BUS RAPID TRANSIT CORRIDOR (PART 2)

MOOLCHAND TO DELHI GATE JUNCTION

BICYCLE INFRASTRUCTURE AND SAFETY

BASED ON CYCLE AUDIT

CONDUCTED ON 19th June / 26th June / 1st July 2009

DIMTS Ltd.

Attended by cyclists of differing levels of ability (potential and actual users),

accompanied by experts from DIMTS, RITES, TRIPP and Delhi Traffic Police

The views expressed in the report do not reflect those of any organization but are a sincere attempt to identify and address issues raised by existing and potential cycle corridor users by all those involved in the design, construction and operation of the corridor. The report has been thoroughly conducted, and it is expected that issues raised are studied very carefully for appropriate action. This Cycle Audit Report was organized at the initiative of DIMTS in order to understand the usefulness of cycle tracks on the upcoming BRT corridor from Moolchand to Delhi Gate. DIMTS invited a range of cyclists with differing levels of experience and ability to attend the audit. DIMTS asked each cyclist to explain any issues encountered whilst riding to and from Delhi Gate to Moolchand. Planners, designers, traffic police, engineers and BRT operational staff from relevant organizations (DIMTS, TRIPP, TP, RITES) working on the new corridor helped to facilitate each of the audits. Experts noted down issues raised and discussed possible solutions that might address any issues raised by the participants.

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1 Introduction

The design drawings and proposals have gone through many changes and iterations over the last 3 years of BRTS construction. As provided by Mr. Gandhi on June 19th during his discussions with other auditors, following is the brief chronological background of the events and decisions leading to the current state of infrastructure.

1 Bicycle infrastructure on many stretches along RHS of the corridor was already constructed as per final working drawings provided to RITES by TRIPP, till April 2008. The details of the corridor with listing of areas where the designs have been followed is as given below:

Constructed Cycle Track			
LHS	LENGTH	RHS	LENGTH
8710 - 8960	250	13720 - 14220	500
9080 - 9275	195	10440 - 10540	100
9400 - 10600	1200	9040 - 9600	560
13020 - 14180	1160	8700 - 8900	200
*TOTAL	2805	*TOTAL	1360
* Segregated cycle track constructed except for raised crossings locations as mentioned in drawing.			

2 Mid of May 2008, the government of Delhi took the decision to develop the bus lanes beyond Defence colony bus shelter on the left. Officials later clarified that this is on an experimental basis, side bus lanes will be created from Defence colony to Delhi gate and evaluated whether side lanes are effective compared to central lanes. Therefore new drawings were prepared with a flexibility tat if central lanes are to be introduced later it could be done with minimal reconstruction.[1]

3 Following this many changes and compromises on the designs and drawings were suggested by RITES engineers, to accommodate construction difficulties. These included limitations in bridge expansion/strengthening, difficulties in getting permission to cut trees, etc. These were incorporated and the drawings also went through other modifications to accommodate left bus shelters or stop locations, and other limitations such as trees. All the revised drawings (with left bus lanes) but nearly no compromise on segregated bicycle infrastructure and pedestrian paths were submitted to RITES in parts from June 2008 to Dec. 15, 2008. These designs were based on the principle that central bus lanes can and would be constructed on the basis of the experiment result – in line with the official plan of action.

4 On December 30, 2008, RITES during a meeting at TRIPP, informed that it is unable to construct any new segregated bicycle infrastructure on most parts of the corridor due to limitations in shifting some services. It also informed IIT that it would not be incorporating any designs which suggest shifting of existing median or footpath. This essentially meant that segregated cycle tracks and alignments/geometry cannot be constructed as per original designs. So no new drawings would be issued; however assistance or advice can be provided to RITES to help them execute the task as per best international practices for bicycle and pedestrian infrastructure.

[1] 6th May 2008 – Meeting with Chief Secretary

Observations from site visit - June 2009

In June 2009, the result of construction of side bus lane infrastructure, mainly bus shelters, could be seen at most locations. It soon became clear that many of these new shelters on the left were being constructed on the already constructed and perfectly functional bicycle tracks. Ruchi Varma from TRIPP raised this issue with RITES vied her email dated June 17 2009.

Simon Bishop from DIMTS who cycles this stretch frequently was also worried on these new developments which rendered the bicycle infrastructure useless. Mr. Bishop quickly organized a site visit to understand the issues in detail. He put together a team of auditors comprising, RITES and DIMTS engineers, corridor operations staff from DIMTS, corridor Designers, and main stream bicycle users. The team conducted the audit during morning peak hours in two parts. Southbound or RHS audit was conducted on June 19, 2009 and Northbound or LHS audit was conducted on June 26, 2009. The audit was conducted on bi-cycles, and auditors cycled the entire stretch to better understand the issues.

During the audit Mr. Gandhi briefed the auditors on the requirements of a good bicycle infrastructure. Mr. Gandhi and his team who were involved in the design of the BRTS corridor explained the success of bicycle infrastructure in BRT-1. He said that the most cyclist from Ambedkar Nagar to Moolchand are in the cycle track as it follows the following internationally accepted principles[2]:

Coherence – This implies that bicycle infrastructure is a coherent whole. It is not discontinued or broken at locations.

Directness – This implies directness in terms of distance and directness in terms of time. Directness in terms of distance implies that there are no detours or sharp bends requiring cyclists to break or slow down. Directness in terms of time implies that cyclist delays are reduced, by establishing their right of way at minor junctions and improving delays at signalized junctions. This is achieved by introducing raised crossings at minor junctions and improved signal phase plan and cycle length at signalized junctions.

Safety – Safety is ensured either by segregation or by reducing vehicular speeds to 30km/hr or less by the use of traffic calming measures. At intersections, special designs such as raised crossings, and signals reduce conflicts and increase safety.

Comfort – This relates to riding comfort and protection against nuisance by shared use of the facility, such as that by either by motor vehicles (in our case two wheelers) or by pedestrians. Riding comfort is important as mainstream cyclists travel long distances and riding comfort is an important factor effecting usage. Also in our conditions riding comfort also relates to shade provided by trees in hot summer days.

Attractiveness – Cycles travel through the city at a much slower pace than motorists. Attractiveness of the surrounding to them thus has a very different meaning. A bicycle track would be attractive if its spatial quality is designed for slow speeds. Attention to detail thus becomes important. Edges, planters, paving, finishes etc., all add to the attractiveness of the bicycle infrastructure.

Sandeep explained that the success of bicycle infrastructure in BRT-1 can be attributed to the fact that its coherence, directness, safety, comfort and attractiveness was better than the carriageway. Cyclists automatically opted for bicycle infrastructure over the carriageway, releasing essential space for motorists and reducing cyclist fatalities to 'zero' for that stretch. He remarked that provision of safety in itself cannot be enough for a bicycle infrastructure to be used. Cyclists perception of accident risk is very low and they prefer coherence, directness and comfort over safety. He added, therefore it is important to package safety in to a coherent, direct, comfortable and attractive bicycle infrastructure.

It is understood from the operational experiences on BRT-1, that central bus lanes are ideal not only for smooth movement of buses but also for cyclist safety (refer annexure – side lane punctures along BRT corridor). The audit

2 CROW, Record 25, Design Manual for Bicycle Traffic, June 2007, The Netherlands

brought about this fact that side bus lanes present much more dangerous situations for cyclists with heavy vehicles moving in close proximity to them and sometimes even sharing there lanes. Even more hazardous conditions exist at bus shelters where cyclists are potentially squeezed between bus passengers and buses or they are required to make frequent and cumbersome detours. A number of issues threatening the use of bicycle infrastructure on the corridor were identified during these audits, but they can be classified broadly in to the following four categories:

1. Bus shelters have been constructed on the already constructed, direct and coherent bicycle infrastructure. This has compromised the entire concept of a dedicated bicycle infrastructure on the corridor.

2. Proper raised crossings in red colur CC tiles, as specified in the designs (and used effectively in BRT-1) have not been constructed at most locations. This compromises bicycle safety and also effects its coherence and directness adversely – discouraging its use.

3. Only painted bicycle lanes are constructed and these are proposed adjacent to bus lanes on the carriageway. At bus shelters these appear between the bus shelter and the bus lane, creating potentially fatal conditions for cyclists. This compromises bicyclists safety, though there directness and coherence is only compromised at bus shelters. Cyclists are thus likely to continue to use this facility.

4. Some segregated cycle tracks are located far away from the carriageway and have indirect and obscure entrances as well connections to the junctions. At some locations the tracks are abruptly ending at a dust bin, or a park. These facilities score much lower than carriageway in terms of their directness and coherence and thus are not likely to attract use.

By the time the third audit was conducted on July 01, 2009 to find solutions as directed by Mr. Bhure Lal at the EPCA meet on June 27th 2009, most auditors were in agreement that the first two issues can be easily resolved, without major site interventions and should be taken up by M/s. Rites Ltd. at the earliest. The following two actions were agreed upon as an immediate remedy:

1. It was agreed that the bus shelters constructed on the cycle track should be removed/re-located immediately and the construction at other such locations should be halted.

2. Raised crossings should be provided as per standard design in 80mm thick red coloured CC tiles at all locations with signal free turns including property and petrol pump entrances.

The other two issues required alignment changes and longer development time. It was agreed that though provision of infrastructure as per (standard) design for a bicycle friendly corridor is essential, the same may not be possible due to multiple limitations concerning, budget, time and other site constraints. In such a scenario, cyclist safety may only be ensured through the use of traffic calming measures to bring down carriageway speeds to 30km/hr or less at locations where a properly designed, coherent, direct and comfortable cycle track is non existent.
In depth details of audits conducted on the three days with specific location based issues and solutions are listed iin subsequent sections of this report.

2 Bicycle Audit for Identification of issues on BRT cycle track

2.1 Introduction

An audit to identify design issues in the constructed bicycle infrastructure on BRT-2 was undertaken in two parts. The first part was along the southbound route on 19th June 2009, and the second part was undertaken along the northbound route on 26th June 2009.

2.1.1 Present

Sandeep Gandhi, (IIT Delhi), Ruchi Varma (IIT Delhi), Anoosha Ranganathan, (Architectural Trainee, IIT Delhi), Sanghavi Rohit, (Architectural Trainee, IIT Delhi), Col (Ret'd) A K Singh, (BRT Operations Manager, DIMTS), Rajbeer Jain, (Engineer, RITES), Arjun Singh (Co-ordinator, IDS and National Cyclists' Union), Sunita (Co-ordinator, IDS and National Domestic Workers Union), Nitin Jain, (Engineer, DIMTS), Abishek Nath (BRT Operations Officer, DIMTS), Simon Bishop, (Transport Planner, DIMTS)

2.1.2 Group expertise

The group was represented by people of differing cycling confidence and expertise. There were two everyday commuter cyclists, four occasional cyclists, five reasonably confident cyclists and two novices including two women. We were a reasonable cross section of people who could be attracted to using the BRT corridor.

2.1.3 What did we do?

We carried out a bicycle reconnaissance of the BRT cycle track from its starting point south of Delhi Gate to the junction at Moolchand. The trip lasted for over two hours. During this time we stopped at different locations to explain how we felt cycling on the track. We took photographs which have been uploaded on www.flickr.com. To illustrate the issue, wherever possible, main issues raised are cross-referenced with a photograph. The photostream is available from simonbishop50@yahoo.com using the password "BRTcorridor2" (all one word).

2.1.4 Aim of visit

The overall aim of the exercise was to understand the track's 'usability' by gauging how the track met the following objectives:

2.1.5 Objectives

Safety – to identify any issues which are likely to deter usage of the cycle track

Coherence – in this case to identify any issues, which might confuse users as to the route of the cycle track.

Directness issues – any diversions or obstacles, which might deter usage of the cycle track

Since detailed design drawings had been passed from IIT Delhi (the designer) to RITES (the engineering contractor) another objective was to point out any differences between the cycle track design plans and implementation on the ground.

