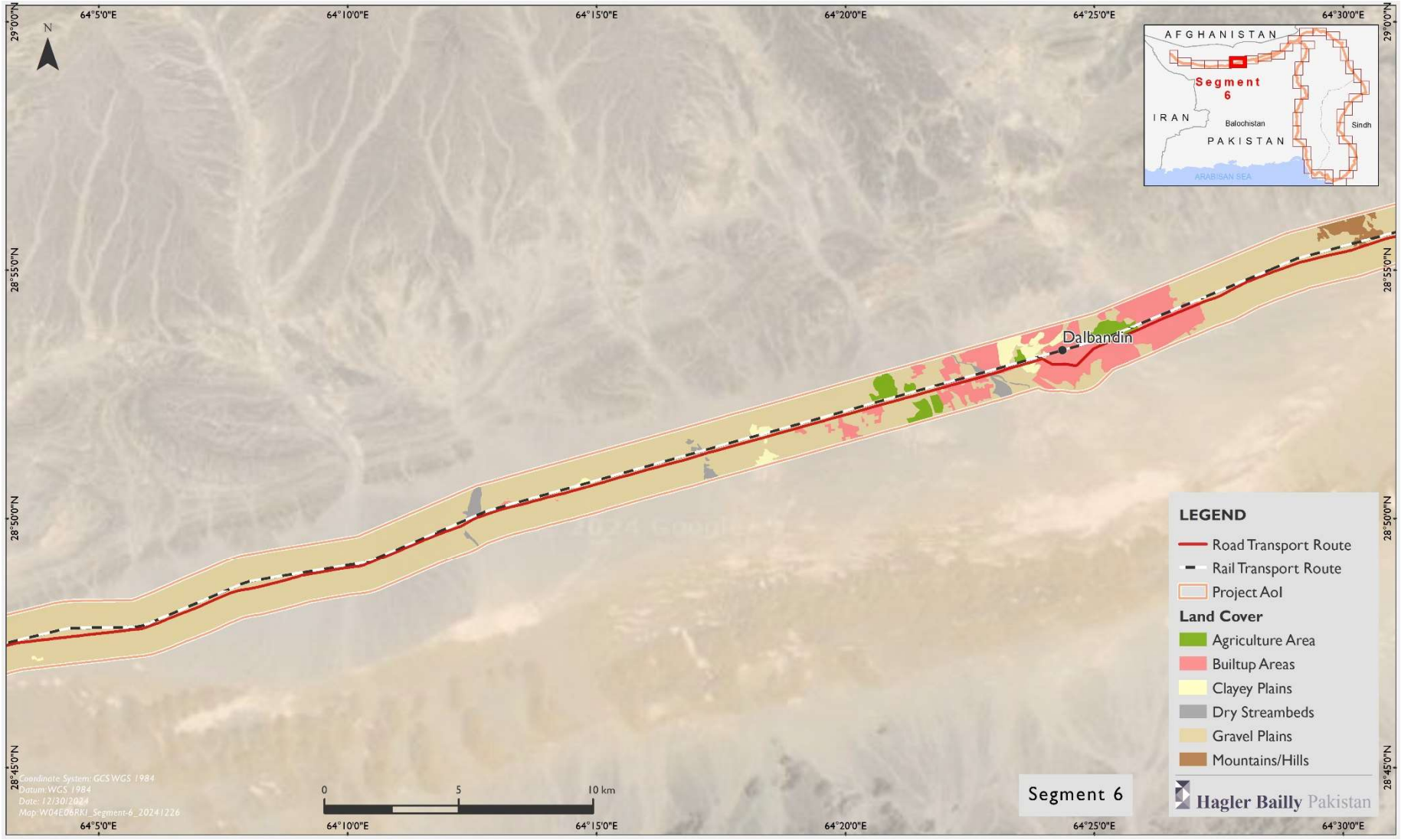
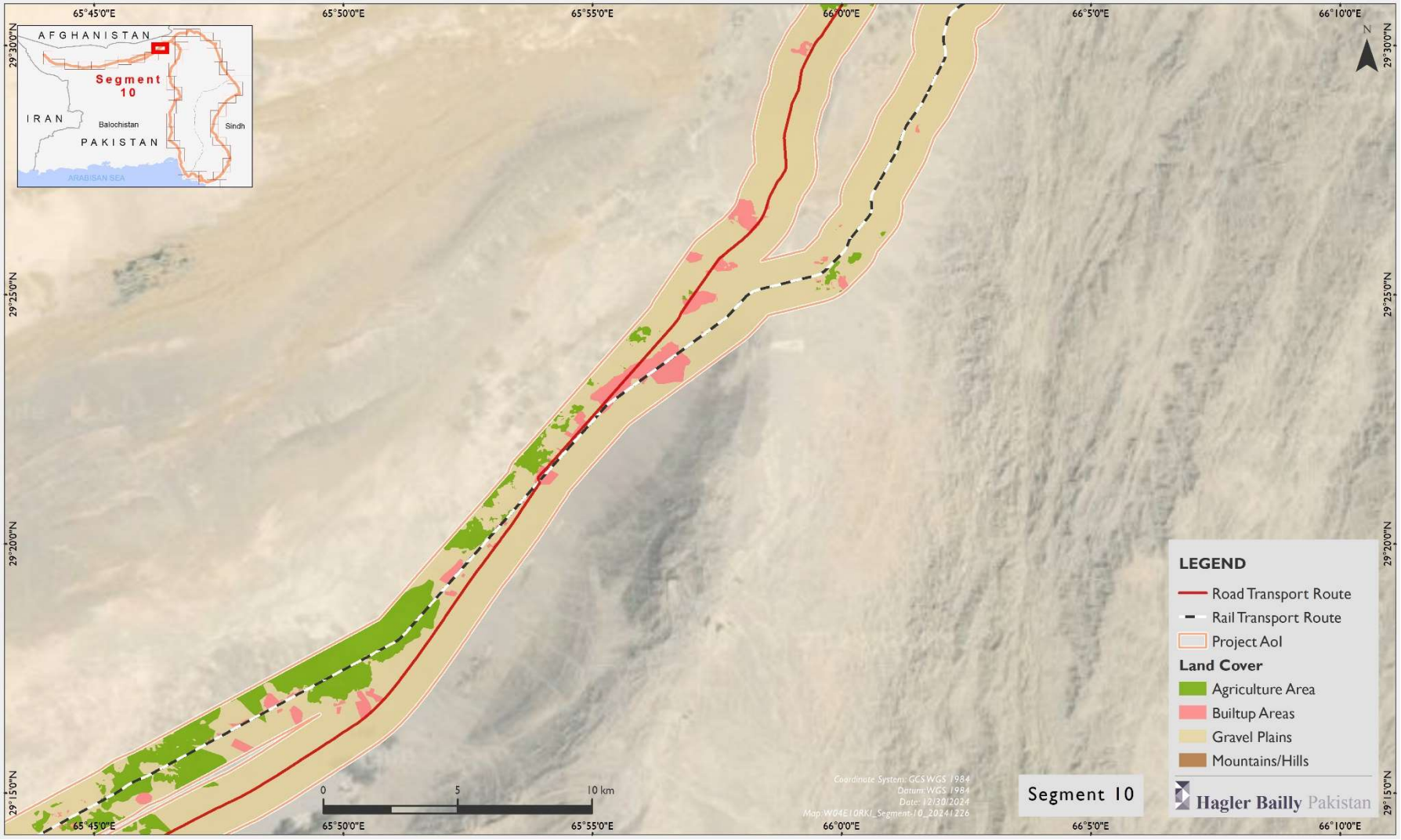


Exhibit A.7: Land Cover for Segment 7

Exhibit A.8: Land Cover for Segment 8

Exhibit A.9: Land Cover for Segment 9

Exhibit A.10: Land Cover for Segment 10



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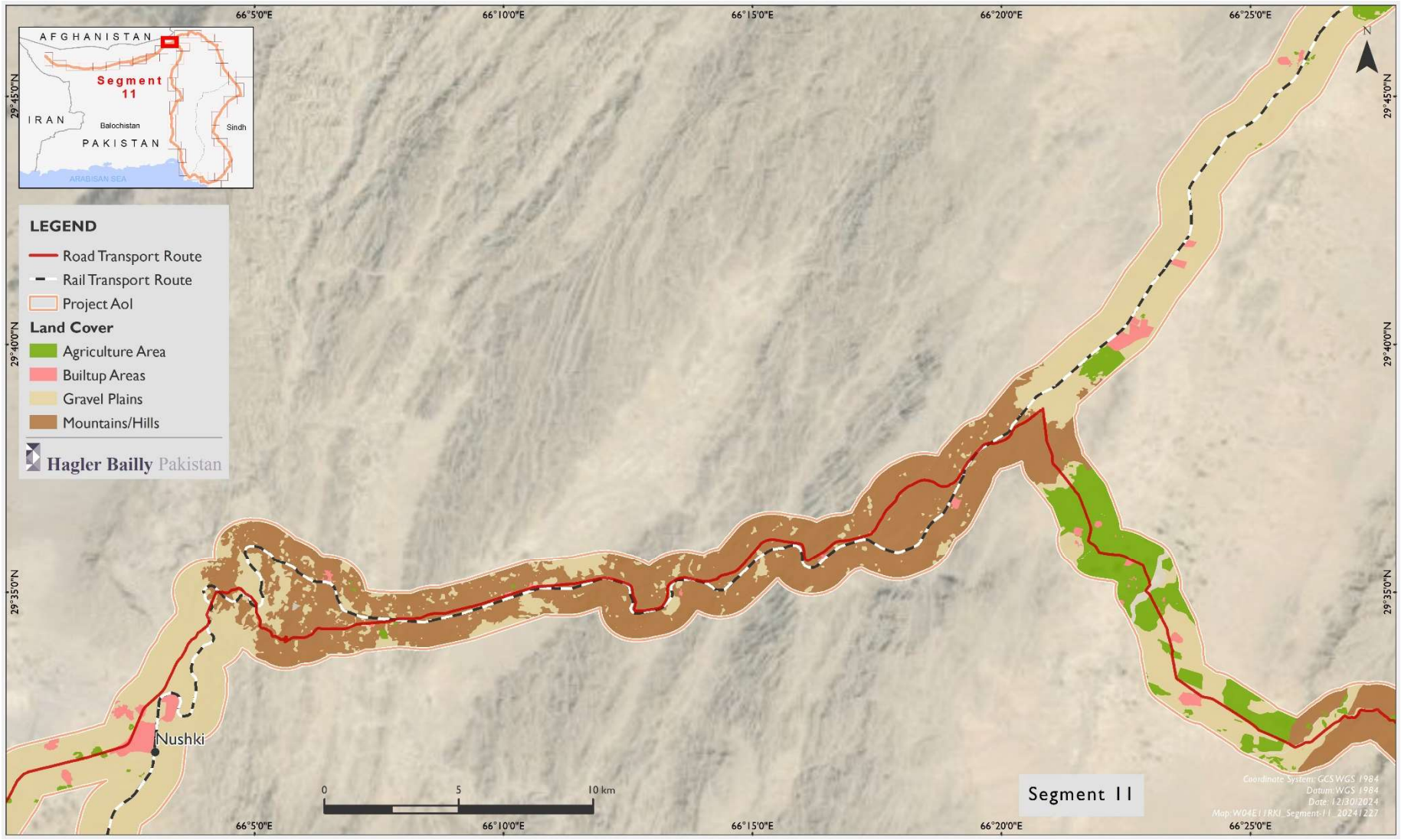


Exhibit A.12: Land Cover for Segment 12

Exhibit A.13: Land Cover for Segment 13

Exhibit A.14: Land Cover for Segment 14

Exhibit A.15: Land Cover for Segment 15

Exhibit A.16: Land Cover for Segment 16

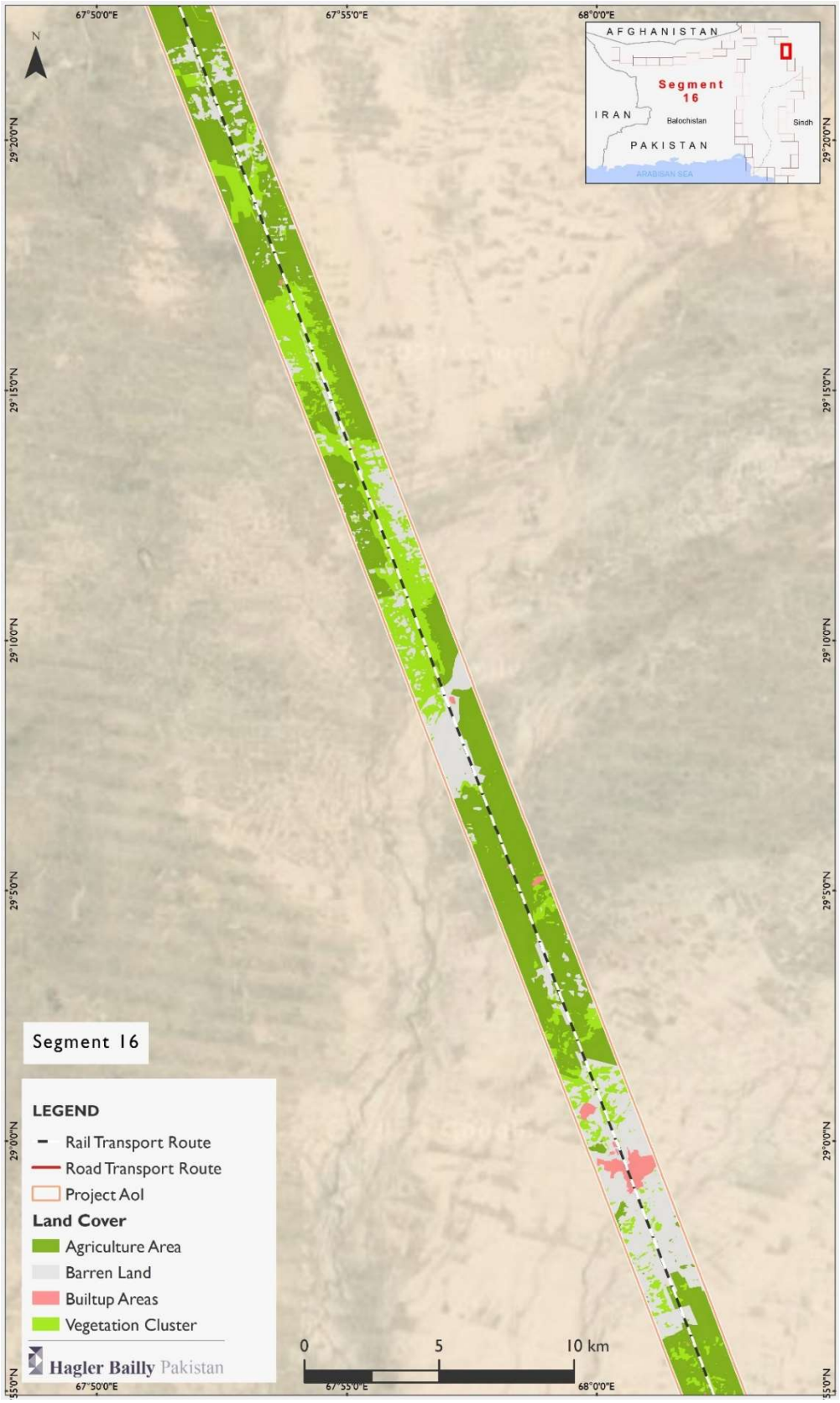
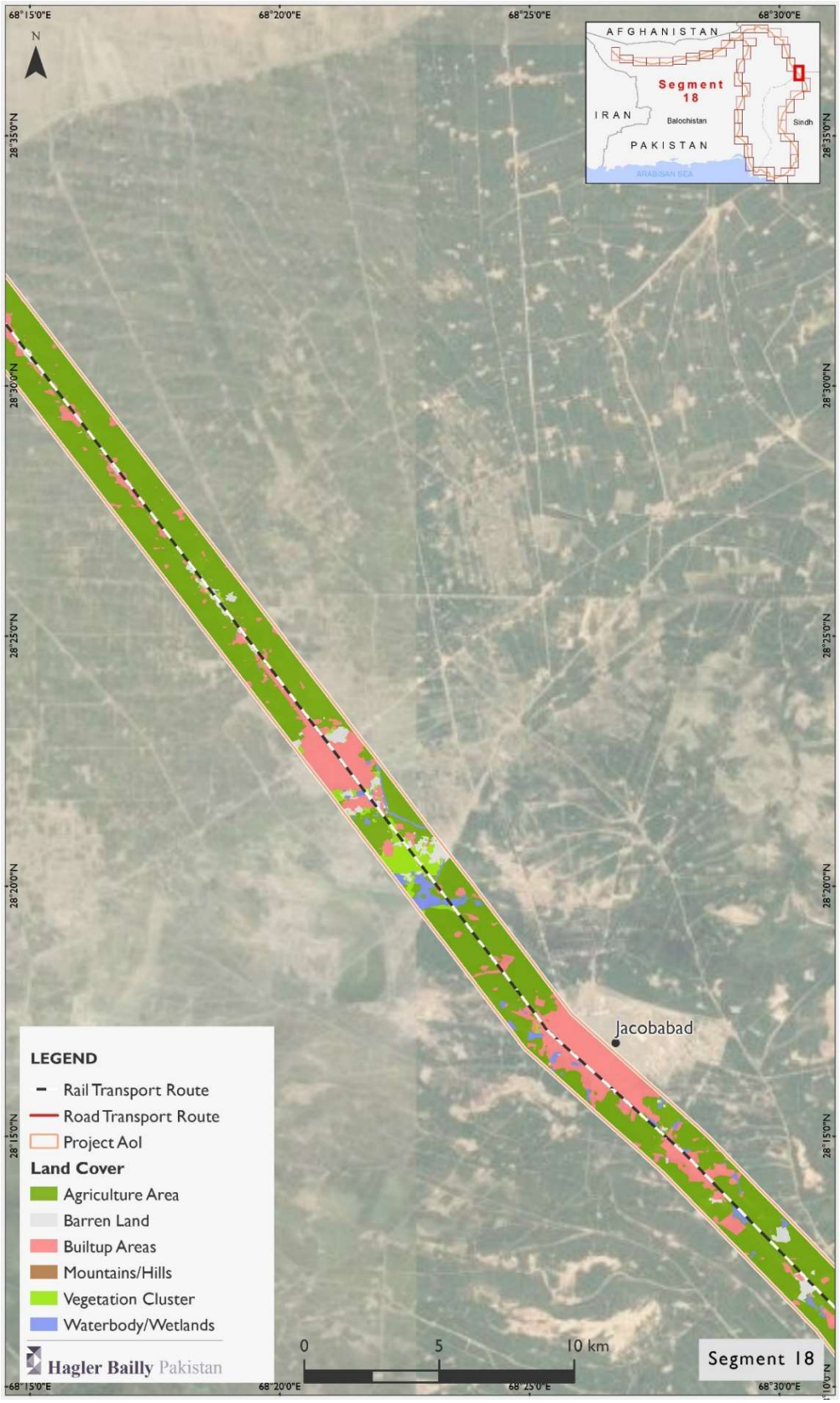


Exhibit A.17: Land Cover for Segment 17

Exhibit A.18: Land Cover for Segment 18



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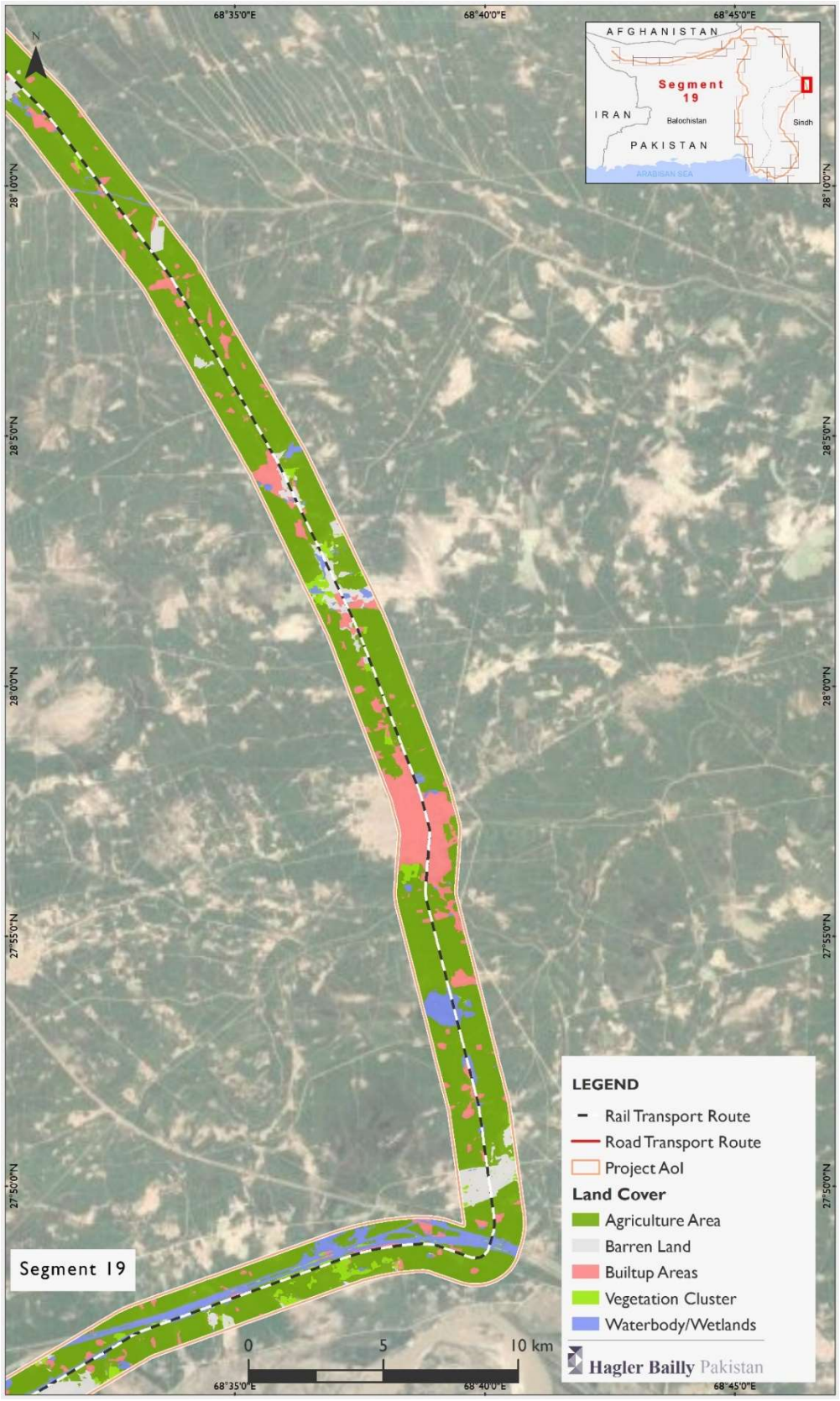


Exhibit A.20: Land Cover for Segment 20

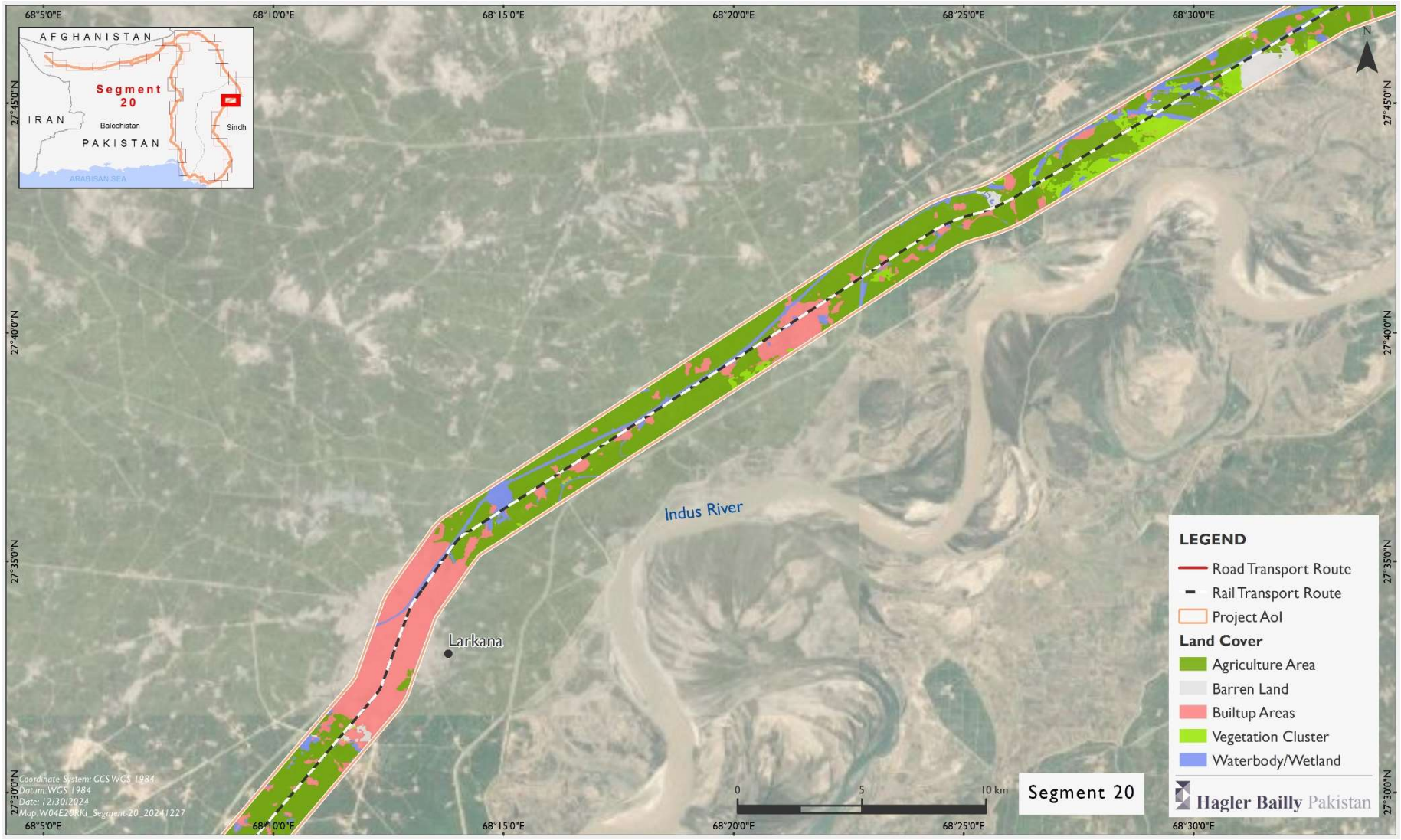


Exhibit A.21: Land Cover for Segment 21

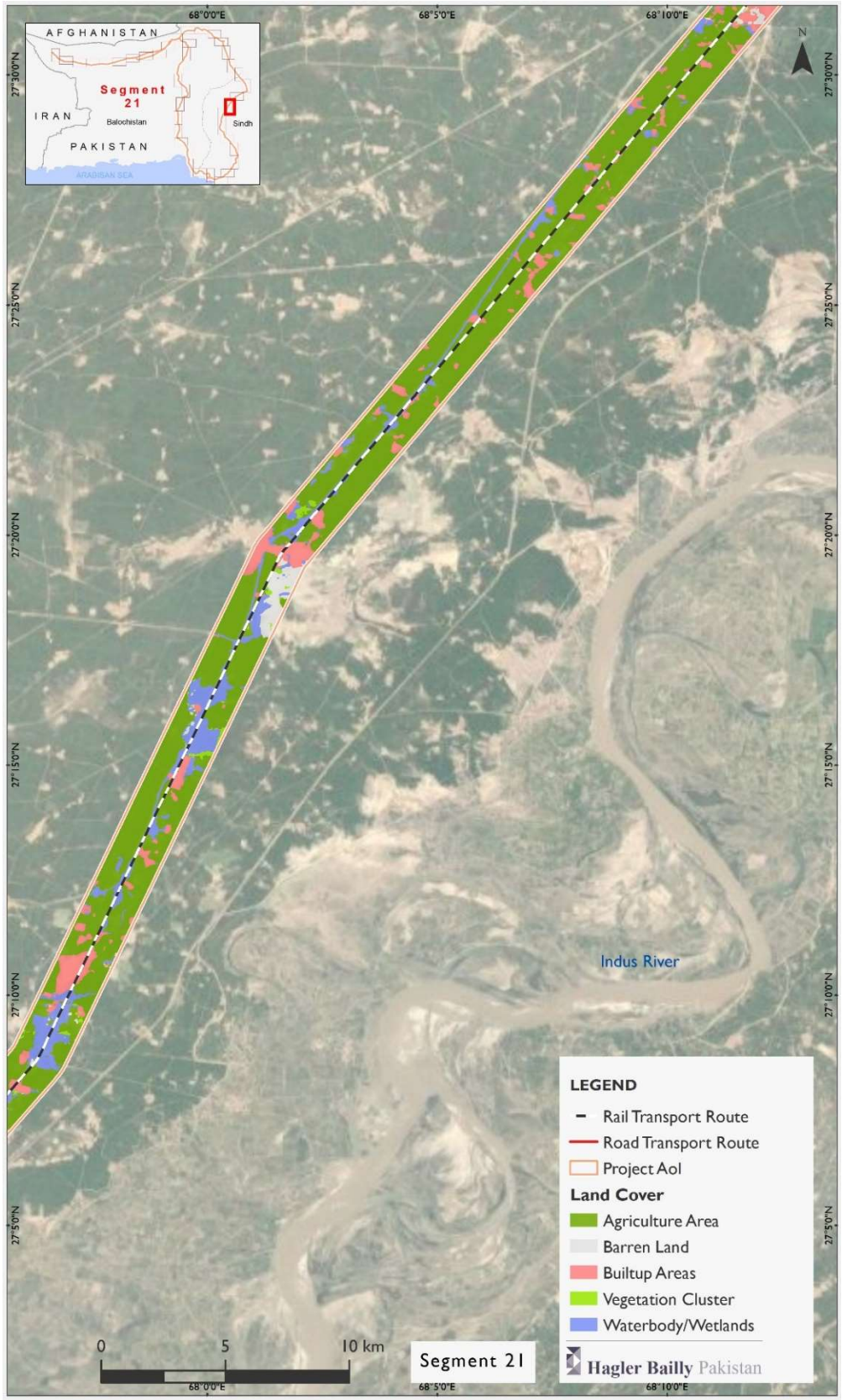


Exhibit A.22: Land Cover for Segment 22

Exhibit A.23: Land Cover for Segment 23

Exhibit A.24: Land Cover for Segment 24

Exhibit A.25: Land Cover for Segment 25

Exhibit A.26: Land Cover for Segment 26

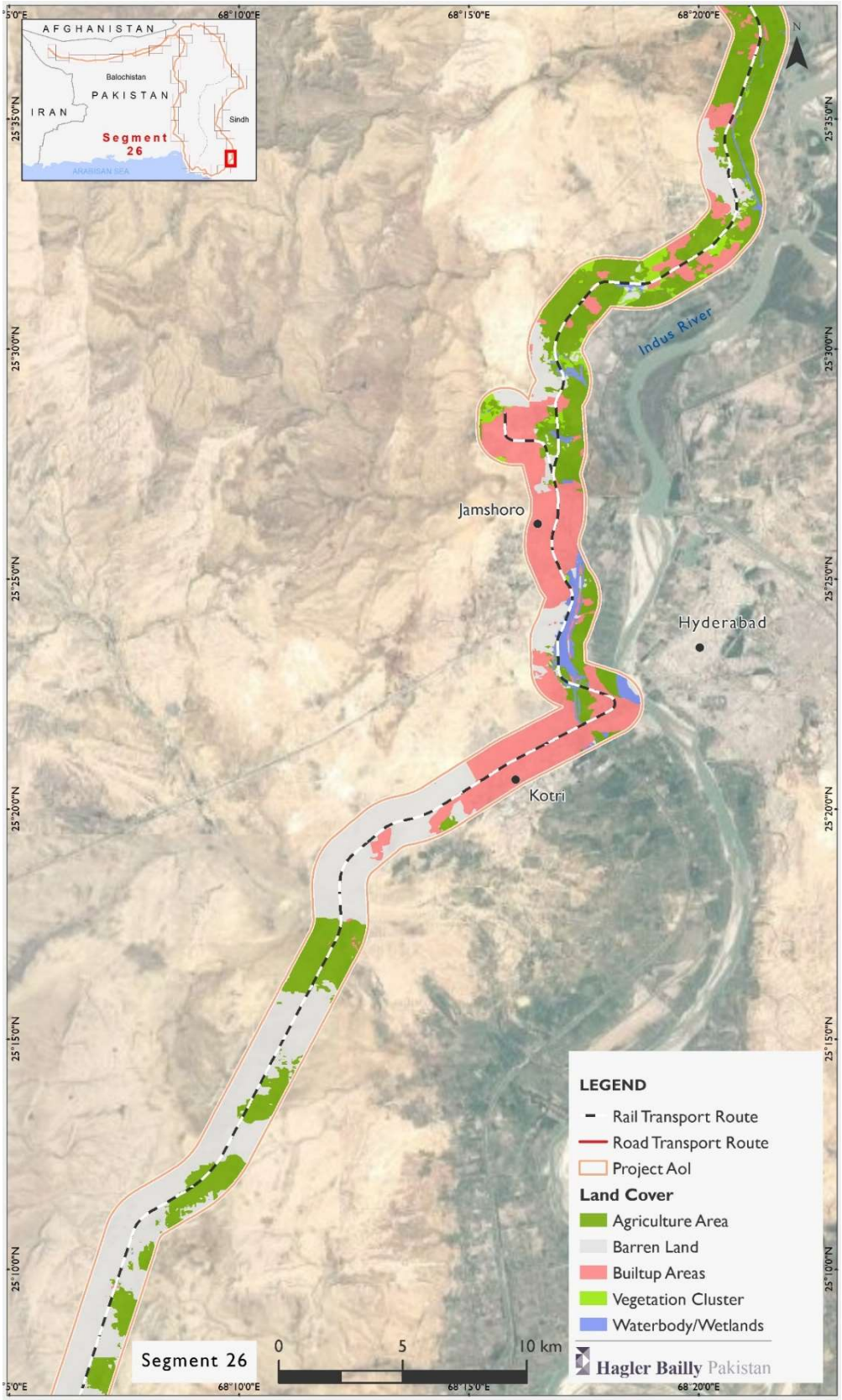
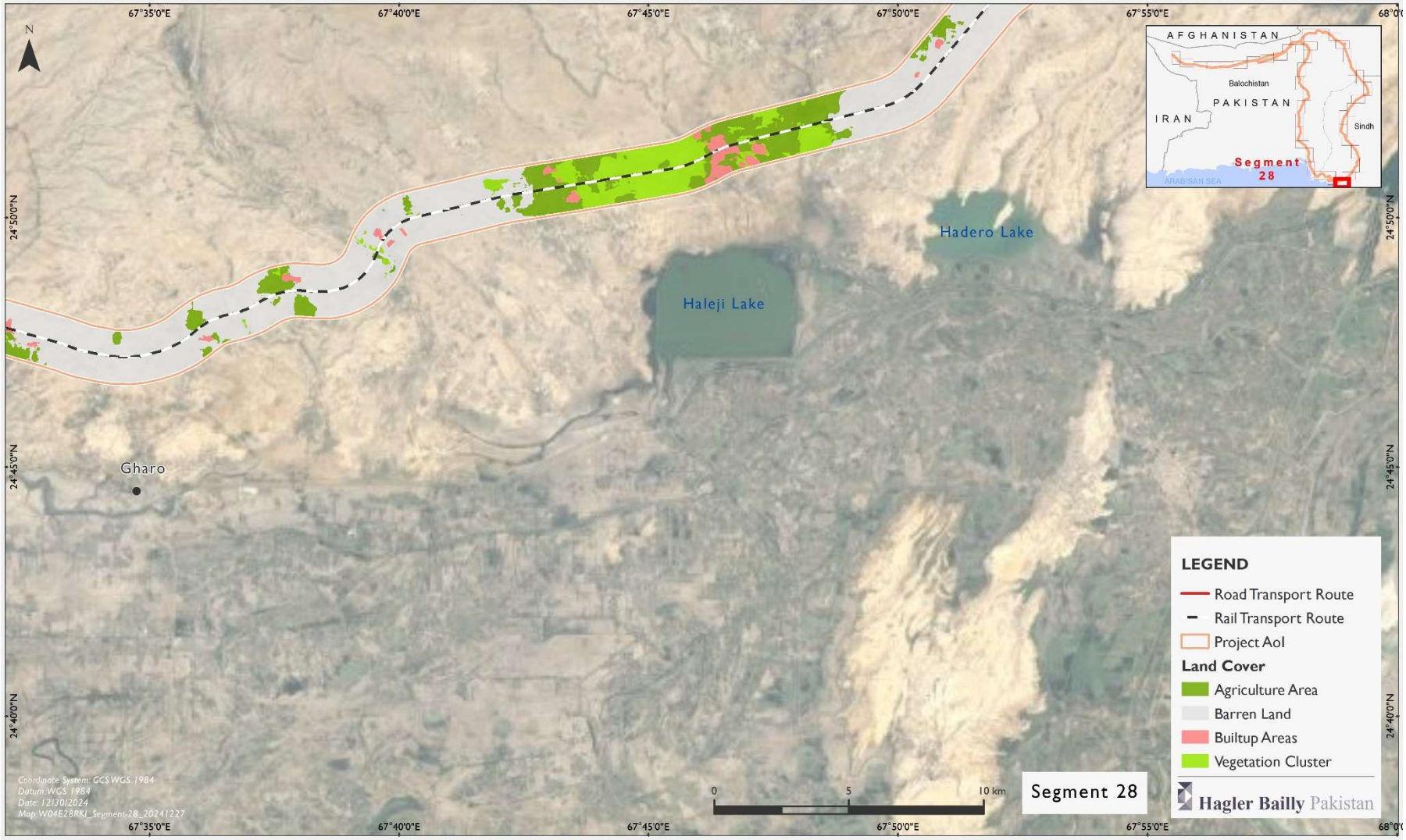


