

Executive Summary

The Toyota Road Improvement Project focuses on a 13.5 km segment of National Highway (N-5) in Pakistan, from Kalaboard bus stop to Port Qasim Chowrangi. This critical section, vital for industrial and commercial activities, experiences diverse traffic, including motorcycles, cars, vans, and heavy vehicles.

Comprehensive data collection—travel time surveys, traffic counts, road inventory, and accident data from Sindh traffic police—revealed significant road defects and safety concerns. Peak travel times showed congestion, with morning peaks (Kalaboard to Toyota Roundabout) ranging from 17 to 58 minutes and evening peaks (opposite direction) from 17 to 66 minutes. Traffic volume was highest at Kalaboard, and road inventory identified geometric issues, including inconsistent median widths, poorly placed U-turns, and inadequate roundabout dimensions.

Key defects include potholes, abrupt turns, encroachment near bus stops, and heavy vehicle disruptions. Traffic modeling estimated travel times of 51 minutes (Malir 15 to Toyota Roundabout) and 46 minutes (opposite direction). Proposed improvements include:

- Consolidating U-turns at Malir 15 and Malir Court into one wider U-turn.
- Redesigning minor intersections with chamfered islands for smoother merging.
- Increasing Toyota Roundabout's diameter by 54% for heavy vehicle navigation.
- Removing encroachments and standardizing bus stop designs with chamfered areas.
- Ensuring uniform median widths and adding height restriction poles and signals at key intersections.

The primary recommendation is to reclassify this N-5 segment as an "Urban Arterial" due to its mixed residential, commercial, and industrial land use and numerous uncontrolled

intersections. Design enhancements, including service roads, proper medians, U-turns, bus stops, and parking spaces, will improve safety, efficiency, and accessibility.

Table 1 Problems at Critical Locations and their solutions

LOCATIONS	COORDINATES	PROBLEMS IDENTIFIED	SOLUTIONS PROPOSED
<ul style="list-style-type: none"> Kalaboard Bus Stop Quaidabad Bus Stop Jafco Plaza Qasim Textile Mill Cattle Colony 	<ul style="list-style-type: none"> 24°52'56.54"N, 67°10'56.37"E 24°51'19.48"N, 67°12'42.41"E 24°51'17.55"N, 67°13'22.81"E 24°51'12.73"N, 67°14'48.96"E 24°49'40.48"N, 67°17'9.39"E 	<ul style="list-style-type: none"> Column present in fast lane (orientation of column is different in each type) Encroachment No proper bus stop 	<ul style="list-style-type: none"> Chamfered Median Hawkers and Stalls Removed Chamfered area for Bus Stop On Road Parking Removed
Malir 15, Malir Court U-turn	24°52'24.22"N, 67°11'43.64"E	<ul style="list-style-type: none"> Traffic congestion present on the u-turn Wrongway movements 	<ul style="list-style-type: none"> Protected U-turn must be designed
Qomi Shahrah Bridge over Malir River	24°52'6.74"N, 67°22'31.13"E	Inadequate height of New Jersey Barrier	<ul style="list-style-type: none"> install Fibre Glass sheets to separate the traffic in both directions install barriers that are at least 3.5 feet high

Malir 15 Flyover	24°52'43.57"N, 67°11'18.62"E • Force merging and diverging of vehicles at the end and start of flyovers respectively		• Extend the flyover’s edge to allow gradual merging and diverging of vehicles at start and end point
Intersections • Razzaqabad • Manzil Pump	• 24°51'51.70"N, 67°17'32.89"E • 24°51'17.07"N, 67°13'44.78"E	• Intersections at 90° direct opening on the highway	• Must provide a proper gradual merging of vehicles in all intersections
• Razaqabad U-Turn	• 24°51'51.99"N, 67°17'33.41"E	• Sudden increase in median width near U-turn	• signage indicating the presence of an abrupt median • Cut the median and provide studs near the U-turn
• Toyota Roundabout	• 24°51'58.62"N, 67°18'0.88"E	• Diameter not adequate for maneuvering HGVs	• Redesigning after Detailed Study