2.1.6 The process.

1. Identify potential issues for cyclists using the route. The team will be repeating this exercise on Friday this week (26th June 2009), travelling northbound from Moolchand to Delhi Gate on the other side of the road.

2. Designers develop possible options to tackle each of the issues

3. Interaction between designers and users and then engineers to assess option desirability and feasibility

4. Agree possible measures (with caveats as necessary)

5. Present potential remediation measures to the Transport Department

2.2 Southbound (RHS) - Dr Ambedkar Stadium to Moolchand Junction - Friday, 19th June 2009

2.2.1 Issues Summary

The following general points were raised. The points are not listed in any order of priority and most were agreed by everyone present. When a point was made specifically by one member their name has been provided.

1. Lack of segregation at congested and fast moving points when it was most needed – (See especially photos P1030928, 31,32, 36, 37, 38,39, 41 (Flickr site), 42, 43, 44, 45, 46, 47)

2. Bus stops constructed on the few segregated cycle tracks on the site (total of eight such locations) renders even these segregated facilities impractical, contradicting all advice given so far by the Traffic Police, PWD, MCD, on the need for all new cycle tracks to have continuity. (See photos 1030917, 50)

3. Lack of adequate prioritization of bicycle oriented planning leading to some additional compromises such as shifting bicycle infrastructure to the edge of the ROW, mixing with pedestrians, steep ramps for cyclists (looked line 1:6), absence of raised crossings, etc.

4. Cycle/Vehicle conflict at junctions like Bhairon Marg (See especially photos P1030937, 49, 58)

5. Buses moving fast and close to cycles (See especially P1030930, 31, 33, 36,

6. Weaving in and out of obstructions in the cycle lane - parked vehicles, parked buses, bus users alighting (See especially photos, P1030920, 24, 25, 31, 38, 39, 41,

7. Rail bridge discomfort caused by expansion joints (Ruchi) (See photo P1030961)

8. Cyclists pushed to the edge of the ROW at ITO bus shelter and sight lines obscured at ITO junction (See especially photos, P1030920, 23)

9. Uncertain direction of travel at places like Balmiki Basti. Not sure whether to enter the service lane or go on the carriageway. (See photo P1030918, although just onward from this point)

10. Wide, two-way cycle track gives over to one-way very narrow painted lane on the main carriageway with cycle trailers and rickshaws coming in other direction (See photo P1030956)

11. Discontinuity even in the painted cycle track, e.g at the corner at the start of Mathura Road after going under the Metro bridge.(See photo P1030927)

2.2.2 Issues in Depth

This section reports what individuals said at the end of the event. All individuals were speaking as a cyclist using the corridor. **The views expressed by individuals are done so in a personal capacity as a cyclist using the corridor and do not represent the organization that they work for unless explicitly stated.**

Anoosha, student of architecture, training at SGA

Anusha felt extremely unsafe in the mixed traffic section of the corridor, particularly in points where there was considerable congestion south of the turn of Bhairon Marg adjacent to the boating lake. Here she had to cycle with motorcyclists mounting the pavement and motorized vehicles using the painted cycle lane.

Anusha also felt very unsafe at junctions like that at Bhairon Marg where she had to continue going forward on the road and a very high volume of vehicles were cutting in to turn left from Mathura Road onto Bhairon Marg.

A long stretch of the road from the Supreme Court on Mathura Road has only a 1.5 metre painted cycle lane. Cars are parked forcing the cyclist to weave outwards which Anusha found made her cycle in very close proximity to buses too.

Anusha said that she would be willing to cycle along faster road sections like Pragati Maidan if there was a physically separated cycle lane here. Currently she feels it is too dangerous to do so.

Sunita , Co-ordinator, Institute for Democracy and Sustainability and National Domestic Workers' Union
Issues which Sunita raised were similar to Anoosha, the lack of any physical segregation on fast moving (e.g Pragati Maidan, Sundar Nagar) and more congested stretches (between Bhairon Marg and Shershah Road).

Sunita also felt unsafe when the bus came into the cycle lane and passengers in the road at the bus stop. When the bus stopped, passengers alighted in the cycle lane, forcing Sunita to stop to avoid an accident occurring.

Rohit, student of architecture, training at SGA
As in the case of Sunita and Anooshka, Rohit stated that the lack of physical segregation would deter him from using the cycle lane, although he would like to cycle more for fitness and health reasons. Rohit also disliked crossing junctions, particularly when cars and fast moving vehicles were turning left. Rohit always had to cede the right of way at these junctions which interrupted and slowed down his journey. The more traffic there was the longer he waited and the more likely he became to take a risk. At the very least Mali thought the crossings should be raised but there should also be a signal there to allow pedestrians and cycles to cross.

Ruchi Varma, Architect , IIT Delhi
Cars were parked in non-segregated cycle lanes and Ruchi felt very unsafe when she had to weave in and out of them with fast moving buses travelling behind.

Ruchi also highlighted that the expansion joints on the rail overbridge between Janpura and Lajpat Nagar make cycling there uncomfortable.

Ruchi concurred with everyone else that the junction at Bhairon Marg made her feel extremely unsafe.

Arjun Singh, Co-ordinator, Institute for Democracy and Sustainability and National Cyclists' Union
Arjun thought that Phase I of the BRT was excellently planned for cyclists with a dedicated lane for the whole stretch of the corridor. Without a dedicated lane cyclists for the whole length cyclists would neither feel safe or be likely to use the lane that did exist. There was a very grave danger that the whole exercise would be a waste of time and render the unconnected cycle lane a 'white elephant'.

Arjun was very worried about being hit from behind on faster sections of the corridor like Sundar Nagar. XX thought that cyclist safety was secondary to supplying as much space as possible to motorized vehicles. XX thought that Delhi could become a laughing stock internationally if these matters weren't put to right before the Commonwealth Games when countries like Australia that have proper cycle facilities will ridicule Delhi's efforts.

Sandeep Gandhi, Architect and Urban Designer, IIT Delhi
Sandeep appraised everyone on the history of the compromises made on the project so far. He mentioned that salient features of the project were gradually compromised. First the bus segregation was compromised by pushing the lanes to the left, then bicycle segregated tracks were compromised and converted to bicycle lanes at most places while at others it was pushed to the extreme edge of the ROW on account of the underground utilities which Rites was reluctant to integrate or re-locate. The result is the current cycle infrastructure which is a complete compromise from the original designs which had continuous segregated paths on the entire corridor with raised crossing and controlled intersections (in line with the bicycle infrastructure design for the current operational BRT corridor between Ambedkar Nagar and Moolchand). Sandeep also pointed that the more than 90% of the segregated bicycle tracks that we see in the Phase 2 of BRT is the one which was constructed before June 2008, i.e. before decision

amounting to diluting or completely compromising BRTS elements were taken. No segregated bicycle infrastructure were constructed since then in the haste to wrap up the project. Now even that earlier developed bicycle infrastructure is compromised by 8 shelters erected bang on the perfectly functional tracks rendering them useless.

Sandeep identified the placement of bus stops on the cycle lane as a real problem. It would render investment in the cycle lane useless and encourage cyclists to use the main carriageway because they would lose trust in the infrastructure having to compete with pedestrians for space.

Sandeep pointed out that designs were not followed at any of the 8 places where bus shelters have been located on bicycle path, and that at most of the places ample space was available between the bus lane and the cycle track to create a bus shelter without disturbing cycle tracks (this included both LHS and RHS location at Oberoi and the Sunder Nagar Cycle track (on LHS). Sandeep pointed out that it appeared as a deliberate attempt to develop the shelter on the cycle track where it was available to save the effort of building the required foundation for bus shelters. He also pointed out at these sites that the shelter was so far away from the carriageway (on RHS at Oberoi) that the bus shelter will have to be 5m wide to allow level boarding and alighting, which may still not be possible as the cyclists discouraged from the tracl would now exist between the shelter and the bus.

At the very least the cycle track should be continuous with the same concrete material. Sandeep reacted to Mr. Jains comments on raised crossing which were that the same have been provided in BT; by mentioning that they are too gentle to act as raised crossing and they do not even provide at grade crossing (without level difference) to cyclists or disabled. He said that technically none of the raised crossing shown in the plans have been constructed. Raised crossings are a must at all junctions (across free left turns and un-signalised crossings including property entrances) he said. He added that vehicular ramps cannot be gentler that 1:8 or 1:10 while bicycle ramps should be between 1:12 and 1:20. He agreed with Simon who added that at tiled raised crossing the texture and the colour of the surface help in defining the ROW in favor of cyclists and pedestrians thereby discourage the motorists from speeding.

At the Media offices Sandeep agreed with others that dual facility should be provided for cyclists. The lane along the carriageway can be retained on the top while service lane can be used as an access street with traffic calming and sign boards indicating give way to cyclists.

Just before the ITO crossing at the shelter cyclists have been pushed to the edge of the ROW against a bare wall. This is likely to discourage use due friction between pedestrians and static a static surface. Here Simon added by saying that cyclists never like to be away from the main carriageway. At the ITO crossing the first half of the carriageway a police box obscured sight lines for pedestrians and drivers. This is potentially lethal and needs to be removed.

Outside the zoo, where the traffic was very congested, Sandeep thought that cyclists were risking their lives by moving in the carriageway. Sandeep thought that a segregated cycle lane should be considered behind the footpath at this busy point.

Sandeep felt unsafe in the un-segregated lane as buses overtook. Their speed created turbulence and unsteadied him on the cycle. Some kind of separation was needed between the bus and the cycle.

Where segregation was not possible for whatever reason Sandeep suggested that traffic calming measures should be considered to slow traffic down gradually to acceptable speeds.

Rajbeer Jain, RITES Engineer
Rajbeer did not like experiencing the conflict between buses and cycles at bus stops as the bus pulled in to the cycle lane to offload passengers. Left turning, fast moving traffic cutting across at places like Bhairon Marg was also an issue.

Mr. Jain also pointed out that in his opinion raised crossings are good but they alone may not be sufficient to make conflicts with left turning traffic safer – here signals may also need to be introduced.

Colonel Singh, BRT Operations Manager, DIMTS
Colonel Singh thought that there was a natural alignment to follow the service lane before ITO where the press are located.
The stretch of road running parallel to Sundar Nagar was very fast and the cycle lane served also for other fast moving traffic like buses. Col Singh felt unsafe here and wondered if a dedicated cycle track could be laid in Sundar Nagar itself.

Nitin Jain, DIMTS Engineer
Nitin felt that more signage was needed to denote the cycle lane. At times he got lost because of interruptions in signage, either on the ground or above on lampposts, etc.

Abishek Nath, BRT Operations Officer, DIMTS
Abishek felt that the corridor had been entirely subordinated to the MV users desire to travel fast and smoothly. Even when cycle safety was compromised, at places like Sundar Nagar, no effort was made to slow down traffic or segregate cycles for fear that this would slow down journeys or create congestion.
Like everyone else Abishek found the crossings very dangerous and noted that signage demarcating the cycle track was lacking on the road.

Satya, RITES engineer
Satya explained that the bus shelters had been designed to effect level boarding and for this reason they needed to be sited in the cycle track. Satya did, however, acknowledge that this would make the cyclist's journey longer and, possibly, encourage him into the main carriageway rather than use the cycle track.

Simon Bishop, Transport Planner, DIMTS
42 years old, male, transport planner, cycled since I was a child, cycle everyday to work in Delhi and before that in London, would like BRT to enable me to cycle with my family to visit heritage sites and enable me to get around the city safely.
Simon liked the first part of the corridor until the Press Business Park. There the pavement abruptly stopped and Simon did not like the choice between following a service lane packed with parked cars (whose doors can open on you easily causing a fatal accident) or entering the main line of traffic.
Simon felt unsafe sharing a lane next to buses along Pragati Maidan and then getting stuck as bus passengers alighted. When he tried to overtake a bus he narrowly missed an overtaking bus which had commandeered the right of way.
Simon concurred with his colleagues about congestion at the zoo, the danger of going straight whilst traffic turned left at Bhairon Marg and then competing with traffic turning left out of Bhairon Marg onto Mathura Road. Signals and raised crossings with a dedicated 'green man' crossing time for cycles and pedestrians is essential there Simon felt.
South of the junction of Lodhi Road where there is a 1.5metre lane Simon did not feel safe as cycle rickshaws and trailers came in the opposite direction.
After emerging under Tilak Bridge onto Mathura Road, the cycle lane abruptly ends as you turn the corner. This is very unsettling.