Exhibit A.27: Land Cover for Segment 27

Exhibit A.28: Land Cover for Segment 28



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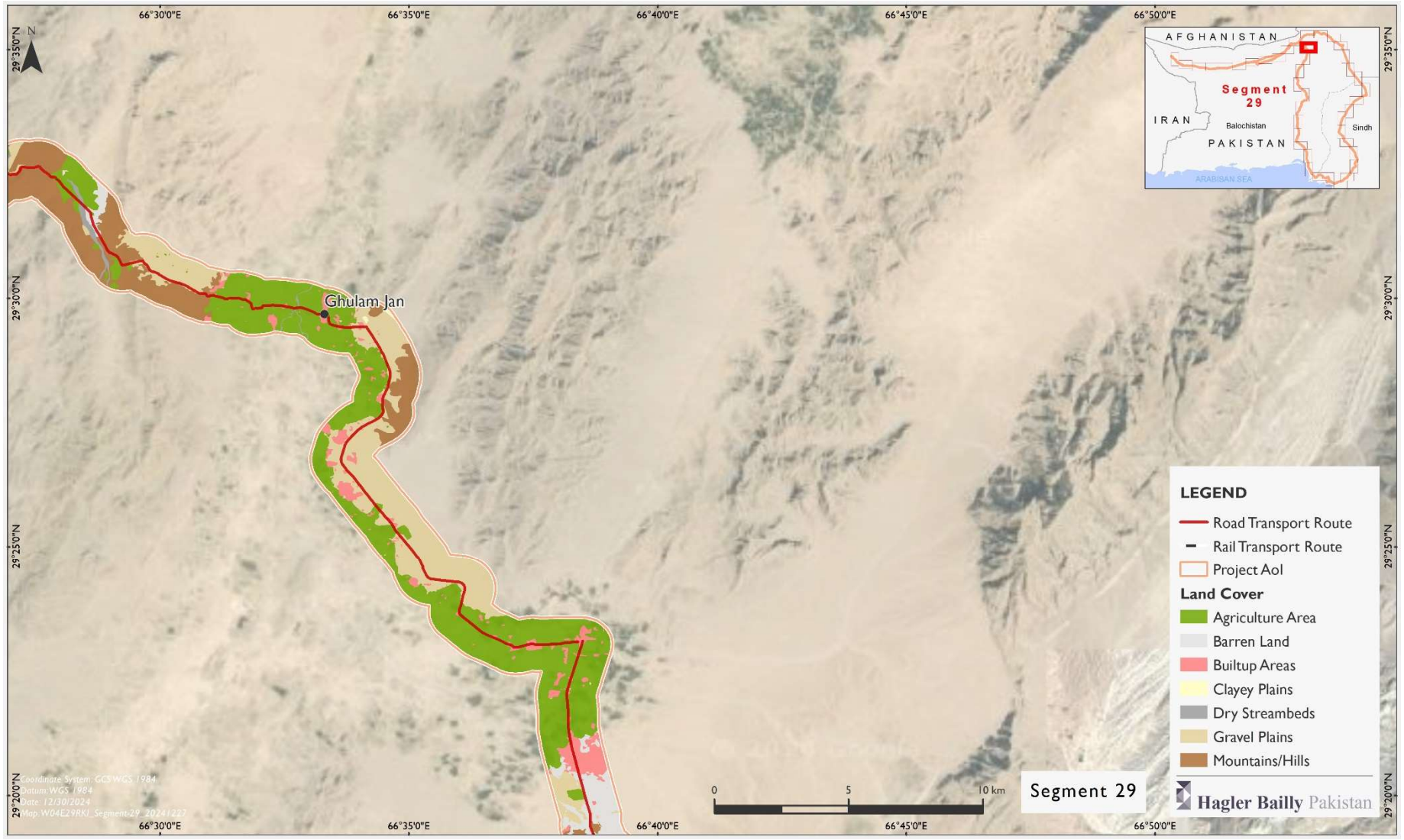


Exhibit A.30 Land Cover for Segment 30

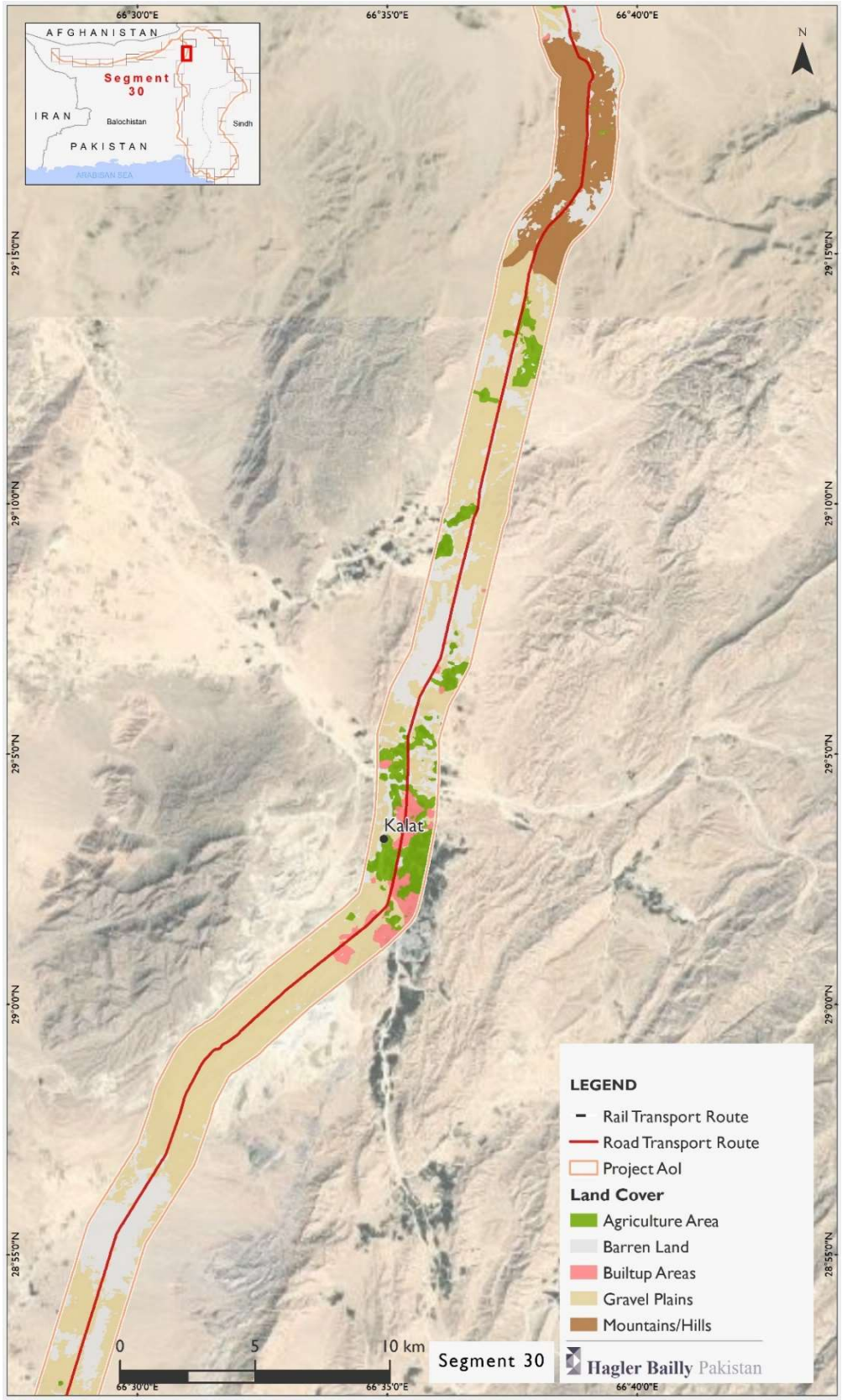


Exhibit A.31: Land Cover for Segment 31

Exhibit A.32: Land Cover for Segment 32

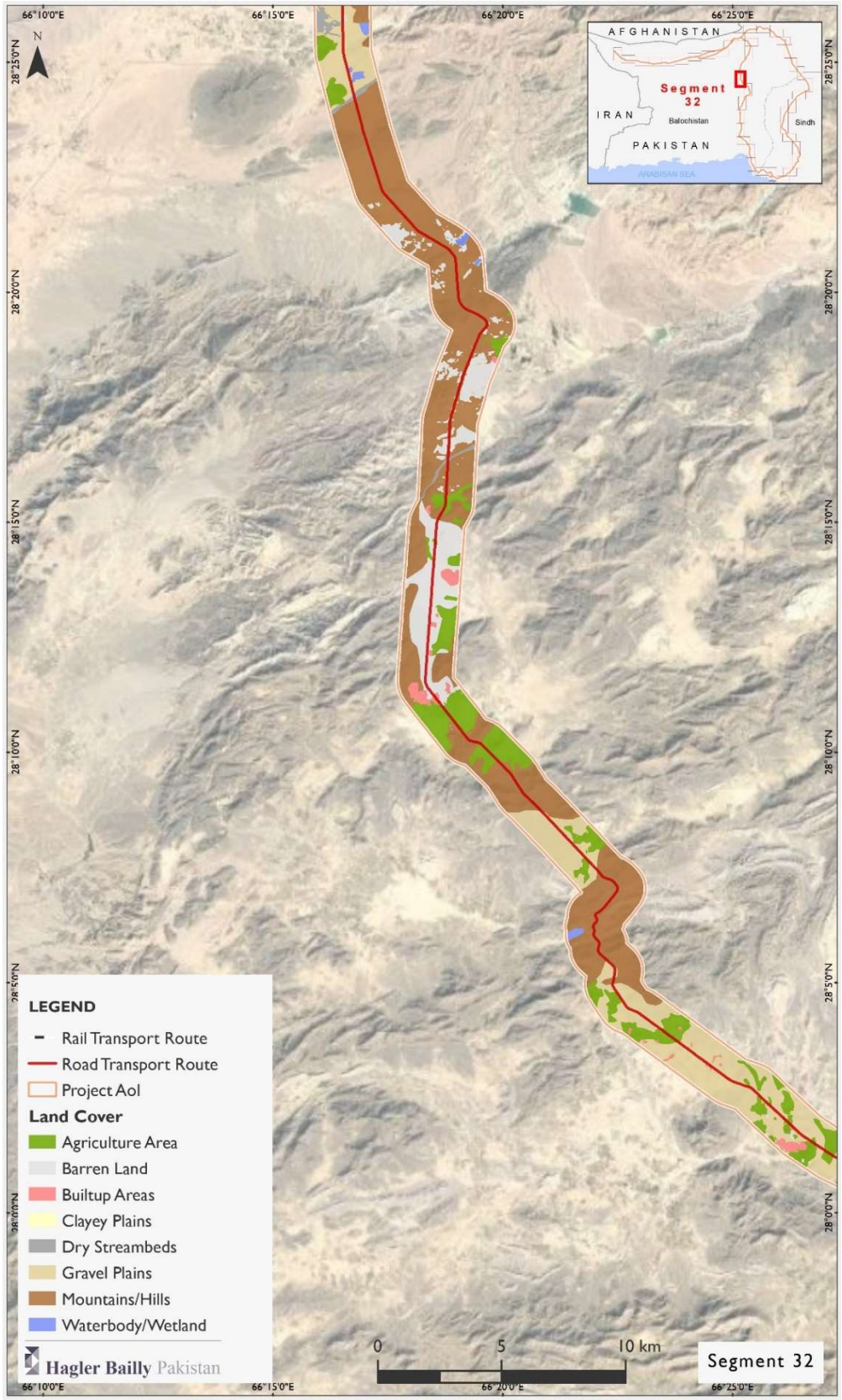
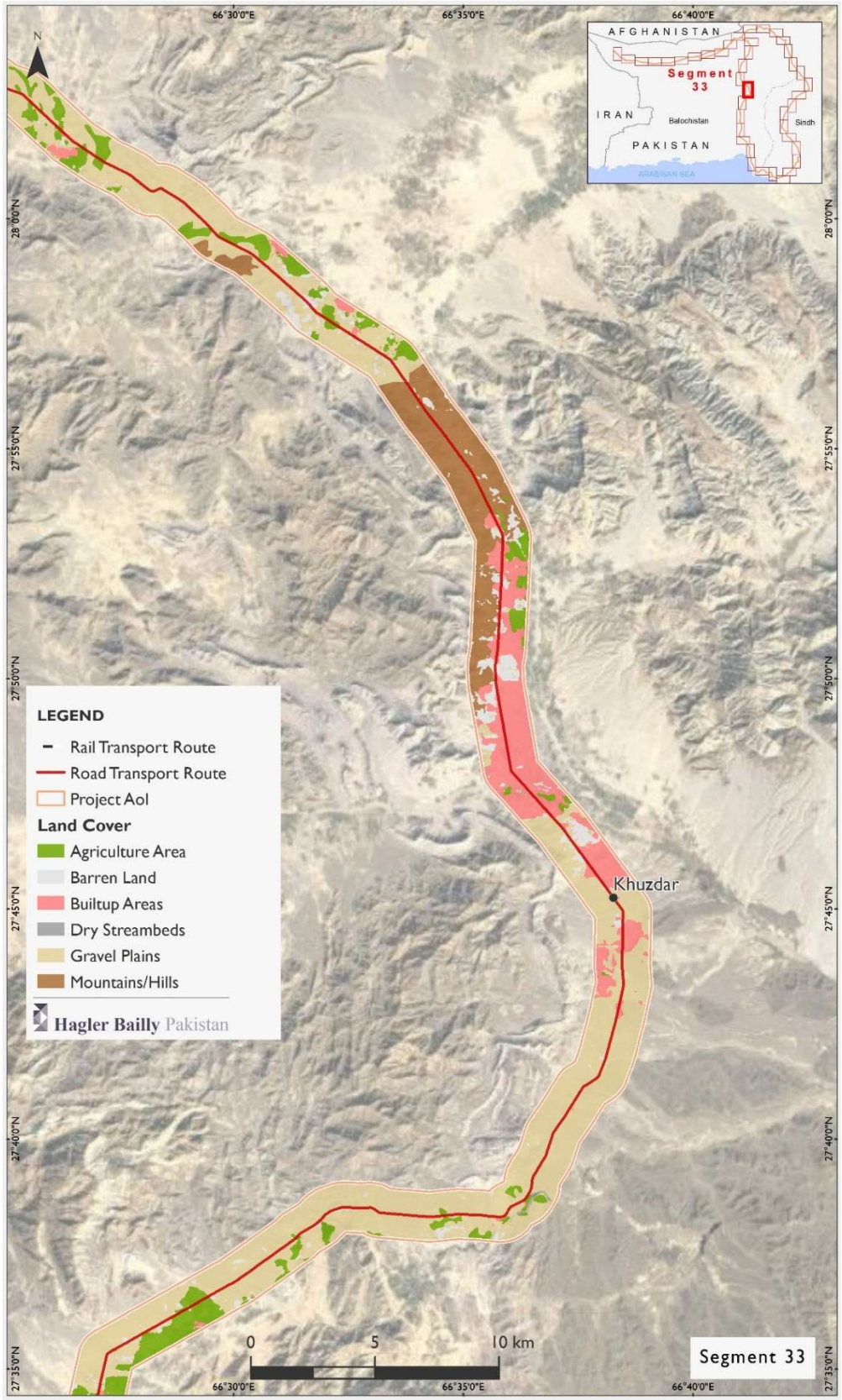


Exhibit A.33: Land Cover for Segment 33



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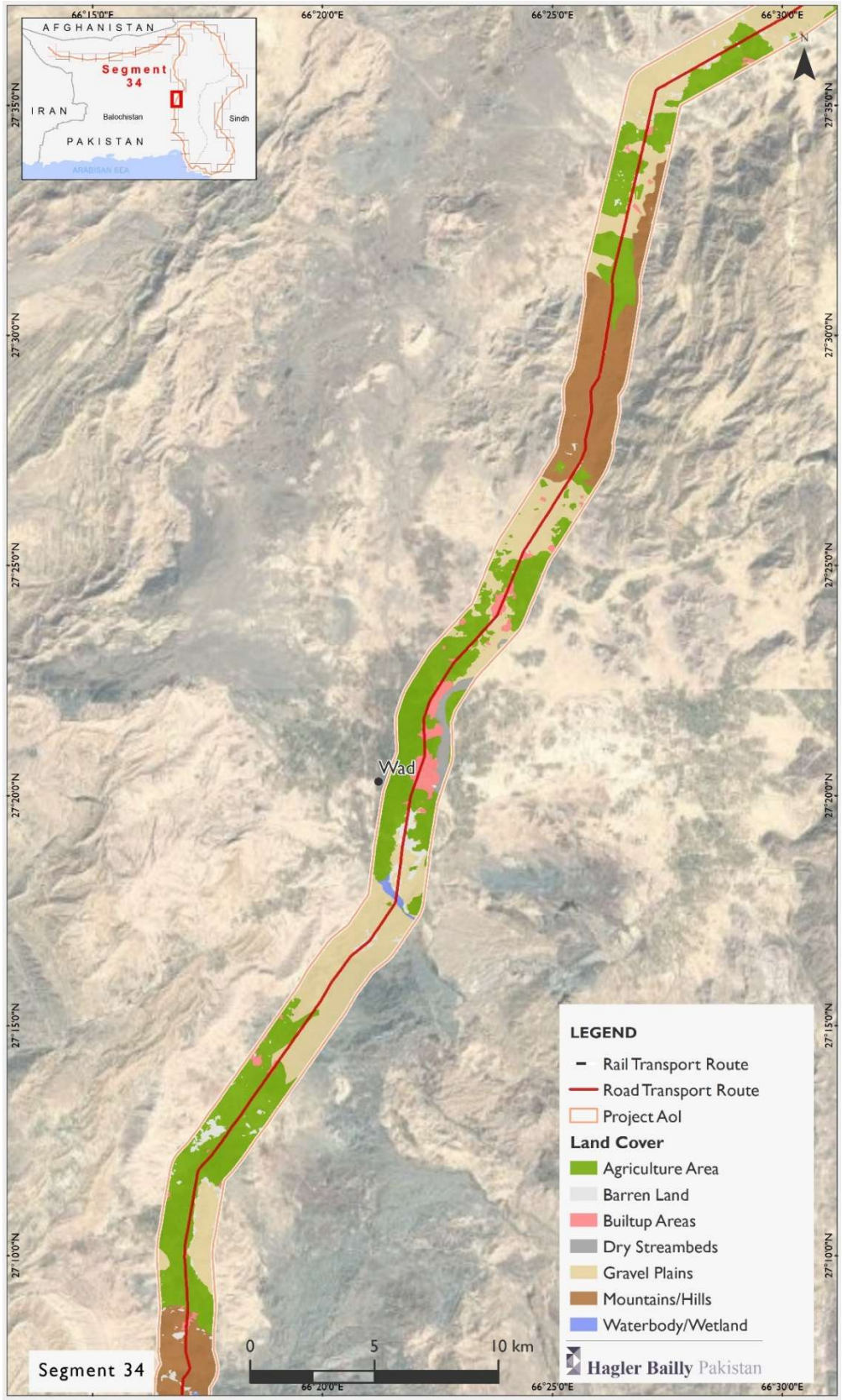
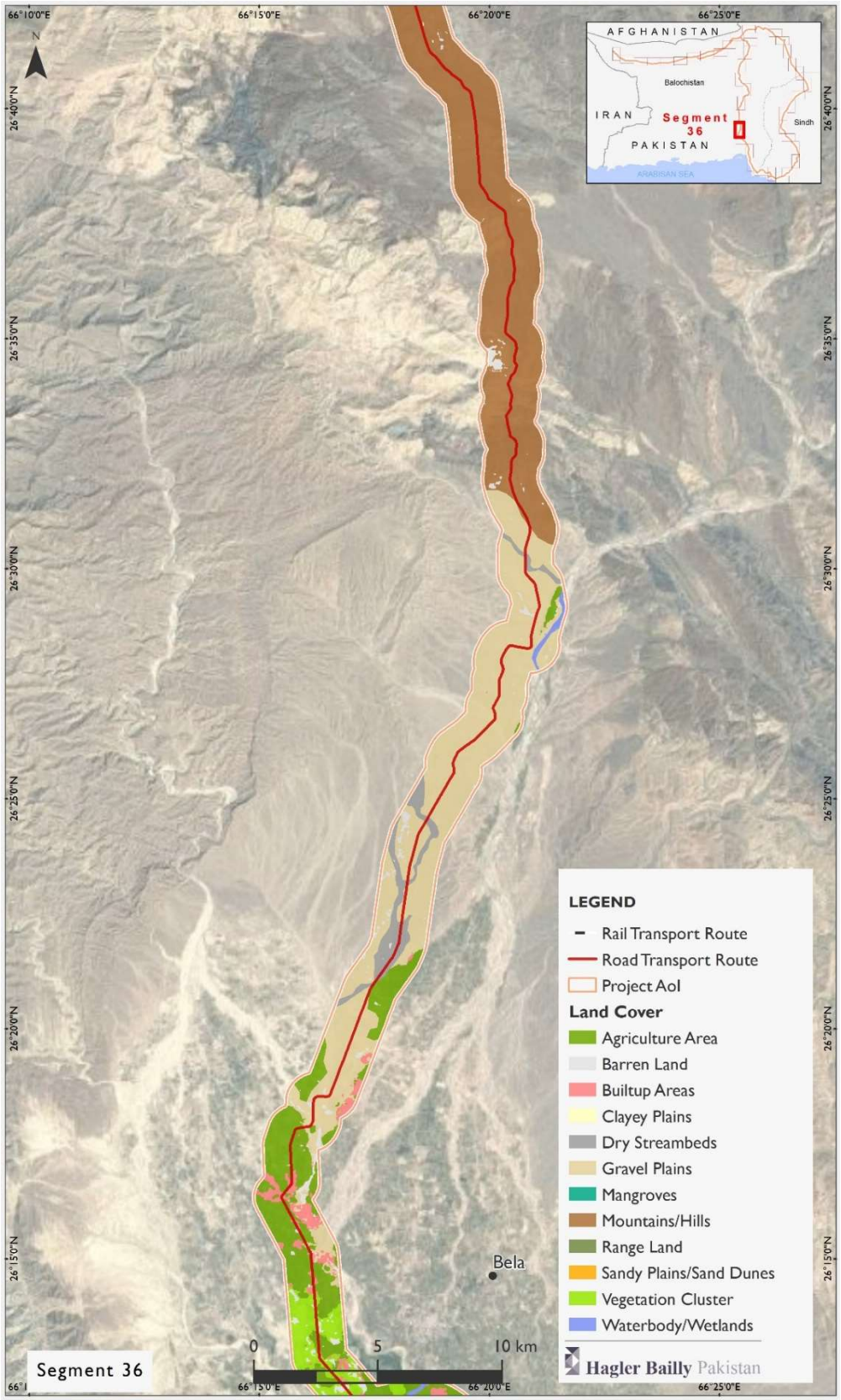


Exhibit A.35: Land Cover for Segment 35

Exhibit A.36: Land Cover for Segment 36



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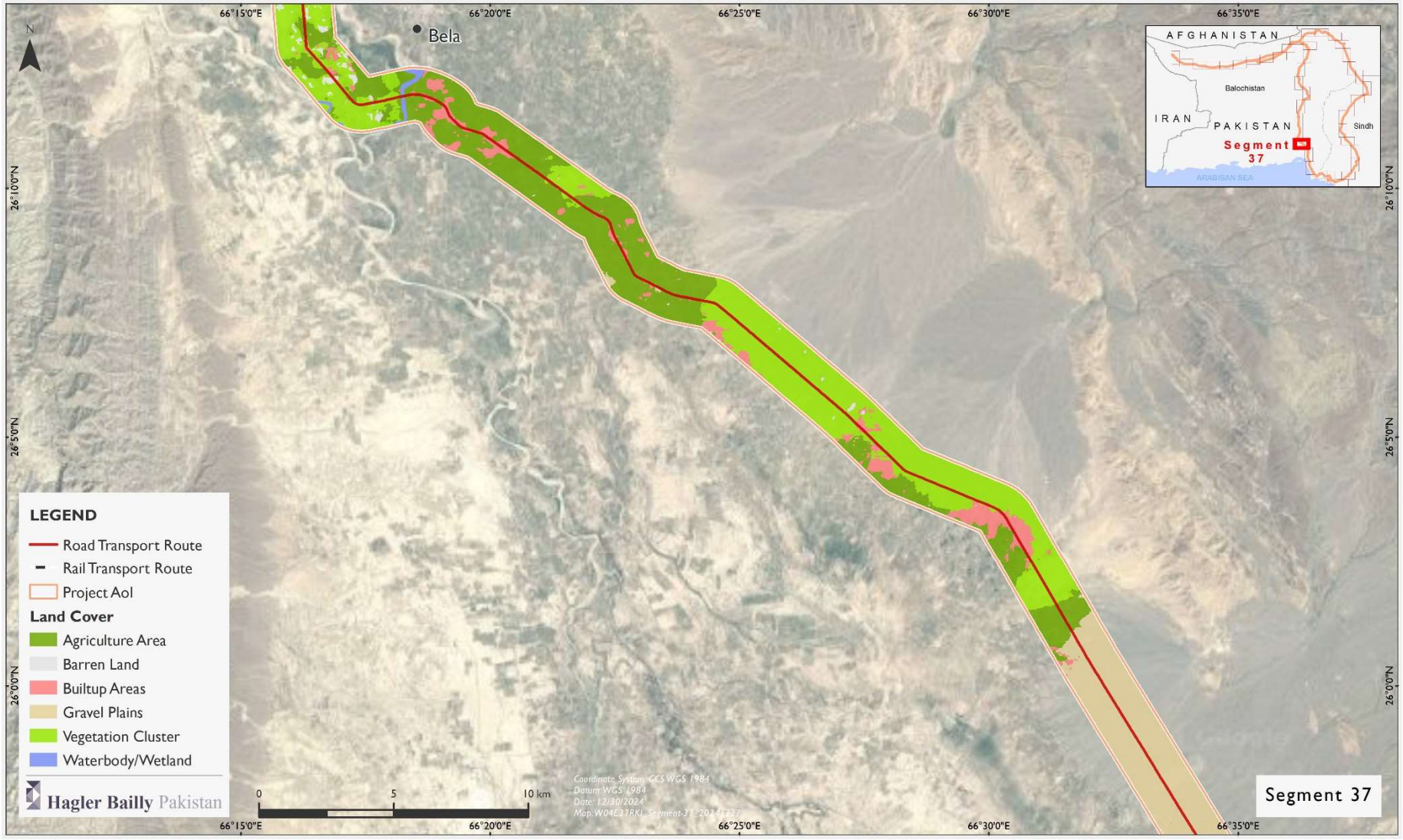