After the Indraprastha Marg junction the cycle lane is painted. There were a lot of parked vehicles here outside the Office of the Institute of Engineers, for instance which made it necessary to weave dangerously.
Like nearly all other riders Simon thought that the positioning of bus stops on the cycle lane would break the continuity of the cycle track. Since this is something that has expressly been stated by the Traffic Police as a deterrent for cyclists to use existing cycle tracks its seems strange that it is happening again now.

2.3 Northbound (LHS) – Moolchand Junction to Dr Ambedkar Stadium - Friday, 26th June 2009

2.3.1 Issues in Depth

Mr. Abhishek Nath
BRT Operations Officer, DIMTS
He pointed out that the signages and the cycle track are discontinuous. He also pointed out that the junction boxes in the green areas are missing (stolen), creating unsafe conditions for cyclists.

Mr. Sandeep Gandhi
Architect and BRTS Designer
He felt the cycle track was good at Moolchand but for where metro had caused an obstruction (an FOB is being made); this however is a temporary problem. The subway he thought was a good example of a situation where an obstruction in the cycle way has been dealt with well and the cycle track's continuity has been maintained.
At the bridge, he pointed out that the cycle track's level is lower than the rest of the road as it is unpaved, but it can easily be rearpeted and the levels can be improved to improve the ramp slopes to 1:12 to 1:20.
The cycle track seemed fine to him on top of the bridge except for the blockage created due to plastic bollards placed at the entrance created by the metro. He emphasized on the need for a raised crossing in the event of this entrance being made a permanent feature.
He pointed out that the original entrance to Jangpura is supposed to have a raised crossing and that beyond that the cycle track comes onto the carriageway. He further pointed out that there is a bus shelter further down, behind which is a wide footpath which can easily be made a wide, continuous cycle track.
He emphasized on the need for a raised crossing opposite the original entrance to Jangpura, (chainage: 7940).
Sandeep feels that the service lane at the petrol pump that comes ahead is not required and can be concreted and made a formal cycle track as per original design.
He emphasized on the need for segregation, using plastic bollards (incase a median cannot be incorporated) in front of the CGO complex. Though he pointed out that it will not ensure the safety of the cyclist which can only be ensured by reducing speeds to 30kmph if a median is not provided.
At the Lodhi road crossing, he pointed out the presence of the bus shelter on the cycle track. He feels it is not required there and should be shifted to after the turning. He suggested an alternative solution of providing a gradual turning radius and taking the track around the bus shelter if nothing else is possible. He pointed out the risk of such detours for cyclists, which is reduced usage of the cycle track and increased accidents.
He suggested the widening of the cycle track near the blind school at locations where trees are present on the track.
He suggested the removal of an existing pole on the cycle track.
He also pointed out the abrupt ending of the cycle track in front of the Oberoi and a small stretch where the carriageway and the cycle track get combined. This he says can be segregated by use of plastic bollards or by slight widening of footpath after removing an existing light pole to allow shared usage for this small stretch.
He feels visible continuity is a must for cyclists. He found that a raised crossing was absent opposite DPS, R.K Puram (Chainage 9500). He also found continuity maintained beyond this but for the bus shelters (constructed on the tracks) which he feels are not needed and completely destroy a good infrastructure. The solutions he suggested are:

1. The bus shelter can be moved next to the bus lane. (Currently, it is 10m away.)
2. The service lane can be used as a bus lane with just one lane for buses and the rest used as the bus shelter.

He found the cycle track convenient for a stretch till it was stopped abruptly by a bus shelter that should have actually been next to the bus lane. He saw no reason for the shelter to be on the track when 3.2m wide space is available between the track and the bus lane. He informed that as per measurements made on site, space existed between the trees for the bus shelter (to be located in this 3.2m wide geeen belt), and even if it did not,one of the side ramp could easily be compromised (and steps provided), instead of compromising a perfectly good infrastructure.
He felt the need for a raised crossing at S.D marg, with a ramp of slope 1:8 to 1:10 for cars. He found the cycle track pushed next to the boundary wall till ITO and feels it will stop cyclists from using the track due to the distance from the carriageway. This he says, can be improved by making the entry and exits to the track more direct, with gentle ramps and alignment as per the natural path of the cyclists.
He found the track could not be entered from Bahiron marg directly and that cyclists could not turn right. He suggested removal of the tree at chainage 11850 which causes a discontinuity in the cycle track.
He suggested that the raised crossing and the cycle track entrance at chainage 11710 is missing and should be restored. The chief justice of high court may be contacted by DIMTS and EPCA to have a raised crossing made in front of her house.
Beyond this point, there is a level difference of 50 cm between the track and the service lane which calls for a tow wall and railings as a safety measure. He found that a raised crossing with a steep slope (one in eight) for cars was needed at the FOB at Bhagwan Das road and in front of the Supreme Court. He also noticed the track ending abruptly at ITO.
Sandeep feels that all free left turns need to be provided with raised crossings, and signals for cyclists need to be provided at major signalized junctions.
The track can easily be segregated from Sikandra Road up to DD road. The space for the same exists. He also felt that the free left turn from Sikandra road can be extended till the bridge to avoid weaving in this short stretch. The track he feels, is continuous post this but for the presence of a dust bin and three bus shelters which need to be removed. He also suggests a provision for cycle rickshaw parking at Delhi Gate.
He feels the need for awareness (rally) and marshals. He also feels, the track has to be extremely convenient for it to be used regularly.

Mr. Rajbir Jain, Rites Engineer
Mr. Jain said says that some of the raised crossings are made in bitumen. He also assured that the needful would be done to incorporate the required changes. He also suggested a different color and texture be used for the unsegregated cycle lane.

Anusha, Student Trainee, SGA
Found the cycle track convenient and comfortable for an everyday cyclist. She however was apprehensive at crossings and would not prefer to cycle given a choice.

3 Bicycle Infrastructure Audit (looking for Answers) with Traffic Police – July 01, 2009

The draft finding of bicycle audits conducted on June 19th and 26th June 2009, were shared with Mr. Bhure Lal during the EPCA meeting on June 27th, 2009. Mr. Bhure Lal advised that another audit, to identify possible solutions to the problem be conducted in the presence of Traffic Police. This audit was undertaken on July 01, 2009 in the presence of ACP Harender, from Traffic Police, Mr. Rajbiur Jain from Rites, Mr. Simon Bishop from DIMTS, Mr. Abhishek from DIMTS, Mr. Nitin from DIMTS, Col. Ashok Singh from DIMTS, Mr. Sandeep Gandhi from SGA, Ms. Ruchi Varma from TRIPP and Ms. Anusha Ranganathan from SGA. The findings of this Audit have been presented below chainage wise on each side cycle infrastructure.

3.1 Moolchand Junction to Delhi Gate Junction - North bound (LHS)

At the beginning of the Audit, ACP traffic clarified to Mr. Bishop that traffic police is interested in the safety of the cyclists on the corridor, and would therefore prefer a good quality and a usable bicycle infrastructure on this stretch. In a short briefing Mr. Gandhi explained that bicycle infrastructure design and implementation has to ensure that the facility is better than the carriageway (which is currently being used by cyclists) to ensure use. He said the designs have thus been prepared keeping in mind the cyclist requirements of directness, coherence, comfort, safety and attractiveness. He explained that any solutions to current problems will need to comply by these principles to ensure use. If the said principles are not followed the designs may simply be a theoretical exercise and cyclists will continue to use the carriageway for their daily commute, putting the entire effort and money spent, to waste.
Following this the audit was conducted using two cars. Auditors got off at locations to discuss problems and find solutions. The location wise details of the audit has been presented in the following sections.
Most Solutions on this stretch were simple and required the Rites to undertake the following actions:

1. Construct raised crossings as per standard design in 80mm thick red coloured CC tiles with 1:8 to 1:10 ramp for cars and 1:12 to 1:20 ramp for cyclists. The crossings have to be provided at all free left turns, petrol pump entrances, property entrances, etc. as per design drawings provided.
2. Re-locate or remove bus shelters constructed on the already functional bicycle track.

Other solutions requiring larger changes and alignment modifications to comply with the designs were:

1. Provision of segregated cycle track at locations where the same is not provided.
2. Improvement of entry and exist of cycle track and improvement of junction geometry

3.1.1 6200 LHS - TSR parking- No raised area in Cycle track

PROBLEM IDENTIFIED	Wheelchair accessibility to raised crossing not provided (as seen in the first part of the corridor – Part A). This is in the form of a raised crossing across bicycle track with gentle 1:20 ramps for cyclists.
IMPLICATION	TSR parkings not accessible or disable friendly.
SOLUTION	Proper detail designs as per BRT – 1 can be followed to complete TSR parking

3.1.2 6300 LHS - DMRC FOB – Footpath and Cycle track Covered with Debris

PROBLEM IDENTIFIED	Construction Activities block the cycle track
IMPLICATION	Cyclists do not re-enter the segregated facility already in place towards Delhi Gate and will be on the carriageway with buses and other mixed traffic in unsafe conditions.
SOLUTION	Construction plan can integrate facilities for cyclists and pedestrians for this zone and minimum clear and segregated pathway provided for the same

3.1.3 6750 LHS – Cycle Track Behind Defense Colony Subway

PROBLEM IDENTIFIED	Shoddy work behind the subway. A guiding block used to cover drainage glitches. Water collection at base of ramp.
IMPLICATION	Adds to uncomfortable riding experience
SOLUTION	Correction in slope and surface finishes Are required as per detail drawings

3.1.4 6980 – At Foot of ROB - Re-surfacing Needed on Cycle Track

PROBLEM IDENTIFIED	Entry to the segregated facility at Rail Over Bridge (ROB) has sharp entry slope and bad or unfinished surface leading to extremely poor riding quality and uncomfortable journey for cyclists
IMPLICATION	Cyclists discontinue the use of segregated facility at this point and continue on the carriageway
SOLUTION	During the Audit on July 01 with Traffic Police, DIMTS, Rites and TRIPP representatives it was agreed that correction in slope and re layering of the concrete surface. as per standard bicycle infrastructure design details is required.

3.1.5 7880 to 7990, LHS Jungpura entrance

OBSERVATION	The cycle facility is interrupted by two entrances - one created by DMRC - now used for entering jangpura and the other an existing entrance for to enter jangpura – now used by DMRC vehicles for the construction of the CGO station. At the first entry points, plastic bollards at 60cm c/c block the bicycle track, making it discontinuous beyond this point. It was observed during the audit that DMRC has constructed the first entry point as a diversion during construction. However both entrances continue to be used. Beyond this point, the cyclist segregation from the carriageway continues, by a kerb up to the second entry point. However no raised crossing exists. Beyond the second entry point cyclists continue in painted lanes. Both entry points lack proper raised crossing infrastructure for bicyclists.
PROBLEM IDENTIFIED	Bicyclists face speeding cars and two wheelers at the entry and exit points. No signage for motorists to caution them for crossing cyclists. The cyclists and other users need to be informed about the conflict areas. The footpath beyond the segregation is wide. Still cyclists are using the painted lane. No ramp to access footpath.

IMPLICATION	Lack of raised crossings is a safety hazard for cyclists.
SOLUTION	A raised crossing with 80mm interlocking tiles (red color) as used in other parts (especially in BRT – 1) should be incorporated with gentle ramp in 1:12 to 1:20 slope for cyclists and steeper ramps in 1:8 to 1:10 slope for cars. Adequate Signages as per design (detail no. 27 of the design drawings) to be incorporated. Segregated bicycle infrastructure should be continuous (and not discontinued beyond second entrance (to Jangpura). One possibility is to
REMARKS	The need for a raised crossing was especially highlighted as basic safety requirement by ACP, Traffic Police.

3.1.6 7980 *(left figure)*, 8020 *(right figure)* LHS - No segregated Bicycle Facility Provided

OBSERVATION / PROBLEM IDENTIFIED	The cyclists are using the painted facility which is unsafe. They are next to the bus lane and a bus shelter is on this stretch. With buses stopping and people boarding and alighting the shelter, cyclists overtake the bus from the right coming in conflict with fast moving traffic coming from the ROB. It was informed by Mr. Gandhi that there are plans of a segregated facility for cyclists with the central shelter and land acquisition was to be taken up. However in the meanwhile the possibility of using the pedestrian path as shared facility by cyclists and pedestrians (for this short stretch) along with paint marking and signage as per design is plausible. The same is included in the drawing also.
IMPLICATION	High safety risk to cyclists using painted cycle track. Cyclists in painted track would also disrupt the use of bus shelters and bus lanes.
SOLUTION	The entire path of the cyclists should be marked over the footpath with ramps (1:12 – 1:20) for access. Existing designs/drawings and details for this location may be used. Tree pruning needs to be taken up at a regular basis. While agreeing to these solutions, ACP Traffic also highlighted the use of retro-reflective stickers on trees to ensure their visibility at night He reiterated that segregation of cyclists is required to ensure their safety.

3.1.7 8100 LHS - painted lane along Nala (no segregated tracks)

PROBLEM IDENTIFIED	The cycle track is painted over the nala.
IMPLICATION	Unsafe.
SOLUTION	The segregation needs to be kept. This could be done by the use of elevated marking/fluorescent markers (cats eye). Segregated cycle tracks proposed in the designs for this location was rejected due to limitations in bridge expansion.

3.1.8 8250 LHS - Service lane behind CGO subway and 8350 LHS-NMV Parking and Footpath Occupied by Taxis/Vehicles

OBSERVATION / PROBLEM IDENTIFIED	The cyclists need to get onto a raised crossing which is in front of the petrol pump and share the ROW with the pedestrians before they move ahead to the stretch near the subway. It is observed that due to cars waiting to access petrol pumps, the raised area is blocked for cyclists and therefore they mix with motor vehicles on the carriageway. It was observed that the service lane at the rear was not being used at all for access by motor cars. Instead it is merely used for illegal parking, which also occupies, pedestrian path and bicycle track. Ahead of the subway, the cycle track is segregated and an at grade access for wheelchairs provided. The rickshaws are seen parked on the road at the CGO node.
IMPLICATION	High risk for cyclists using painted cycle track.
SOLUTION	Continuous segregated infrastructure from the raised crossing in front of petrol pump till the road crossing (entrance to CGO complex) should be provided. As informed by Mr. Gandhi drawings for this design already exist and can be

	followed to achieve the desired product.
REMARKS	ACP, Traffic Police gave his consent to the proposal of taking the cyclists behind the subway and use of unused service lane for a segregated facility to be used by cyclists as per bicycle track design requirements of levels, texture and finish. It would make the infrastructure more reliable and usable by cyclists.

3.1.9 8650 LHS – Painted Cycle Lane adjacent to bus lane


OBSERVATION / PROBLEM IDENTIFIED	1.2m wide painted bicycl lane along side painted bus lanes provided from chainage 8380 – 8650. High pedestrian volume on narrow pedestrian paths was observed along with two way movement of cyclists on the painted tracks. ACP traffic police pointed at the potential risk to the life of cyclist, especially because it is on a sharp bend at this location.
IMPLICATION	High accident risk for cyclists using painted cycle track.
SOLUTION	ACP, Traffic Police that some sort of segregation is required to make the cyclists safe. He suggested taking them over the footpath since in his view taking space from carriageway here was not a practical option. RITES representative informed him that the footpath is not very wide as the stretch is along a disputed land and cannot be acquired. Mr. Gandhi suggested that sharing of bicycle and pedestrian facility is a mere theoretical exercise which may not result in actual use. He suggested that instead a 30cm wide curb could be used at the painted line, and a minimum 2.0m wide bicycle track (between the light poles) provided by acquiring the unpaved area between poles and some space from the carriageway. Other means of segregation that may be used are plastic bollards and raised markings (reflectors). Plastic bollards even if used at considerable distances may discourage fast moving vehicles from entering bicycle infrastructure. Though this may not be sufficient to ensure bicyclists safety and prevention of encroachment by stopping vehicles. In case segregation is not possible here the only other means of ensuring bicycle safety is to reduce speed of motorized vehicles to 30Km/hr., through the adequate use of speed breakers, rumble strips or other design means. Bus shelter encroaching pedestrian path, may be used for through movement of pedestrians in the absence of dedicated facility for them.

3.1.10 8700 – No Proper Access to Segregated cycle track Ahead of crossing at 8700

Problem Identified	A minor road crossing on LHS at 8700 has not been treated with the use of raised crossing.
Implication	Entrance to the cycle track beyond this point remains undefined and cyclists face risk of accidents and conflicts with turning traffic at the crossing.
Solutions	Segregated bicycle track can be provided at this location (before chainage 8700) leading to a raised crossing (that should be provided) at chainage 8700. Mr. Gandhi informed that drawings for such design already exist hence the same may be followed.

3.1.11 8850 LHS - Bus Shelter on Cycle Track

PROBLEM IDENTIFIED	The bus shelter is constructed on the segregated cycle track. Cycle infrastructure is abruptly disrupted and discontinued here..
IMPLICATION	It is a visual obstruction, a clear encroachment over already constructed bicycle infrastructure. Cyclists move out onto the carriageway and merge with carriageway traffic to cross the junction 100m ahead. Making it unsafe as this gets them to a conflict with the buses.
SOLUTION	A number of simple solutions exist for this location. One of the following may be chosen: A bus shelter may not be provided here and a simple pole marker for bus stop with space created on the unpaved for passengers to stand may be created. Bus shelters are only required here for turning buses, the same may be located after the left and right turn and thus this shelter may be removed. Proper concrete bicycle infrastructure is continued around the bus shelter using gentle bends to ensure both visual and physical continuity. Wheel chair access to shelter may be ensured by providing at grade wheelchair crossings (3m wide) across cycle track like the ones which already exist in BRT-1.
REMARKS	The bus shelter was seen as an encroachment in the cycle track. The Traffic Police also commented on such actions. They saw this as a redundant effort and did not see the reason of why a formal big shelter is required to run left lanes. This could also work by installing a signage indicating a bus to stop since the entire action has been done to experiment the center and the left lane of the BRT.

3.1.12 9100 LHS - Pole and Trees Restrict Footpath and cycle track

PROBLEM IDENTIFIED	Blinker pole obstructing the cycle track. Narrow pavement and trees outside Blind School creates conflicts between cycles and pedestrians and also limits clear usable space for both.
IMPLICATION	The cyclists could move on the carriageway, mixing with vehicles which may result in fatal accidents.
SOLUTION	Simple solutions could restore the use of a well constructed and conceived segregated track here, These are: Blinker pole should be shifted / removed from the cycle track Where trees restrict the width of bicycle path, the same may need to be removed or the bicycle path widened into the unpaved for these short stretches. Retro-reflective stickers should be provided on trees. Use of tree guards was also suggested by TRIPP representatives to get additional width on footpath and retaining breathing space for trees. The pointed out that detail drawings for the same existed.

3.1.13 9200 LHS - Discontinued Cycle track. Cyclists share space with buses on the carriageway.

Problems Identified	6. Segregated cycle track in front of blind school and in front of Oberoi is discontinued here at chainage 9200 due to constrained ROW at Mosque. 7. Taxi parking occupies footpath and service lane near gate before mosque 8. There is a pole located in middle of footpath 9. The slope of ramps in the pedestrian path do not comply to the ratio of 1:12 – 1:20 10. No raised crossing with interlocking tiles in front of oberoi hotel gate.
Implications	Cyclist mix with high speed and weaving motorized traffic at the bottom of the flyover, putting them in risk of accidents.
Solutions	The 1.8m wide pedestrian path can be shared for this distance of 25-30m by cyclists (at the mosque). This can be achieved by providing them with gentle 1:20 ramps to reach the pedestrian path, including adequate signages and removing the lone light pole standing in the middle of the pedestrian path at this location.

3.1.14 9330 LHS - Side bus shelter at Oberoi Hotel Constructed on Cycle Track

PROBLEM IDENTIFIED	Continuous cycle track from Lodhi Road Junction all the way upto Oberoi is disrupted at the Mosque and Oberoi entrance. The footpath in front of Oberoi hotel entrance is also discontinued . Pedestrians and cyclists use the edge of the carriageway and have to weave towards the moving fast traffic coming down from the flyover due to parked cars on the side of the road. The pedestrians include here a higher share of differently-abled due to the BLIND SCHOOL – 250m from this place. The bus shelter is constructed on the segregated cycle track. Cyclists move on the carriageway. The bus shelter effectively destroys the continuity and usability of a well constructed bicycle infrastructure here.
IMPLICATION	High risk of accidents for pedestrians and cyclists from traffic from the flyover which also weaves with traffic coming from Lodhi Road Junction. Bicycle infrastructure is discontinued be the presence of bus shelter on it. This clearly puts cyclists in the lowest priority for planners, making cyclists loose

	their trust in the infrastructure resulting in minimal or no use of the bicycle infrastructure in the entire corridor. Thus cyclists merge with the high speed motorists on the carriageway even at those locations where a perfectly good bicycle infrastructure was conceived and created for them.
SOLUTION	It has been suggested by RITES that a ramp before and after the shelter is constructed with marking for cyclists to weave with the footpath. However, since the entry to the track is indirect (DETOUR 1) and then due to bus shelter the cyclists are expected to use the footpath (DETOUR 2), they will opt for using the convenience and be on the carriageway on the bus lane in unsafe conditions. Another suggestion by Mr. Gandhi was that the bus shelter be re-located to its original suggested position (as per drawings) or a sign board may be used instead of a formal shelter. Especially since it was noticed that bus commuters still preferred to stand under the tree by the side, away from the shelter. If none of the two options are feasible then a proper continuous concrete (PQC) concrete as per design should be continued behind the shelter using direct alignment and very gentle bends such as used for continuing bicycle infrastructure at the defense colony subway.
REMARKS	It was seen as an encroachment in the cycle track. The Traffic Police also commented on such actions. They saw this as a redundant effort and did not see the reason of why a formal big shelter is required to run left lanes. This could also work by installing a signage indicating a bus to stop since the entire action has been done to experiment the center and the left lane of the BRT. Also regarding the entry into the cycle track blocked by vehicles/ taxi's in front of oberoi hotel, he observed that strengthening of enforcement was required at this place. The police also expressed their concern on the discontinuity and unusability of footpath.