Exhibit A.38: Land Cover for Segment 38

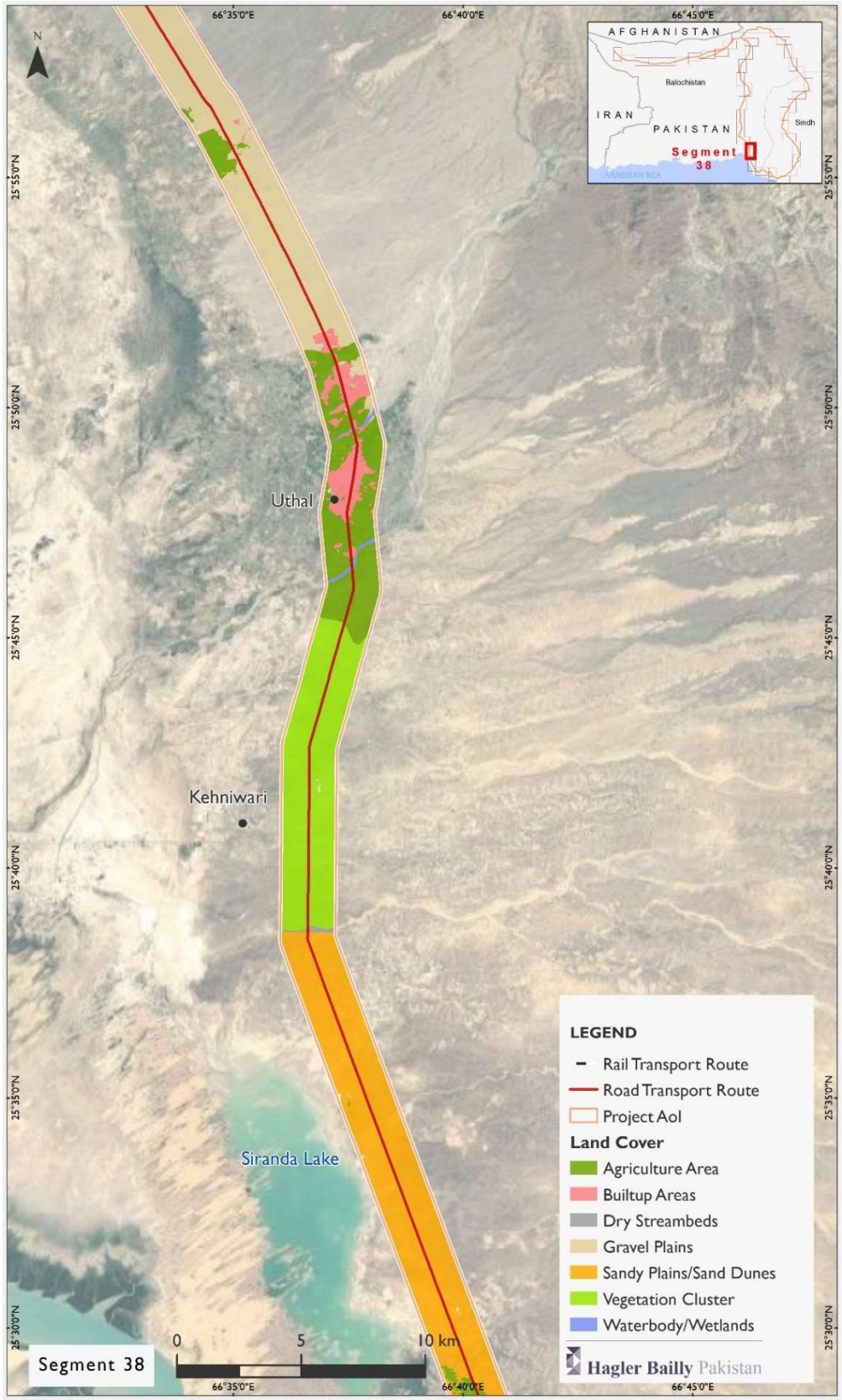


Exhibit A.39: Land Cover for Segment 39

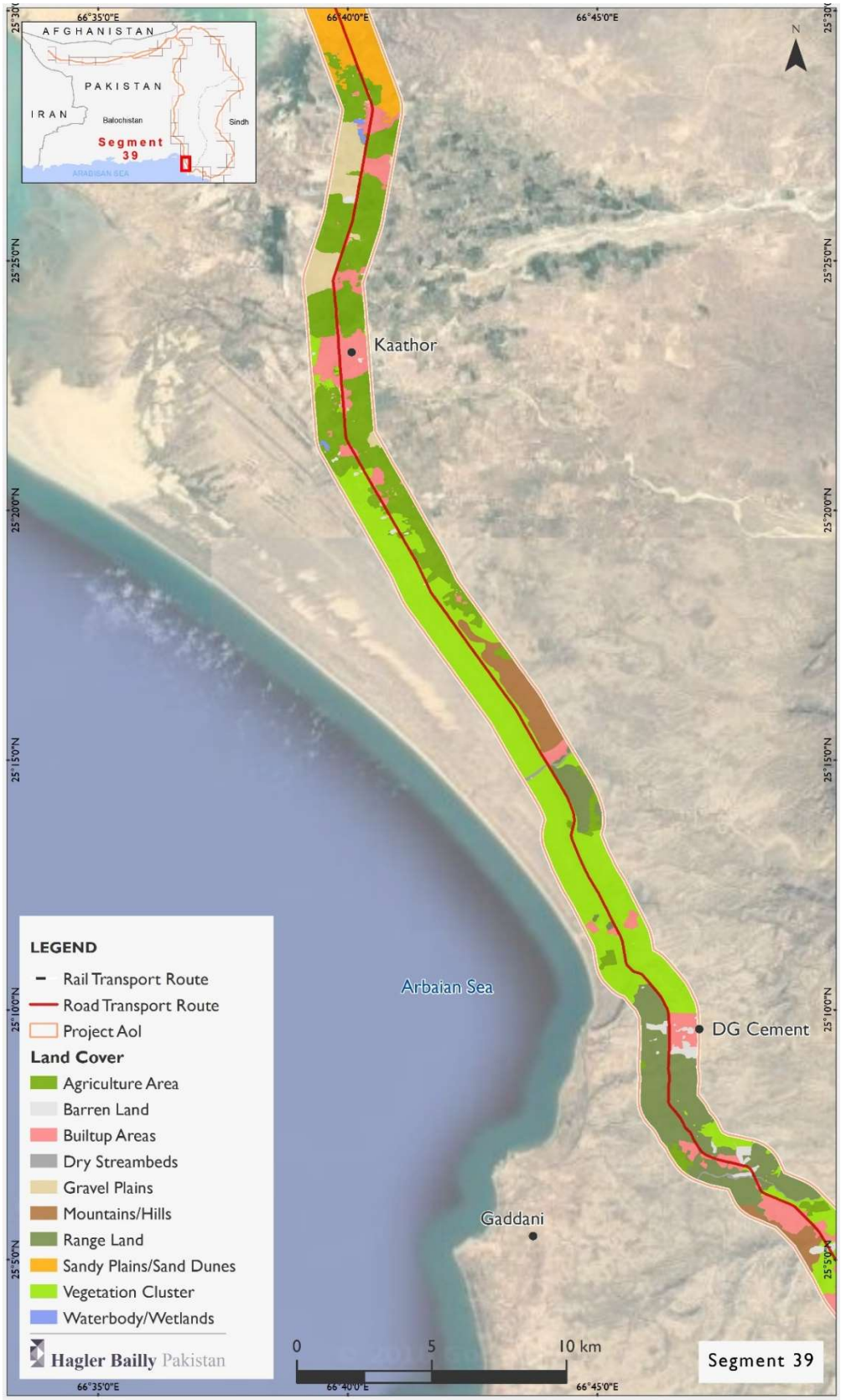


Exhibit A.40: Land Cover for Segment 40

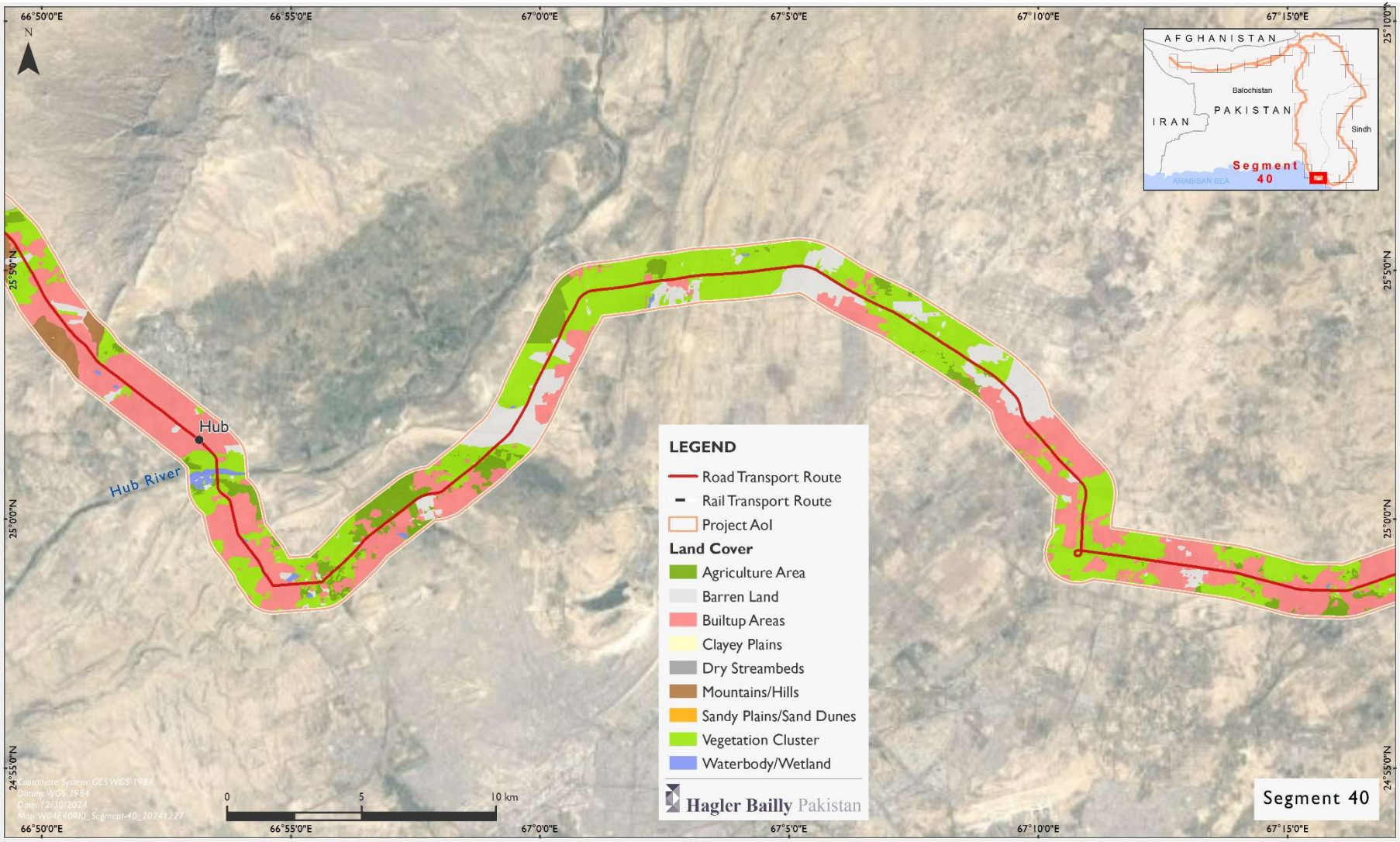
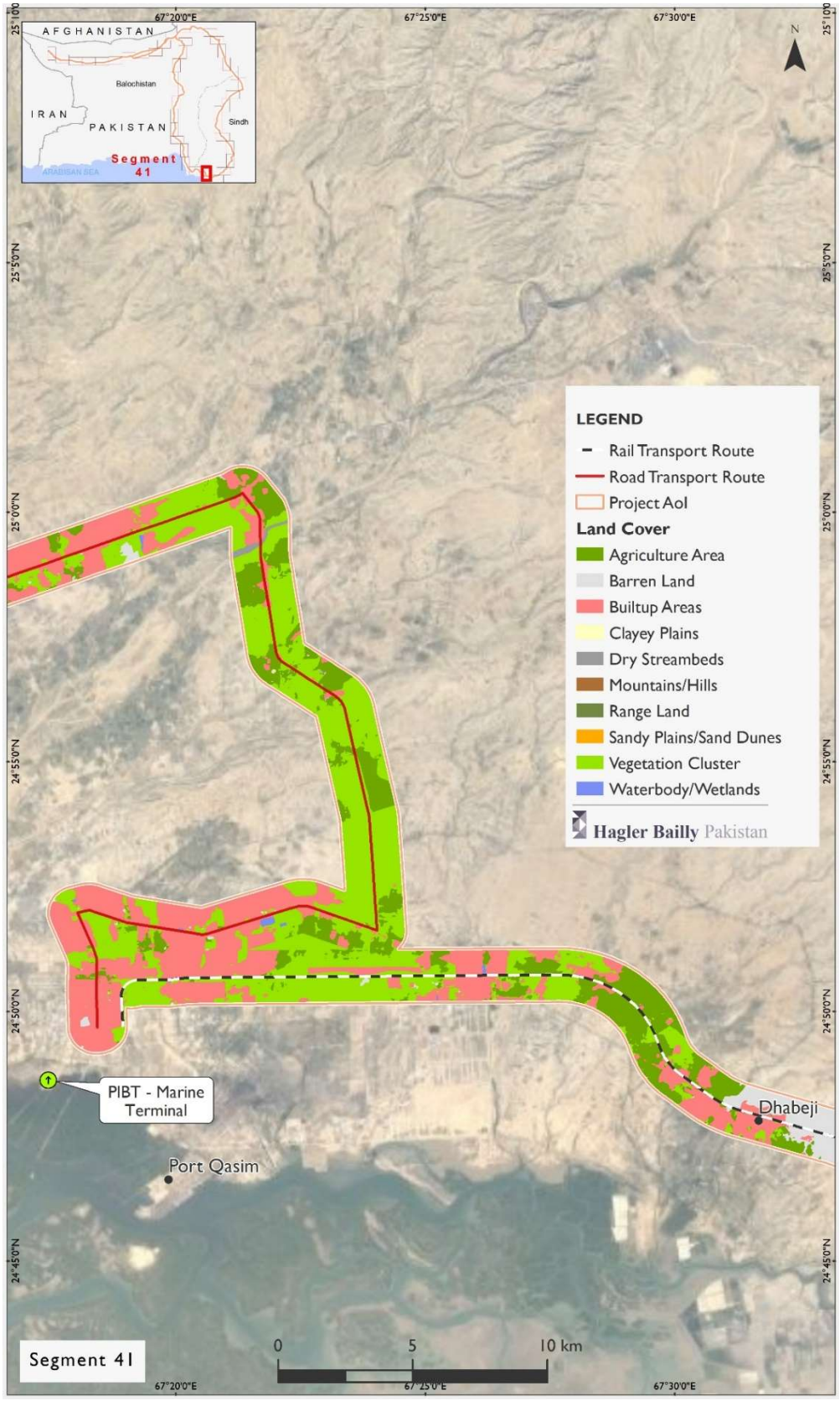


Exhibit A.41: Land Cover for Segment 41



Appendix B: Literature and Survey Based Species

See the following pages.

B.1 List of Plant Species Reported in Literature, Previous EIA's (2010 and 2020) and Surveyed Based (Post-Monsoon 2022, Spring 2023 and Post-Monsoon 2023)

No	Scientific Name	Common Name	IUCN Status	Survey Based					Literature Based		
				EIA 2010	EIA 2020	Post-Monsoon 2022 Survey	Spring 2023 Survey	Post-Monsoon 2023 Survey	Reko Diq Mine Site and Associated Infrastructure	Port Qasim	Rail and Road Route Corridor
1	*Abutilon fruticosum*	Indian Mallow	Not Evaluated	–	–	–	–	–	–	✓	–
2	*Abutilon indicum*	Thuthi	Not Evaluated	–	–	–	–	✓	–	✓	✓
3	*Abutilon pakistanicum*		Not Evaluated	–	–	–	–	–	–	–	✓
4	*Acacia arabica*		Not Evaluated	–	–	–	–	–	–	–	✓
5	*Acacia jacquemontii*	Bhabri	Least Concern	–	–	–	–	–	–	–	✓
6	*Acacia nilotica*	Sindhi Babur	Least Concern	✓	–	–	–	–	✓	✓	✓
7	*Acacia senegal*	Gum Arabic	Least Concern	–	–	–	–	–	✓	✓	✓
8	*Acanthophyllum sp.*	Spiny Head	Not Assessed	–	–	–	✓	–	✓	–	–
9	*Achillea welhemsii*	Bohay Madran	Not Evaluated	–	–	–	–	–	–	–	✓
10	*Achras sapota*	Chiku / Nest Berry	Not Evaluated	–	–	–	–	–	–	✓	✓
11	*Achyranthes aspera*	Prickly Chaff Flower	Not Evaluated	–	–	–	–	–	–	✓	✓
12	*Acroptilon repens*	Russian knapweed	Not Evaluated	–	–	–	–	–	✓	–	✓
13	*Aegiceras corniculatum*	Black Mangrove	Least Concern	–	–	–	–	–	–	–	✓
14	*Aeluropus lagopoides*	Kalar Garh	Not Evaluated	–	–	✓	–	–	✓	✓	✓
15	*Aerva javanica*	Desert Cotton/ Booh	Not Evaluated	–	–	–	✓	✓	–	✓	✓

No	Scientific Name	Common Name	IUCN Status	Survey Based					Literature Based		
				EIA 2010	EIA 2020	Post-Monsoon 2022 Survey	Spring 2023 Survey	Post-Monsoon 2023 Survey	Reko Diq Mine Site and Associated Infrastructure	Port Qasim	Rail and Road Route Corridor
16	*Aerva persica*	Kapok Bush	Not Evaluated	–	–	–	–	–	–	–	✓
17	*Aerva tomentosa*	Kapok Bush	Not Evaluated	–	–	–	–	–	–	–	✓
18	*Aizoon canariense*	Pursaleen-Leaved Aizoon	Not Evaluated	–	–	–	–	–	–	✓	✓
19	*Albizia lebbeck*	Indian Siris	Least Concern	–	–	–	–	–	–	✓	✓
20	*Albizia procera*	White Siris	Least Concern	–	–	–	–	–	–	–	✓
21	*Alhagi camelorum*		Not Evaluated	–	–	–	–	–	–	–	✓
22	*Alhagi maurorum*	Camelthorn	Not Evaluated	✓	✓	✓	✓	–	✓	–	✓
23	*Alhagi pseudalhagi*	Camel Thorn	Not Evaluated	–	–	–	–	–	–	–	✓
24	*Allium cepa*	Pimaz	Not Evaluated	–	–	–	–	–	–	–	✓
25	*Allium rubellum*		Not Evaluated	–	–	–	–	–	–	–	✓
26	*Aloe vera*	Kanwar gandal	Not Evaluated	–	–	–	–	–	–	–	✓
27	*Alstonia scholaris*	Blackboard Tree	Least Concern	–	–	–	–	–	–	✓	–
28	*Alstonias cholaris*	Blackboard tree	Not Evaluated	–	–	–	–	–	–	–	✓
29	*Alternanthera sessilis*	Sessile Joyweed	Least Concern	–	–	–	–	–	–	✓	–
30	*Althaea ludwigii*	Gul-e- Khero	Not Evaluated	–	–	–	–	–	–	–	✓
31	*Alyssum desertorum*	Tukhm-e-shirgin	Not Evaluated	–	–	–	–	–	–	–	✓
32	*Amaranthus graecizans*	Short-Tepalled Pigweed	Not Evaluated	–	–	–	–	–	–	✓	–

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33	*Amaranthus lividus*	Livid Pigweed	Not Evaluated	–	–	–	–	–	–	–	✓
34	*Amaranthus viridis*	Pig Weed	Not Evaluated	–	–	–	–	–	–	✓	✓
35	*Amberboa ramosa*		Not Evaluated	–	–	–	–	–	–	–	✓
36	*Ammannia baccifera*	Blistering Ammania	Least Concern	–	–	–	–	–	–	–	✓
37	*Amygdalus brahuica*	Mazhmonk	Not Evaluated	–	–	–	–	–	–	–	✓
38	*Anabasis setifera*	Anabasis	Not Evaluated	–	–	✓	✓	–	✓	–	–
39	*Anabasis articulata*	Jointed Anabasis	Not Evaluated	–	–	–	–	–	✓	–	–
40	*Andrachne aspera*		Not Evaluated	–	–	–	–	–	–	–	✓
41	*Anticharis linearis*		Not Evaluated	–	–	–	–	–	–	–	✓
42	*Apteranthes tuberculates*	Marmoot	Not Evaluated	–	–	–	–	–	–	–	✓
43	*Aristida adscensionis*	Sixweeks Threeawn	Not Evaluated	–	–	✓	✓	–	✓	✓	✓
44	*Aristida funiculata*		Not Evaluated	–	–	–	–	–	–	–	✓
45	*Aristida hystriculata*		Not Evaluated	–	–	–	–	–	–	–	✓
46	*Aristida mutabilis*		Not Evaluated	–	–	–	–	–	–	–	✓
47	*Aristida pupurea*	Purple Threeawn	Not Evaluated	–	–	✓	✓	–	✓	–	–
48	*Aristida sp.*	–	Not Assessed	✓	–	–	–	–	✓	–	–
49	*Aristolochia bracteata*		Not Evaluated	–	–	–	–	–	–	–	✓
50	*Arnebia hispidissima*	Arabian Primrose	Not Evaluated	–	–	–	–	–	–	–	✓

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51	*Artemisia maritima*		Not Evaluated	–	–	–	–	–	–	–	✓
52	*Artemisia scoparia*	Redstem Wormwood	Not Evaluated	–	–		–	–	✓	–	✓
53	*Arthrocnemum indicum*	Kolliam	Not Evaluated	–	–	–	–	–	–	✓	–
54	*Arthrocnemum macrostachyum*	Glaucous Glasswort	Not Evaluated	–	–	–	–	–	–	✓	–
55	*Arundo donax*	Giant Reed	Least Concern	–	–		–	✓		✓	✓
56	*Asparagus capensis*	Wild Asparagus	Not Evaluated	–	–	–	–	–	–	–	✓
57	*Asparagus dumosus*		Not Evaluated	–	–	–	–	–	–	–	✓
58	*Asparagus gharoensis*		Not Evaluated	–	–	–	–	–	–	–	✓
59	*Asphodelus tenuifolius*		Not Evaluated	–	–	–	–	–	–	–	✓
60	*Astragalus fatmensis*	Milktech	Not Evaluated	–	–	–	–	–	–	✓	–
61	*Astragalus hycanus*		Not Evaluated	–	–	–	–	–	–	–	✓
62	*Astragalus sp.*	Milkvetch	Not Assessed	–	✓	–	–	–	✓	–	–
63	*Atriplex dimorposregium*		Not Evaluated	–	–	–	–	–	–	–	✓
64	*Atriplex griffithii*	Griffith's Saltbush	Not Evaluated	–	–	–	–	–	–	–	✓
65	*Atriplex stocksii*	Saltbush	Not Evaluated	–	–	–	–	–	–	✓	✓
66	*Atriplex tatarica*	Tatarian Orache	Not Evaluated	–	–	–	–	–	–	✓	–
67	*Avena sativa*	Jowari	Least Concern	–	–	–	–	–	–	–	✓

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68	*Avicennia marina*	Mangrove/ Timmer	Least Concern	–	–	–	–	✓	–	✓	✓
69	*Azadirachta indica*	Neem Tree	Least Concern	–	–	✓	–	✓	✓	✓	✓
70	*Azolla pinnata*		Least Concern	–	–	–	–	–	–	–	✓
71	*Bacopa monnieri*		Least Concern	–	–	–	–	–	–	–	✓
72	*Barleria acanthoides*	Spiny White Barleria	Not Evaluated	–	–	–	–	–	–	–	✓
73	*Berberis baluchistanica*	Zralga	Least Concern	–	–	–	–	–	✓	–	✓
74	*Berberis lycium*	Indian Barberry	Least Concern	–	–	–	–	–	–	–	✓
75	*Bergia suffruticosa*		Not Evaluated	–	–	–	–	–	–	–	✓
76	*Bismarckia nobilis*	Bismaick Palm	Least Concern	–	–	–	–	–	–	✓	✓
77	*Blepharis sindica*	Bhangari	Not Evaluated	–	–	–	–	–	–	–	✓
78	*Blumea obliqua*		Not Evaluated	–	–	–	–	–	–	–	✓
79	*Boerhaavia verticilata*		Not Evaluated	–	–	–	–	–	–	–	✓
80	*Boerhavia procumbens*		Not Evaluated	–	–	–	–	–	–	–	✓
81	*Bouchia marrubifolia*		Not Evaluated	–	–	–	–	–	–	–	✓
82	*Bougainvillea glabra*	Paper Flower	Least Concern	–	–	–	–	–	–	✓	✓
83	*Brassica juncea*	Jambo	Not Evaluated	–	–	–	–	–	–	–	✓
84	*Brassica rapa*	Sirah saag	Not Evaluated	–	–	–	–	–	–	–	✓
85	*Breweria latifolia*	-	Not Evaluated	–	–	–	–	–	–	✓	–

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86	*Breweria latifolia*		Not Evaluated	–	–	–	–	–	–	–	✓
87	*Bromus sp*	Cheat Grasses	Not Assessed	–	–	✓	–	–	✓	–	–
88	*Bryonia aspera*		Not Evaluated	–	–	–	–	–	–	–	✓
89	*Bunium persicum*	Moninga Riza	Not Evaluated	–	–	–	–	–	–	–	✓
90	*Cadaba heterotricha*		Not Evaluated	–	–	–	–	–	–	–	✓
91	*Caesalpinia pulcherrima*	Peacock Flower / Gull Mohar	Least Concern	–	–	–	–	–	–	✓	✓
92	*Calligonum comosum*	Fire Bush	Not Evaluated	–	–	✓	✓	–	✓	–	✓
93	*Calligonum crinitum*	-	Not Evaluated	–	✓	–	–	–	–	–	–
94	*Calligonum polygonoides*	Phog	Not Evaluated	–	✓	✓	✓	–	✓	–	–
95	*Calotropis procera*	Aak	Least Concern	–	–		–	✓	–	✓	✓
96	*Cannabis sativa*	Bhang	Not Evaluated	–	–	–	–	–	–	–	✓
97	*Capparis aphylla*	Sodada	Least Concern	–	–	–	–	–	–	–	✓
98	*Capparis cartilaginea*	Caper	Least Concern	–	–	–	–	–	–	–	✓
99	*Capparis decidua*	Kirar	Least Concern	–	–	–	–	✓	–	✓	✓
100	*Capparis spinosa*	Kirrav pith	Least Concern	–	–	–	–	–	–	–	✓
101	*Capsicum annuum*	Mirch	Least Concern	–	–	–	–	–	–	–	✓
102	*Caragana ambigua*		Not Evaluated	–	–	–	–	–	–	–	✓

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103	*Caralluma edulis*		Not Evaluated	–	–	–	–	–	–	–	✓
104	*Caralluma tuberculata*	Marmootk	Not Evaluated	–	–	–	–	–	–	–	✓
105	*Cardaria chalepense*	Garbust	Not Evaluated	–	–	–	–	–	–	–	✓
106	*Cardaria draba*	Hoary Cress	Not Evaluated	–	–	–	–	–	–	–	✓
107	*Cardiospermum helicacabum*		Not Evaluated	–	–	–	–	–	–	–	✓
108	*Carica papaya*	Papaya / Papita	Data Deficient	–	–	–	–	–	–	✓	✓
109	*Caroxylon incanescens*	Hashok	Not Evaluated	–	–	–	–	–	–	–	✓
110	*Carthamus oxyacantha*	Pith	Not Evaluated	–	–	–	–	–	–	–	✓
111	*Cassia fistula*	Amaltas	Least Concern	–	–	–	–	–	–	✓	✓
112	*Cassia italic*	Ghora Wal	Not Evaluated	–	–	–	–	–	–	–	✓
113	*Cassia italica*	Ghora Wal	Not Evaluated	–	–	–	–	–	–	✓	–
114	*Cenchrus americanus*	Bajra	Not Evaluated	–	–	–	–	–	–	–	✓
115	*Cenchrus biflorus*	Sandbur	Not Evaluated	–	–	✓	–	–	✓	–	✓
116	*Cenchrus ciliaris*	Foxtail Buffalo Grass	Least Concern	✓	–	–	–	–	–	–	✓
117	*Cenchrus pennisetiformis*	Slender Buffel Grass	Not Evaluated	–	–	–	–	–	–	–	✓
118	*Cenchrus setigerus*	Birdwood Grass	Not Evaluated	–	–	–	–	–	–	–	✓
119	*Centaurea melitensis*	Maltese Star-Thristal	Not Evaluated	–	–	–	–	–	–	✓	✓

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120	*Ceriops tagal*		Least Concern	–	–	–	–	–	–	–	✓
121	*Cestrum nocturnum*	Queen Of Night/ Raatki Raani	Least Concern	–	–	–	–	–	–	✓	✓
122	*Chamaedorea elegans*	Cat Palm	Not Evaluated	–	–	–	–	–	–	✓	✓
123	*Chascanum marrubifolium*		Not Evaluated	–	–	–	–	–	–	–	✓
124	*Chenopodium album*	Kalpir	Not Evaluated	–	–	–	–	–	–	–	✓
125	*Chenopodium glaucum*	Oak-leaved Goosefoot	Not Evaluated	–	✓	–	–	–	–	–	–
126	*Chenopodium murale*	Nettle-leaved Goosefoot	Not Evaluated	–	–	–	–	–	–	✓	–
127	*Chloris barbata*	Windmill Grass	Not Evaluated	–	–	–	–	–	–	✓	✓
128	*Chrozophora obliqua*		Least Concern	–	–	–	–	–	–	–	✓
129	*Chrozophora plicata*		Not Evaluated	–	–	–	–	–	–	–	✓
130	*Chrozophora tinctoria*	Kappo	Least Concern	–	–	–	–	–	–	–	✓
131	*chrysopogon aucheri*		Not Evaluated	–	–	–	–	–	–	–	✓
132	*Cichorium endivia*	Chikori	Not Evaluated	–	–	–	–	–	–	–	✓
133	*Cinnamomum cassia*	Chinese Cinnamon	Least Concern	–	–	–	–	–	–	✓	✓
134	*Cistanche tubulosa*		Not Evaluated	–	–	✓	–	–	–	–	–
135	*Cithareloma lehmannii*	-	Not Evaluated	–	–	–	✓	–	–	–	–

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136	*Citrullus colocynthis*	Bitter apple	Not Evaluated	–	–	✓	✓	–	✓	✓	✓
137	*Citrus limon*	Lemon Tree	Least Concern	–	–	–	–	–	–	✓	✓
138	*Citrus sinensis*	Orange	Not Evaluated	–	–	–	–	–	–	✓	✓
139	*Cleome brachycarpa*	Shamako	Not Evaluated	–	–	–	–	–	–	✓	✓
140	*Cleome gynandra*	Spiderwisp	Not Evaluated	–	–	–	–	–	–	–	✓
141	*Cleome scaposa*	Spider Flowers	Not Evaluated	–	–	–	–	–	–	–	✓
142	*Cleome viscosa*	Tick Weed	Not Evaluated	–	–	–	–	–	–	✓	✓
143	*Clerodendrum phlomoides*		Not Evaluated	–	–	–	–	–	–	–	✓
144	*Cocculus hirsutus*		Not Evaluated	–	–	–	–	–	–	–	✓
145	*Cocculus pendulus*	Zamur	Not Evaluated	–	–	–	–	–	–	–	✓
146	*Cocos nucifera*	Coconut/ Narial	Not Evaluated	–	–	–	–	–	–	✓	✓
147	*Codiaeum variegatum*	Garden Croton	Least Concern	–	–	–	–	–	–	✓	✓
148	*Commelina albescens*		Not Evaluated	–	–	–	–	–	–	–	✓
149	*Commiphora mukul*		Not Evaluated	–	–	–	–	–	–	–	✓
150	*Commiphora stocksiana*	Mitha Guggul	Endangered	–	–	–	–	–	–	–	✓
151	*Commiphora wightii*		Critically Endangered	–	–	–	–	–	–	–	✓
152	*Conocarpus erectus*	Button Mangrove	Least Concern	–	–	–	–	–	–	✓	✓

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153	*Conocarpus lancifolius*	Damas	Vulnerable	–	–	–	–	–	–	–	✓
154	*Convolovulus microphyllous*		Not Evaluated	–	–	–	–	–	–	–	✓
155	*Convolvulus arvensis*	Morning Glory	Not Evaluated	–	–	–	–	–	–	✓	✓
156	*Convolvulus glomeratus*	Bindweed	Not Evaluated	–	–	–	–	–	–	✓	✓
157	*Convolvulus leiocalycinus*	Morning Glory	Not Evaluated	–	–	–	–	–	–	–	✓
158	*Convolvulus pluricaulis*	Shankhpushpi	Not Evaluated	–	–	–	–	–	–	–	✓
159	*Convolvulus scindicus*		Not Evaluated	–	–	–	–	–	–	–	✓
160	*Conyza bonariensis*	Booch	Not Evaluated	–	–	–	–	–	–	–	✓
161	*Conyza canadensis*	Canadian fleabane	Not Evaluated	–	–	–	–	–	–	–	✓
162	*Copernicia prunifera*	Carnaubeira Palm	Not Evaluated	–	–	–	–	–	–	✓	✓
163	*Corbichonia decumbens*	Prostrate Purslane	Not Evaluated	–	–	–	–	–	–	–	✓
164	*Corchorus depressus*	Mudairi	Not Evaluated	–	–	–	–	–	–	–	✓
165	*Corchorus tridens*	Horn-fruited Jute	Not Evaluated	–	–	–	–	–	–	–	✓
166	*Corchorus trilocularis*	Wild Jute	Not Evaluated	–	–	–	–	–	–	–	✓
167	*Cordia gharaf*	Grey-leaved Cordia	Least Concern	–	–	–	–	–	–	–	✓
168	*Cordia myxa*	Lesuro	Least Concern	–	–	–	–	–	–	–	✓
169	*Coriandrum sativum*	Gisnichh	Not Evaluated	–	–	–	–	–	–	–	✓

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170	*Cornulaca monacantha*	Tahara	Not Evaluated	–	✓	✓	✓	–	✓	–	–
171	*Coronopus didymus*		Not Evaluated	–	–	–	–	–	–	–	✓
172	*Cotoneaster nummularius*	Asian cotoneaster	Not Evaluated	–	–	–	–	–	–	–	✓
173	*Cousinia stocksii*	Naryan Band	Not Evaluated	–	–	–	–	–	–	–	✓
174	*Cressa cretica*	Rudravanti	Least Concern	–	–	–	–	–	–	✓	✓
175	*Crotalaria burhia*	Burhia Rattlepod	Not Evaluated	✓	–	–	✓	–	✓	✓	✓
176	*Cucumis melo*	Muskmelon	Not Evaluated	–	–	–	–	–	–	✓	✓
177	*Cucumis prophetarum*	Zaran chibit	Not Evaluated	–	–	–	–	–	–	–	✓
178	*Cucurbtia maxima*	Kaddoo	Not Evaluated	–	–	–	–	–	–	–	✓
179	*Cuminum cyminum*	Reeza	Not Evaluated	–	–	–	–	–	–	–	✓
180	*Cuscuta cassytoides*	Amarbell	Not Evaluated	–	–	–	–	–	–	–	✓
181	*Cuscuta pulchella*	Paichi	Not Evaluated	–	–	–	–	–	–	–	✓
182	*Cymbopogon jawarancusa*	Katoori	Not Evaluated	–	–	–	–	–	–	–	✓
183	*Cymbopogon jwarancusa*	Katoori	Not Evaluated	–	–	–	–	–	✓	✓	–
184	*Cymbopogon schoenanthus*		Not Evaluated	–	–	–	–	–	–	–	✓
185	*Cynodon dactylon*	Bermuda Grass	Not Evaluated	–	–	✓	–	–	✓	✓	✓

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186	*Cynomorium coccineum*	Maltese Fungus	Not Evaluated	–	–	–	✓	–	✓	–	–
187	*Cyperus bulbosus*		Least Concern	–	–	–	–	–	–	–	✓
188	*Cyperus arenarius*	Mudu Kalanduru	Least Concern	–	–	–	–	–	–	✓	–
189	*Cyperus bulbosus*	Wild Onion	Least Concern	–	–	–	–	–	–	✓	–
190	*Cyperus conglomeratus*	Coco-Grass	Not Evaluated	–	–	–	–	–	–	✓	–
191	*Cyperus longus*	Galingale	Least Concern	–	–	–	–	–	–	✓	–
192	*Cyperus rotundus*	Purple Nutsedge	Least Concern	–	–	–	–	–	–	✓	✓
193	*Dactyloctenium aegyptium*	Crow Foot Grass	Not Evaluated	–	–	–	–	–	–	✓	✓
194	*Dactyloctenium aristatum*	Najm	Not Evaluated	–	–	–	–	–	–	✓	
195	*Dactyloctenium scindicum*	Sind Crowfoot Grass	Not Evaluated	–	–	–	–	–	–	–	✓
196	*Dalbergia sissoo*		Least Concern	–	–	–	–	–	–	–	✓
197	*Daphne oleoides*	Spurge-olive	Not Evaluated	–	–	–	–	–	–	–	✓
198	*Datura alba*	Indian Datura	Not Evaluated	–	–	–	–	–	–	✓	–
199	*Dauscus carota*	Gazir	Not Evaluated	–	–	–	–	–	–	–	✓
200	*Delonix regia*	Royal Poinciana/ Flame Tree	Least Concern	–	–	–	–	–	–	✓	✓
201	*Descurainia sophia*	Roosh	Not Evaluated	–	–	–	–	–	–	–	✓

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202	*Desmostachya bipinnata*	Halfa grass	Least Concern	–	✓	–	–	–	–	–	✓
203	*Dichanthium annulatum*	Sheda Grass	Not Evaluated	–	–	–	–	–	–	–	✓
204	*Dicoma tomentosa*		Not Evaluated	–	–	–	–	–	–	–	✓
205	*Digera muricata*	False Amaranth	Not Evaluated	–	–	–	–	–	–	✓	–
206	*Digeria muricata*	Burr	Not Evaluated	–	–	–	–	–	–	–	✓
207	*Digitaria nodosa*		Not Evaluated	–	–	–	–	–	–	–	✓
208	*Dioscorea communis*	Black Bryony	Not Evaluated	–	–	–	–	–	–	✓	✓
209	*Dipcadi erythraeum*		Not Evaluated	–	–	–	–	–	–	–	✓
210	*Dipteracanthus longifolius*		Not Evaluated	–	–	–	–	–	–	–	✓
211	*Dodonaea viscosa*	Anartirk	Least Concern	–	–	–	–	–	–	–	✓
212	*Ducrosia anthilifolia*	Gowathk	Not Evaluated	–	–	–	–	–	–	–	✓
213	*Dypsis lutescens*	Areca Palm	Near Threatened	–	–	–	–	–	–	✓	✓
214	*Echinochloa colonum*		Least Concern	–	–	–	–	–	–	–	✓
215	*Echinops echinatus*		Not Evaluated	–	–	–	–	–	–	–	✓
216	*Eclipta prostrata*		Least Concern	–	–	–	–	–	–	–	✓
217	*Ehretia aspera*		Data Deficient	–	–	–	–	–	–	–	✓
218	*Elaeagnus angustifolia*	Sinjid	Least Concern	–	–	–	–	–	–	–	✓

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219	*Elaeis guineensis*	African Oil Palm	Least Concern	–	–	–	–	–	–	✓	✓
220	*Eleusine compressa*	Sandbur	Not Evaluated	–	–	✓	✓	–	✓	–	–
221	*Eleusine flagellifera*		Not Evaluated	–	–	–	–	–	–	–	✓
222	*Eleusine indica*	Indian Goosegrass	Not Evaluated	–	–	–	–	–	–	✓	–
223	*Elionurus royleanus*		Not Evaluated	–	–	–	–	–	–	–	✓
224	*Elwendia persica*	Zera Siyah	Not Evaluated	–	–	–	–	–	–	–	✓
225	*Enhydra fluctuans*		Not Evaluated	–	–	–	–	–	–	–	✓
226	*Ephedra ciliata*	Naromb	Least Concern	–	–	–	–	–	–	–	✓
227	*Ephedra foliata*		Least Concern	–	–	–	–	–	–	–	✓
228	*Ephedra intermedia*	Naromb	Least Concern	–	–	–	–	–	–	–	✓
229	*Ephedra nebrodensis*		Not Evaluated	–	–	–	–	–	–	–	✓
230	*Ephedra procera*	Naromb	Not Evaluated	–	–	–	–	–	–	–	✓
231	*Epilacia ammophila*		Not Evaluated	–	–	–	–	–	–	–	✓
232	*Epipremnum aureum*	Money Plant	Not Evaluated	–	–	–	–	–	–	✓	✓
233	*Equisetum debile*		Least Concern	–	–	–	–	–	–	–	✓
234	*Eragrostis ciliaris*	Gophertail Lovegrass	Not Evaluated	–	–	–	–	–	–	✓	✓
235	*Eragrostis cynosuroides*	Kush	Not Evaluated	–	–	–	–	–	–	–	✓
236	*Eragrostis pilosa*	Indian lovegrass	Not Evaluated	–	–	–	–	–	–	–	✓

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237	*Eragrostris japonica*	Soft Grass	Not Evaluated	–	–	–	–	–	–	✓	✓
238	*Eremurus vehitinus*	Foxtail lilies	Not Evaluated	–	–	–	–	–	–	–	✓
239	*Erigeron canadensis*		Not Evaluated	–	–	–	–	–	–	–	✓
240	*Eucalyptus camaldulensis*	River Red Gum	Near Threatened	–	–	–	✓	–	✓	✓	✓
241	*Eucalyptus citriodora*		Least Concern	–	–	–	–	–	–	–	✓
242	*Euphorbia caducifolia*	Kheer Wal	Not Evaluated	–	–	–	–	–	–	–	✓
243	*Euphorbia falcata*	Sickle Spurge	Not Evaluated	–	–	–	–	–	–	–	✓
244	*Euphorbia granulata*	Prostrate Spurge	Not Evaluated	–	–	–	–	–	–	–	✓
245	*Euphorbia helioscopia*	Zahar	Not Evaluated	–	–	–	–	–	–	–	✓
246	*Euphorbia hirta*	Asthma Weed, Pill-Bearing Spurge	Not Evaluated	–	–	–	–	–	–	✓	–
247	*Euphorbia hirta*		Not Evaluated	–	–	–	–	–	–	–	✓
248	*Euphorbia milii*	Crown of Thorns/Christ Plant	Least Concern	–	–	–	–	–	–	✓	✓
249	*Euphorbia prostrata*	Prostrate Spurge	Not Evaluated	–	–	–	–	–	–	–	✓
250	*Euphorbia serpens*	Matted Sandmat	Not Evaluated	–	–	–	–	–	–	✓	–
251	*Euphorbia tirucalli*		Least Concern	–	–	–	–	–	–	–	✓
252	*Euphorbia neriifolia*	Indian Spurge Tree	Least Concern	–	–	–	–	–	–	✓	

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253	*Evolvulus alsinoides*		Not Evaluated	–	–	–	–	–	–	–	✓
254	*Fagonia arabica*	Dhamasa	Not Evaluated	–	–	–	–	–	–	–	✓
255	*Fagonia bruguieri*	Gul-e- kakarh	Not Evaluated	–	–	–	–	–	–	–	✓
256	*Fagonia cretica*	Virgin's mantle	Not Evaluated	–	✓	–	–	✓	–	✓	–
257	*Fagonia indica*	Fagon Bushes	Not Evaluated	–	–	–	–	–	–	✓	✓
258	*Fagonia ovalifolia*	Showeika	Not Evaluated	–	–	✓	✓	–	✓	–	–
259	*Farsetia jacquemontii*		Not Evaluated	–	–	–	–	–	–	–	✓
260	*Ferula asafoetida*	Hing	Not Evaluated	–	–	–	–	–	–	–	✓
261	*Ferula oopoda*	Hing	Not Evaluated	–	–	–	–	–	–	–	✓
262	*Ficus benghalensis*		Not Evaluated	–	–	–	–	–	–	–	✓
263	*Ficus carica*	Anjeer	Least Concern	–	–	–	–	–	–	–	✓
264	*Ficus johannis*	Afghan Fig	Least Concern	–	–	–	–	–	✓	–	✓
265	*Ficus palmata*	Anjer	Least Concern	–	–	–	–	–	–	–	✓
266	*Ficus religiosa*	Peepal Tree	Least Concern	–	–	–	–	–	–	✓	✓
267	*Foeniculum vulgare*	Wadof	Not Evaluated	–	–	–	–	–	–	–	✓
268	*Forsskaolea tenacissima*		Not Evaluated	–	–	–	–	–	–	–	✓
269	*Fortuynia bungei*	-	Not Evaluated	–	–	–	✓	–	✓	–	–
270	*Fraxinus xanthoxyloides*	Afghan Ash	Not Evaluated	–	–	–	–	–	–	–	✓

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271	*Fumaria indica*	Shatira	Not Evaluated	–	–	–	–	–	–	–	✓
272	*Gentianodes olivieri*	Bangairo	Not Evaluated	–	–	–	–	–	–	–	✓
273	*Glinus lotoides*	Lotus Sweetjuice	Least Concern	–	–	–	–	–	–	✓	✓
274	*Glossonema varians*	Attar	Not Evaluated	–	–	–	–	–	–	–	✓
275	*Glycyrrhiza glabra*	Madav	Least Concern	–	–	–	–	–	–	–	✓
276	*Gossypium stocksii*		Not Evaluated	–	–	–	–	–	–	–	✓
277	*Grewia asiatica*	Faalsa	Least Concern	–	–	–	–	–	–	✓	✓
278	*Grewia tenax*	Gangi	Least Concern	–	–	–	–	–	–	✓	✓
279	*Grewia villosa*		Least Concern	–	–	–	–	–	–	–	✓
280	*Gymnocarpus decadrus*		Not Evaluated	–	–	–	–	–	–	–	✓
281	*Gymnosporia senegalensis*		Least Concern	–	–	–	–	–	–	–	✓
282	*Halopyrum mucronatum*	Beach Grass	Not Evaluated	–	–	–	–	–	–	✓	✓
283	*Halostachys belangeriana*	-	Least Concern	–	–	–	–	–	–	✓	–
284	*Haloxylon ammodendron*	Saxaul	Least Concern	–	–	–	–	–	–	–	✓
285	*Haloxylon griffithii*	Bundi	Not Evaluated	–	–	–	–	–	–	–	✓
286	*Haloxylon persicum*	White Saxaul	Least Concern	✓	✓	✓	✓	–	✓	–	–
287	*Haloxylon recurvum*		Not Evaluated	–	–	–	–	–	–	–	✓

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288	*Haloxylon salicornicum*	Rimth Saltbush	Not Evaluated	–	✓	✓	✓	✓	✓	✓	✓
289	*Haplophyllum padicellatum*	Gandaraim	Not Evaluated	–	–	–	–	–	–	–	✓
290	*Haplophyllum tuberculatum*	Ganderam	Not Evaluated	–	–	–	–	–	–	–	✓
291	*Helianthus annuus*	Sun Flower	Least Concern	–	–	–	–	–	–	–	✓
292	*Heliotropium bacciferum*	Salt Heliotrope	Not Evaluated	–	–	–	–	–	–	✓	–
293	*Heliotropium crispum*	Cherry Pie Flower	Not Evaluated	✓	–	✓	✓	–	✓	✓	✓
294	*Heliotropium curassavicum*	Salt Heliotrope	Least Concern	–	–	–	–	–	–	✓	–
295	*Heliotropium dasycarpum*	Sagdaroo	Not Evaluated	–	–	–	–	–	–	–	✓
296	*Heliotropium europaeum*	Gidar wal	Not Evaluated	–	–	–	–	–	–	–	✓
297	*Heliotropium ophioglossum*	Adder's -Tongue Ferns	Not Evaluated	–	–	–	–	–	–	✓	–
298	*Heliotropium ophioglossum*		Not Evaluated	–	–	–	–	–	–	–	✓
299	*Heliotropium strigosum*	Bristly Heliotrope/ Gorakh Pam	Not Evaluated	–	–	–	–	–	–	✓	–
300	*Heliotropium subulatum*	Pilo Hathi Sundho	Not Evaluated	–	–	–	–	–	–	–	✓
301	*Heliotropium ulophyllum*	Popat	Not Evaluated	–	–	–	–	–	–	–	✓
302	*Heliotropium undulatum*	Turnsole	Not Evaluated	–	–	–	–	–	–	–	✓

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303	*Heliotropium zeylanicum*	Salt Heliotrope	Not Evaluated	–	–	✓	–	–	✓	–	–
304	*Hertia intermedia*	Manguli	Not Evaluated	–	–	–	–	–	–	–	✓
305	*Hibiscus aristivalvis*		Not Evaluated	–	–	–	–	–	–	–	✓
306	*Hibiscus micranthus*		Not Evaluated	–	–	–	–	–	–	–	✓
307	*Hibiscus rosa-sinensis*	Hibiscus/China Rose	Not Evaluated	–	–	–	–	–	–	✓	✓
308	*Hochstetteria schimperi*		Not Evaluated	–	–	–	–	–	–	–	✓
309	*Hydrilla verticillata*		Least Concern	–	–	–	–	–	–	–	✓
310	*Indigofera cordifolia*	Heart-Leaf Indigo.	Not Evaluated	–	–	–	–	–	–	✓	✓
311	*Indigofera hochstetteri*	Sind Indigo	Least Concern	–	–	–	–	–	–	✓	✓
312	*Indigofera linifolia*	Narrow-leaf Indigo	Least Concern	–	–	–	–	–	–	–	✓
313	*Indigofera oblongifolia*	Lathio	Least Concern	✓	–	–	–	–	–	✓	✓
314	*Indigofera sessiliflora*	Stalkless Indigo	Least Concern	–	–	–	–	–	–	✓	–
315	*Inula granteoides*		Not Evaluated	–	–	–	–	–	–	–	✓
316	*Iphiona grantioides*		Not Evaluated	–	–	–	–	–	–	–	✓
317	*Ipomoea carnea*		Not Evaluated	–	–	–	–	–	–	–	✓
318	*Ipomoea pes caprae*	Beach Morning Glory	Least Concern	–	–	–	–	–	–	✓	✓
319	*Isatis stocksii*		Not Evaluated	–	–	–	–	–	–	–	✓
320	*Ixiolirion tatarium*	Sosing	Not Evaluated	–	–	–	–	–	–	–	✓

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321	*Jacaranda mimosifolia*	Blue Jacaranda /Karcunda	Vulnerable	–	–	–	–	–	–	–	✓
322	*Jasminum sambac*	Motia	Not Evaluated	–	–	–	–	–	–	✓	✓
323	*Jaubertia aucheri*	Thusso	Not Evaluated	–	–	–	–	–	–	–	✓
324	*Juglans regia*	Common Walnut	Least Concern	–	–	–	–	–	–	–	✓
325	*Juncellus laevigatus*	Smooth Flatsedge	Least Concern	✓	–	–	–	–	–	–	–
326	*Juncus maritimus*		Least Concern	–	–	–	–	–	–	–	✓
327	*Juniperus excelsa*	Apurhs	Least Concern	–	–	–	–	–	–	–	✓
328	*Justica heterocarpa*		Not Evaluated	–	–	–	–	–	–	–	✓
329	*Kickxia ramosissima*		Not Evaluated	–	–	–	–	–	–	–	✓
330	*Koelpinia linearis*		Not Evaluated	–	–	–	–	–	–	–	✓
331	*Lasiurus hirsutus*	Sewan Grass	Not Evaluated	–	–	–	–	–	–	✓	–
332	*Lasiurus hirsutus*		Not Evaluated	–	–	–	–	–	–	–	✓
333	*Lasiurus scindicus*	Sewan Grass	Not Evaluated	–	–	–	–	–	✓	–	–
334	*Lasiurus sindicus*		Not Evaluated	–	–	–	–	–	–	–	✓
335	*Launaea glomerata*	Lone'ah megubbevet	Not Evaluated	–	–	–	–	–	–	–	✓
336	*Launaea nudicaulis*		Not Evaluated	–	–	–	–	–	–	–	✓
337	*Launaea procumbens*	Creeping Launaea	Not Evaluated	–	–	–	–	–	–	✓	–

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338	*Launaea resedifolia*	Bold-Leaf Launaea	Not Evaluated	–	–	–	–	–	–	✓	–
339	*Lawsonia inermis*	Mehndi	Least Concern	–	–	–	–	–	–	–	✓
340	*Lemna minor*		Least Concern	–	–	–	–	–	–	–	✓
341	*Leptadenia pyrotechnica*	Khipp	Least Concern	–	–	–	–	–	–	✓	✓
342	*Leptadenia spartium*		Not Evaluated	–	–	–	–	–	–	–	✓
343	*Leptorhabdos benthamiana*		Not Evaluated	–	–	–	–	–	–	–	✓
344	*Leptothrium senegalense*	Hook Grass	Not Evaluated	–	–	–	–	–	–	✓	–
345	*Leucas nutans*	Drooping Leucas	Not Evaluated	–	–	–	–	–	–	–	✓
346	*Leucas urticifolia*		Not Evaluated	–	–	–	–	–	–	–	✓
347	*Limeum indicum*		Not Evaluated	–	–	–	–	–	–	–	✓
348	*Limonium stocksii*	Sea-Lavender	Not Evaluated	–	–	–	–	–	–	✓	–
349	*Limonium stocksii*		Not Evaluated	–	–	–	–	–	–	–	✓
350	*Lindenbergia indica*		Least Concern	–	–	–	–	–	–	–	✓
351	*Linum perenne*	Barhz	Not Evaluated	–	–	–	–	–	–	–	✓
352	*Lippia nodiflora*		Not Evaluated	–	–	–	–	–	–	–	✓
353	*Livistona chinensis*	Chinese Fan Palm	Not Evaluated	–	–	–	–	–	–	✓	✓
354	*Lolium temulentum*		Not Evaluated	–	–	–	–	–	–	–	✓

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355	*Lonicera hypoleuca*		Not Evaluated	–	–	–	–	–	–	–	✓
356	*Lotus garcinii*	Kanwal/Lotus	Not Evaluated	–	–	–	–	–	–	✓	✓
357	*Lycium depressum*		Not Evaluated	–	–	–	–	–	–	–	✓
358	*Lycium europaeum*		Not Evaluated	–	–	–	–	–	–	–	✓
359	*Maerua arenaria*		Not Evaluated	–	–	–	–	–	–	–	✓
360	*Magnolia champaca*	White Champa/Farangipani	Least Concern	–	–	–	–	–	–	✓	✓
361	*Malcolmia africana*	African Mustard	Not Evaluated	–	–	–	–	–	–	–	✓
362	*Malcolmia scorpioides*	Virginia Stock	Not Evaluated	–	–	–	✓	–	✓	–	–
363	*Malva neglecta*	Common Mallow	Not Evaluated	–	–	–	–	–	–	–	✓
364	*Malva parviflora*		Not Evaluated	–	–	–	–	–	–	–	✓
365	*Malva sylvestris*	Tusso	Not Evaluated	–	–	–	–	–	–	–	✓
366	*Malvastrum coromandelianum*		Not Evaluated	–	–	–	–	–	–	–	✓
367	*Mangifera indica*	Mango/Aam	Data Deficient	–	–	–	–	–	–	✓	✓
368	*Matricaria lasiocarpa*	German chamomile	Not Evaluated	–	–	–	–	–	–	–	✓
369	*Medicago sativa*	Alfalfa	Least Concern	–	–	–	–	–	–	–	✓
370	*Melia azedarach*	Zahr	Not Evaluated	–	–	–	–	–	–	–	✓
371	*Melilotus indicus*		Not Evaluated	–	–	–	–	–	–	–	✓

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372	*Melva neglecta*		Not Evaluated	–	–	–	–	–	–	–	✓
373	*Mentha longifolia*	Poorchink	Least Concern	–	–	–	–	–	–	–	✓
374	*Merremia dissecta*		Not Evaluated	–	–	–	–	–	–	–	✓
375	*Microcephala lamellata*	Pehun Phuli	Not Evaluated	–	–	–	–	–	–	–	✓
376	*Mimosa hamata*		Not Evaluated	–	–	–	–	–	–	–	✓
377	*Mimosa pudica*	Touch Me Not/ Chui Moi	Least Concern	–	–	–	–	–	–	✓	✓
378	*Mirabilis jalapa*	Gul-e-Abbas	Not Evaluated	–	–	–	–	–	–	–	✓
379	*Momordica balsamina*		Not Evaluated	–	–	–	–	–	–	–	✓
380	*Momordica charantia*	Karela	Not Evaluated	–	–	–	–	–	–	–	✓
381	*Monosonia heliotropioides*		Not Evaluated	–	–	–	–	–	–	–	✓
382	*Monsonia senegalensis*		Not Evaluated	–	–	–	–	–	–	–	✓
383	*Moringa oleifera*	Drumstick Tree / Suhanjana	Least Concern	–	–	–	–	–	–	✓	–
384	*Moringa olifera*	Drumstick tree / Suhanjana	Not Evaluated	–	–	–	–	–	–	–	✓
385	*Morus alba*		Least Concern	–	–	–	–	–	–	–	✓
386	*Morus nigra*	Toot	Data Deficient	–	–	–	–	–	–	–	✓
387	*Najas minor*		Least Concern	–	–	–	–	–	–	–	✓

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388	*Nannorrhops ritchiana*	Mazari Palm	Not Evaluated	–	–	–	–	–	–	–	✓
389	*Nepeta praetervisa*	Simsok	Not Evaluated	–	–	–	–	–	–	–	✓
390	*Nerium odorum*	Rosebay	Not Evaluated	–	–	–	–	–	–	–	✓
391	*Nothoserua bracteata*		Not Evaluated	–	–	–	–	–	–	–	✓
392	*Ochradenus baccatus*		Least Concern	–	–	–	–	–	–	–	✓
393	*Ocimum americanum*		Not Evaluated	–	–	–	–	–	–	–	✓
394	*Ocimum basilicum*	Nazboo	Not Evaluated	–	–	–	–	–	–	–	✓
395	*Oldenlandia aspera*	Small-flowered Kohautia	Not Evaluated	–	–	–	–	–	–	–	✓
396	*Oldenlandia retrorsa*		Not Evaluated	–	–	–	–	–	–	–	✓
397	*Olea cuspidata*	Indian olive	Not Evaluated	–	–	–	–	–	–	–	✓
398	*Olea ferruginea*	Kahoo	Not Evaluated	–	–	–	–	–	–	–	✓
399	*Oligochaeta ramosa*	Oont Kantalo	Not Evaluated	–	–	–	–	–	–	–	✓
400	*Oligomeris linifolia*	Shootk	Not Evaluated	–	–	–	–	–	–	–	✓
401	*Onobrychis dealbata*	Chunka shanpashtir	Not Evaluated	–	–	–	–	–	–	–	✓
402	*Onobrychis tavernierifolia*	Bamus na Phuli	Not Evaluated	–	–	–	–	–	–	–	✓
403	*Ornithopsis intermedia*		Not Evaluated	–	–	–	–	–	–	–	✓
404	*Orygia decumbens*	Prostrate Purslane	Not Evaluated	–	–	–	–	–	–	✓	–

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405	*Oxalis corriculata*	Ust Panni	Not Evaluated	–	–	–	–	–	–	–	✓
406	*Oxystelma esculentum*		Least Concern	–	–	–	–	–	–	–	✓
407	*Pandanus odorifer*	Kewra/ Screw-Pine	Least Concern	–	–	–	–	–	–	✓	✓
408	*Panicum antidotale*		Not Evaluated	–	–	–	–	–	–	–	✓
409	*Panicum sp.*	Panicgrass	Not Assessed	–	–	–	–	–	✓	–	–
410	*Panicum turgidum*	Desert Grass	Not Evaluated	–	✓	✓	✓	✓	✓	✓	✓
411	*Papaver somniferum*	Kokinar	Not Evaluated	–	–	–	–	–	–	–	✓
412	*Parkinsonia aculeata*	Palo Verde	Least Concern	–	–	–	–	–	–	–	✓
413	*Paspalidium geminatum*		Least Concern	–	–	–	–	–	–	–	✓
414	*Pavonia arabica*		Not Evaluated	–	–	–	–	–	–	–	✓
415	*Pavonia procumbens*		Not Evaluated	–	–	–	–	–	–	–	✓
416	*Pedalium murex*		Not Evaluated	–	–	–	–	–	–	–	✓
417	*Peganam harmala*	Kisankoor	Not Evaluated	–	–	–	–	–	–	–	✓
418	*Peganum harmala*	Syrian rue	Not Evaluated	–	–	✓	✓	–	✓	–	–
419	*Pennesitum orientale*		Not Evaluated	–	–	–	–	–	–	–	✓
420	*Pennisetum flaccidum*	Flaccid Grass	Not Evaluated	–	–	–	–	–	–	–	✓
421	*Pennisetum orientale*	Oriental Fountain Grass	Not Evaluated	–	–	–	–	–	–	–	✓

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422	*Pentanema divaricatum*	Phosri	Not Evaluated	–	–	–	–	–	–	–	✓
423	*Pentatropis nivalis*	White Milkweed	Not Evaluated	–	–	–	–	–	–	–	✓
424	*Pentatropis spiralis*		Not Evaluated	–	–	–	–	–	–	–	✓
425	*Pergularia daemia*		Least Concern	–	–	–	–	–	–	–	✓
426	*Periploca aphylla*	Leafless Silkflower Shrub	Not Evaluated	–	–	–	–	–	–	–	✓
427	*Peristrophe bicalyculata*		Not Evaluated	–	–	–	–	–	–	–	✓
428	*Perovskia abrotanoides*	Dresha	Not Evaluated	–	–	–	–	–	–	–	✓
429	*Perovskia artiplicifolia*	Guari darna	Not Evaluated	–	–	–	–	–	–	–	✓
430	*Phoenix dactylifera*	Date Palm /Khajoor	Not Evaluated	–	✓	✓	✓	–	✓	✓	✓
431	*Phragmites australis*	Common Reed/ Nara Ghass	Least Concern	–	–	–	–	–	–	✓	–
432	*Phragmites karka*	Tall Reed	Least Concern	–	–	–	–	✓	–	✓	✓
433	*Physalis minima*		Not Evaluated	–	–	–	–	–	–	–	✓
434	*Physorhynchus chamaerapistrum*	Bladder-seed	Not Evaluated	–	–	–	✓	–	✓	–	–
435	*Pisonia alba*	Cabbage Tree	Not Evaluated	–	–	–	–	–	–	✓	✓
436	*Pistacia atlantica*	Guan	Near Threatened	–	–	–	–	–	–	–	✓
437	*Pistacia cabulica*		Not Evaluated	–	–	–	–	–	–	–	✓

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438	*Pistacia khinjjuk*	Guan	Not Evaluated	–	–	–	–	–	–	–	✓
439	*Pistacia terebinthus*		Least Concern	–	–	–	–	–	–	–	✓
440	*Pistia stratiotes*		Least Concern	–	–	–	–	–	–	–	✓
441	*Pithecellobium dulce*	Camachile/ Jangly Jaleebi	Least Concern	–	–	–	–	–	–	✓	✓
442	*Plantago ciliata*	Bartang	Not Evaluated	–	–	–	–	–	–	–	✓
443	*Plantago lanceolata*	Ispaghol	Not Evaluated	–	–	–	–	–	–	–	✓
444	*Plantago major*	Broadleaf Plantain	Least Concern	–	–	–	–	–	–	–	✓
445	*Plumeria rubra*	Frangipani	Least Concern	–	–	–	–	–	–	✓	✓
446	*Polycarpaea corymbosa*	Old Man's Cap	Not Evaluated	–	–	–	–	–	–	–	✓
447	*Polycarpaea spicata*	-	Least Concern	–	–	–	–	–	–	✓	✓
448	*Polygala erioptera*	Woolly-winged Milkwort	Not Evaluated	–	–	–	–	–	–	–	✓
449	*Polygonum patulum*		Not Evaluated	–	–	–	–	–	–	–	✓
450	*Polypogon monspeliensis*	Annual Beard Grass	Least Concern	–	–	–	–	–	–	–	✓
451	*Populus euphratica*		Least Concern	–	–	–	–	–	–	–	✓
452	*Portulaca oleracea*	Pichli	Least Concern	–	–	–	–	–	–	–	✓
453	*Potamogeton pectinatus*		Least Concern	–	–	–	–	–	–	–	✓
454	*Potamogeton perfoliatus*	Perfoliate Pondweed	Least Concern	–	–	–	–	–	–	–	✓

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455	*Potentilla supina*	Pushkun Phul	Least Concern	–	–	–	–	–	–	–	✓
456	*Potentilla supina*	Potentille Couchée	Least Concern	–	–	–	–	–	–	–	✓
457	*Prosopis cineraria*	Khandi	Not Evaluated	–	–	–	–	–	–	✓	✓
458	*Prosopis glandulosa*	Honey Mesquite	Least Concern	✓	–	–	–	–	✓	✓	✓
459	*Prosopis juliflora*	Devi	Least Concern	✓	–	–	–	✓	–	✓	✓
460	*Prosopis spicigera*		Not Evaluated	–	–	–	–	–	–	–	✓
461	*Prunus domestica*	Santroza	Data Deficient	–	–	–	–	–	–	–	✓
462	*Prunus eburnea*	Wild Almond	Not Evaluated	–	–	–	–	–	–	–	✓
463	*Psammogeton biternatum*	Izbotk	Not Evaluated	–	–	–	–	–	–	–	✓
464	*Psammogeton cabulicus*		Not Evaluated	–	–	–	–	–	–	–	✓
465	*Psidium guajava*	Guava /Amrood	Least Concern	–	–	–	–	–	–	✓	✓
466	*Pteropyrum olivieri*	Karwan Kush	Not Evaluated	–	–	–	–	–	–	–	✓
467	*Pulicaria angustifolia*		Not Evaluated	–	–	–	–	–	–	–	✓
468	*Pulicaria boissieri*		Not Evaluated	–	–	–	–	–	–	–	✓
469	*Punica granatum*	Anar	Least Concern	–	–	–	–	–	–	–	✓
470	*Pupalia lappacea*		Least Concern	–	–	–	–	–	–	–	✓
471	*Raphanus sativus*	Radish	Not Evaluated	–	–	–	–	–	–	–	✓

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472	*Rhazya stricta*	Senhwar	Not Evaluated	–	–	–	–	–	–	✓	✓
473	*Rhizophora mucronata*		Least Concern	–	–	–	–	–	–	–	✓
474	*Rhus mysorensis*		Not Evaluated	–	–	–	–	–	–	–	✓
475	*Rhynchosia minima*	Least Snout-bean	Least Concern	–	–	–	–	–	–	–	✓
476	*Ricinus communis*	Bedanjeer	Not Evaluated	–	–	–	–	–	–	–	✓
477	*Rosa indica*	Gul Gulap	Not Evaluated	–	–	–	–	–	–	–	✓
478	*Rosa lacerans*		Not Evaluated	–	–	–	–	–	–	–	✓
479	*Rostraria cristata*	Mediterranean Hairgrass	Not Evaluated	–	–	–	–	–	–	–	✓
480	*Rumex vesicarius*	Bladder Dock	Not Evaluated	–	–	–	✓	–	✓	–	✓
481	*Saccharum bengalense*	Munj Sweetcane	Not Evaluated	–	–	–	–	–	–	–	✓
482	*Saccharum griffithii*	Kashum	Not Evaluated	–	–	–	–	–	–	–	✓
483	*Saccharum munja*	Haado	Not Evaluated	–	–	–	–	✓	–	✓	✓
484	*Saccharum spontaneum*	Canne Dauvage	Least Concern	–	–	–	–	–	–	–	✓
485	*Salix tetrasperma*	Indian Willow	Least Concern	–	–	–	✓	–	✓	–	
486	*Salmalia malabarica*		Least Concern	–	–	–	–	–	–	–	✓
487	*Salsola arbuscula*		Not Evaluated	–	–	–	–	–	–	–	✓
488	*Salsola baryosma*	Milchit mav'ishah	Not Evaluated	–	–	–	–	–	–	–	✓

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489	*Salsola foetida*		Not Evaluated	–	–	–	–	–	–	–	✓
490	*Salsola imbricata*	Fetid Saltwort	Not Evaluated	–	–	–	–	–	–	✓	–
491	*Salsola kali*	Prickly Russian Thistle	Not Evaluated								✓
492	*Salsola stocksii*	Saltwort	Not Evaluated	–	–	✓	✓	–	✓	✓	–
493	*Salvadora oleoides*	Jar / Peroon	Data Deficient	–	–	–	–	✓	–	✓	✓
494	*Salvadora persica*	Arak	Least Concern	–	–	–	–	–	–	✓	✓
495	*Salvia bucharica*	Gul-e-Kakar	Not Evaluated	–	–	–	–	–	–	–	✓
496	*Salvia cabulica*	Matetav	Not Evaluated	–	–	–	–	–	–	–	✓
497	*Salvia santolinifolia*		Not Evaluated	–	–	–	–	–	–	–	✓
498	*Sarcostemma stocksii*		Not Evaluated	–	–	–	–	–	–	–	✓
499	*Schweinfurthia papilionacea*		Not Evaluated	–	–	–	–	–	–	–	✓
500	*Scirpus capitatus*		Not Evaluated	–	–	–	–	–	–	–	✓
501	*Scorzonera tortuosissima*	Shamahur	Not Evaluated	–	–	–	–	–	–	–	✓
502	*Seddera latifolia*	-	Not Evaluated	–	–	–	–	–	✓	–	✓
503	*Senegalia modesta*	Palosa	Not Evaluated	–	–	–	–	–	–	–	✓
504	*Senna alexandrina*	Sana makki	Least Concern	–	–	–	–	–	–	–	✓
505	*Senna angustifolia*		Not Evaluated	–	–	–	–	–	–	–	✓