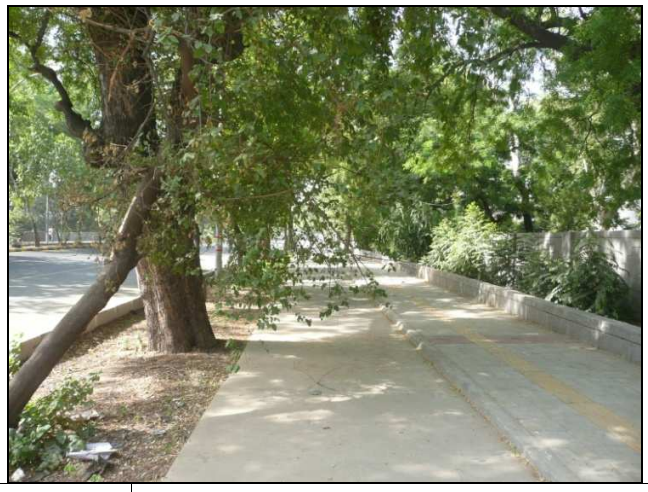
3.1.15 9500 LHS – No Raised Crossing Provided at Zakir Hussain Marg

PROBLEM IDENTIFIED	Fast turning traffic into Zakir Hussain Marg from the corridor. Difficulty in crossing the road by pedestrians and cyclists.
IMPLICATION	Safety hazard to cyclists going straight from the turning vehicles.
SOLUTION	A raised crossing (as per BRT standards of detailing) with 80mm interlocking tiles (red color) as used in other parts should be incorporated with gentle ramp for cyclists and steeper ramps for cars. Use of blinkers and advance warning signages recommended.
REMARKS	The police agreed to the need of a raised crossing that has already been used at other places in the corridor. The turning traffic was high speed and needed to be slowed down for the safety of bicyclists and also make the footpath continuous. The police also felt that the use of a short pedestrian and cyclist signal may also be desirable at this location (along with the raised crossing with gentle slopes for cyclists and sharper ramps for cars).

3.1.16 9680 LHS - Bus Shelter on Cycle track

PROBLEM IDENTIFIED	The bus shelter is constructed on the segregated cycle track almost 10m away from the bus lanes
IMPLICATION	Continuity of a very good bicycle infrastructure is broken yet again, forcing cyclists on to the carriageway even when a good facility exists. Bus passengers would need to get off on to a service lanes, cross raised segregation between service lane and bus lane to access the buses.
SOLUTION	The traffic police said that it would be very difficult for the buses to weave into this bay and come out again. They can stop in the bus lane for boarding and alighting passengers. There is an island already in place with dense trees which would act as a bus shelter if a simple sign board and route map is provided along with some paving for commuters. The service lane may be discontinued here as it is not being used. Here Mr. Gandhi commented that this service lane has been created because of central bus shelter requirements of additional width, and is thus not required currently for the side bus lane experiment. Thus here pedestrian access across bicycle track and discontinued service lane may be provided till the bus lane. The pedestrians can come into the shelter from the footpath at the rear. This would retain the continuity of bicycle infrastructure. Mr. Gandhi also commented this shelter as so many others constructed are not as per design. He added that even if a segregated bus lane was desired here, the bus shelter could easily be constructed on the service lane along with improved alignment leaving one lane free for buses. Also here Ruchi informed the auditors that no shelter was proposed in the drawings at this location, and only a platform with sign post was mentioned in the drawing, and hence the same drawings may be followed.
REMARKS	Bus shelter was seen as an encroachment in the cycle track. This could also work by installing a signage indicating a bus to stop since the entire action has been done to experiment the center and the left lane of the BRT. The island in this particular location offers an ideal place for a shelter which can even work by placing a signage.

3.1.17 9900 LHS – Tree Pruning Required



PROBLEM IDENTIFIED	Tree branches at eye level or even below would hit the cyclists providing discomfort while riding
IMPLICATION	Mainstream commuters may opt out of segregated facility.
SOLUTION	Maintenance plays a vital role. Needs to be taken up at a regular interval.

3.1.18 10060 LHS - Side shelter on Cycle Track

PROBLEM IDENTIFIED	A 1.7m bus shelter constructed on the segregated cycle track 3.2m away from the carriageway.
IMPLICATION	The space in front of the cycle track is more than the cycle track and closer to the carriageway. A bus shelter could have been easily constructed onto the unpaved areas as seen in the photograph. This is completely ruining the usage of a well constructed, shaded cycle track. If it has been done to ensure level boarding and alighting, the right space is the unpaved area which is 3.2m wide and exact required width is available between trees.
SOLUTION	Relocating this shelter and placing it in the unpaved area.
REMARKS	All auditors(excluding RITES) agreed to the fact that there was no reason of constructing it on the track. It was seen as an encroachment in the cycle track. The Traffic Police also commented on such actions. They saw this as a redundant effort and did not see the reason of why a formal big shelter is required to run left lanes. This

	could also work by installing a signage indicating a bus to stop since the entire action has been done to experiment the center and the left lane of the BRT.

3.1.19 10650 LHS - Painted Cycle Lane - No Direct Access to segregated Cycle Track

PROBLEM IDENTIFIED	The footpath is discontinuous (rasied crossings for wheelchair do not exist at many places). After the S B Marg junction (10600)the cyclists are in a painted lane. 100m down the corridor a segregated cycle track is made at the rear of the footpath but it is not visually clear and a major detour for the cyclists. The entry to the cycle track is also not direct and smooth to enter the track and cyclists miss the entry and prefer going straight. No information through signages on changing conditions. The traffic flow was not even occupying the left most lane including the buses.
IMPLICATION	Cyclists ride next to the side bus lane which is unsafe. Once they miss the entry they again would need to weave across the left turning traffic .
SOLUTION	Continuity of pedestrian infrastructure should be retained across property entrances by providing raised crossings. Segregated bicycle infrastructure shold be provided to cyclists as per standard bicycle track details used in BRT – 1. Mr. Gandhi informed everyone that drawings for the same already exists and is available with all agencies.

3.1.20 10650 LHS – Poor Condition of Segregated Cycle Track



PROBLEM IDENTIFIED	Construction of the bus shelter onto the footpath and close to the junction. Drainage issue - water collecting on carriageway. Cycle track made in a straight alignment and weaving through trees affecting the width of the track. The drop near the trees is also dangerous. It makes it a very unattractive and unusable facility provided to the cyclists.
IMPLICATION	Even if the cyclists enter once and use this, they would easily opt out and use the carriageway instead. The current bicycle infrastructure is not only far away from the carriageway (making it undesirable for use by cyclists), its directness, coherence and comfort is far worse than the carriageway.
SOLUTION	Since the last car lane is not being used, the shelter can be constructed in that bay and a little further away from the junction and a segregated bicycle track can continue behind the shelter between footpath and the bus stop (with proper level crossing details for wheelchairs). Mr. Gandhi commented that the drawing for such a design already exists. Drainage needs to be resolved by improving slopes or collection points.
REMARKS	Retro reflective stickers required to be provided on the trees along the cycle infrastructure.

3.1.21 10800 LHS – No Proper Access to Cycle Track

Problem Identified	1. No entry to cyclists to get into cycle track across the Shershah Road Junction 2. The slope of ramps in the pedestrian path do not comply to the ratio of 1:12 – 1:20, and are much steeper
Implications	Cyclists find bicycle tracks and other infrastructure unattractive for use and thus remain on the carriageway, forcing buses away from the shelter and creating risks for accidents.
Solution	Raised crossings across the free left turn should be provided complete as per detail designs used in BRT-1, i.e. in red colour interlocking CC tiles with 1:8 to 1:12 ramps for cars to effectively reduce speed. Bicycle track entrances should be provided as direct and in line with bicycle movement. All slopes for cyclists should preferably be not steeper than 1:20 Mr. Gandhi informed the auditors that drawings/plans for this area already exists with all the said details, and may be followed to achieve the desired result.

3.1.22 11200 – 12600 – Cycle Track Not Usable – Away from Carriageway

Problem Identified	The cycle track is at the rear – near the boundary wall. The mainstream commuters were not seen on the track and preferred using the carriageway. This is a sub-optimal solution and would be very difficult to retain cyclists using the segregated infrastructure.
Implication	Cyclists find bicycle tracks and other infrastructure unattractive for use and thus remain on the carriageway, forcing buses away from the shelter and creating risks for accidents.
Solution	Proper cycle track along the carriageway with good and direct connections at junctions is required. The levels, texture, slope etc., should be as per standard, bicycle track design used in BRT-1. Once again Mr. Gandhi, commented to the respondents that drawing for such a design already exists and may be used.

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3.1.23 11200 LHS - no access fron segregated Cycle Track to intersection

PROBLEM IDENTIFIED	There is no access for the cyclists to come onto the carriageway to cross at Bhairon Marg junction. In this stretch, the cycle track is behind the footpath. Turning cycles need to exit out and come out on the junction which is not constructed on the site.
IMPLICATION	Even if the cyclists enter once and use this, they would easily opt out and use the carriageway instead.
SOLUTION	Entry and exit to the track should be constructed with a smooth alignment. Representatives from TRIPP informed the auditors that drawing for the location showing entry and exist connections for cyclists exists and can be used. They said the drawing incorporates the best practices for doing so.
REMARKS	Traffic police informed that the junction has a high volume of traffic and the safety of turning cyclists would need to be seen critically.

3.1.24 11400 LHS – Cycle Track Abruptly Ends at Dustbin

PROBLEM IDENTIFIED	Cycle track is obstructed by the dustbin. Temporary detour indicated is perpendicular to the flow of travel and not visual seen from a distance. No signage informing the cyclists about the dead end. RITES representative informed that a request with MCD has been sent to remove the obstruction,
IMPLICATION	Even if the cyclists enter once and use this, they would easily opt out and use the carriageway instead. Since already it is a suboptimal solution : the track is away from the carriageway.
SOLUTION	Cyclists should be informed using signages. A safe detour which is visually seen from a distance (a combination with footpath for the length of the dustbin) is preferred. The bicycle track alignment needs to incorporate minimum but gentle bends to retain its directness and coherence and thus present itself as an attractive and a usable option. Mr. Gandhi commented that the ideal solution for this situation is to provide the bicycle infrastructure along the carriageway as per design drawings. That would give it an ideal chance of being used.
REMARKS	The chances of the cycle track being used look faint because it is at the rear, away from the carriageway. A task with operations would be to introduce the facility to the cyclists has to be taken up but any kind of the obstacles should be removed to make it reliable.

3.1.25 11600 LHS - Cycle Track Behind FOB – Bad Access to Junction

PROBLEM IDENTIFIED	Condition of cycle track behind the footover bridge. No common area at the foot of the steps to indicate the cyclists that it would be a common cycle track and footpath. The inclined trunk of the tree would hit the head of the cyclists.
IMPLICATION	Even if the cyclists enter once and use this, they would easily opt out and use the carriageway instead. Since already it is a suboptimal solution : the track is away from the carriageway, and is prone to high friction from pedestrians and hawkers, etc.
SOLUTION	Cyclists should be informed using signages. Common area should be indicated.
REMARKS	The chances of the cycle track being used look faint because it is at the rear, away from the carriageway. A task with operations would be to introduce the facility to the cyclists has to be taken up but any kind of the obstacles should be removed to make it reliable.

3.1.26 11660 LHS - Need for Traffic Calming and Improvement in Ramp Design

PROBLEM IDENTIFIED	The exit of the cycle track is unfavorable for usage by the cyclists. Left turning vehicles constantly cross. The ramp of the exit is also very steep and ends directly into the junction. This makes it unsafe to use both for pedestrians and cyclists.
IMPLICATION	The cyclists take much more time to cross the segment from the segregated infrastructure than using the carriageway. Even if the cyclists enter once and use this, they would easily opt out and use the carriageway instead. Since already it is a suboptimal solution : the track is away from the carriageway.
SOLUTION	Correction in the slope with gradient from 1:12 - 1:20. No free left turning should be allowed. A landing at +150mm level is preferred near the junction with adequate space for crossing cyclists to wait. Hnece the ramp to come down from already elevated cycle track to +150mm level should be set back by 5 to 10m. The use of raised crossing at the location of zebra crossing across the side road was also suggested by ACP traffic.
REMARKS	The chances of the cycle track being used look faint because it is at the rear, and away from the carriageway.

3.1.27 11750 LHS - INDIRECT - Entry to Cycle track, Perpendicular to Carriageway

PROBLEM IDENTIFIED	The entry into the cycle track is perpendicular to the travel flow. Raised crossing at 11800 is not constructed, because of objections raised by the resident at this area.
IMPLICATION	Cyclist prefer directness and coherence of a bicycle infrastructure more than anything else. Indirect entrances result in reduced speed , sharp turns and dangerous maneuvers, not preferred by NMV users. They thus miss the entrance and ocntinue straight on the carriageway mixing with buses, raising the risk of fatal accidents.