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506	*Senna holosericea*	-	Not Evaluated	–	–	–	–	–	–	✓	✓
507	*Senna italica*	Senegal Senna	Not Evaluated	–	–	–	–	✓	–	✓	–
508	*Senna obovata*		Not Evaluated	–	–	–	–	–	–	–	✓
509	*Senna occidentalis*	Coffe Senna	Least Concern	–	–	–	–	–	–	–	✓
510	*Senra incana*		Not Evaluated	–	–	–	–	–	–	–	✓
511	*Seriphidium quettense*	Bootao/Jir	Not Evaluated	–	–	–	–	–	–	–	✓
512	*Sesamum indicum*	Tirr/Till	Not Evaluated	–	–	–	–	–	–	–	✓
513	*Sesbania aegyptiaca*		Not Evaluated	–	–	–	–	–	–	–	✓
514	*Sesbania bispinosa*	Dunchi Fiber	Least Concern	–	–	–	–	–	–	–	–
515	*Sesbania grandiflora*	West Indian Pea Tree	Data Deficient	–	–	–	–	✓	–	✓	–
516	*Setaria intermedia*	Kutela	Not Evaluated								✓
517	*Setaria verticillata*	Bristly Foxtail	Not Evaluated	–	–	–	–	–	–	✓	✓
518	*Sida ovata*	Oval-leaf Fan-petals	Not Evaluated	–	–	–	–	–	–	✓	–
519	*Sida spinosa*	Prickly Fanpetals	Not Evaluated	–	–	–	–	–	–	–	✓
520	*Sisymbrium irio*	Jangli siray	Not Evaluated	–	–	–	–	–	–	–	✓
521	*Solanum albicaule*		Not Evaluated	–	–	–	–	–	–	–	✓
522	*Solanum nigrum*	Tol angur	Not Evaluated	–	–	–	–	–	–	–	✓
523	*Solanum surattense*	Bahera	Not Evaluated	–	–	–	–	–	–	–	✓

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524	*Solanum tuberosum*	Patata	Not Evaluated	–	–	–	–	–	–	–	✓
525	*Sonchus asper*	Prickly Sowthistle	Not Evaluated	–	–	–	–	–	–	–	✓
526	*Sophora alopecuroides*	Bitter Bean	Not Evaluated	–	–	–	–	–	✓	–	✓
527	*Sophora griffithii*	Edwardsia griffithii	Not Evaluated	–	–	–	–	–	–	–	✓
528	*Sophora mollis*	Shampashteer	Not Evaluated	–	–	–	–	–	–	–	✓
529	*Sorghum bicolor*	Jawari	Not Evaluated	–	–	–	–	–	–	–	✓
530	*Spergularia diandra*	Dandalo	Not Evaluated	–	–	–	–	–	–	–	✓
531	*Spiraea bronica*		Not Evaluated	–	–	–	–	–	–	–	✓
532	*Sporobolus arabicus*	Desert Grass	Not Evaluated	✓	–	–	–	–	–	✓	–
533	*Sporobolus coromendelianus*		Not Evaluated								✓
534	*Sporobolus virginicus*	Coastal Rat-Tail Grass	Least Concern	–	–	–	–	–	–	✓	–
535	*Sterculia foetida*	The Ghost Tree	Least Concern	–	–	–	–	–	–	✓	✓
536	*Stipa cabulica*		Not Evaluated	–	–	–	–	–	–	–	✓
537	*Stipa capillata*	Needle Grass	Not Evaluated	–	–	–	–	–	✓	–	–
538	*Stipa himalacia*		Not Evaluated	–	–	–	–	–	–	–	✓
539	*Stipa pennata*	Needle Grass	Not Evaluated	–	–	–	–	–	–	–	✓
540	*Stocksia brahuica*	–	Not Evaluated	–	–	–	–	–	✓	–	✓

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541	*Suaeda fruticosa*	Shrubby Seablite	Not Evaluated	–	–	–	–	–	–	✓	–
542	*Suaeda fruticosa*	Lani/ Lar,ri	Not Evaluated	–	–	–	–	–	–	–	✓
543	*Suaeda monoica*		Not Evaluated	–	–	–	–	–	–	–	✓
544	*Suaeda vermiculata*		Not Evaluated	–	–	–	–	–	–	–	✓
545	*Swertia chirayita*	Chiraita	Not Evaluated	–	–	–	–	–	–	–	✓
546	*Syzygium aromaticum*	Lawang	Not Evaluated	–	–	–	–	–	–	–	✓
547	*Syzygium cumini*	Blackberry/Jamun Tree	Least Concern	–	–	–	–	–	–	✓	✓
548	*Tamarindus indica*	Imlee	Least Concern	–	–	–	–	–	–	✓	✓
549	*Tamarix aphylla*	Athel Tamarisk	Least Concern	–	–	✓	✓	✓	✓	✓	✓
550	*Tamarix articulata*		Not Evaluated	–	–	–	–	–	–	–	✓
551	*Tamarix dioica*	Lai Gez	Least Concern	–	–	–	–	–	–	–	✓
552	*Tamarix gallica*	French Tamarisk	Least Concern	–	–	–	–	–	–	–	✓
553	*Tamarix indica*	Salt Cedar	Least Concern	–	–	–	–	–	–	–	✓
554	*Tamarix karelini*	Kirri	Not Evaluated	–	–	–	–	–	–	–	✓
555	*Tamarix macrocarpa*		Not Evaluated	–	–	–	–	–	–	–	✓
556	*Tamarix stricta*	-	Data Deficient	✓	✓	✓	✓	–	✓	–	✓
557	*Tamarix szovitsiana*	Kirri	Data Deficient	–	–	–	–	–	–	–	✓

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558	*Taraxacum neolobulatum*	Chaman na Phul	Not Evaluated	–	–	–	–	–	–	–	✓
559	*Tecomella undulata*	Desert Teak	Endangered	–	–	–	–	–	–	–	✓
560	*Tephrosia strigosa*	Bristly Tephrosia	Not Evaluated	–	–	–	–	–	–	✓	✓
561	*Tephrosia subtriflora*		Not Evaluated	–	–	–	–	–	–	–	✓
562	*Tephrosia uniflora*	Rock Tephrosia	Not Evaluated	✓	–	–	–	–	✓	✓	✓
563	*Terminalia arjuna*		Not Evaluated	–	–	–	–	–	–	–	✓
564	*Tetrapogon villosus*	Shaggy Finger Grass	Not Evaluated	–	–	–	–	–	–	–	✓
565	*Teucrium stocksianum*	Kalpora	Not Evaluated	–	–	–	–	–	–	–	✓
566	*Thespesia populnea*	Portia Tree	Least Concern	–	–	–	–	–	–	–	✓
567	*Thymus linearis*	Jangli ajwain	Not Evaluated	–	–	–	–	–	–	–	✓
568	*Thymus serpyllum*	Creeping Thyme	Not Evaluated	–	–	–	–	–	–	–	✓
569	*Tragus roxburghii*		Not Evaluated	–	–	–	–	–	–	–	✓
570	*Trianthema pentandra*	African Purslane	Not Evaluated	–	–	–	–	–	–	–	✓
571	*Tribulus longipetalum*	Gurgandako	Not Evaluated	–	–	–	–	–	–	–	✓
572	*Tribulus pentandrus*	Caltrop	Not Evaluated	–	–	–	–	–	–	–	✓
573	*Tribulus terrestris*	Puncture Vine	Least Concern	–	✓	✓	✓	–	✓	✓	✓
574	*Trichodesma africanum*	Charmahing	Not Evaluated	–	–	–	–	–	–	–	✓

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575	*Trichodesma amplexicaule*		Not Evaluated	–	–	–	–	–	–	–	✓
576	*Trichodesma indicum*	Gau zaban	Not Evaluated	–	–	–	–	–	–	–	✓
577	*Triticum aestivum*	Kholam/ karank, Ann, Gandum	Not Evaluated	–	–	–	–	–	–	–	✓
578	*Typha angustata*		Not Evaluated	–	–	–	–	–	–	–	✓
579	*Urochondra setulosa*	Creek Rat-Tail Grass	Not Evaluated	–	–	–	–	–	–	✓	–
580	*Urochondra setulosa*		Not Evaluated								✓
581	*Vachellia jacquemontii*	Bhabri	Least Concern	–	–	✓	–	–	✓	✓	–
582	*Vachellia nilotica*	Babur/ Kikar	Least Concern	–	–	–	–	–	–	–	✓
583	*Valerianella oxyrrhynchata*	Booch	Not Evaluated	–	–	–	–	–	–	–	✓
584	*Vallisneria spiralis*		Least Concern	–	–	–	–	–	–	–	✓
585	*Verbascum erianthum*	Khar Bhang	Not Evaluated	–	–	–	–	–	–	–	✓
586	*Vernonia cinerascens*	Grey-leaved Vernonia	Not Evaluated	–	–	–	–	–	–	–	✓
587	*Vernonia cinerea*	Little Ironweed	Not Evaluated	–	–	–	–	–	–	–	✓
588	*Viola stocksii*		Not Evaluated	–	–	–	–	–	–	–	✓
589	*Vitex agnus-castus*	Gowanik	Data Deficient	–	–	–	–	–	–	–	✓
590	*Vitis vinifera*	Wild Grape	Least Concern	–	–	–	–	–	–	–	✓

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591	*Withania coagulans*	Panirbank	Not Evaluated	–	–	–	–	–	–	–	✓
592	*Withania somnifera*	Lakri/ Aswagandh	Not Evaluated	–	–	–	–	–	–	–	✓
593	*Wolffia arrhiza*	Rootless Duckweed	Least Concern	–	–	–	–	–	–	–	✓
594	*Xanthium spinosum*		Not Evaluated	–	–	–	–	–	–	–	✓
595	*Xanthium strumarium*	Common Cocklebur	Not Evaluated	–	–	–	–	–	–	–	✓
596	*Zannichellia palustris*		Least Concern	–	–	–	–	–	–	–	✓
597	*Zataria multiflora*	Izghand	Not Evaluated	–	–	–	–	–	–	–	✓
598	*Ziziphora clinopodioides*	Mashana Poorchink	Not Evaluated	–	–	–	–	–	–	–	✓
599	*Ziziphora tenuior*	Mashana poorchink	Not Evaluated	–	–	–	–	–	–	–	✓
600	*Ziziphus jujuba*	Common Jujube	Least Concern	–	–	–	–	✓	–	✓	–
601	*Ziziphus mauritiana*	Indian Jujube	Least Concern	–	–	–	–	–	–	✓	✓
602	*Ziziphus nummularia*	Wild jujube	Least Concern	–	–	–	–	–	–	✓	✓
603	*Zizipus spina-crista*	Syrian Christ-thorn	Least Concern	–	–	–	–	–	–	–	✓
604	*Zosimia absinthifolia*	Gowatk	Not Evaluated	–	–	–	–	–	–	–	✓
605	*Zygophyllum atripliciodes*		Not Evaluated	–	–	–	–	–	–	–	✓
606	*Zygophyllum eurypterum*	Alonj	Not Evaluated	–	–	–	–	–	–	–	✓
607	*Zygophyllum fabago*			–	–	✓	–	–	–	–	–

No	*Scientific Name*	*Common Name*	*IUCN Status*	*Survey Based*					*Literature Based*		
				EIA 2010	*EIA 2020*	*Post-Monsoon 2022 Survey*	*Spring 2023 Survey*	*Post-Monsoon 2023 Survey*	*Reko Diq Mine Site and Associated Infrastructure*	*Port Qasim*	*Rail and Road Route Corridor*
608	*Zygophyllum simplex*	Simple-Leaved Bean Caper	Not Evaluated	✓	✓	–	–	–	✓	✓	✓
				15	**15**	**29**	**31**	**18**	**55**	**150**	**530**

Appendix C: IBAT-Based Species List

See the following pages.

C.1 Terrestrial Vegetation

C.1.1 List of Plant Species based on IBAT Report within 50 km buffer of Reko Diq Mine Site and Associated Facilities

Class	*Order*	*Family*	*Genus*	*Scientific Name*	*Common Name*	*Category*	*Population Trend*	*Publication Year*	*Assessment Date*	*Biome Marine*	*Biome Freshwater*	*Biome Terrestrial*
Magnoliopsida	Sapindales	Anacardiaceae	Pistacia	*Pistacia khinjuk*		LC	Stable	2016	2/1/2014	No	No	Yes
Magnoliopsida	Lamiales	Linderniaceae	Lindernia	*Lindernia procumbens*	Common No Pimpernel	LC	Stable	2011	7/12/2011	No	Yes	Yes
Liliopsida	Poales	Juncaceae	Juncus	*Juncus articulatus*		LC	Stable	2011	5/25/2010	No	Yes	Yes
Liliopsida	Poales	Juncaceae	Juncus	*Juncus bufonius*	Toad Rush	LC	Stable	2017	6/9/2016	No	Yes	Yes
Liliopsida	Poales	Typhaceae	Typha	*Typha elephantina*		LC	Unknown	2020	4/29/2020	No	Yes	Yes
Magnoliopsida	Lamiales	Plantaginaceae	Bacopa	*Bacopa monnieri*	Water Hyssop	LC	Stable	2013	4/23/2012	No	Yes	Yes
Liliopsida	Alismatales	Potamogetonaceae	Potamogeton	*Potamogeton alpinus*	Red Pondweed	LC	Stable	2011	5/10/2010	No	Yes	Yes
Magnoliopsida	Apiales	Apiaceae	Centella	*Centella asiatica*	Centella	LC	Stable	2019	4/17/2018	No	Yes	Yes
Magnoliopsida	Fabales	Fabaceae	Aeschynomene	*Aeschynomene indica*	Indian Jointvetch	LC	Stable	2019	5/23/2018	No	Yes	Yes
Magnoliopsida	Lamiales	Plantaginaceae	Limnophila	*Limnophila rugosa*	Om kop	LC	Unknown	2011	5/29/2010	No	Yes	Yes
Magnoliopsida	Fabales	Fabaceae	Aeschynomene	*Aeschynomene aspera*	Sola Pith Plant	LC	Unknown	2011	2/10/2010	No	Yes	Yes
Liliopsida	Poales	Juncaceae	Juncus	*Juncus prismatocarpus*		LC	Unknown	2011	4/21/2010	No	Yes	Yes
Magnoliopsida	Lamiales	Plantaginaceae	Limnophila	*Limnophila indica*	Indian Marshweed	LC	Unknown	2020	9/27/2019	No	Yes	Yes
Liliopsida	Poales	Poaceae	Aegilops	*Aegilops tauschii*	Rough-spike Hard Grass	LC	Stable	2017	1/8/2014	No	No	Yes
Liliopsida	Poales	Poaceae	Triticum	*Triticum monococcum*	Einkorn	LC	Stable	2017	8/2/2016	No	No	Yes
Magnoliopsida	Rosales	Rosaceae	Prunus	*Prunus mahaleb*	Mahaleb Cherry	LC	Unknown	2016	3/31/2014	No	No	Yes
Liliopsida	Poales	Poaceae	Aegilops	*Aegilops triuncialis*	Jointed Goat Grass	LC	Increasing	2017	1/8/2014	No	No	Yes
Liliopsida	Poales	Poaceae	Aegilops	*Aegilops peregrina*	Goatgrass	LC	Unknown	2017	1/8/2014	No	No	Yes
Liliopsida	Poales	Poaceae	Aegilops	*Aegilops kotschyi*		LC	Unknown	2017	1/8/2014	No	No	Yes
Magnoliopsida	Rosales	Rosaceae	Prunus	*Prunus spinosa*	Blackthorn	LC	Stable	2016	3/17/2014	No	No	Yes
Liliopsida	Poales	Poaceae	Aegilops	*Aegilops caudata*	Cretan Hard-grass	LC	Stable	2017	7/13/2017	No	No	Yes
Magnoliopsida	Apiales	Apiaceae	Daucus	*Daucus carota*	Wild Carrot	LC	Stable	2021	11/17/2020	No	No	Yes
Liliopsida	Poales	Poaceae	Aegilops	*Aegilops geniculata*	Ovate Goat Grass	LC	Stable	2017	1/8/2014	No	No	Yes
Liliopsida	Poales	Poaceae	Aegilops	*Aegilops speltoides*	Tandat Bockvete	LC	Stable	2017	1/8/2014	No	No	Yes
Liliopsida	Poales	Poaceae	Aegilops	*Aegilops cylindrica*	Jointed Goat Grass	LC	Unknown	2017	1/8/2014	No	No	Yes
Liliopsida	Poales	Poaceae	Aegilops	*Aegilops neglecta*	Three-awn Goat Grass	LC	Stable	2017	1/8/2014	No	No	Yes
Liliopsida	Poales	Poaceae	Aegilops	*Aegilops columnaris*		LC	Stable	2017	1/7/2014	No	No	Yes
Liliopsida	Poales	Poaceae	Aegilops	*Aegilops umbellulata*		LC	Stable	2017	1/8/2014	No	No	Yes
Liliopsida	Poales	Poaceae	Aegilops	*Aegilops biuncialis*	Mediterranean Aegilops	LC	Stable	2017	8/1/2016	No	No	Yes
Magnoliopsida	Fabales	Fabaceae	Medicago	*Medicago sativa*	Alfalfa	LC	Stable	2016	7/1/2014	No	No	Yes
Magnoliopsida	Fabales	Fabaceae	Sesbania	*Sesbania bispinosa*	Sesbania Pea	LC	Stable	2017	6/12/2016	No	Yes	Yes
Magnoliopsida	Fabales	Fabaceae	Medicago	*Medicago constricta*		LC	Stable	2016	7/1/2014	No	No	Yes

Class	*Order*	*Family*	*Genus*	*Scientific Name*	*Common Name*	*Category*	*Population Trend*	*Publication Year*	*Assessment Date*	*Biome Marine*	*Biome Freshwater*	*Biome Terrestrial*
Magnoliopsida	Fabales	Fabaceae	Medicago	*Medicago doliata*	Keg Medic	LC	Stable	2016	7/1/2014	No	No	Yes
Magnoliopsida	Lamiales	Plantaginaceae	Limnophila	*Limnophila micrantha*	Ya cham	LC	Unknown	2011	7/12/2011	No	Yes	Yes
Magnoliopsida	Malpighiales	Salicaceae	Populus	*Populus alba*	White Poplar	LC	Decreasing	2018	3/17/2017	No	No	Yes
Liliopsida	Poales	Poaceae	Aegilops	*Aegilops vavilovii*		LC	Unknown	2017	5/1/2014	No	No	Yes
Liliopsida	Poales	Poaceae	Aegilops	*Aegilops crassa*	Persian Goat Grass	LC	Unknown	2017	1/8/2014	No	No	Yes
Magnoliopsida	Sapindales	Anacardiaceae	Pistacia	*Pistacia eurycarpa*	Kazwan	LC	Stable	2016	1/1/2014	No	No	Yes
Liliopsida	Poales	Poaceae	Triticum	*Triticum timopheevii*	Timopheev's Wheat	LC	Stable	2017	8/2/2016	No	No	Yes
Liliopsida	Poales	Poaceae	Triticum	*Triticum turgidum*	Wild Emmer	LC	Unknown	2017	8/2/2016	No	No	Yes
Liliopsida	Poales	Poaceae	Aegilops	*Aegilops juvenalis*		DD	Unknown	2017	1/8/2014	No	No	Yes
Magnoliopsida	Rosales	Rosaceae	Prunus	*Prunus argentea*	Silver Almond	DD	Unknown	2016	2/13/2014	No	No	Yes
Magnoliopsida	Rosales	Rosaceae	Prunus	*Prunus bifrons*		DD	Decreasing	2016	3/17/2014	No	No	Yes
Magnoliopsida	Rosales	Rosaceae	Prunus	*Prunus fenzliana*	Fenzls Almond	DD	Unknown	2020	2/19/2014	No	No	Yes
Magnoliopsida	Rosales	Rosaceae	Prunus	*Prunus incana*	Willow Cherry	DD	Unknown	2016	3/4/2014	No	No	Yes
Magnoliopsida	Rosales	Rosaceae	Prunus	*Prunus jaquemontii*	Flowering Almond	DD	Unknown	2016	3/6/2014	No	No	Yes
Liliopsida	Poales	Poaceae	Triticum	*Triticum urartu*		DD	Unknown	2017	8/2/2016	No	No	Yes
Liliopsida	Poales	Poaceae	Oryza	*Oryza coarctata*		DD	Unknown	2017	6/16/2017	No	No	Yes
Liliopsida	Alismatales	Potamogetonaceae	Potamogeton	*Potamogeton pusillus*	Lesser Pondweed	LC	Stable	2019	4/19/2018	No	Yes	No
Liliopsida	Alismatales	Hydrocharitaceae	Vallisneria	*Vallisneria spiralis*	Tapegrass	LC	Stable	2019	4/19/2018	No	Yes	No
Liliopsida	Alismatales	Alismataceae	Alisma	*Alisma plantago-aquatica*	Common Water-plantain	LC	Stable	2017	5/12/2016	No	Yes	No
Liliopsida	Alismatales	Potamogetonaceae	Zannichellia	*Zannichellia palustris*	Horned Pondweed	LC	Stable	2016	10/8/2011	No	Yes	No
Magnoliopsida	Myrtales	Lythraceae	Trapa	*Trapa natans*	Water Caltrop	LC	Unknown	2019	4/19/2018	No	Yes	No
Liliopsida	Poales	Typhaceae	Typha	*Typha angustifolia*	Lesser Bulrush	LC	Unknown	2011	4/15/2010	No	Yes	No
Liliopsida	Poales	Typhaceae	Typha	*Typha domingensis*	Southern Cat-tail	LC	Stable	2019	4/19/2018	No	Yes	No
Liliopsida	Poales	Juncaceae	Juncus	*Juncus effusus*	Soft Rush	LC	Stable	2017	6/21/2016	No	Yes	No
Liliopsida	Alismatales	Potamogetonaceae	Potamogeton	*Potamogeton nodosus*	Loddon Pondweed	LC	Unknown	2017	6/14/2016	No	Yes	No
Liliopsida	Alismatales	Araceae	Spirodela	*Spirodela polyrhiza*	Greater Duckweed	LC	Stable	2019	4/19/2018	No	Yes	No
Liliopsida	Alismatales	Hydrocharitaceae	Najas	*Najas graminea*	Ricefield Waternymph	LC	Unknown	2017	6/21/2016	No	Yes	No
Liliopsida	Alismatales	Hydrocharitaceae	Najas	*Najas marina*	Holly-leaved Naiad	LC	Stable	2019	4/19/2018	No	Yes	No
Liliopsida	Alismatales	Potamogetonaceae	Potamogeton	*Potamogeton trichoides*	Hairlike Pondweed	LC	Stable	2017	6/14/2016	No	Yes	No
Liliopsida	Alismatales	Hydrocharitaceae	Najas	*Najas minor*		LC	Unknown	2014	2/27/2013	No	Yes	No
Liliopsida	Alismatales	Potamogetonaceae	Potamogeton	*Potamogeton natans*	Broad-leaved Pondweed	LC	Stable	2013	4/11/2010	No	Yes	No
Liliopsida	Commelinales	Pontederiaceae	Monochoria	*Monochoria korsakowii*		LC	Increasing	2011	4/7/2010	No	Yes	No
Liliopsida	Alismatales	Hydrocharitaceae	Hydrilla	*Hydrilla verticillata*	Hydrilla	LC	Increasing	2017	6/8/2016	No	Yes	No
Liliopsida	Alismatales	Araceae	Lemna	*Lemna perpusilla*		LC	Unknown	2011	4/13/2010	No	Yes	No
Liliopsida	Alismatales	Alismataceae	Sagittaria	*Sagittaria trifolia*		LC	Stable	2011	4/15/2010	No	Yes	No

Class	*Order*	*Family*	*Genus*	*Scientific Name*	*Common Name*	*Category*	*Population Trend*	*Publication Year*	*Assessment Date*	*Biome Marine*	*Biome Freshwater*	*Biome Terrestrial*
Liliopsida	Alismatales	Potamogetonaceae	Potamogeton	*Potamogeton wrightii*		LC	Unknown	2011	4/3/2010	No	Yes	No
Magnoliopsida	Lamiales	Acanthaceae	Acanthus	*Acanthus ilicifolius*	Holy Mangrove	LC	Unknown	2011	2/21/2010	Yes	Yes	No
Liliopsida	Commelinales	Pontederiaceae	Monochoria	*Monochoria vaginalis*	Pickerel Weed	LC	Unknown	2011	4/7/2009	No	Yes	No
Magnoliopsida	Nymphaeales	Nymphaeaceae	Nymphaea	*Nymphaea pubescens*	Hairy Water Lily	LC	Unknown	2011	3/31/2010	No	Yes	No
Magnoliopsida	Nymphaeales	Nymphaeaceae	Nymphaea	*Nymphaea nouchali*	Blue Lotus	LC	Unknown	2019	5/23/2018	No	Yes	No
Liliopsida	Alismatales	Potamogetonaceae	Stuckenia	*Stuckenia pectinata*	Fennel Pondweed	LC	Stable	2019	4/19/2018	No	Yes	No
Magnoliopsida	Lamiales	Acanthaceae	Hygrophila	*Hygrophila polysperma*	Dwarf Hygrophila	LC	Unknown	2011	4/17/2010	No	Yes	No
Liliopsida	Alismatales	Araceae	Colocasia	*Colocasia esculenta*	Wild Taro	LC	Unknown	2011	3/23/2010	No	Yes	No
Liliopsida	Poales	Cyperaceae	Schoenoplectus	*Schoenoplectus tabernaemontani*	Grey Club-rush	LC	Stable	2014	7/17/2011	No	Yes	No
Liliopsida	Alismatales	Araceae	Wolffia	*Wolffia globosa*		LC	Stable	2011	12/25/2010	No	Yes	No
Liliopsida	Alismatales	Araceae	Wolffia	*Wolffia angusta*		LC	Unknown	2011	7/12/2011	No	Yes	No

C.1.2 List of Plant Species based on IBAT Report within 50 km buffer along Rail and Road Route Corridor

Class	*Orde r*	*Family*	*Genus*	*Scientific Name*	*Common Name*	*Category*	*Population Trend*	*Publication Year*	Assessment Date	*Biome Marine*	*Biome Freshwater*	*Biome Terrestrial*
Magnoliopsida	Sapindales	Burseraceae	Commiphora	Commiphora stocksiana	Mitha Guggul	EN	Decreasing	2020	10/14/2017	NO	NO	YES
Magnoliopsida	Lamiales	Bignoniaceae	Tecomella	Tecomella undulata	Desert Teak	EN	Decreasing	2021	5/14/2020	NO	NO	YES
Liliopsida	Asparagales	Orchidaceae	Dactylorhiza	Dactylorhiza hatagirea	Salampanja	EN	Decreasing	2022	8/13/2021	NO	NO	YES
Magnoliopsida	Rosales	Rosaceae	Prunus	Prunus microcarpa	Anti Lebanon Wild Cherry	NT	Unknown	2022	12/15/2021	NO	NO	YES
Magnoliopsida	Myrtales	Lythraceae	Woodfordia	Woodfordia fruticosa		LC	Stable	2023	1/26/2022	NO	NO	YES
Magnoliopsida	Sapindales	Anacardiaceae	Pistacia	Pistacia khinjuk		LC	Stable	2016	2/1/2014	NO	NO	YES
Magnoliopsida	Lamiales	Oleaceae	Chrysojasminum	Chrysojasminum humile	Italian Jasmine	LC	Unknown	2024	6/12/2023	NO	NO	YES
Polypodiopsida	Salviniales	Marsileaceae	Marsilea	Marsilea quadrifolia	Water Shamrock	LC	Unknown	2011	5/6/2010	NO	YES	NO
Magnoliopsida	Lamiales	Linderniaceae	Lindernia	Lindernia procumbens	Lindernie couch	LC	Stable	2011	7/12/2011	NO	YES	YES
Magnoliopsida	Asterales	Asteraceae	Grangea	Grangea maderaspatana		LC	Stable	2017	5/17/2016	NO	YES	YES
Liliopsida	Alismatales	Potamogetonaceae	Potamogeton	Potamogeton pusillus	Lesser Pondweed	LC	Stable	2019	4/19/2018	NO	YES	NO
Liliopsida	Poales	Juncaceae	Juncus	Juncus articulatus		LC	Stable	2011	5/25/2010	NO	YES	YES
Polypodiopsida	Salviniales	Salviniaceae	Salvinia	Salvinia natans	Floating Fern	LC	Decreasing	2011	7/29/2011	NO	YES	NO
Liliopsida	Poales	Juncaceae	Juncus	Juncus bufonius	Toad Rush	LC	Stable	2017	6/9/2016	NO	YES	YES
Liliopsida	Alismatales	Hydrocharitaceae	Vallisneria	Vallisneria spiralis	Tapegrass	LC	Stable	2019	4/19/2018	NO	YES	NO
Liliopsida	Alismatales	Alismataceae	Alisma	Alisma plantago-aquatica	Common Water-plantain	LC	Stable	2017	5/12/2016	NO	YES	NO
Liliopsida	Alismatales	Potamogetonaceae	Zannichellia	Zannichellia palustris	Horned Pondweed	LC	Stable	2016	10/8/2011	NO	YES	NO
Magnoliopsida	Myrtales	Lythraceae	Trapa	Trapa natans	Water Caltrop	LC	Unknown	2019	4/19/2018	NO	YES	NO
Liliopsida	Poales	Typhaceae	Typha	Typha elephantina		LC	Unknown	2020	4/29/2020	NO	YES	YES
Magnoliopsida	Lamiales	Plantaginaceae	Bacopa	Bacopa monnieri	Water Hyssop	LC	Stable	2013	4/23/2012	NO	YES	YES
Liliopsida	Poales	Typhaceae	Typha	Typha angustifolia	Lesser Bulrush	LC	Unknown	2011	4/15/2010	NO	YES	NO
Liliopsida	Poales	Typhaceae	Typha	Typha domingensis	Southern Cat-tail	LC	Stable	2019	4/19/2018	NO	YES	NO
Liliopsida	Poales	Juncaceae	Juncus	Juncus effusus	Soft Rush	LC	Stable	2017	6/21/2016	NO	YES	NO
Liliopsida	Alismatales	Potamogetonaceae	Potamogeton	Potamogeton nodosus	Loddon Pondweed	LC	Unknown	2017	6/14/2016	NO	YES	NO
Liliopsida	Alismatales	Araceae	Spirodela	Spirodela polyrhiza	Greater Duckweed	LC	Stable	2019	4/19/2018	NO	YES	NO
Liliopsida	Alismatales	Hydrocharitaceae	Najas	Najas graminea	Ricefield Waternymph	LC	Unknown	2017	6/21/2016	NO	YES	NO
Magnoliopsida	Brassicales	Brassicaceae	Nasturtium	Nasturtium officinale	Water-cress	LC	Unknown	2020	4/16/2019	NO	YES	NO
Liliopsida	Alismatales	Hydrocharitaceae	Najas	Najas marina	Holly-leaved Naiad	LC	Stable	2019	4/19/2018	NO	YES	NO
Polypodiopsida	Salviniales	Marsileaceae	Marsilea	Marsilea minuta	Dwarf Water Clover	LC	Stable	2019	5/23/2018	NO	YES	NO
Liliopsida	Alismatales	Potamogetonaceae	Potamogeton	Potamogeton trichoides	Hairlike Pondweed	LC	Stable	2017	6/14/2016	NO	YES	NO
Liliopsida	Alismatales	Hydrocharitaceae	Najas	Najas minor		LC	Unknown	2014	2/27/2013	NO	YES	NO
Liliopsida	Alismatales	Potamogetonaceae	Potamogeton	Potamogeton natans	Broad-leaved Pondweed	LC	Stable	2013	4/11/2010	NO	YES	NO
Magnoliopsida	Caryophyllales	Amaranthaceae	Alternanthera	Alternanthera sessilis	Sessile Joyweed	LC	Increasing	2019	4/17/2018	NO	YES	YES
Liliopsida	Alismatales	Hydrocharitaceae	Ottelia	Ottelia alismoides	Duck-Lettuce	LC	Unknown	2017	6/9/2016	NO	YES	NO
Liliopsida	Commelinales	Pontederiaceae	Monochoria	Monochoria korsakowii		LC	Increasing	2011	4/7/2010	NO	YES	NO

Class	*Orde r*	*Family*	*Genus*	*Scientific Name*	*Common Name*	*Category*	*Population Trend*	*Publication Year*	Assessment Date	*Biome Marine*	*Biome Freshwater*	*Biome Terrestrial*
Liliopsida	Alismatales	Hydrocharitaceae	Hydrilla	Hydrilla verticillata	Hydrilla	LC	Increasing	2017	6/8/2016	NO	YES	NO
Magnoliopsida	Nymphaeales	Nymphaeaceae	Nymphaea	Nymphaea tetragona		LC	Unknown	2011	########	3/23/2010	YES	NO
Liliopsida	Alismatales	Potamogetonaceae	Potamogeton	Potamogeton alpinus	Red Pondweed	LC	Stable	2011	5/10/2010	NO	YES	YES
Magnoliopsida	Myrtales	Lythraceae	Trapa	Trapa incisa		LC	Unknown	2011	4/13/2010	NO	YES	NO
Liliopsida	Alismatales	Araceae	Lemna	Lemna perpusilla		LC	Unknown	2011	4/13/2010	NO	YES	NO
Liliopsida	Alismatales	Hydrocharitaceae	Vallisneria	Vallisneria natans		LC	Unknown	2011	4/14/2010	NO	YES	NO
Magnoliopsida	Apiales	Apiaceae	Centella	Centella asiatica	Centella	LC	Stable	2019	4/17/2018	NO	YES	YES
Magnoliopsida	Asterales	Asteraceae	Wedelia	Wedelia chinensis	Chinese Wedelia	LC	Stable	2011	8/8/2011	NO	YES	YES
Magnoliopsida	Apiales	Apiaceae	Oenanthe	Oenanthe javanica	Water Dropwort	LC	Stable	2011	4/13/2010	NO	YES	YES
Magnoliopsida	Fabales	Fabaceae	Sesbania	Sesbania javanica		LC	Stable	2011	7/28/2010	NO	YES	YES
Liliopsida	Alismatales	Alismataceae	Sagittaria	Sagittaria trifolia		LC	Stable	2011	4/15/2010	NO	YES	NO
Magnoliopsida	Lamiales	Acanthaceae	Hygrophila	Hygrophila salicifolia		LC	Unknown	2011	4/29/2010	NO	YES	YES
Liliopsida	Alismatales	Potamogetonaceae	Potamogeton	Potamogeton wrightii		LC	Unknown	2011	4/3/2010	NO	YES	NO
Magnoliopsida	Lamiales	Acanthaceae	Acanthus	Acanthus ilicifolius	Holy Mangrove	LC	Unknown	2011	2/21/2010	YES	YES	NO
Magnoliopsida	Fabales	Fabaceae	Aeschynomene	Aeschynomene indica	Indian Jointvetch	LC	Stable	2019	5/23/2018	NO	YES	YES
Liliopsida	Commelinales	Pontederiaceae	Monochoria	Monochoria hastata	Leaf Pondweed	LC	Unknown	2011	4/8/2010	NO	YES	NO
Liliopsida	Commelinales	Pontederiaceae	Monochoria	Monochoria vaginalis	Pickerel Weed	LC	Unknown	2011	4/7/2009	NO	YES	NO
Magnoliopsida	Nymphaeales	Nymphaeaceae	Nymphaea	Nymphaea pubescens	Hairy Water Lily	LC	Unknown	2011	3/31/2010	NO	YES	NO
Magnoliopsida	Lamiales	Acanthaceae	Hygrophila	Hygrophila pinnatifida	Miramar Weed	LC	Unknown	2011	4/16/2010	NO	YES	NO
Magnoliopsida	Lamiales	Plantaginaceae	Limnophila	Limnophila rugosa	Om kop	LC	Unknown	2011	5/29/2010	NO	YES	YES
Magnoliopsida	Nymphaeales	Nymphaeaceae	Nymphaea	Nymphaea nouchali	Blue Lotus	LC	Unknown	2019	5/23/2018	NO	YES	NO
Liliopsida	Alismatales	Alismataceae	Limnophyton	Limnophyton obtusifolium	Arrow Head	LC	Unknown	2017	5/12/2016	NO	YES	YES
Magnoliopsida	Solanales	Hydroleaceae	Hydrolea	Hydrolea zeylanica		LC	Unknown	2011	4/18/2010	NO	YES	YES
Magnoliopsida	Fabales	Fabaceae	Aeschynomene	Aeschynomene aspera	Sola Pith Plant	LC	Unknown	2011	2/10/2010	NO	YES	YES
Liliopsida	Alismatales	Potamogetonaceae	Stuckenia	Stuckenia pectinata	Fennel Pondweed	LC	Stable	2019	4/19/2018	NO	YES	NO
Liliopsida	Alismatales	Hydrocharitaceae	Blyxa	Blyxa aubertii	Round Fruit Blyxa	LC	Stable	2017	6/8/2016	NO	YES	NO
Magnoliopsida	Lamiales	Plantaginaceae	Dopatrium	Dopatrium junceum	Rushlike Dopatrium	LC	Unknown	2020	10/16/2019	NO	YES	YES
Liliopsida	Poales	Juncaceae	Juncus	Juncus prismatocarpus		LC	Unknown	2011	########	4/21/2010	YES	YES
Magnoliopsida	Lamiales	Acanthaceae	Hygrophila	Hygrophila polysperma	Dwarf Hygrophila	LC	Unknown	2011	4/17/2010	NO	YES	NO
Liliopsida	Alismatales	Araceae	Landoltia	Landoltia punctata	Dotted Duckweed	LC	Unknown	2011	12/30/2010	NO	YES	NO
Magnoliopsida	Asterales	Asteraceae	Enydra	Enydra fluctuans	Buffalo Spinach	LC	Stable	2017	5/13/2016	NO	YES	YES
Liliopsida	Alismatales	Araceae	Lasia	Lasia spinosa		LC	Unknown	2011	4/11/2010	NO	YES	YES
Liliopsida	Alismatales	Hydrocharitaceae	Hydrocharis	Hydrocharis dubia	Ja-ra-pul	LC	Unknown	2011	1/26/2011	NO	YES	NO
Magnoliopsida	Lamiales	Plantaginaceae	Limnophila	Limnophila indica	Indian Marshweed	LC	Unknown	2020	9/27/2019	NO	YES	YES
Liliopsida	Alismatales	Hydrocharitaceae	Blyxa	Blyxa octandra		LC	Unknown	2011	12/13/2010	NO	YES	NO
Magnoliopsida	Caryophyllales	Droseraceae	Drosera	Drosera burmanni		LC	Unknown	2011	4/13/2010	NO	YES	YES
Liliopsida	Alismatales	Hydrocharitaceae	Nechamandra	Nechamandra alternifolia		LC	Unknown	2011	12/7/2010	NO	YES	NO
Liliopsida	Commelinales	Commelinaceae	Cyanotis	Cyanotis axillaris		LC	Unknown	2011	5/10/2010	NO	YES	YES

Class	*Orde r*	*Family*	*Genus*	*Scientific Name*	*Common Name*	*Category*	*Population Trend*	*Publication Year*	Assessment Date	*Biome Marine*	*Biome Freshwater*	*Biome Terrestrial*
Magnoliopsida	Malpighiales	Podostemaceae	Hydrobryum	Hydrobryum griffithii		LC	Unknown	2011	1/17/2011	NO	YES	NO
Liliopsida	Alismatales	Araceae	Colocasia	Colocasia esculenta	Wild Taro	LC	Unknown	2011	3/23/2010	NO	YES	NO
Magnoliopsida	Brassicales	Brassicaceae	Rhamphospermum	Rhamphospermum nigrum	Black Mustard	LC	Stable	2020	5/27/2019	NO	NO	YES
Liliopsida	Poales	Poaceae	Aegilops	Aegilops tauschii	Rough-spike Hard Grass	LC	Stable	2017	1/8/2014	NO	NO	YES
Liliopsida	Poales	Poaceae	Triticum	Triticum monococcum	Einkorn	LC	Stable	2017	8/2/2016	NO	NO	YES
Magnoliopsida	Rosales	Rosaceae	Prunus	Prunus mahaleb	Mahaleb Cherry	LC	Unknown	2016	3/31/2014	NO	NO	YES
Liliopsida	Poales	Poaceae	Aegilops	Aegilops triuncialis	Jointed Goat Grass	LC	Increasing	2017	1/8/2014	NO	NO	YES
Liliopsida	Poales	Poaceae	Aegilops	Aegilops peregrina	Goatgrass	LC	Unknown	2017	1/8/2014	NO	NO	YES
Liliopsida	Poales	Poaceae	Aegilops	Aegilops kotschyi		LC	Unknown	2017	1/8/2014	NO	NO	YES
Magnoliopsida	Rosales	Rosaceae	Prunus	Prunus spinosa	Blackthorn	LC	Stable	2016	3/17/2014	NO	NO	YES
Liliopsida	Poales	Poaceae	Aegilops	Aegilops caudata	Cretan Hard-grass	LC	Stable	2017	7/13/2017	NO	NO	YES
Magnoliopsida	Apiales	Apiaceae	Daucus	Daucus carota	Wild Carrot	LC	Stable	2021	11/17/2020	NO	NO	YES
Liliopsida	Poales	Poaceae	Aegilops	Aegilops geniculata	Ovate Goat Grass	LC	Stable	2017	1/8/2014	NO	NO	YES
Liliopsida	Poales	Poaceae	Aegilops	Aegilops speltoides	Tandat Bockvete	LC	Stable	2017	1/8/2014	NO	NO	YES
Liliopsida	Poales	Poaceae	Aegilops	Aegilops cylindrica	Jointed Goat Grass	LC	Unknown	2017	1/8/2014	NO	NO	YES
Liliopsida	Poales	Poaceae	Aegilops	Aegilops neglecta	Three-awn Goat Grass	LC	Stable	2017	1/8/2014	NO	NO	YES
Liliopsida	Poales	Poaceae	Aegilops	Aegilops columnaris		LC	Stable	2017	1/7/2014	NO	NO	YES
Liliopsida	Poales	Poaceae	Aegilops	Aegilops umbellulata		LC	Stable	2017	1/8/2014	NO	NO	YES
Liliopsida	Poales	Poaceae	Aegilops	Aegilops biuncialis	Mediterranean Aegilops	LC	Stable	2017	8/1/2016	NO	NO	YES
Magnoliopsida	Fabales	Fabaceae	Lathyrus	Lathyrus cicera	Chickling Vetch	LC	Stable	2019	2/25/2018	NO	NO	YES
Magnoliopsida	Fabales	Fabaceae	Medicago	Medicago sativa	Alfalfa	LC	Stable	2016	7/1/2014	NO	NO	YES
Magnoliopsida	Fabales	Fabaceae	Sesbania	Sesbania bispinosa	Sesbania Pea	LC	Stable	2017	6/12/2016	NO	YES	YES
Liliopsida	Poales	Cyperaceae	Schoenoplectus	Schoenoplectus tabernaemontani	Grey Club-rush	LC	Stable	2014	7/17/2011	NO	YES	NO
Magnoliopsida	Fabales	Fabaceae	Vicia	Vicia sativa	Common Vetch	LC	Stable	2019	3/31/2017	NO	NO	YES
Magnoliopsida	Fabales	Fabaceae	Medicago	Medicago constricta		LC	Stable	2016	7/1/2014	NO	NO	YES
Magnoliopsida	Fabales	Fabaceae	Medicago	Medicago doliata	Keg Medic	LC	Stable	2016	7/1/2014	NO	NO	YES
Liliopsida	Poales	Cyperaceae	Cyperus	Cyperus tenuispica		LC	Stable	2018	12/30/2017	NO	YES	NO
Liliopsida	Alismatales	Araceae	Wolffia	Wolffia globosa		LC	Stable	2011	12/25/2010	NO	YES	NO
Magnoliopsida	Malpighiales	Rhizophoraceae	Bruguiera	Bruguiera gymnorhiza		LC	Decreasing	2010	3/7/2008	YES	NO	YES
Magnoliopsida	Malpighiales	Rhizophoraceae	Ceriops	Ceriops tagal		LC	Decreasing	2010	3/7/2008	YES	NO	YES
Magnoliopsida	Malpighiales	Rhizophoraceae	Rhizophora	Rhizophora mucronata	Yes Mangrove	LC	Decreasing	2010	3/7/2008	YES	NO	YES
Magnoliopsida	Lamiales	Acanthaceae	Avicennia	Avicennia marina	Grey Mangrove	LC	Decreasing	2010	3/7/2008	YES	NO	YES
Magnoliopsida	Asterales	Asteraceae	Gnaphalium	Gnaphalium polycaulon		LC	Stable	2020	3/13/2019	NO	YES	YES
Liliopsida	Poales	Typhaceae	Sparganium	Sparganium fallax		LC	Unknown	2011	7/28/2011	NO	YES	NO
Liliopsida	Alismatales	Araceae	Typhonium	Typhonium flagelliforme		LC	Unknown	2011	7/12/2011	NO	YES	NO
Liliopsida	Alismatales	Araceae	Wolffia	Wolffia angusta		LC	Unknown	2011	7/12/2011	NO	YES	NO
Magnoliopsida	Lamiales	Scrophulariaceae	Curanga	Curanga amara		LC	Unknown	2011	7/12/2011	NO	YES	YES

Class	*Orde r*	*Family*	*Genus*	*Scientific Name*	*Common Name*	*Category*	*Population Trend*	*Publication Year*	Assessment Date	*Biome Marine*	*Biome Freshwater*	*Biome Terrestrial*
Magnoliopsida	Lamiales	Plantaginaceae	Limnophila	Limnophila micrantha	Ya cham	LC	Unknown	2011	7/12/2011	NO	YES	YES
Magnoliopsida	Sapindales	Anacardiaceae	Cotinus	Cotinus coggygria	Smoke-bush	LC	Stable	2018	2/2/2018	NO	NO	YES
Magnoliopsida	Fabales	Fabaceae	Glycyrrhiza	Glycyrrhiza glabra	Liquorice	LC	Stable	2021	11/19/2020	NO	NO	YES
Magnoliopsida	Myrtales	Myrtaceae	Myrtus	Myrtus communis	Myrtle	LC	Stable	2018	10/9/2017	NO	NO	YES
Magnoliopsida	Malpighiales	Salicaceae	Populus	Populus alba	White Poplar	LC	Decreasing	2018	3/17/2017	NO	NO	YES
Liliopsida	Poales	Poaceae	Aegilops	Aegilops vavilovii		LC	Unknown	2017	5/1/2014	NO	NO	YES
Magnoliopsida	Malpighiales	Salicaceae	Populus	Populus euphratica	Euphrates Poplar	LC	Decreasing	2018	8/9/2017	NO	NO	YES
Magnoliopsida	Rosales	Rhamnaceae	Ziziphus	Ziziphus nummularia		LC	Unknown	2023	11/22/2022	NO	NO	YES
Magnoliopsida	Gentianales	Apocynaceae	Calotropis	Calotropis procera	Apple of Sodom	LC	Unknown	2022	1/14/2022	NO	NO	YES
Magnoliopsida	Gentianales	Apocynaceae	Leptadenia	Leptadenia pyrotechnica	Broom Brush	LC	Unknown	2020	1/14/2020	NO	NO	YES
Liliopsida	Poales	Poaceae	Aegilops	Aegilops crassa	Persian Goat Grass	LC	Unknown	2017	1/8/2014	NO	NO	YES
Magnoliopsida	Rosales	Moraceae	Ficus	Ficus palmata		LC	Unknown	2022	7/16/2021	NO	NO	YES
Magnoliopsida	Brassicales	Capparaceae	Capparis	Capparis cartilaginea	Caper	LC	Stable	2019	6/12/2018	NO	NO	YES
Magnoliopsida	Brassicales	Capparaceae	Capparis	Capparis decidua	Sodada	LC	Stable	2023	1/29/2020	NO	NO	YES
Magnoliopsida	Fabales	Fabaceae	Lathyrus	Lathyrus aphaca	Yellow Vetch	LC	Unknown	2019	2/25/2018	NO	NO	YES
Magnoliopsida	Fabales	Fabaceae	Lathyrus	Lathyrus inconspicuus	Solitary-Flowered Pea	LC	Unknown	2019	2/25/2018	NO	NO	YES
Magnoliopsida	Sapindales	Anacardiaceae	Pistacia	Pistacia eurycarpa	Kazwan	LC	Stable	2016	1/1/2014	NO	NO	YES
Magnoliopsida	Gentianales	Apocynaceae	Periploca	Periploca aphylla		LC	Unknown	2020	1/30/2020	NO	NO	YES
Magnoliopsida	Rosales	Elaeagnaceae	Elaeagnus	Elaeagnus angustifolia	Russian Olive	LC	Unknown	2017	2/13/2017	NO	NO	YES
Magnoliopsida	Fabales	Fabaceae	Dalbergia	Dalbergia sissoo		LC	Unknown	2020	11/3/2019	NO	NO	YES
Magnoliopsida	Sapindales	Sapindaceae	Dodonaea	Dodonaea viscosa	Purple Hop-Bush	LC	Stable	2019	6/12/2018	NO	NO	YES
Liliopsida	Poales	Poaceae	Triticum	Triticum timopheevii	Timopheev's Wheat	LC	Stable	2017	8/2/2016	NO	NO	YES
Liliopsida	Poales	Poaceae	Triticum	Triticum turgidum	Wild Emmer	LC	Unknown	2017	8/2/2016	NO	NO	YES
Magnoliopsida	Malpighiales	Salicaceae	Salix	Salix wilhelmsiana		LC	Unknown	2022	9/22/2021	NO	NO	YES
Magnoliopsida	Lamiales	Oleaceae	Fraxinus	Fraxinus xanthoxyloides	Afghan Ash	LC	Stable	2017	4/20/2017	NO	NO	YES
Magnoliopsida	Fabales	Fabaceae	Vicia	Vicia sativa subsp. cordata	Vesce Ã feuilles en cÅ“ur	LC	Stable	2019	9/29/2018	NO	NO	YES
Magnoliopsida	Fabales	Fabaceae	Vicia	Vicia sativa subsp. nigra	Narrow-leaf Vetch	LC	Unknown	2019	9/29/2018	NO	NO	YES
Magnoliopsida	Boraginales	Cordiaceae	Cordia	Cordia sinensis		LC	Unknown	2020	1/29/2020	NO	NO	YES
Magnoliopsida	Boraginales	Ehretiaceae	Ehretia	Ehretia obtusifolia		LC	Stable	2019	6/12/2018	NO	NO	YES
Magnoliopsida	Myrtales	Lythraceae	Lawsonia	Lawsonia inermis	Henna	LC	Unknown	2024	6/18/2019	NO	NO	YES
Magnoliopsida	Rosales	Rosaceae	Crataegus	Crataegus songarica		LC	Stable	2019	6/12/2018	NO	NO	YES
Magnoliopsida	Malvales	Malvaceae	Grewia	Grewia optiva		LC	Stable	2022	10/1/2021	NO	NO	YES
Magnoliopsida	Rosales	Moraceae	Ficus	Ficus religiosa		LC	Stable	2022	10/1/2021	NO	NO	YES
Magnoliopsida	Sapindales	Sapindaceae	Aesculus	Aesculus indica		LC	Unknown	2020	10/16/2019	NO	NO	YES
Magnoliopsida	Lamiales	Lamiaceae	Rydingia	Rydingia limbata	Kandiari	LC	Decreasing	2020	11/25/2019	NO	NO	YES
Magnoliopsida	Malpighiales	Phyllanthaceae	Flueggea	Flueggea leucopyrus	Spinous flueggea	LC	Stable	2021	5/21/2020	NO	NO	YES
Magnoliopsida	Fabales	Fabaceae	Senegalia	Senegalia catechu	Black Cutch	LC	Decreasing	2021	10/19/2020	NO	NO	YES

Class	*Orde r*	*Family*	*Genus*	*Scientific Name*	*Common Name*	*Category*	*Population Trend*	*Publication Year*	Assessment Date	*Biome Marine*	*Biome Freshwater*	*Biome Terrestrial*
Magnoliopsida	Caryophyllales	Tamaricaceae	Tamarix	Tamarix indica		LC	Unknown	2024	12/5/2023	NO	NO	YES
Liliopsida	Alismatales	Alismataceae	Ranalisma	Ranalisma rostrata	Mui vang	DD	Unknown	2011	7/26/2011	NO	YES	YES
Liliopsida	Poales	Poaceae	Aegilops	Aegilops juvenalis		DD	Unknown	2017	1/8/2014	NO	NO	YES
Magnoliopsida	Rosales	Rosaceae	Prunus	Prunus argentea	Silver Almond	DD	Unknown	2016	2/13/2014	NO	NO	YES
Magnoliopsida	Rosales	Rosaceae	Prunus	Prunus bifrons		DD	Decreasing	2016	3/17/2014	NO	NO	YES
Magnoliopsida	Rosales	Rosaceae	Prunus	Prunus fenzliana	Fenzls Almond	DD	Unknown	2020	2/19/2014	NO	NO	YES
Magnoliopsida	Rosales	Rosaceae	Prunus	Prunus incana	Willow Cherry	DD	Unknown	2016	3/4/2014	NO	NO	YES
Magnoliopsida	Rosales	Rosaceae	Prunus	Prunus jaquemontii	Flowering Almond	DD	Unknown	2016	3/6/2014	NO	NO	YES
Liliopsida	Poales	Poaceae	Triticum	Triticum urartu		DD	Unknown	2017	8/2/2016	8/2/2016	NO	YES
Liliopsida	Poales	Poaceae	Oryza	Oryza coarctata		DD	Unknown	2017	6/16/2017	NO	NO	YES
Magnoliopsida	Brassicales	Salvadoraceae	Salvadora	Salvadora alii		DD	Unknown	2021	12/2/2020	NO	NO	YES

Appendix D: Field Data

See the following pages.

D.1 Reko Diq Mine Site

D.1.1 Post-Monsoon 2022 Survey

D.1.1.1 Vegetation

Location ID	*Coordinates*		*Date*	*Habitat*	*Aeluropus lagopoides*		*Anabasis setifera*		*Bromus sp.*		*Calligonum comosum*		*Calligonum polygonide*		*Cenchrus biflorus*		*Citrullus colocynthis*		*Cornulaca monacantha*		*Cynodon dactylon*		*Eleusine compressa*	
	Latitude	*Longitude*			*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*
E13	29°9' 30.3"	61°59' 31.2"	9/15/22	Mountain/Hills	0.00%	–	0.00%	–	0.00%	–	6.30%	2	0.00%	–	0.00%	–	0.00%	–	8.66%	3	0.00%	–	0.00%	–
E14	29°8' 54"	61°54' 42.5"	9/15/22	Clayey Plains	0.00%	–	0.38%	4	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.55%	1	0.00%	–	0.00%	–	0.00%	–
E15	29°10' 12.3"	62°1' 6.7"	9/14/22	Dry Streambeds	0.13%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–
E16	29°10' 32.7"	62°2' 8.5"	9/14/22	Gravel Plains	0.00%	–	0.00%	–	0.00%	–	9.49%	2	0.00%	–	0.01%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–
E17	29°12' 47.9"	62°2' 14.1"	9/14/22	Mountain/Hills	0.00%	–	0.00%	–	0.00%	–	3.76%	3	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–
E18	29°12' 41.8"	62°8' 1.9"	9/13/22	Sandy Plains/ Sand Dunes	0.00%	–	0.00%	–	0.00%	–	12.96%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–
E19	29°10' 7.2"	62°6' 16.1"	9/13/22	Mountain/Hills	0.13%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–
E20	29°9' 16.3"	62°2' 4.6"	9/14/22	Gravel Plains	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.02%	2	0.00%	–	0.00%	–	0.00%	–	0.00%	–
E21	29°7' 19.9"	62°0' 28.7"	9/15/22	Dry Streambeds	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.01%	1	0.00%	–	0.00%	–
E22	29°8' 4.4"	62°2' 49.9"	9/14/22	Gravel Plains	0.00%	–	0.09%	1	0.00%	–	0.97%	2	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–
E23	29°8' 19"	62°6' 3"	9/13/22	Gravel Plains	0.00%	–	0.00%	–	0.02%	2	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.01%	3
E24	29°7' 20.6"	62°7' 5.6"	9/13/22	Gravel Plains	0.00%	–	0.00%	–	0.00%	–	0.24%	3	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.02%	2
E25	29°5' 44.3"	62°6' 19.3"	9/13/22	Dry Streambeds	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.02%	3	0.04%	4
E26	29°6' 9.2"	62°5' 4.3"	9/16/22	Gravel Plains	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–
E27	29°6' 46.8"	62°3' 1.3"	9/14/22	Dry Streambeds	0.00%	–	0.00%	–	0.00%	–	0.55%	2	0.00%	–	0.03%	2	0.00%	–	0.00%	–	0.00%	–	0.00%	–
E28	29°6' 36.6"	62°1' 54.9"	9/16/22	Mountain/Hills	0.00%	–	0.00%	–	0.00%	–	5.60%	1	0.00%	–	0.00%	–	0.00%	–	0.09%	1	0.00%	–	0.00%	–
E29	29°5' 15.8"	62°1' 57.1"	9/16/22	Dry Streambeds	0.00%	–	0.00%	–	0.00%	–	0.58%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–
E30	29°6' 7"	61°59' 17.1"	9/16/22	Dry Streambeds	0.00%	–	0.00%	–	0.00%	–	0.73%	2	0.30%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–
E31	29°6' 49.6"	61°57' 50.7"	9/15/22	Gravel Plains	0.00%	–	0.00%	–	0.00%	–	0.92%	1	0.00%	–	0.02%	2	0.00%	–	0.00%	–	0.00%	–	0.00%	–
E32	29°3' 1"	61°59' 34"	9/15/22	Gravel Plains	0.00%	–	0.58%	6	0.00%	–	0.21%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–
					0.25%	**2**	1.05%	11	0.02%	2	42.31%	21	0.30%	1	0.08%	7	0.55%	1	8.76%	5	0.02%	3	0.07%	9

Location ID	Coordinates		Date	Habitat	Fagonia ovalifolia		Haloxylon persicum		Haloxylon salcornicom		Haloxylon stocksii		Helitropium zeyloncum		Panicum turgidum		Tamarix aphylla		**Total Cover**	**Total count**	**Species Count**
	Latitude	Longitude			Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count			
E13	29°9' 30.3"	61°59' 31.2"	9/15/22	Mountain/Hills	0.09%	1	2.79%	4	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	**17.85%**	**10**	**4**
E14	29°8' 54"	61°54' 42.5"	9/15/22	Clayey Plains	0.00%	–	0.00%	–	0.00%	–	4.99%	1	0.00%	–	0.15%	6	2.42%	2	**8.49%**	**14**	**5**
E15	29°10' 12.3"	62°1' 6.7"	9/14/22	Dry Streambeds	0.00%	–	0.46%	2	0.14%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–	**0.72%**	**4**	**3**
E16	29°10' 32.7"	62°2' 8.5"	9/14/22	Gravel Plains	0.00%	–	0.00%	–	0.47%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–	**9.97%**	**4**	**3**
E17	29°12' 47.9"	62°2' 14.1"	9/14/22	Mountain/Hills	0.00%	–	8.39%	4	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	**12.15%**	**7**	**2**
E18	29°12' 41.8"	62°8' 1.9"	9/13/22	Sandy Plains/ Sand Dunes	0.01%	1	0.00%	–	1.16%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–	**14.13%**	**3**	**3**
E19	29°10' 7.2"	62°6' 16.1"	9/13/22	Mountain/Hills	0.00%	–	2.25%	12	0.11%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–	**2.49%**	**14**	**3**
E20	29°9' 16.3"	62°2' 4.6"	9/14/22	Gravel Plains	0.11%	1	4.28%	1	0.13%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–	**4.54%**	**5**	**4**
E21	29°7' 19.9"	62°0' 28.7"	9/15/22	Dry Streambeds	0.01%	1	0.00%	–	0.00%	–	0.51%	4	0.16%	2	0.06%	10	0.00%	–	**0.74%**	**18**	**5**
E22	29°8' 4.4"	62°2' 49.9"	9/14/22	Gravel Plains	0.00%	–	1.04%	3	0.57%	3	0.00%	–	0.00%	–	0.00%	–	0.00%	–	**2.66%**	**9**	**4**
E23	29°8' 19"	62°6' 3"	9/13/22	Gravel Plains	0.00%	–	2.23%	3	0.00%	–	0.26%	3	0.00%	–	0.00%	–	0.00%	–	**2.52%**	**11**	**4**
E24	29°7' 20.6"	62°7' 5.6"	9/13/22	Gravel Plains	0.00%	–	0.11%	1	0.06%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–	**0.43%**	**7**	**4**
E25	29°5' 44.3"	62°6' 19.3"	9/13/22	Dry Streambeds	0.00%	–	0.00%	–	0.00%	–	1.54%	21	0.00%	–	0.00%	–	0.00%	–	**1.60%**	**28**	**3**
E26	29°6' 9.2"	62°5' 4.3"	9/16/22	Gravel Plains	0.00%	–	0.00%	–	2.48%	6	0.33%	2	0.00%	–	0.00%	–	0.00%	–	**2.80%**	**8**	**2**
E27	29°6' 46.8"	62°3' 1.3"	9/14/22	Dry Streambeds	0.07%	1	0.00%	–	3.26%	9	0.00%	–	0.00%	–	0.02%	2	0.00%	–	**3.93%**	**16**	**5**
E28	29°6' 36.6"	62°1' 54.9"	9/16/22	Mountain/Hills	0.00%	–	0.00%	–	0.73%	3	0.41%	1	0.00%	–	0.00%	–	0.00%	–	**6.82%**	**6**	**4**
E29	29°5' 15.8"	62°1' 57.1"	9/16/22	Dry Streambeds	0.00%	–	0.00%	–	0.00%	–	2.52%	5	0.00%	–	0.00%	–	0.00%	–	**3.10%**	**6**	**2**
E30	29°6' 7"	61°59' 17.1"	9/16/22	Dry Streambeds	0.00%	–	0.00%	–	0.00%	–	1.49%	2	0.00%	–	0.00%	–	0.00%	–	**2.51%**	**5**	**3**
E31	29°6' 49.6"	61°57' 50.7"	9/15/22	Gravel Plains	0.00%	–	0.00%	–	0.00%	–	4.91%	4	0.00%	–	0.05%	13	0.00%	–	**5.90%**	**20**	**4**
E32	29°3' 1"	61°59' 34"	9/15/22	Gravel Plains	0.00%	–	0.00%	–	0.00%	–	0.40%	1	0.09%	1	0.00%	–	0.00%	–	**1.28%**	**9**	**4**
					0.29%	5	21.54%	30	9.09%	27	17.34%	44	0.25%	3	0.28%	31	2.42%	2	**104.6%**	**204**	**17**

D.1.2 Spring 2023 Survey

D.1.2.1 Vegetation

Location ID	Coordinates		Date	Habitat	Anabasis setifera		Aristida adscensionis		Calligonum comosum		Calligonum polygonoides		Cornulaca monacantha		Eleusine compressa		Haloxylon persicum		Haloxylon salicornicum		Salsola stocksii		Tribulus terrestris		**Total Cover**	**Total count**	**Species Count**
	Latitude	Longitude			Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count			
E13	29°9' 30.3"	61°59' 31.2"	5/2/23	Mountain/Hills	0.00%	–	0.00%	–	0.00%	–	0.08%	1	0.00%	–	0.00%	–	8.58%	7	0.00%	–	0.25%	2	0.00%	–	**8.91%**	**10**	**3**
E14	29°8' 54"	61°54' 42.5"	4/30/23	Clayey Plains	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	4.18%	2	6.07%	12	0.00%	–	**10.25%**	**14**	**2**
E15	29°10' 12.3"	62°1' 6.7"	4/30/23	Dry Streambeds	0.00%	–	0.01%	1	2.45%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.04%	2	0.00%	–	**2.50%**	**4**	**3**
E16	29°10' 32.7"	62°2' 8.5"	5/2/23	Gravel Plains	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	2.93%	4	0.00%	–	**2.93%**	**4**	**4**
E17	29°12' 47.9"	62°2' 14.1"	5/1/23	Mountain/Hills	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.01%	1	0.00%	–	6.03%	6	0.00%	–	0.00%	–	0.01%	1	**6.04%**	**8**	**2**
E18	29°12' 41.8"	62°8' 1.9"	5/1/23	Sandy Plains	0.00%	–	0.00%	–	2.90%	5	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	**2.90%**	**5**	**1**
E19	29°10' 7.2"	62°6' 16.1"	5/1/23	Mountain/Hills	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	7.40%	2	0.00%	–	0.03%	2	0.00%	–	**7.43%**	**4**	**0**
E20	29°9' 16.3"	62°2' 4.6"	5/2/23	Gravel Plains	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.04%	1	0.00%	–	**0.04%**	**1**	**1**
E21	29°7' 19.9"	62°0' 28.7"	5/3/23	Dry Streambeds	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	12.88%	9	0.00%	–	**12.88%**	**9**	**1**
E22	29°8' 4.4"	62°2' 49.9"	5/2/23	Mountain/Hills	0.00%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	9.07%	2	0.27%	4	0.16%	4	0.00%	–	**9.50%**	**11**	**4**
E23	29°8' 19"	62°6' 3"	5/2/23	Gravel Plains	0.00%	–	0.02%	11	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.01%	2	0.00%	–	**0.03%**	**13**	**2**
E24	29°7' 20.6"	62°7' 5.6"	5/1/23	Gravel Plains	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.01%	2	0.00%	–	0.00%	–	0.00%	–	0.00%	–	**0.01%**	**2**	**1**
E25	29°5' 44.3"	62°6' 19.3"	5/2/23	Dry Streambeds	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.83%	1	0.00%	–	1.45%	6	0.00%	–	**2.28%**	**7**	**2**

Location ID	*Coordinates*		*Date*	*Habitat*	*Anabasis setifera*		*Aristida adscensionis*		*Calligonum comosum*		*Calligonum polygonoides*		*Cornulaca monacantha*		*Eleusine compressa*		*Haloxylon persicum*		*Haloxylon salicornicum*		*Salsola stocksii*		*Tribulus terrestris*		***Total Cover***	***Total count***	***Species Count***
	Latitude	*Longitude*			*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*			
E26	29°6' 9.2"	62°5' 4.3"	4/30/23	Gravel Plains	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	5.76%	1	0.00%	–	0.67%	6	0.00%	–	**6.43%**	**7**	**2**
E27	29°6' 46.8"	62°3' 1.3"	5/2/23	Dry Streambeds	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	15.31%	8	0.00%	–	**15.31%**	**8**	**1**
E28	29°6' 36.6"	62°1' 54.9"	5/2/23	Mountain/Hills	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.03%	2	0.00%	–	0.00%	–	0.03%	2	0.00%	–	0.00%	–	**0.06%**	**4**	**2**
E29	29°5' 15.8"	62°1' 57.1"	5/3/23	Dry Streambeds	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	2.11%	7	0.00%	–	**2.11%**	**7**	**1**
E30	29°6' 7"	61°59' 17.1"	5/3/23	Dry Streambeds	0.00%	–	0.03%	9	0.00%	–	8.88%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–	2.10%	1	0.00%	–	**11.00%**	**11**	**3**
E31	29°6' 49.6"	61°57' 50.7"	5/3/23	Gravel Plains	0.00%	–	0.01%	8	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	2.63%	4	0.00%	–	**2.64%**	**12**	**2**
E32	29°3' 1"	61°59' 34"	5/3/23	Gravel Plains	0.00%	–	0.01%	2	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	16.14%	5	0.00%	–	**16.15%**	**7**	**2**
					0.00%	1	0.08%	31	5.35%	6	8.96%	2	0.03%	3	0.01%	2	37.67%	19	4.48%	8	62.82%	75	0.01%	1	**119.4%**	**148**	**10**