SOLUTION	The entry should be along the path of the cyclists and should be visually distinct. Correction in the slope with gradient from 1:12 - 1:20. Information via signages.
REMARKS	The chances of the cycle track being used look faint because it is at the rear, away from the carriageway. A task with operations would be to introduce the facility to the cyclists has to be taken up but any kind of the obstacles should be removed to make it reliable.

3.1.28 11800 LHS - Tree Occupying Width of Cycle track

PROBLEM IDENTIFIED	The tree occupies the entire width of the footpath. Also the cycle track is visually hidden from the main carriageway due to this wall between the footpath and the cycle track.
IMPLICATION	Even if the cyclists enter once and use this, they would easily opt out and use the carriageway instead. Since already it is a suboptimal solution : the track is away from the carriageway.
SOLUTION	The cycle track should be taken around the tree and it can be easily done. The wall dividing the track and the footpath should be broken so that the a vidible connection is achieved between cyclists and the carriageway (even if it cannot be physically close to it). Use of retro-reflective stickers on trees is important to ensure cyclist safety.
REMARKS	The chances of the cycle track being used look faint because it is at the rear, away from the carriageway. e.

3.1.29 12020 LHS – Raised Crossing Required – Lack of Space for Cyclists and Pedestrians on the Common Footpath and Cycle Track.

PROBLEM IDENTIFIED	The ramp for the cyclists onto the junction is very steep and there is no space for the pedestrians to stand, let alone cyclists. Constant left turning vehicles make it difficult to cross.
IMPLICATION	Even if the cyclists enter once and use this, they would easily opt out and use the carriageway instead. Since already it is a suboptimal solution : the track is away from the carriageway.
SOLUTION	Raised crossing should be introduced for left turning vehicles. A raised crossing with 80mm interlocking tiles (red color) as used in other parts should be incorporated with gentle ramp for cyclists and steeper ramps for cars. The left turning traffic needs to be stopped using a traffic signal This was also highlighted to ACP, Traffic Police.
REMARKS	The chances of the cycle track being used look faint because it is at the rear, away from the carriageway. A task with operations would be to introduce the facility to the cyclists has to be taken up but any kind of the obstacles should be removed to make it reliable.

3.1.30 12050 LHS – Raised Crossing Required

PROBLEM IDENTIFIED	Turning vehicles into the service lane are in conflcit with the pedestrains ans cyclists. No continuous footpath from the junction before. 1:12 – 1:20 gradient ramps missing. Raised crossing missing. RITES representative informed that they were not able to make a raised crossing due to the non-agreement of the people residing.
IMPLICATION	It would be difficult to get the cyclists into the segregated cycle track made ahead Especially since it has an in-direct and angular entry (it is not aligned to the cyclists natural path of movement) about 100m ahead of the ones proposed in the drawing.
SOLUTION	Raised crossing with 80mm interlocking tiles (red color) as used in other parts needs to be constructed at chainage 11800, to ensure continuity. Here ACP traffic commented that since vehicle entering the service lane are few, a raised crossing since objected by the resident, may be avoidable. Mr. Gandhi suggested explaining to the resident the safety benefits of raised crossing and informing them that there entrance will not get effected in any adverse way. ACP traffic police also suggested that the left turning traffic at the junction needs to be stopped using a traffic signal This was also highlighted to ACP, Traffic Police.
REMARKS	No compromise should be done in the continuity of pedestrian paths and cycle infrastructure. Pedestrian path have to comply under the disability act. The chances of the cycle track being used look faint because it is at the rear, away from the carriageway. A task with operations would be to introduce the facility to the cyclists has to be taken up but any kind of the obstacles should be removed to make it reliable.

3.1.31 12200 LHS – Steep Gradient of ramp - Raised Crossing Required

PROBLEM IDENTIFIED	No raised crossing at various supreme court entrances. Turning vehicles enter at a speed and do not slow down for crossing pedestrians and cyclists. Also the ramps provided for pedestrians and cyclists are very steep at the entrances.
IMPLICATION	Raised crossing design makes it unfavorable for bicycle and wheelchair use. Even if the cyclists enter once and use this, they would easily opt out and use the carriageway instead. The facility does not present any signs of providing better directness, coherence and comfort for cyclists (and places like these even safety is compromised), hence giving cyclists no incentive to use the bicycle facility.
SOLUTION	Raised crossing should be introduced for left turning vehicles. A raised crossing with 80mm interlocking tiles (red color) as used in other parts should be incorporated with gentle ramp for cyclists and steeper ramps for cars. The left turning traffic needs to be warned using a blinker.
REMARKS	The chances of the cycle track being used look faint because it is at the rear, away from the carriageway. A task with operations would be to introduce the facility to the cyclists has to be taken up but any kind of the obstacles should be removed to make it reliable.

3.1.32 12500 LHS – Cycle Track Ends at Park at W Point, Tilak Bridge

PROBLEM IDENTIFIED	The Cycle track terminates on the wall of the park at tilak bridge junction and no temporary provision of exiting cyclists have been made . Neither any ramp to bring on the footpath. RITES representative informed that the cycle track is through the park and the work is pending. No space for cyclists to stand on the shared pedestrian path before coming on to the junction. Crossing the Tilak Bridge on Cyclists is a very dangerous task. It lacked refuge islands for cyclists.
IMPLICATION	Unfavorable to cycle if not smooth. Even if the cyclists enter once and use this, they would easily opt out and use the carriageway instead. Since already it is a suboptimal solution : the track is away from the carriageway. Crossing the junction is a safety hazard.
SOLUTION	The track should be terminated at the junction (as per junction designs with adequate ramps and waiting spaces for cyclists). Here space needs to be acquired from the park from both pedestrians and cyclists to wait. Since junction crossing should be critically looked into, it was suggested by Ms. Ruchi that on large junctions like these the path of the cyclists should be marked throughout the junction. ACP, Traffic Police was asked by Mr. Bishop, if something could be looked into with the signal cycle. For eg, a separate phase for the cyclists.

3.1.33 12600 – 13000 – Unsafe Tilak Bridge Crossing

Problem Identified	Cyclist crossing at Tilak Bridge and ITO junction is very complex and unsafe. No segregated bicycle facility provided between Tilak Bridge and ITO junction.
Implications	Very heavy and fast traffic at both Tilak Bridge and ITO junction coupled with complex weaving between these areas is leading to near fatal conditions for

	cyclists.
Solutions	ACP, Traffic Police, agreed that the left turning vehicles entering from Sikandra road towards ITO can remain segregated and use the left most lane under the Tilak Bridge along with the painted cycle track and then weave after the bridge. This would reduce conflicts and at to cyclist safety. Following this development of a segregated cycle track under or just after the tilak bridge is possible. Here Mr. Gandhi commented that the same is already shown in the design drawings. At both Tilak Bridge ITO junction, signal phasing plan and marking design need careful consideration (or a possible re-look) to improve the safety and efficiency of crossing cyclists.

3.1.34 13050 LHS - Entry into Cycle Is not Aligned

PROBLEM IDENTIFIED	The entry to the cycle track is not in the natural alignment of the path of the cyclists. Raised crossing missing and discontinuous footpath.
IMPLICATION	The cyclists would miss the entry and then be with the carriageway traffic in unsafe conditions.
SOLUTION	The entry needs to be re-looked into and should be along the natural alignment of the cyclists. Here Ruchi informed the auditors that the desired alignment is shown and included in the design drawings provided to RITES.

3.1.35 13100 LHS - Side Bus Shelter Constructed on Cycle Track

PROBLEM IDENTIFIED	The bus shelter is constructed on the segregated cycle track. Cyclists move on the carriageway.
IMPLICATION	It is a visual obstruction, a clear encroachment of space of cyclists, cyclists move out onto the carriageway and merge with carriageway since a raised crossing and ramp to the carriageway is right next to the shelter.(as seen in the photograph). Safety of cyclists is adversely affected.
SOLUTION	It has been suggested by RITES that a ramp before and after the shelter is constructed with marking for cyclists to use the footpath. Here, since cyclists are expected to deviate from their rightful and natural path, they are likely to choose a more comfortable and direct option. In which case cyclists will most certainly remain on the carriageway than mix with slower pedestrians on the footpath. This will lead to conflicts between buses and cyclists with near fatal results. A bus shelter at a location where it compromises bicycle infrastructure and safety may not be desirable. At such locations a platform for standing commuters may be used for the shelter with a pole marker, or the shelter design itself needs to be modified so as its implementation does not leave bicycle infrastructure useless. Auditors felt that similar strategy needs to be adapted for this location. Here Ruchi informed the auditors that the shelter was not proposed at this location (as per design drawings) and only a waiting area for commuters with a sign post was proposed in the drawing, and the same may be followed to resolve this problem.
REMARKS	It was seen as an encroachment in the cycle track. The Traffic Police also commented on such actions. They saw this as a redundant effort and did not see the reason of why a formal big shelter is required to run left lanes. This could also work by installing a signage indicating a bus to stop since the entire action has been done to experiment the center and the left lane of the BRT.

3.1.36 13200 LHS – Cycle Track Ends Abruptly at Dustbin

PROBLEM IDENTIFIED	Cycle track Is terminated or discontinued due to the presence of an existing dust bin. RITES representative informed that a request with MCD has been sent and DIMTS is following up the same
IMPLICATION	The dead end can be seen from a distance. The cyclists would move out onto the carriageway and mix with the traffic. All such inconveniences requiring cyclists to move on and off the track either to the carriageway or to the footpath, discourage cyclists from using the track even in areas where it is reasonably usable (for short stretches). Cyclists will opt for a continuous direct path which in this case is offered by the carriageway. This though entails the risk if cyclists getting hit by buses or other vehicles (like any other road in Delhi).
SOLUTION	Dust Bin needs to be removed along with any other encroachments in the cycle track to ensure a continuous quality facility.

3.1.37 13400 LHS – Illegal Parking on Cycle Track and Footpath

PROBLEM IDENTIFIED	Car parking on the track for cyclists.
IMPLICATION	Cyclists discouraged to use the shared facility and move onto the carriageway.
SOLUTION	Enforcement should be strengthened. The path of the cyclists should be marked on raised / shared areas to inform other users and prevent encroachment.

3.1.38 13580 LHS - Side Bus Shelter on Cycle Track

PROBLEM IDENTIFIED	The bus shelter is constructed on the segregated cycle track. Cyclists move on the carriageway.
IMPLICATION	It is a visual obstruction, a clear encroachment of space of cyclists, cyclists move out onto the carriageway and merge with carriageway since a raised crossing and ramp to the carriageway is right next to the shelter. Safety of cyclists is affected.
SOLUTION	The bus shelter should be shifted to its planned location at chainage 13540 (TSR parking) with or without a shelter. However it was suggested by RITES that a ramp before and after the shelter will be constructed with marking for cyclists to use the footpath. It was though agreed by most auditors that, the cyclists won't use the footpath since the entry width is very slim (masjid next to it and cyclists are already sharing the footpath from ITO subway) and filled with trees. They would opt for the carriageway and mainstream cyclists might not even enter the facility from the very beginning.
REMARKS	It was seen as an encroachment in the cycle track. The Traffic Police also commented on such actions. They saw this as a redundant effort and did not see the reason of why a formal big shelter is required to run left lanes. This could also work by installing a signage indicating a bus to stop since the entire action has been done to experiment the center and the left lane of the BRT.