D.2 Northern Groundwater System

D.2.1 Post-Monsoon 2022 Survey

D.2.1.1 Vegetation

Location ID	*Coordinates*		*Date*	*Habitat*	*Aeluropus lapopoides*		*Alhagi maurorum*		*Anabasis setifera*		*Aristida purpurea*		*Azadirachta indica*		*Calligonum comosum*		*Calligonum polygonide*		*Citrullus colocynthis*		*Fagonia ovalifolia*		*Haloxylon persicum*		*Haloxylon salcornicum*		*Haloxylon stocksii*	
					Cover	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*
E1	29°38' 9.1"	61°27' 28"	9/17/22	Clayey Plains	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	6.64%	3	0.00%	–	0.00%	–	0.00%	–	0.00%	–
E2	29°33' 59.7"	61°31' 30.7"	9/17/22	Clayey Plains	0.00%	–	0.02%	5	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.25%	4	0.01%	2	0.00%	–	0.00%	–	0.00%	–	0.00%	–
E3	29°31' 43.1"	61°33' 46.2"	9/17/22	Gravel Plains	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.01%	1	0.00%	–	0.00%	–	0.00%	–
E4	29°30' 37.8"	61°31' 26.1"	9/17/22	Dry Streambeds	0.00%	–	0.02%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.09%	3	0.00%	–	0.00%	–	0.00%	–
E5	29°28' 22.7"	61°37' 52.2"	9/18/22	Sandy Plains/ Sand Dunes	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	6.48%	5	0.00%	–	0.97%	5
E6	29°25' 53.7"	61°37' 53.8"	9/18/22	Gravel Plains	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	1.42%	10
E7	29°24' 10.4"	61°44' 31.2"	9/18/22	Sandy Plains/ Sand Dunes	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	6.37%	2	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.16%	1	0.86%	4
E8	29°21' 3.4"	61°44' 30.3"	9/18/22	Dry Streambeds	0.02%	4	0.00%	–	0.00%	–	0.00%	–	4.28%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.37%	3	0.00%	–	0.93%	10
E9	29°19' 20.6"	61°45' 49.6"	9/19/22	Dry Streambeds	0.01%	3	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	2.24%	13
E10	29°16' 55.3"	61°50' 19.5"	9/19/22	Gravel Plains	0.01%	1	0.00%	–	0.00%	–	0.07%	2	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.28%	2	10.51%	2	0.00%	–	0.19%	1
E11	29°28' 22.6"	61°23' 15.5"	9/19/22	Mountains/ Hills	0.00%	–	0.00%	–	1.30%	7	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	1.66%	7	0.00%	–
E12	29°11' 9.3"	61°55' 7.7"	9/19/22	Gravel Plains	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	1.29%	7	2.94%	6
MH1	29°28' 22.6"	61°23' 15.5"	9/17/22	Agriculture Areas/ Date Palms	0.00%	–	0.36%	6	0.00%	–	0.10%	2	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–
					0.04%	**8**	**0.41%**	**12**	**1.30%**	**7**	**0.17%**	**4**	**4.28%**	**1**	**6.37%**	**2**	**0.25%**	**4**	**6.65%**	**5**	**0.38%**	**6**	**17.37%**	**10**	**3.12%**	**15**	**9.55%**	**49**

Location ID	*Coordinates*		*Date*	*Habitat*	*Helitropium crispum*		*Panicum turgidum*		*Peganum harmala*		*Phoenix dactylifera*		*Tamarix aphylla*		*Tribulus terrestris*		*Vachellia jacquemontii*		*Zygophylon sp.*		***Total Cover***	***Total count***	***Species Count***
	Latitude	*Longitude*			*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*			
E1	29°38' 9.1"	61°27' 28"	9/17/22	Clayey Plains	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.17%	30	0.00%	–	0.00%	–	**6.81%**	**33**	2
E2	29°33' 59.7"	61°31' 30.7"	9/17/22	Clayey Plains	0.02%	2	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.03%	6	0.00%	–	0.00%	–	**0.32%**	**19**	5
E3	29°31' 43.1"	61°33' 46.2"	9/17/22	Gravel Plains	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.02%	3	0.00%	–	0.00%	–	**0.03%**	**4**	2
E4	29°30' 37.8"	61°31' 26.1"	9/17/22	Dry Streambeds	0.01%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.01%	1	0.00%	–	0.00%	–	**0.13%**	**6**	6
E5	29°28' 22.7"	61°37' 52.2"	9/18/22	Sandy Plains/ Sand Dunes	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	**7.46%**	**10**	3
E6	29°25' 53.7"	61°37' 53.8"	9/18/22	Gravel Plains	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.21%	3	**1.62%**	**13**	6
E7	29°24' 10.4"	61°44' 31.2"	9/18/22	Sandy Plains/ Sand Dunes	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.19%	2	0.00%	–	0.00%	–	**7.59%**	**9**	0
E8	29°21' 3.4"	61°44' 30.3"	9/18/22	Dry Streambeds	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	**5.60%**	**18**	4
E9	29°19' 20.6"	61°45' 49.6"	9/19/22	Dry Streambeds	0.00%	–	0.03%	6	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	**2.29%**	**22**	3
E10	29°16' 55.3"	61°50' 19.5"	9/19/22	Gravel Plains	0.02%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	**11.08%**	**9**	6
E11	29°28' 22.6"	61°23' 15.5"	9/19/22	Mountains/ Hills	0.00%	–	0.04%	2	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	**3.00%**	**16**	3
E12	29°11' 9.3"	61°55' 7.7"	9/19/22	Gravel Plains	0.00%	–	0.09%	8	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	**4.32%**	**21**	6
MH1	29°28' 22.6"	61°23' 15.5"	9/17/22	Agriculture Areas/ Date Palms	0.00%	–	0.00%	–	1.12%	6	39.36%	2	5.89%	4	0.00%	–	0.22%	6	0.00%	–	**47.05%**	**26**	6
					0.05%	4	0.17%	16	1.12%	6	39.36%	2	5.89%	4	0.42%	42	0.22%	6	0.21%	3	**97.3%**	**206**	**20**

D.2.2 Spring 2023 Survey

D.2.2.1 Vegetation

Location ID	*Coordinates*		*Date*	*Habitat*	*Aerva tomentosa*		*Alhaji maurorum*		*Aristida adscensionis*		*Aristida pupurea*		*Acanthophyllum*		*Calligonum comosum*		*Citharelloma lehmannii*		*Calligonum polygonoides*		*Citrullus colocynthis*		*Cornulaca monacantha*		*Crotalaria burhia*		*Cynomorium coccineum*		*Eucalyptus camaldulensis*		*Fagonia ovalifolia*		*Fortuynia bungei*	
	Latitude	*Longitude*			*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*
E1	29°38' 9.1"	61°27' 28"	4/28/23	*Clayey Plains*	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.01%	1	0.06%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.01%	1	0.00%	–
E2	29°33' 59.7"	61°31' 30.7"	4/28/23	Clayey Plains	0.00%	–	0.28%	12	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	4.08%	7	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–
E3	29°31' 43.1"	61°33' 46.2"	4/28/23	Gravel Plains	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–
E4	29°30' 37.8"	61°31' 26.1"	4/28/23	Dry Streambeds	0.00%	–	0.00%	–	0.00%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.08%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–
E5	29°28' 22.7"	61°37' 52.2"	4/30/23	Sandy Plains	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–
E6	29°25' 53.7"	61°37' 53.8"	4/30/23	Dry Streambeds	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–
E7	29°24' 10.4"	61°44' 31.2"	4/29/23	Gravel Plains	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	10.42%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–
E8	29°21' 3.4"	61°44' 30.3"	4/28/23	Dry Streambeds	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	8.60%	3	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–
E9	29°19' 20.6"	61°45' 49.6"	4/28/23	Dry Streambeds	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	4.28%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–
E10	29°16' 55.3"	61°50' 19.5"	4/28/23	Gravel Plains	0.00%	–	0.00%	–	0.00%	–	0.00%	2	0.00%	–	10.10%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–
E11	29°28' 22.6"	61°23' 15.5"	4/28/23	Mountain/Hills	0.00%	–	0.00%	–	0.01%	1	0.00%	–	0.02%	1	9.89%	4	0.02%	1	0.20%	1	0.00%	–	0.04%	2	0.00%	–	0.04%	1	0.00%	–	0.06%	2	0.07%	1
E12	29°11' 9.3"	61°55' 7.7"	4/30/23	Gravel Plains	0.68%	6	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–
MH1	29°28' 22.6"	61°23' 15.5"	4/30/23	Agricultural Area/ Date Palms	0.00%	–	0.91%	12	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.55%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–	8.39%	2	0.00%	–	0.00%	–
					0.68%	**6**	**1.20%**	**24**	**0.01%**	**2**	**0.00%**	**2**	**0.02%**	**1**	**43.28%**	**10**	**0.02%**	**1**	**0.76%**	**3**	**4.14%**	**8**	**0.04%**	**2**	**0.08%**	**1**	**0.04%**	**1**	**8.39%**	**2**	**0.06%**	**3**	**0.07%**	**1**

Location ID	*Coordinates*		*Date*	*Habitat*	*Penicum turgidum*		*Haloxylon persicum*		*Haloxylon salicornicum*		*Heliotropium crispum*		*Malcolmia scorpioides*		*Peganum harmala*		*Phoenix dactylifera*		*Physorrhynchus chamaerapistrum*		*Rumex vasicarius*		*Salix tetrasperma*		*Salsola stocksii*		*Tamarix aphylla*		*Tribulus terrestris*		***Total Cover***	***Total count***	***Species Count***
					Cover	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*	*Cover*	*Count*			
E1	29°38' 9.1"	61°27' 28"	4/28/23	Clayey Plains	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.10%	3	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.07%	9	**0.25%**	**15**	**5**
E2	29°33' 59.7"	61°31' 30.7"	4/28/23	Clayey Plains	0.00%	–	0.00%	–	0.00%	–	0.01%	2	0.00%	–	0.58%	3	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.09%	2	**5.05%**	**26**	**5**
E3	29°31' 43.1"	61°33' 46.2"	4/28/23	Gravel Plains	0.00%	–	0.00%	–	0.00%	–	0.00%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	**0.00%**	**1**	**1**
E4	29°30' 37.8"	61°31' 26.1"	4/28/23	Dry Streambeds	0.00%	–	0.00%	–	0.00%	–	0.06%	3	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.13%	3	0.00%	–	0.00%	–	**0.28%**	**8**	**4**
E5	29°28' 22.7"	61°37' 52.2"	4/30/23	Sandy Plains	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	12.73%	9	0.00%	–	0.00%	–	**12.73%**	**9**	**1**
E6	29°25' 53.7"	61°37' 53.8"	4/30/23	Dry Streambeds	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	20.62%	13	0.00%	–	0.00%	–	**20.62%**	**13**	**1**
E7	29°24' 10.4"	61°44' 31.2"	4/29/23	Gravel Plains	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	2.32%	3	0.00%	–	0.00%	–	**12.74%**	**4**	**2**
E8	29°21' 3.4"	61°44' 30.3"	4/28/23	Dry Streambeds	0.00%	–	5.55%	2	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	12.91%	2	0.00%	–	0.00%	–	**27.05%**	**7**	**3**
E9	29°19' 20.6"	61°45' 49.6"	4/28/23	Dry Streambeds	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	4.38%	4	0.00%	–	0.00%	–	**8.66%**	**5**	**2**
E10	29°16' 55.3"	61°50' 19.5"	4/28/23	Gravel Plains	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	11.49%	2	0.00%	–	0.00%	–	**21.59%**	**5**	**3**
E11	29°28' 22.6"	61°23' 15.5"	4/28/23	Mountain/Hills	0.00%	–	0.00%	–	5.38%	7	0.00%	–	0.02%	1	0.00%	–	0.00%	–	0.00%	–	0.01%	1	0.03%	1	0.00%	–	0.00%	–	0.00%	–	0.00%	–	**15.78%**	**24**	**13**
E12	29°11' 9.3"	61°55' 7.7"	4/30/23	Gravel Plains	0.00%	–	0.00%	–	0.29%	4	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	**0.97%**	**10**	**2**
MH1	29°28' 22.6"	61°23' 15.5"	4/30/23	Agricultural Area/Date Palms	1.37%	4	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.17%	2	62.93%	3	0.00%	–	0.00%	–	0.83%	1	0.00%	–	3.23%	5	0.00%	–	**78.39%**	**30**	**8**
					1.37%	4	5.55%	2	5.66%	11	0.07%	6	0.02%	1	0.86%	8	62.93%	3	0.01%	1	0.03%	1	0.83%	1	64.58%	36	3.23%	5	0.17%	11	**204.1%**	**157**	**28**

D.3 Access Route to Reko Diq Mine Site

D.3.1 Post-Monsoon 2022 Survey

D.3.1.1 Vegetation

Location ID	Coordinates		Date	Habitat	Aeluropus lagopoides		Aristida adscensionis		Anabasis setifera		Calligonium comosum		Calligonum polygonides		Cistanche tubulosa		Cornulaca monacanta		Fagonia ovalifolia		Haloxylon persicum		Haloxylon salicornicum		Salsola stocksii		Tamarix stricta		Tamarix aphylla		**Total Cover**	**Total count**	**Species Count**
					Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count			
E41	29°0' 22.5"	62°3' 3.8"	9/16/2022	Gravel Plains	0.03%	8	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	8.39%	1	0.00%	–	**8.42%**	**9**	**2**
E42	28°58' 53.4"	62°6' 19.9"	9/16/2022	Dry Streambeds	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.75%	2	5.68%	4	1.02%	1	3.32%	5	**10.76%**	**12**	**4**
E43	28°57' 43.3"	62°7' 38.4"	9/22/2022	Mountain/Hills	0.00%	–	0.00%	–	0.20%	2	0.00%	–	0.21%	1	0.00%	–	0.66%	3	0.00%	–	0.00%	–	0.79%	2	0.62%	3	0.00%	–	0.00%	–	**2.50%**	**11**	**5**
E44	28°55' 27.3"	62°11' 32.1"	9/22/2022	Dry Streambeds	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.81%	3	0.00%	–	0.00%	–	0.13%	1	0.00%	–	0.00%	–	3.12%	11	0.00%	–	0.00%	–	**4.06%**	**15**	**3**
E45	28°54' 28.5"	62°14' 30"	9/23/2022	Gravel Plains	0.00%	–	0.04%	3	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	1.59%	4	0.00%	–	0.00%	–	**1.63%**	**7**	**2**
E46	28°51' 34"	62°18' 38.4"	9/23/2022	Dry Streambeds	0.00%	–	0.00%	–	0.00%	–	3.14%	2	0.00%	–	0.00%	–	0.00%	–	0.08%	1	0.00%	–	0.00%	–	6.26%	10	0.00%	–	0.00%	–	**9.48%**	**13**	**3**
E47	28°50' 27.5"	62°21' 32.7"	9/23/2022	Gravel Plains	0.00%	–	0.00%	–	0.00%	–	3.61%	7	0.00%	–	0.04%	1	0.00%	–	0.10%	1	0.00%	–	0.00%	–	2.14%	7	0.00%	–	0.00%	–	**5.89%**	**16**	**4**
E48	28°49' 53"	62°25' 1.7"	9/23/2022	Dry Streambeds	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.00%	–	0.03%	1	0.36%	1	0.00%	–	5.59%	13	0.00%	–	0.00%	–	**5.98%**	**15**	**3**
					0.03%	8	0.04%	3	0.20%	2	6.75%	9	1.02%	4	0.04%	1	0.66%	3	0.34%	4	0.36%	1	1.54%	4	24.99%	52	9.41%	2	3.32%	5	**48.72%**	**98**	**13**

D.4 Access Route to Reko Diq Mine Site

D.4.1 Spring 2023 Survey

D.4.1.1 Vegetation

Location ID	Coordinates	Date	Habitat	Aristida adsecensionis		Calligonum polygonoides		Haloxylon persicum		Haloxylon salicornicum		Salsola stocksii		Tamarix aphylla		Tamarix stricta		**Total Cover %**	**Total count**	**Species Count**
				Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count			
E41	29° 0' 28.81" 62° 3' 8.65"	5/5/23	Dry Streambeds																	
E42	28° 58' 54.75" 62° 6' 19.85"	5/5/23	Dry Streambeds																	
E43	28° 57' 40.24" 62° 7' 12.06"	5/5/23	Mountain/Hills																	
E44	28° 55' 15.05" 62° 11' 39.22"	5/7/23	Dry Streambeds																	
E45	28° 54' 34.44" 62° 14' 23.86"	5/7/23	Gravel Plains																	
E46	28° 51' 39.99" 62° 18' 41.52"	5/6/23	Dry Streambeds																	
E47	28° 50' 32.34" 62° 21' 25.27"	5/7/23	Gravel Plains																	
E48	28° 50' 1.13" 62° 25' 0.88"	5/7/23	Dry Streambeds																	
Total																		**0.00**	**67**	**7**

D.5 Post Monsoon 2023 Survey

D.5.1.1 Vegetation

Location ID	Coordinates		Date	Habitat	Abutilon indicum		Aerva javanica		Arundo donex		Avicennia marina		Azadirachta indica		Calotropis procera		Capparis decidua		Fogonia cretica		Haloxylon salicornicum		Panicum turgidum		Phragmites karka	
	Lat	Long			Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count
T1	24° 47' 45.33"	67° 19' 33.45"	10/13/23	Vegetation Cluster	46.89%	2	0.34%	1	0.00%	–	0.00%	–	0.00%	–	60.92%	8	416.06%	4	0.00%	–	0.00%	–	0.00%	–	0.00%	–
T2	24° 46' 47.72"	67° 20' 41.66"	10/13/23	Barren Land/ Open Plot	53.04%	1	0.73%	2	0.00%	–	0.00%	–	862.40%	3	9.22%	5	0.00%	–	23.86%	4	0.00%	–	0.00%	–	0.00%	–
T3	24° 46' 47.72"	67° 20' 41.66"	10/13/23	Industrial Units	0.00%	–	0.00%	–	566.30%	4	566.30%	8	0.00%	–	263.30%	3	0.00%	–	1.16%	1	1.54%	5	1175.26%	4	5.14%	10
					99.93%	**3**	**1.06%**	**3**	**566.30%**	**4**	**566.30%**	**8**	**862.40%**	**3**	**333.44%**	**16**	**416.06%**	**4**	**25.03%**	**5**	**1.54%**	**5**	**1175.26%**	**4**	**5.14%**	**10**

Location ID	Coordinates		Date	Habitat 1	Prosopis juliflora		Saccharum munja		Salvadora oliodes		Senna Italica		Sesbania grandiflora		Tamarix aphylla		Ziziphus jujuba		**Total Cover**	**Total count**	**Species Count**
	Lat	Long			Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count	Cover	Count			
T1	24° 47' 45.33"	67° 19' 33.45"	10/13/23	Vegetation Cluster	3435.83%	12	189.12%	3	63.12%	1	3.31%	1	0.00%	–	0.00%	–	0.00%	–	**4215.6%**	**32**	8
T2	24° 46' 47.72"	67° 20' 41.66"	10/13/23	Barren Land/Open Plot	122.44%	11	0.00%	–	0.00%	–	0.51%	2	0.00%	–	0.00%	–	16.94%	3	**1089.1%**	**31**	8
T3	24° 46' 47.72"	67° 20' 41.66"	10/13/23	Industrial Units	8.47%	7	0.00%	–	0.00%	–	0.00%	–	1626.08%	10	7.99%	1	0.00%	–	**4221.5%**	**53**	10
					3566.73%	**30**	**189.12%**	**3**	**63.12%**	**1**	**3.82%**	**3**	**1626.08%**	**10**	**7.99%**	**1**	**16.94%**	**3**	**9526.3%**	**116**	**18.00**

Appendix E: Comparison of Post-Monsoon 2022 and Spring 2023 Surveys with Previous Post-Monsoon and Spring Surveys

This appendix provides a comparison of the terrestrial vegetation surveys conducted in the Post-Monsoon 2022 Survey with Previous Post-Monsoon Surveys conducted in November 2008 and August 2020, referred hereafter as Previous Post-Monsoon Surveys. It also provides comparison of the results of the Comparison of Post-Monsoon 2022 Survey with Previous Post-Monsoon Surveys

The results of Post-Monsoon 2022 Survey (conducted in September-October 2022) for common sampling locations are compared with Previous Post-Monsoon Surveys which were carried out in similar seasons i.e., November 2008, and August 2020 surveys. The weather conditions were almost comparable with the current survey season, therefore, the results for common sampling locations using common sampling method were used for the comparison with these surveys.

Exhibit E.1 provides a map of common sampling locations where sampling was conducted in Previous Post-Monsoon Surveys and Post-Monsoon 2023 Survey.

A total of 28 plant species were observed from common sampling locations in the Post-Monsoon 2022 Survey compared to 19 plant species observed in the Previous Post-Monsoon Surveys. Overall, species richness in the Post-Monsoon 2022 Survey was higher compared to Previous Post-Monsoon Surveys.

Exhibit E.2 provides the list of plant species observed in different surveys conducted in Previous Post-Monsoon Surveys and Post-Monsoon 2022 Survey.

Exhibit E.1: Common Sampling Locations Sampled in Previous Post-Monsoon Surveys and Post-Monsoon 2022 Survey

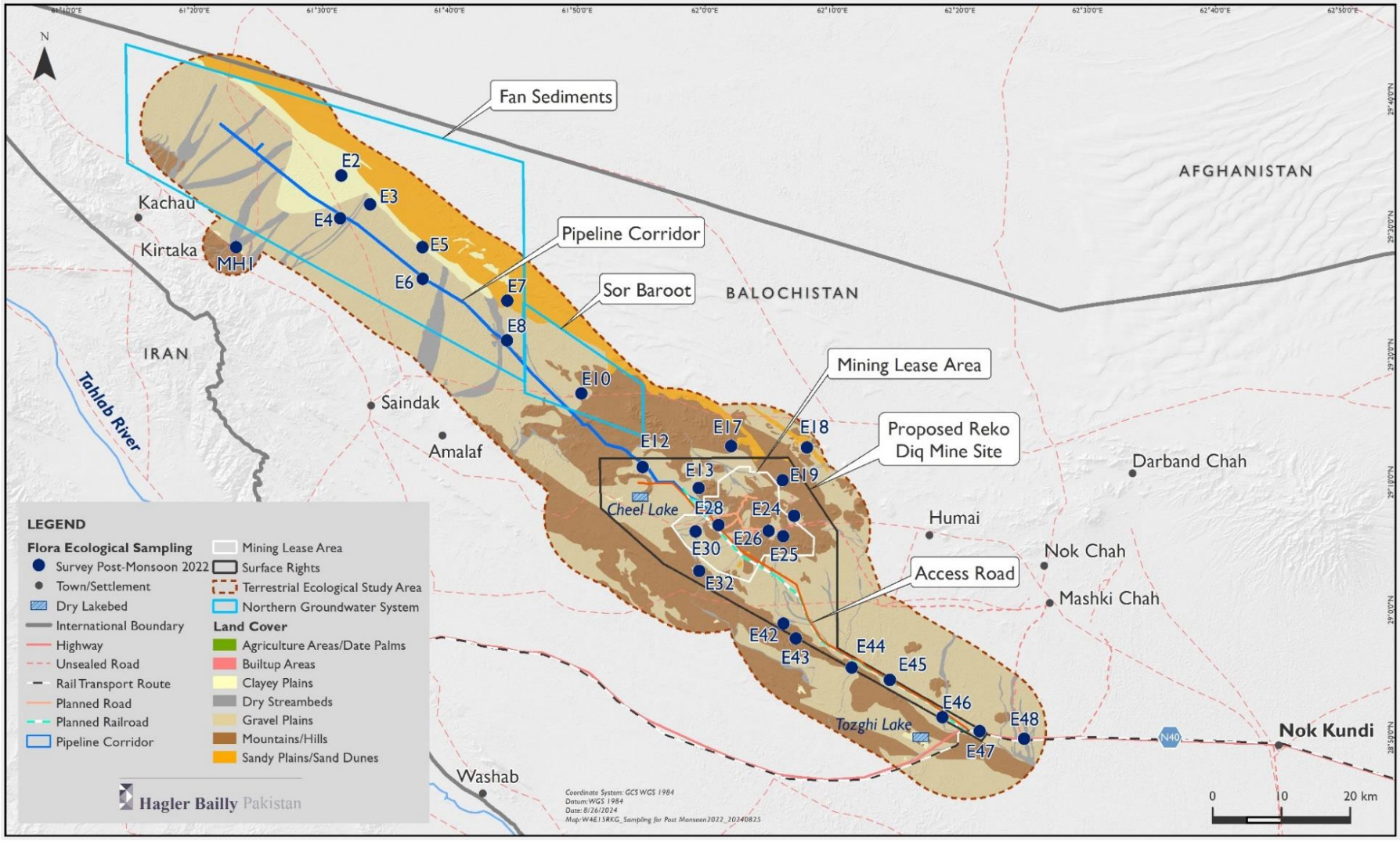


Exhibit E.2: Plant Species Observed in Previous Post-Monsoon Surveys and Post-Monsoon 2022 Survey

No.	*Scientific Name*	*Previous Post-Monsoon Surveys*		*Post-Monsoon 2022 Survey*
		November 2008 Survey	*August 2020 Survey*	
1	*Aeluropus lagopoides*	-	-	✓
2	*Alhagi maurorum*	✓	✓	✓
3	*Anabasis setifera*	-	-	✓
4	*Aristida adscensionis*	-	-	✓
5	*Aristida purpurea*	-	-	✓
6	*Aristida sp.*	✓	-	-
7	*Azadirachta indica*	-	-	✓
8	*Bromus sp.*	-	-	✓
9	*Calligonum comosum*	-	-	✓
10	*Calligonum polygonoides*	-	✓	✓
11	*Cenchrus biflorus*	-	-	✓
12	*Cistanche tubulosa*	-	-	✓
13	*Citrullus colocynthis*	✓	-	✓
14	*Cornulaca monacantha*	-	✓	✓
15	*Cynodon dactylon*	-		✓
16	*Chenopodium glaucum*	-	✓	-
17	*Desmostachya bipinnata*	-	✓	-
18	*Eleusine compressa*	-	-	✓
19	*Fagonia ovalifolia*	✓	-	✓
20	*Fagonia cretica*		✓	
21	*Haloxylon persicum*	✓	✓	✓
22	*Haloxylon salcornicom*	-	✓	✓
23	*Haloxylon stocksii*	✓	-	✓
24	*Heliotropium crispum*	✓	-	✓
25	*Helitropium zeyloncum*	-	-	✓
26	*Panicum turgidum*		✓	✓
27	*Peganum harmala*		✓	✓
28	*Phoenix dactylifera*	✓		✓
29	*Tamarix aphylla*	-	-	✓
30	*Tamarix stricta*	✓	✓	-

No.	*Scientific Name*	*Previous Post-Monsoon Surveys*		*Post-Monsoon 2022 Survey*
		November 2008 Survey	*August 2020 Survey*	
31	*Tribulus terrestris*	✓	✓	✓
32	*Vachellia jacquemontii*	-	-	✓
33	*Zygophyllum simplex*	✓	✓	-
34	*Zygophylon sp.*	-	-	✓
Total		**11**	**13**	**28**
Total (combined total for Previous Post-Monsoon Surveys) and Post-Monsoon 2022 Survey		**19**		**28**

E.1.1 Reko Diq Mine Site

The comparison of abundance and diversity of terrestrial vegetation between the Post-Monsoon 2022 Survey, the November 2008 Survey, and the August 2020 Survey (referred to as the Previous Post-Monsoon Surveys) focused on the proposed Reko Diq Mine Site which is discussed here.

Since the Previous Post-Monsoon Surveys were conducted exclusively at the proposed Reko Diq Mine Site, the comparison was therefore limited to only 10 common locations, which include E13, E17, E18, E19, E24, E25, E26, E28, E30, and E32. Among the 10 common sampling locations, four were in the Mountains/Hills habitat, three in the Gravel Plains habitat, two in Dry Streambeds, and one in the Sandy Plains/Sand Dunes habitat.

Average Diversity and Density in the Overall Survey: The average diversity of plant species observed in the Post-Monsoon 2022 Survey was 2.4 compared to 1.0 observed in Previous Post-Monsoon Surveys. Similarly, the average density observed in the Post-Monsoon 2022 Survey was 9.2 compared to 7.0 in the Previous Post-Monsoon Surveys. This comparison shows that both the diversity and density of vegetation in the Post-Monsoon 2022 Survey are higher compared to Previous Post-Monsoon Surveys.

Average Diversity by Habitat: The highest average diversity was observed in the Sandy Plains habitat (3.0) at the proposed Reko Diq Mine Site in the Post-Monsoon 2022 Survey, followed by Dry Streambeds (2.5), Gravel Plains (2.3), and Mountains/Hills (1.8). This pattern was different in the Previous Post-Monsoon Surveys, i.e., the highest diversity was recorded from Mountains/Hills (2.3) followed by Dry Streambeds (1.0), Gravel Plains (0.7), and Sandy Plains (0.0).

Average Density by Habitat: The highest average density during the Post-Monsoon 2022 Survey was recorded in Dry Streambeds (16.5), followed by Mountains/Hills (9.3), Gravel Plains (8.0), and Sandy Plains (3.0). Whereas in the Previous Post-Monsoon Surveys, the highest density was observed in Mountains/Hills (12.0), followed by Gravel Plains (4.3), Dry Streambeds (4.0), and no species of plant was observed in Sandy Plains/Sand Dunes. Overall, the density of plant species in the Post-Monsoon 2022 Survey is slightly higher compared to Previous Post-Monsoon Surveys.

Exhibit E.3 provides a comparison of the average density and diversity of plant species observed at the Reko Diq Mine Site in the Previous Post-Monsoon Surveys and Post-Monsoon 2022 Survey.

Exhibit E.4 provides a comparison of species abundance for common sampling locations at the Reko Diq Mine in the Previous Post-Monsoon Surveys and the Post-Monsoon 2022 Survey.

Exhibit E.5 provides a comparison of species richness for common sampling locations at the Reko Diq Mine Site in the Previous Post-Monsoon Surveys and the Post-Monsoon 2022 Survey.

Exhibit E.3: Comparison of Average Diversity and Average Density by Habitat at Proposed Reko Diq Mine Site in Post-Monsoon 2022 Survey and Previous Post-Monsoon Surveys

Habitat	*Average Diversity*		*Average Density*	
	Previous Post-Monsoon Survey	*Post-Monsoon 2022 Survey*	*Previous Post-Monsoon Survey*	*Post-Monsoon 2022 Survey*
Dry Streambeds	1.0	2.5	4.0	16.5
Gravel Plains	0.7	2.3	4.3	8.0
Mountains/Hills	2.3	1.8	12.0	9.3
Sandy Plains	0.0	3.0	0.0	3.0

Exhibit E.4: Comparison of Plant Species Abundance by Sampling Location at Reko Diq Mine Site in Post-Monsoon 2022 Survey and Previous Post-Monsoon Surveys

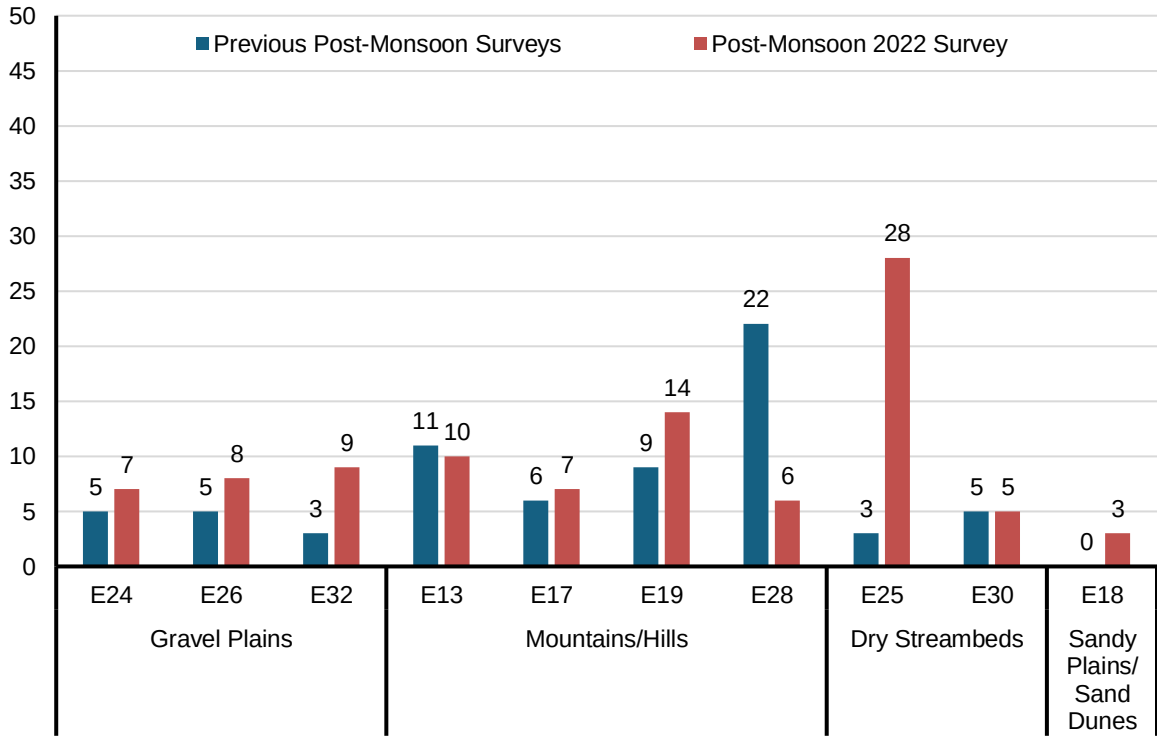
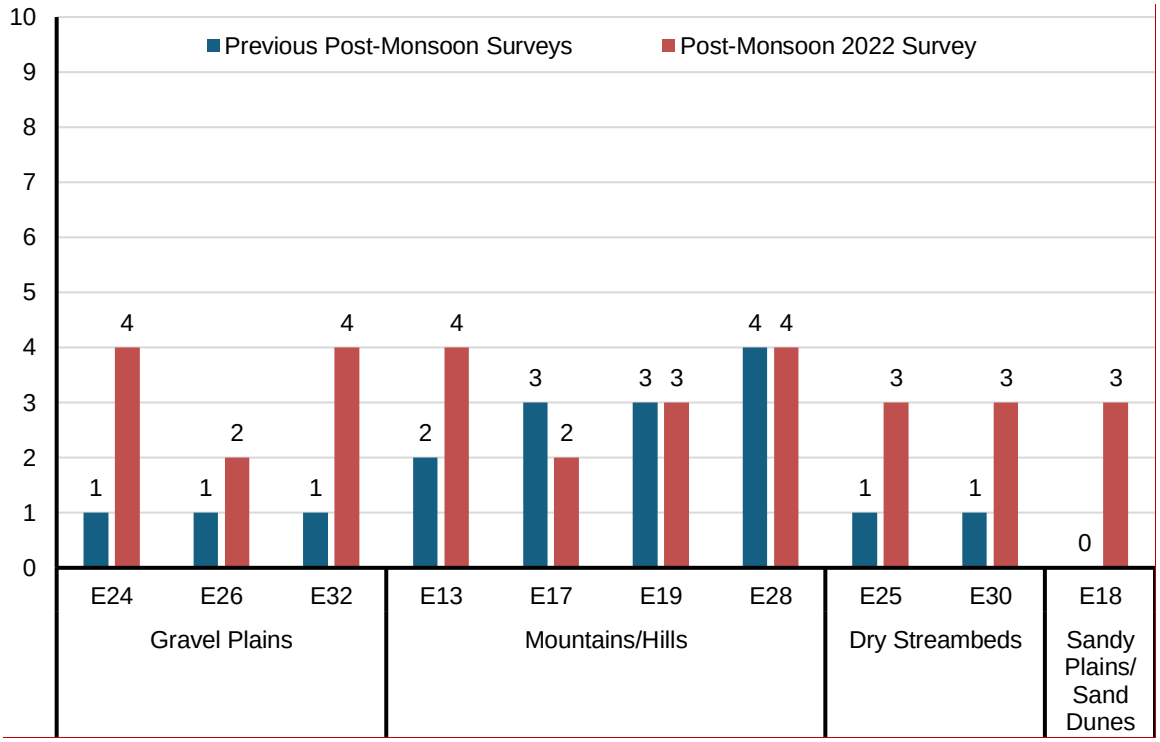


Exhibit E.5: Comparison of Species Richness by Sampling Location at Reko Diq Mine Site in Post-Monsoon 2022 Survey and Previous Post-Monsoon Surveys



E.1.2 Northern Groundwater System

The comparison of terrestrial vegetation abundance and diversity between the Post-Monsoon 2022 Survey and the November 2008, and August 2020 surveys (referred to as the Previous Post-Monsoon Survey) focused along the Northern Groundwater System, which is discussed here.

Since the Previous Post-Monsoon Survey was conducted at Northern Groundwater System, the comparison was limited to the only 10 common sampling locations, which include E2-E8, E10, E12, and MH1 where sampling was conducted in both Post-Monsoon 2022 and Previous Post-Monsoon surveys. Among the 10 common sampling locations, four were located in the Gravel Plains habitat, two each in Sandy Plains/Sand Dunes and Dry Streambeds, and one each in Clayey Plains and Agricultural Areas/Date Palms habitat.

Average Diversity and Density in the Overall Survey: The average diversity (1.9) observed in the Post-Monsoon 2022 Survey was higher compared to the average diversity (1.3) in the Previous Post-Monsoon Surveys. The average density (13.5) observed in the Post-Monsoon 2022 Survey was slightly lower compared to the average density (16.0) in the Previous Post-Monsoon Surveys, which can be attributed to extreme dry conditions since 2009.

Average Diversity by Habitat: Agricultural Areas/Date Palms habitat showed the highest average diversity (6.0) in the Post-Monsoon 2022 Survey due to the availability

of plenty of water and lower anthropogenic disturbances. However, in the Previous Post-Monsoon Surveys, the highest density (26.0) was observed in the Clayey Plains habitat.

Average Density by Habitat: The highest average density in the Post-Monsoon 2022 Survey was recorded in Agricultural Areas/Date Palms (26.0) followed by Clayey Plains (19.0), Dry Streambeds (12.0), Gravel Plains (11.8), and Sandy Plains (9.5) whereas in Previous Post-Monsoon Surveys the trend was almost similar as the highest density was observed in Clayey Plains (26.0) followed by Agricultural Areas/Date Palms (21.0), Sandy Plains/Sand Dunes (16.0), Dry Streambeds (14.5) and Gravel Plains (13.0). The density and diversity in Agricultural Areas/Date Palms were significantly higher as compared to Previous Post-Monsoon Surveys due to the availability of water as well, and it was declared as a restricted area for cross-border trade by security forces, which resulted in a decrease in disturbance and an increase in biodiversity.

Exhibit E.6 provides a comparison of average diversity and average density observed along the Northern Groundwater System in Previous Post-Monsoon Surveys and Post-Monsoon 2022 Survey.

Exhibit E.7 provides a comparison of species abundance observed along the Northern Groundwater System in Previous Post-Monsoon Surveys and Post-Monsoon 2022 Survey.

Exhibit E.8 provides a comparison of species abundance observed along the Northern Groundwater System in Previous Post-Monsoon Surveys and Post-Monsoon 2022 Survey.

Exhibit E.6: Habitat Wise Average Diversity and Average Density Observed along Northern Groundwater System in Previous Post-Monsoon Surveys and Post-Monsoon 2022 Survey

Habitat	*Average Diversity*		*Average Density*	
	Previous Post-Monsoon Surveys	*Post-Monsoon 2022 Survey*	*Previous Post-Monsoon Surveys*	*Post-Monsoon 2022 Survey*
Agricultural Areas/Date Palms	4.0	6.0	21.0	26.0
Clayey Plains	3.0	5.0	26.0	19.0
Dry Streambeds	3.0	4.0	14.5	12.0
Gravel Plains	1.3	2.5	13.0	11.8
Sandy Plains/Sand Dunes	1.5	2.5	16.0	9.5

Exhibit E.7: Plant Species Abundance Observed along Northern Groundwater System in Previous Post-Monsoon Surveys and Post-Monsoon 2022 Survey

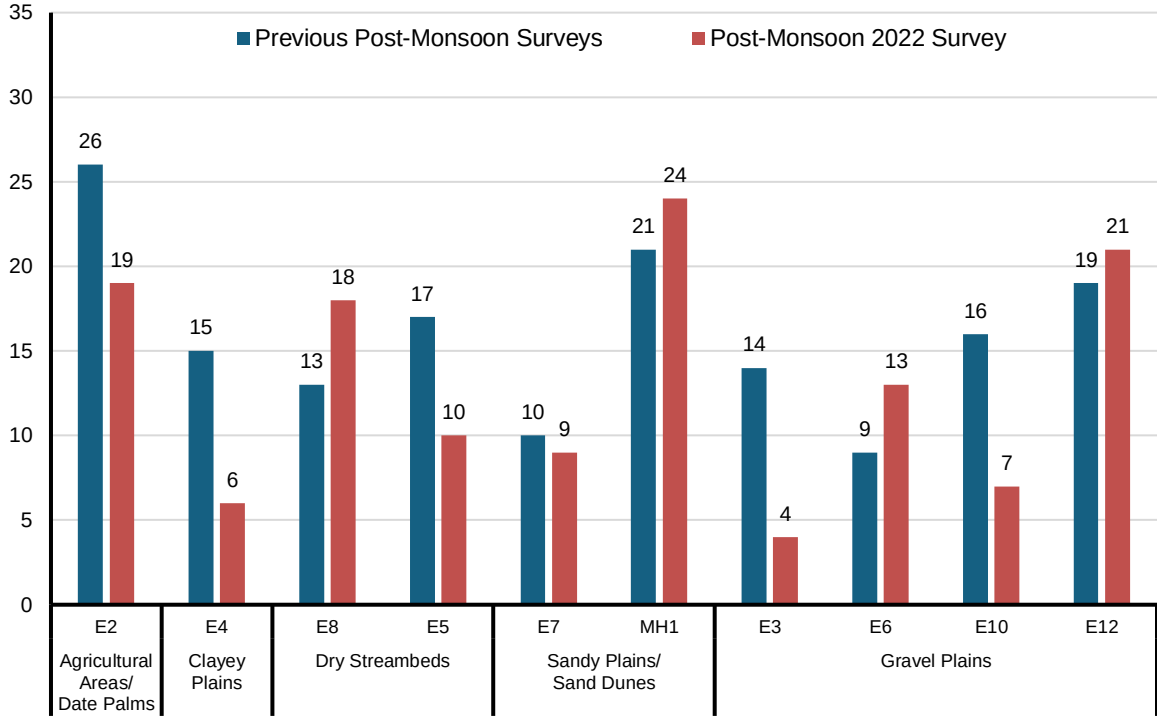
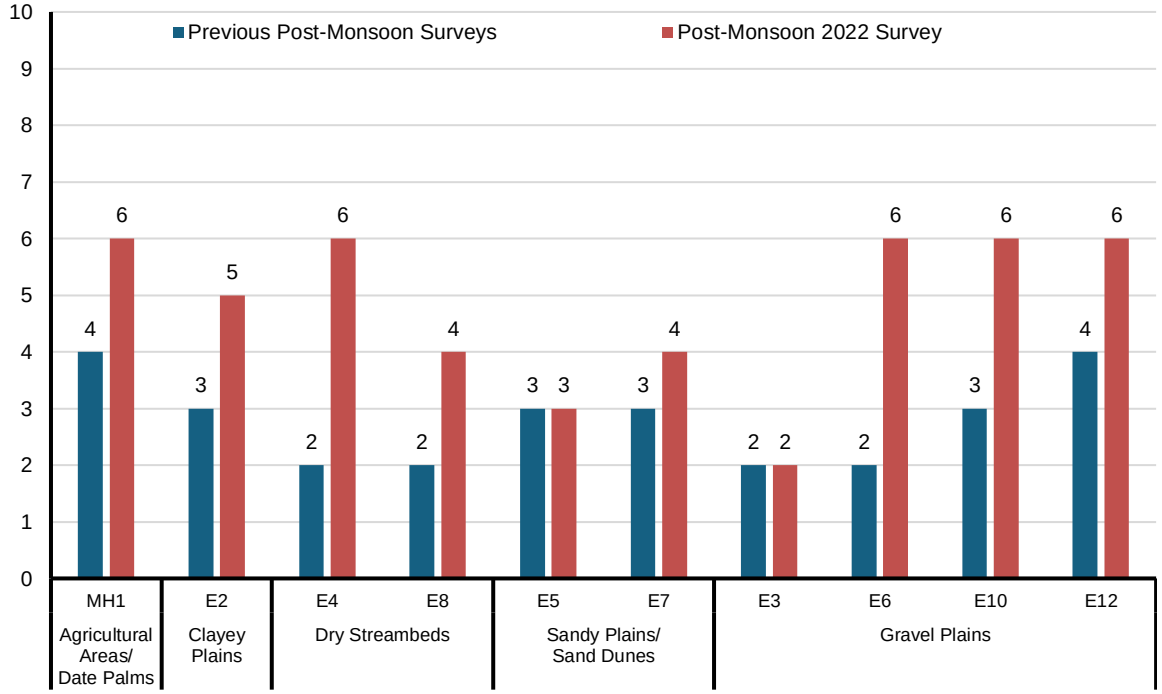


Exhibit E.8: Plant Species Richness Observed along Northern Groundwater System in Previous Post-Monsoon Surveys and Post-Monsoon 2022 Survey



E.1.3 Access Route to Reko Diq Mine Site

The comparison of terrestrial vegetation abundance and diversity between the Post-Monsoon 2022 Survey and the November 2008, and August 2020 surveys (referred to as the Previous Post-Monsoon Survey) focused along the Access Route to Reko Diq Mine Site, which is discussed here.

Since the Previous Post-Monsoon Survey was conducted Access Route to Reko Diq Mine Site, the comparison was limited to the only seven common sampling locations, which include the sampling locations E42-E48 where sampling was conducted in both Post-Monsoon 2022 and Previous Post-Monsoon surveys. Among the seven common sampling locations, three each were located in the Gravel Plains and Dry Streambeds, and one in Mountains/Hills habitat.

Average Diversity and Density in the Overall Survey: The average diversity (1.1) and density (5.3) recorded in the Post-Monsoon 2022 Survey was higher compared to the average diversity (0.5) and density (3.3) in Previous Post-Monsoon Surveys. In the Post-Monsoon 2022 Survey, the highest average diversity was recorded in Gravel Plains (16.0), whereas in Previous Post-Monsoon Surveys, it was recorded in Dry Streambeds (15.0). The highest average diversity (5.0) was observed in Mountains/Hills in the Post-Monsoon 2022 Survey while the highest diversity (1.3) was recorded from Dry Streambeds in Previous Post-Monsoon Surveys. This area was highly disturbed due to frequent movement of vehicles for cross-border trade.

Average Diversity by Habitat: Mountain Hills showed the highest diversity (5.0) in the Post-Monsoon 2022 Survey. However, in the Previous Post-Monsoon Surveys, the highest diversity (1.3) was observed in the Dry Streambeds habitat.

Average Density by Habitat: The highest average density in the Post-Monsoon 2022 Survey (14.3) and Previous Post-Monsoon Surveys (15.0) was recorded in Dry Streambeds habitat.

Exhibit E.6 provides a comparison of average diversity and average density observed along the Access Route to Reko Diq Mine Site in Previous Post-Monsoon Surveys and Post-Monsoon 2022 Survey.

Exhibit E.7 provides a comparison of species abundance observed along the Access Route to Reko Diq Mine Site in Previous Post-Monsoon Surveys and Post-Monsoon 2022 Survey.

Exhibit E.8 provides a comparison of species abundance observed along the Access Route to Reko Diq Mine Site in Previous Post-Monsoon Surveys and Post-Monsoon 2022 Survey.

Exhibit E.9: Habitat Wise Average Diversity and Average Density Observed along Access Route to Reko Diq Mine Site in Previous Post-Monsoon Surveys and Post-Monsoon 2022 Survey

Habitat	*Average Diversity*		*Average Density*	
	Previous Post-Monsoon Surveys	*Post-Monsoon 2022 Survey*	*Previous Post-Monsoon Surveys*	*Post-Monsoon 2022 Survey*
Dry Streambeds	1.3	1.7	15.0	14.3
Gravel Plains	1.0	0.8	5.3	11.7
Mountains/Hills	1.0	5.0	3.0	11.0
Total	**0.5**	**1.1**	**3.3**	**5.3**

Exhibit E.10: Plant Species Abundance Observed along Access Route to Reko Diq Mine Site in Previous Post-Monsoon Surveys and Post-Monsoon 2022 Survey

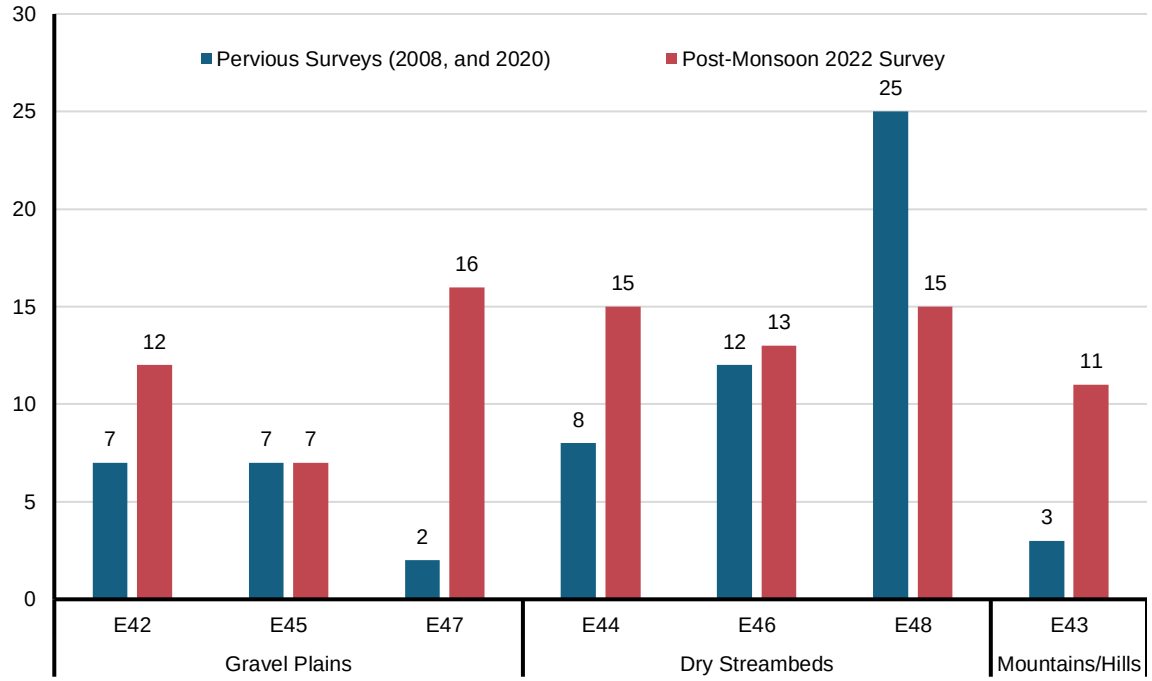
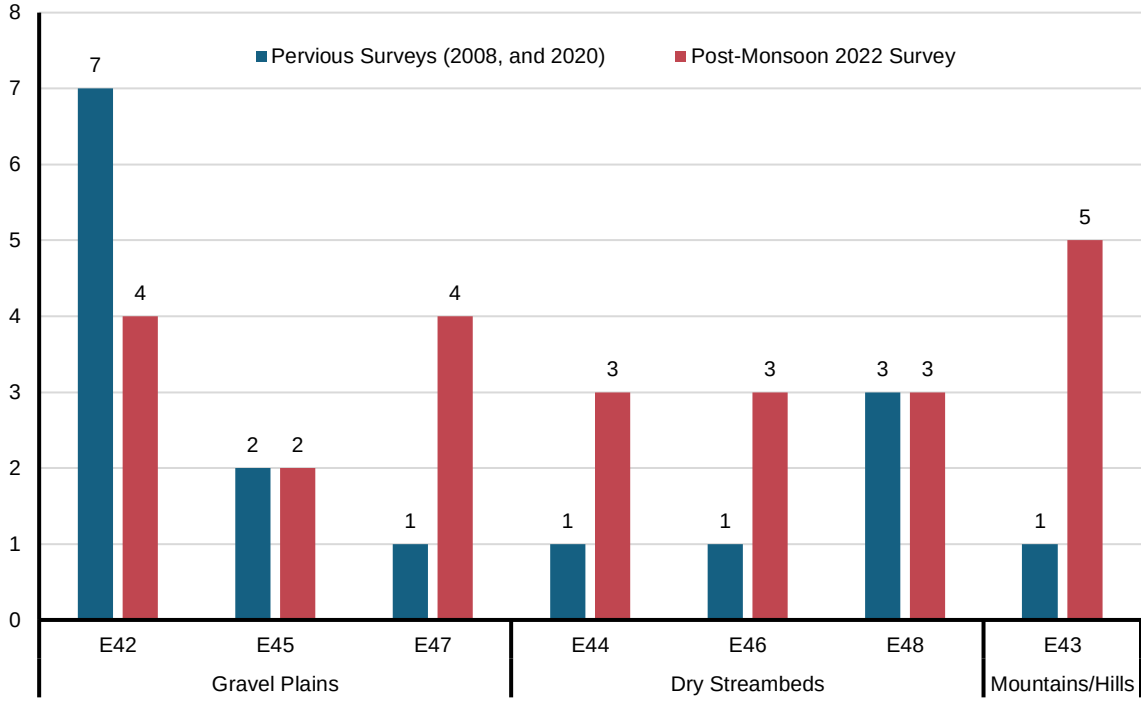


Exhibit E.11: Plant Species Richness Observed along Access Route to Reko Diq Mine Site in Previous Post-Monsoon Surveys and Post-Monsoon 2022 Survey



E.2 Comparison of Spring 2023 Survey with Previous Spring Survey

The results of the Spring 2023 Survey (conducted in April-May 2023) for common sampling locations are compared with Previous Spring Survey which were carried out in similar seasons, i.e., May 2008. The comparison is made for only four common sampling locations (E16, E22, E31, and E32) at the proposed Reko Diq Mine Site. Among the four common sampling locations, three were in Gravel Plains and one in Mountains/Hills. The comparison is based on the line transect sampling method for vegetation.

Exhibit E.12 provides a map of common sampling locations where sampling was conducted in the Previous Spring Survey and Spring 2023 Survey.

A comparison of plant diversity and density observed in Previous Spring Survey and Spring 2023 Survey is given for common sampling locations. Comparison is only provided for the proposed Reko Diq Mine Site, while for the rest of the project's Associated Infrastructure, including the Northern Groundwater System and Access Route to Reko Diq Mine Site, while sampling was not conducted in the Previous Spring Survey. In the Spring 2023 Survey, 16 plant species were observed compared to only eight species during the Previous Spring Survey.

Exhibit E.13 provides a comparison of vegetation species observed in the Previous Spring Survey and Spring 2023 Survey.

Exhibit E.12: Common Sampling Locations Sampled in Previous Spring Survey and Spring 2023 Survey

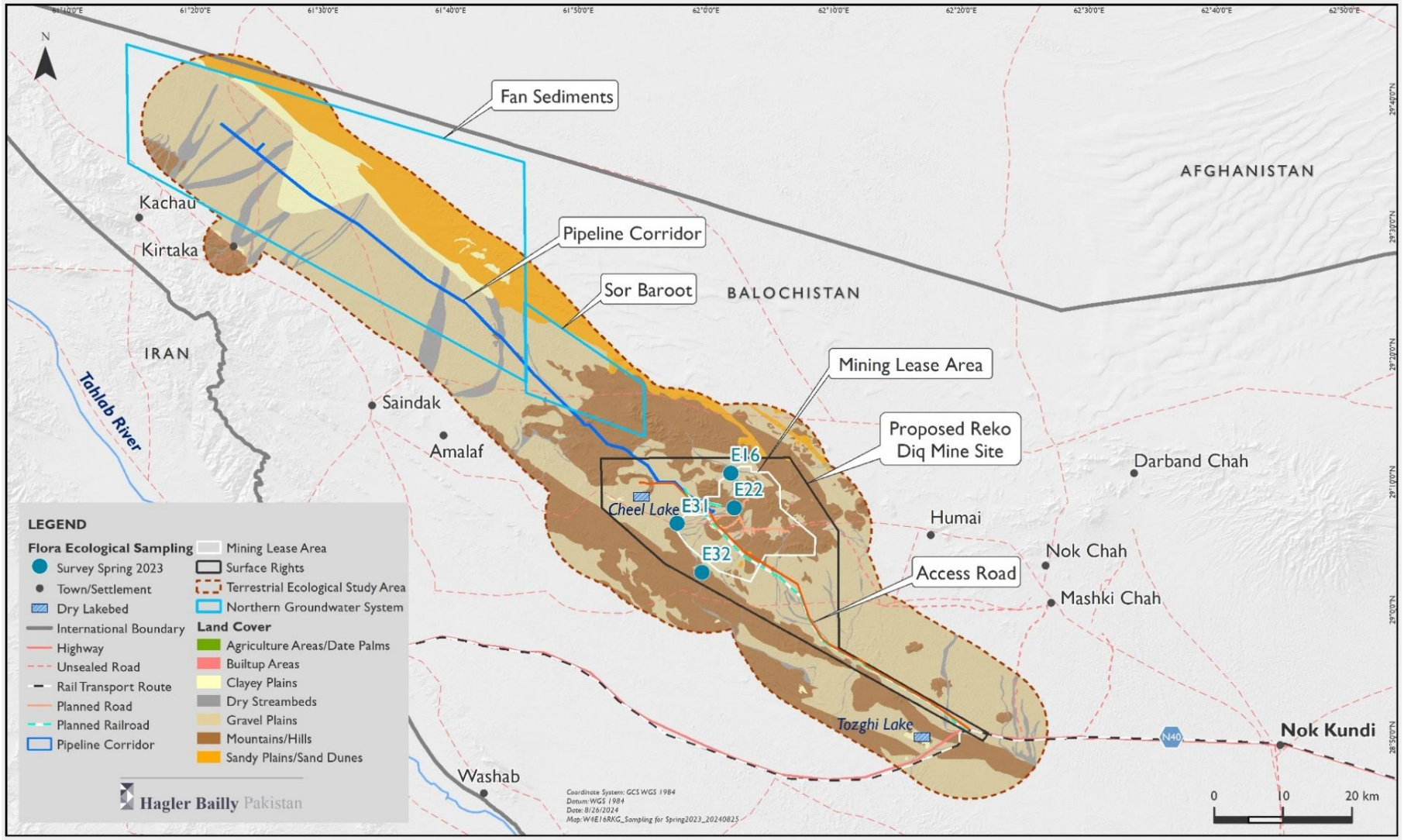


Exhibit E.13: Plant Species Observed in Previous Spring Survey and Spring 2023 Survey

No.	*Scientific Name*	*Common Name*	*Previous Spring Survey*	*Post-Monsoon 2022 Survey*
1.	*Alhaji maurorum*	Camel Thorn	-	✓
2.	*Anabasis setifera*	Anabasis	-	✓
3.	*Aristida adscensionis*	Sixweeks Threeawn	✓	✓
4.	*Arundo donax*	Giant Reed	-	✓
5.	*Calligonum polygonoides*	Phog	-	✓
6.	*Citrullus colocynthis*	Bitter Apple	-	✓
7.	*Cornulaca monacantha*	Djouri	-	✓
8.	*Fagonia ovalifolia*	Dereima	✓	-
9.	*Haloxylon persicum*	Persian Salt Tree	✓	✓
10.	*Haloxylon salicornicum*	Rimth Saltbush	-	✓
11.	*Heliotropium crispum*	Salt Heliotrope	✓	✓
12.	*Peganum harmala*	Mountain-rue	-	✓
13.	*Salix tetrasperma*	Indian Willow	-	✓
14.	*Salsola stocksii*	Saltwort	✓	✓
15.	*Tamarix aphylla*	Athel Tamarisk	-	✓
16.	*Tamarix stricta*	Salt Cedar	✓	✓
17.	*Tribulus terrestris*	Yellow Vine	✓	✓
18.	*Zygophyllum simplex*	Simple-leaved Bean Caper	✓	-
Total			8	16

E.2.1 Reko Diq Mine Site

The comparison of abundance and diversity of terrestrial vegetation between the Spring 2023 Survey and the May 2008 Survey (referred to as the Previous Spring Survey) focused on the proposed Reko Diq Mine Site is discussed here.

Since the Previous survey was conducted exclusively at the proposed Reko Diq Mine Site, the comparison was limited to the only four common sampling locations (E16, E22, E31, and E32) where sampling was conducted in both spring surveys. Among the four common sampling locations, three were located in Gravel Plains and one in Mountains/Hills.

Average Diversity and Density in the Overall Survey: The average diversity of plant species observed in the Spring 2023 Survey was 2.3 compared to 3.5 observed in the Previous Spring Survey. Similarly, the average density observed in the Spring 2023 Survey was 8.5 compared to 31.5 observed in the Previous Spring Survey. This comparison shows that the diversity and density of vegetation in the Previous Spring Survey were higher when compared to the Spring 2023 Survey.

Average Diversity by Habitat: The average diversity of plant species observed in the Previous Spring Survey (1.3) in Gravel Plains was higher than in the Spring 2023 Survey (0.7). Conversely, the average density in Gravel Plain in the Spring 2023 Survey (33.0) was higher than in the Previous Spring Survey (7.7).

Average Density by Habitat: Similarly, the highest density in the Mountains/Hills was observed in the Previous Spring Survey (27.0) compared to the Spring 2023 Survey (11.0), although the diversity remained consistent between the two surveys in this habitat type.

Exhibit E.14 provides the average diversity and density of plant species observed at the proposed Reko Diq Mine Site in the Spring 2023 Survey and Previous Spring Survey.

Exhibit E.15 provides a comparison of species abundance for common sampling locations at the proposed Reko Diq Mine Site in the Spring 2023 Survey and the Previous Spring Survey.

Exhibit E.16 provides a comparison of species richness for common sampling locations at the proposed Reko Diq Mine Site in the Spring 2023 Survey and the Previous Spring Survey.

Exhibit E.14: Comparison of Average Diversity and Density by Habitat at Proposed Reko Diq Mine Site in Spring 2023 Survey and Previous Spring Survey

Habitat	*Average Diversity*		*Average Density*	
	Previous Spring Survey	*Spring 2023 Survey*	*Previous Spring Survey*	*Spring 2023 Survey*
Gravel Plains	1.3	0.7	33.0	7.7
Mountains/Hills	4.0	4.0	27.0	11.0

Exhibit E.15: Comparison of Species Abundance by Sampling Location at the Proposed Reko Diq Mine Site in Spring 2023 Survey and Previous Spring Survey

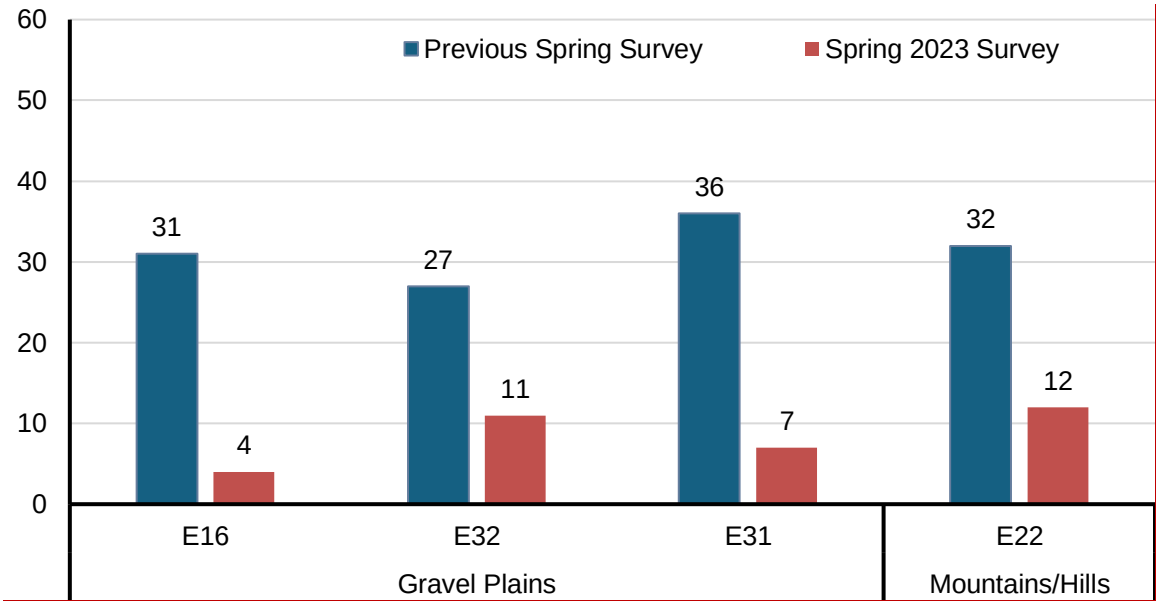
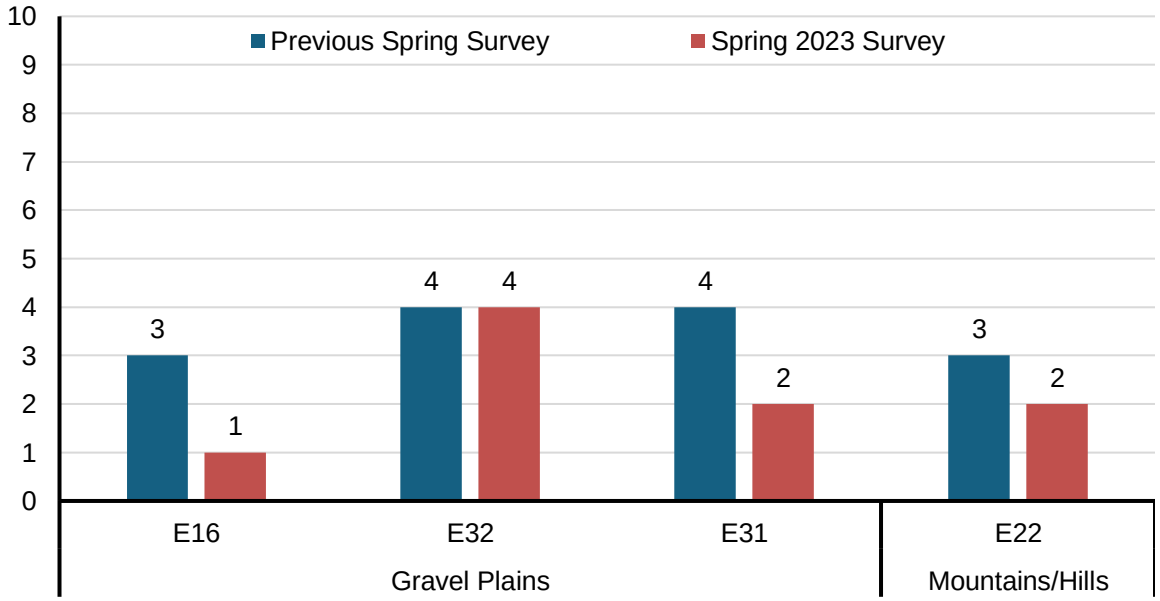


Exhibit E.16: Comparison of Species Richness by Sampling Location at the Proposed Reko Diq Mine Site in Spring 2023 Survey and Previous Spring Survey



E.2.2 Northern Groundwater System

No sampling was conducted along the Northern Groundwater System in the Previous Spring Survey therefore, no comparison is provided.

E.2.3 Access Route to Reko Diq Mine Site

No sampling was conducted along the Access Route to the Reko Diq Mine Site in the Previous Spring Survey, therefore, no comparison is provided.