3.1.39 14180 LHS – Bus shelter on Cycle track, Cycle Rickshaws Parked on Footpath

PROBLEM IDENTIFIED	The bus shelter is constructed on the segregated cycle track. Cyclists move on the carriageway. The pedestrian path was occupied by cycle rickshaws acting as feeder to the shelter.
IMPLICATION	It is a visual obstruction, a clear encroachment of space of cyclists, cyclists move out onto the carriageway and merge with carriageway since a raised crossing and ramp to the carriageway is right next to the shelter. Safety of cyclists is affected.
SOLUTION	It has been suggested by RITES that a ramp before and after the shelter is constructed with marking for cyclists to weave with the footpath. Cyclists would move out onto the carriageway and merge with carriageway using the raised crossing 20m before the shelter. Since there is space at the rear of the footpath (well shaded and wide) , a rickshaw parking could be created.
REMARKS	Bus shelter was seen as an encroachment in the cycle track. The Traffic Police also commented on such actions. They saw this as a redundant effort and did not see the reason of why a formal big shelter is required to run left lanes. This could also work by installing a signage indicating a bus to stop since the entire action has been done to experiment the center and the left lane of the BRT.

3.2 Delhi Gate Junction to Moolchand Junction – Southbound (RHS)

Most Solutions on this stretch were simple and required Rites to undertake the following actions:

1. Construct raised crossings as per standard design in 80mm thick red coloured CC tiles with 1:8 to 1:10 ramp for cars and 1:12 to 1:20 ramp for cyclists. The crossings have to be provided at all free left turns, petrol pump entrances, property entrances, etc. as per design drawings provided.
2. Re-locate or remove bus shelters constructed on the already functional bicycle track.

Other solutions requiring larger changes and alignment modifications to comply with the designs were:

1. Provision of segregated cycle track at locations where the same is not provided.
2. Improvement of entry and exist of cycle track and improvement of junction geometry

3.2.1 14000 - Side Bus Shelter Constructed on Cycle Track at Delhi Gate

PROBLEM IDENTIFIED	The bus shelter is constructed on the segregated cycle track. Cyclists move on the carriageway.
IMPLICATION	It is a visual obstruction, a clear encroachment of space of cyclists, cyclists move out onto the carriageway and merge with carriageway using the raised crossing at the petrol pump before the shelter Making it unsafe as this gets them to a conflict with the buses.
SOLUTION	The bus shelter (formal structure) is not required here and may be replaced by pole marker and paved area between cycle track and carriageway for commuters to stand (up to 1m width), with raised crossing access across cycle track. Also designs to include or designate hawker spaces may be required so as they do not encroach the bicycle infrastructure.
REMARKS	It was seen as an encroachment in the cycle track. The Traffic Police also commented on such actions. They saw this as a redundant effort and did not see the reason of why a formal big shelter is required to run left lanes. This could also work by installing a signage indicating a bus to stop since the entire action has been done to experiment the center and the left lane of the BRT.

3.2.2 13800 RHS – Shop Restricts footpath – Pedestrians Spill over on Cycle Track

OBSERVATION / PROBLEM IDENTIFIED	Restricted footpath due to an MCD shop.
IMPLICATION	The pedestrians would use the cycle track
SOLUTION	Removal of the shop. RITES informed that MCD was informed for its removal.

3.2.3 13500 - MAMC junction – Missing Pavement Markings

OBSERVATION / PROBLEM IDENTIFIED	The wide junction did not have any kind of paint marking/signaling not working. Marshall seen managing traffic in unsafe conditions.
IMPLICATION	Concern for Safety
SOLUTION	RITES representative informed that the painting work is pending and would be taken up. A police box (umbrella) can be placed on a refuge space within the intersection for safety of marshall or any policeman managing traffic.
REMARKS	ACP Traffic gave his consent and said it was a practical option , if space permits.

3.2.4 BSZ Marg - Painted Cycle Lane Adjacent to Bus Lane

OBSERVATION / PROBLEM IDENTIFIED	Lack of ROW on the BSZ marg. No space for segregation, therefore painted bicycle lane.
IMPLICATION	Cyclist mix with fast motorized traffic without any segregation creating risk of fatal accidents.
SOLUTION	The main stream cyclists would opt for the elevated roadway on BSZ Marg. Hence segregation needs to be provided at the upper level. In case a physical kerb segregation with bare minimum 2.0m wide cycle track is not possible, traffic calming measures to reduce vehicular speeds should be provided. In addition bicycle infrastructure should be provided in the service lane. This requires provision of signages and speed reduction using traffic calming measures.
REMARKS	Use of the lower service lane through media houses can be used as an alternative. Although once the peak hour starts and the lane is occupied by parked vehicles, it becomes unfavorable for use by cyclists.

3.2.5 13250 RHS – Disconnected Bicycle Infrastructure – Cycle Track Pushed Next to Boundary Wall, Encroached by Pedestrians

OBSERVATION / PROBLEM IDENTIFIED	The cycle track has been constructed at the rear – along the boundary wall. A compromise in the slope of the ramp can be clearly seen. It is very steep. No raised crossings have been provided for cyclists to cross service lane and access cycle track. Cycle track at the rear (near Gandhi Memorial Hall) is disconnected from the cycle lane proposed on the carriageway, and is thus unlikely to be used.
IMPLICATION	A cyclists won't take such a major detour from the BSZ Marg since it does not come on the natural path of the cyclists and also cannot be seen (or is visually disconnected). Also the cyclists has to cross vehicles exiting from the service lane and get into the cycle track which is a major conflict area since there is no raised crossing to weave in. Clearly accessing cycle track creates near fatal conflicting situation for cyclists. It was also observed that since the location of the cycle track next to Gandhi Memorial Hall was more suitable as a footpath, it was completely occupied by pedestrians. This facility is thus not likely to be used forcing cyclists to mix with buses accessing bus shelters. This creates near fatal conditions for cyclists.
SOLUTION	A raised crossing at service lane crossing with 80mm interlocking tiles (red color) as used in other parts should be incorporated with gentle ramp for cyclists and steeper ramps for cars. It was proposed by Mr. Gandhi that the the near perpendicular detour which is likely to discourage bicycle use can be improved by reducing the bus bay width from 10.5m to 3.3m. This wide space is redundant as buses cannot access bus shelters to come close to the structures for level boarding. The recovered space can be used to provide bus shelters and a segregated cycle track behind them and a wide footpath between the cycle track and the boundary wall. This will make the connection between bicycle facilities more direct with bends no sharper than 30m radius, increasing its chances of use and thus contributing in reducing cyclist fatalities.
REMARKS	The area needs to be critically looked into since it poses high degree safety hazard for the users. Traffic Police agreed that such wide bus bay is redundant for buses.

3.2.6 13100 RHS- Cycle Track Away from Carriageway – Mixes with Footpath

OBSERVATION / PROBLEM IDENTIFIED	Cycle track runs through the footpath on either side. No level difference.
IMPLICATION	Unfavorable for cyclists to use the facility, cyclists are liukely to mix with motorized vehicles on the carriageway.
SOLUTION	Bicycle track needs to be provided ahead of the BOT toilet, which may need to be re-located if space is a constraint. This will also solve the problem of blind crossing for cyclists at the ITO junction. Ruchi informed the auditors that this is also included in the design drawings, and the same is not currently followed at site.

3.2.7 13000RHS – ITO Junction – Blind Crossing

OBSERVATION / PROBLEM IDENTIFIED	Police box completely obscures sight lines for cyclists and pedestrians crossing the road
IMPLICATION	Cyclists would face a collision with motorists taking a left turn, due to a delhi traffic police room, coming in the line of sight.
SOLUTION	As proposed in the previous point, cyclists should be closer to the carriageway which may possibly require shifting of the BOT toilet. In case the same is not possible, railings and the traffic police booth may need to be removed to resotre, the line of sight.

3.2.8 13000 – 12600 – Painted Cycle Lane, Next to Bus Lanes

OBSERVATION / PROBLEM IDENTIFIED	Painted bicycle lane from ITO junction towards Tilak Bridge junction. Cars occupy the side lane for parking / stopping standing.
IMPLICATION	The cyclists overtake the parked vehicles from their right and will have to weave into the bus lane increasing their concern for safety. Painted lanes do not provide safety to cyclists who ride adjacent to high speed buses in the bus lanes. The risk of loosing balance and falling in front of moving buses is very high.
SOLUTION	Mr. Gandhi informed the auditors that the proposal for segregated cycle track provided at this location in the design drawings has so far not been developed. He commented that the same may now be followed to develop segregated bicycle infrastructure. ACP traffic police said that an unsegregated bicycle track next to buses is unacceptable and poses grave risk to the life of cyclists. He stressed on the need to segregate cyclists at this locations and at all bus shelters on this stretch. He agreed that we can rivert back to segregated cycle track design for this locations and the space for the same looks adequate especially if we include the space allocated to painted bicycle lane. In case segregated cycle tracks as per standard design and minimum 2.0m clear width, are not possible to construct using standard design and hard, 75cm wide median, traffic calming measures are required to reduce vehicular speed on the carriageway to 30km/hr.

3.2.9 12700 RHS – Painted Cycle Lane – No Raised Crossing

OBSERVATION / PROBLEM IDENTIFIED	There is no raised area for crossing bicyclists at the intersection. The painted bicycle lane is next to a high footpath.
IMPLICATION	Conflict with high speed left turning vehicles.This reduces the effective width of the painted lane. Safety hazard for bicyclists.
SOLUTION	Raised crossing in red colour 80mm thick cement concrete tiles as per standard raised crossing design with 1:8 to 1:10 ramp for motor vehicles, should be provided at this and all other free turning locations. Ruchi explained that the layout designs and the details drawigns for the same exist with Rites and the same can be followed without any problem at this location.

3.2.10 12590 RHS - No Raised Crossing – Painted Cycle Lane Next to Bus Lane

OBSERVATION / PROBLEM IDENTIFIED	No raised crossing at free left turns at Tilak Bridge crossing
IMPLICATION	Unsafe for cyclists, vehicles do not slow down. They mix with the left turning traffic and are in conflict with the straight coming traffic.
SOLUTION	Raised crossing should be provided as per standard details in 80mm thick red colur cement tiles. Sandeep Informed that the drawing for the same already exists with RITES.

3.2.11 12420 RHS – Bus Commuters Wait on the Cycle Lane

OBSERVATION / PROBLEM IDENTIFIED	Cycle lane occupied by waiting bus commuters. Bus lane along painted cycle lane.
IMPLICATION	The cyclists would either overtake from the right most lane i.e. mix with oncoming fast traffic in the car lanes.
SOLUTION	Segregated cycle track needs to be provided at this location along with adequate footpath and hawker spaces. At designated bus shelters the track should gently manuever behind the shelter, staying as close the the carriageway as possible. Sandeep informed all that drawings for the same are available. ACP traffic agreed that we should revert to the segregated cycle track designs. In case segregated cycle tracks as per standard design and minimum 2.0m clear width, are not possible to construct using standard design and hard, 75cm wide median, traffic calming measures are required to reduce vehicular speed on the carriageway to 30km/hr.

3.2.12 12200 - Painted Bicycle Lane Next to Bus Lane

OBSERVATION / PROBLEM IDENTIFIED	Painted cycle lane next to bus lane.
IMPLICATION	Conflict with high speed bus and slow moving NMT.
SOLUTION	Mr. Gandhi informed the auditors that the proposal for segregated cycle track provided at this location in the design drawings has so far not been developed. He commented that the same may now be followed to develop segregated bicycle infrastructure. ACP traffic police said that an unsegregated bicycle track next to buses is unacceptable and poses grave risk to the life of cyclists. He stressed on the need to segregate cyclists at this locations and at all bus shelters on this stretch. He agreed that we can rivert back to segregated cycle track design for this locations and the space for the same looks adequate especially if we include the space allocated to painted bicycle lane. In case segregated cycle tracks as per standard design and minimum 2.0m clear width, are not possible to construct using standard design and hard, 75cm wide median, traffic calming measures are required to reduce vehicular speed on the carriageway to 30km/hr.

3.2.13 11700 RHS – Painted Cycle Lane Between Bus Lane and Bus Shelter

OBSERVATION / PROBLEM IDENTIFIED	Bus shelter and painted bicycle lane brings buses right up alongside cyclists, precisely what the central lane operations of the original BRT prevented
IMPLICATION	Safety concern for cyclists. Stopping buses will affect the painted bicycle lane. They would overtake from the right which is a conflict with the car lanes.
SOLUTION	ACP traffic police said that an unsegregated bicycle track next to bus shelters is unacceptable and that it will be impossible for buses to come close to the shelters and passengers will occupy the cycle lane. This will force cyclists on to the bus lane, leading to serious risk of accidents. poses grave risk to the life of cyclists. He stressed on the need to segregate cyclists at this locations, going behind the bus shelter. It was agreed by all auditors that segregated cycle track design for this entire stretch should continue behind the bus shelter, though it should be a very gentle bend so as the cyclists do not have to slow down and the connection appears direct. In case segregated cycle tracks as per standard design and minimum 2.0m clear width, are not possible to construct using standard design and hard, 75cm wide median, traffic calming measures are required to reduce vehicular speed on the carriageway to 30km/hr.

3.2.14 11230 RHS – No Riased Crossing – Unsafe for Crossing Cyclists

OBSERVATION / PROBLEM IDENTIFIED	Painted bicycle lane. No raised crossing to slow down left turning vehicles. No vehicles stop and give way to straight going cyclists.
IMPLICATION	Cycle lanes cut across high speed left turning traffic, and cyclists are not in visual contact of turning vehicles. This is a potentially fatal condition for cycling, and may lead to accidents and loss of life.
SOLUTION	Segregated cycle tracks (as proposed in previous points) should lead directly to raised crossing as per designs followed in BRT-1, which should lead to cycle box on the junction. Ruchi explained that such designs exist and have been submitted to all concerned, thus the same may be used without major interventions at site. It was also discussed that even for some reason segregation is not achieved for cycle track in front of Pragati Maidan, cycle track at least 5o to 100m before Bhairon Marg left turn should be segregated as per standard design to ensure safe bicyclist access to raised crossing which should also be constructed as per standard details in 80mm thick CC tiles in red colour with 1:8 to 1:10 CC ramp for cars. Here Mr. Jain explained that the raised crossing has been constructed in Bitumen. To this Simon and ACP traffic police commented that it is not serving the purpose and vehicles are not being warned and not slowing down. To this Sandeep added that standard raised crossing design in CC tile should be used and detail drawings for the same are available with Rites.

3.2.15 11000 RHS - Painted Bicycle Lane Occupied by Vehicles

OBSERVATION / PROBLEM IDENTIFIED	Cyclists on footpath with two wheelers. Painted cycle lane occupied by other vehicles.
IMPLICATION	Impossible for cyclists to use the cycle lane due to heavy traffic occupying the lanes for movement and for waiting at the red light. This forces cyclists on to the footpath which is also occupied by two wheelers during peak hour. This creates risky conditions for cyclists even on the footpath.
SOLUTION	Segregated cycle tracks need to be provided for cyclists at this location. This will need effective enforcement to prevent encroachment by two wheelers. It was observed at site and adequate space was available to construct segregated tracks especially if the 1.5m wide painted cycle lane is included. Sandeep informed the auditors that it is possible to construct a segregated track here, as the same is shown on the proposed drawings, which confirms the availability of space. He added that Rites simply has to follow these drawings available with them to improve cyclist infrastructure at this location. In case segregated cycle tracks as per standard design and minimum 2.0m clear width, are not possible to construct using standard design and hard, 75cm wide median, traffic calming measures are required to reduce vehicular speed on the carriageway to 30km/hr.

3.2.16 11000 RHS - Encroachment on Painted Bicycle Lane by Vehicles

OBSERVATION / PROBLEM IDENTIFIED	Painted cycle lane occupied by other vehicles and buses.
IMPLICATION	Most cyclists are forced onto the footpath with pedestrians(also being used by two-wheelers) and some risk using the carriageway. This creates potentially fatal conditions for cyclists.
SOLUTION	Segregated cycle tracks need to be provided for cyclists at this location. This will need effective enforcement to prevent encroachment by two wheelers. It was observed at site and adequate space was available to construct segregated tracks especially if the 1.5m wide painted cycle lane is included. Sandeep informed the auditors that it is possible to construct a segregated track here, as the same is shown on the proposed drawings, which confirms the availability of space. He added that Rites simply has to follow these drawings available with them to improve cyclist infrastructure at this location. In case segregated cycle tracks as per standard design and minimum 2.0m clear width, are not possible to construct using standard design and hard, 75cm wide median, traffic calming measures are required to reduce vehicular speed on the carriageway to 30km/hr.

3.2.17 10900 RHS – Painted Cycle Lane Next to Bus Lane

OBSERVATION / PROBLEM IDENTIFIED	Painted cycle lane occupied by other vehicles and buses.
IMPLICATION	Available space for a cycle track, though the same not constructed, forcing cyclists to mix with vehicles in high risk conditions.
SOLUTION	Segregated cycle tracks need to be provided for cyclists at this location. This will need effective enforcement to prevent encroachment by two wheelers. It was observed at site and adequate space was available to construct segregated tracks especially if the 1.5m wide painted cycle lane is included. Sandeep informed the auditors that it is possible to construct a segregated track here, as the same is shown on the proposed drawings, which confirms the availability of space. He added that Rites simply has to follow these drawings available with them to improve cyclist infrastructure at this location. In case segregated cycle tracks are not possible to construct using standard design and hard, 75cm wide median, traffic calming measures are required to reduce vehicular speed on the carriageway to 30km/hr.

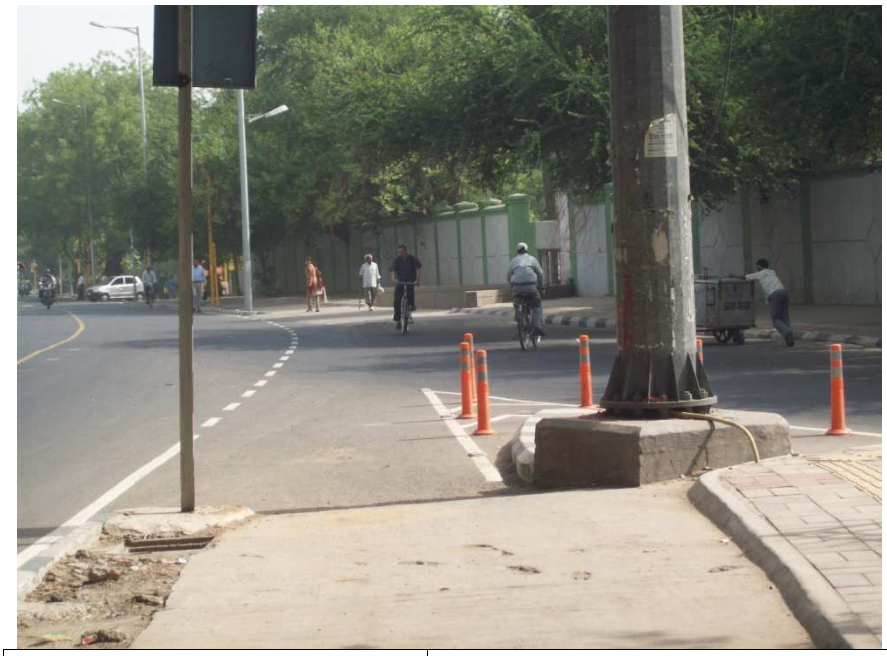
3.2.18 10700 RHS - Debris on Painted Cycle Lane

OBSERVATION / PROBLEM IDENTIFIED	Construction debris on cycle lane.
IMPLICATION	Cyclists weave with the bus and car traffic in unsafe conditions. No safe detour demarcated for cyclists.
SOLUTION	Presence of construction debris on the cycle lane was identified as a temporary problem. Though it highlighted the need to create safe detours for cyclists in such conditions. Also it was highlighted that eventually this location should have a segregated cycle track as per standard design. In case segregated cycle tracks are not possible to construct using standard design and hard, 75cm wide median, traffic calming measures are required to reduce vehicular speed on the carriageway to 30km/hr.

3.2.19 10300 RHS – Cyclists and Buses Share Lane

OBSERVATION / PROBLEM IDENTIFIED	Bicycles in mixed traffic conditions. No painted lane for cyclists – lack of ROW. No Raised crossings to slow down traffic.
IMPLICATION	Cyclists share the bus lane, and cross high vehicular traffic without a raised crossing, creating a potential hazardous condition, and increasing risk to their safety.
SOLUTION	In ideal condition a segregated cycle track is preferred for this stretch. However it may not be possible to construct the same due to constrained carriageway (8.5m total) at this location. It is thus desirable to use traffic calming measures to reduce vehicular speed to 30km/hr. or lower. At Sunder Nagar exit points raised crossings need to be provided as per standard design with 80mm thick cement concrete tiles in red colour and CC ramp in 1:8 to 1:10 slope for cars. ACP traffic police also felt the need to carefully think about a solution to ensure cyclist safety at this location. He suggested that the use of service lane by constructing formal bicycle infrastructure may be explored. Ruchi added here that the designs for raised crossing at this location are included in the design drawings available with Rites and the same may be followed.

3.2.20 9600 RHS - No Raised Crossing for Cyclists



OBSERVATION / PROBLEM IDENTIFIED	Absence of the raised crossing.
IMPLICATION	Crossing cyclists in conflict with left turning car traffic, raise concerns for their safety.
SOLUTION	Raised crossing needs to be provided as per standard design with 80mm thick cement concrete tiles in red colour and CC ramp in 1:8 to 1:10 slope for cars. Ruchi added here that the designs for raised crossing at this location are included in the design drawings available with Rites and the same may be followed.

3.2.21 8900 RHS – Un Marked Entry to Segregated Cycle Track

OBSERVATION / PROBLEM IDENTIFIED	Signage indicating 'Cycle Track' is missing. Open pits and construction debris lying in unpaved area.
IMPLICATION	Cyclists may miss the cycle track entrance and mix with motorized vehicles on the carriageway. Debris on the track also serves to discourage its use,
SOLUTION	Install adequate signage as per standard design and clear the track of construction debris.
REMARKS	The gradient of the slope at the entry to cycle track does not comply with 1:12 to 1:20 slope.

3.2.22 8350 RHS – No Segregated Cycle Track – Wide Road Encourages Speeding

OBSERVATION / PROBLEM IDENTIFIED	Painted bicycle lane. Cars occupy the side lane for parking / stopping standing.

	Painted cycle track on the Nala
IMPLICATION	The cyclists overtake the parked vehicles from their right and will have to weave into the bus lane increasing their concern for safety. Very wide carriageway on the Nala encourages speeding, putting unsegregated cyclists at risk of accidents.
SOLUTION	A segregated cycle track is desirable for this location, however the same may not have been developed at the CGO subway due to the constraint at this location. However a segregated track is perfectly feasible for construction over the Nala. Here Sandeep informed the auditors that the carriageway here is almost 20m in width, and there is enough space to construct a segregated cycle track. He added that the same is already included in the design drawings available with Rites. Auditors agreed that the design drawings can be followed at this location to construct a CC cyle track and median as per standard cycle track design used in BRT-1. In case segregated cycle tracks as per standard design and minimum 2.0m clear width, are not possible to construct using standard design and hard, 75cm wide median, traffic calming measures are required to reduce vehicular speed on the carriageway to 30km/hr.

3.2.23 8100 RHS – Footpath Constructed over Cycle Track Alignment

OBSERVATION / PROBLEM IDENTIFIED	No cycle track present at the location 'cycle track' signboard has been used. Ruchi informed the auditors that the footpath has been constructed on the proposed cycle track alignments. The footpath is to be provided from the park which is acquired, as shown in proposed drawings submitted to Rites. Mr. Jain informed the auditors that cycle track will be constructed, as soon permission to cut the trees is received. Ruchi commented on this that if drawings are followed the cycle track and footpath can be achieved without cutting additional trees.
IMPLICATION	Cyclists use the carriageway even when space exists to construct a perfectly good cycle track to maintain continuity after CGO subway.
SOLUTION	Enough space to construct a track. Also there is a nala before where a segregated cycle track can be constructed. This will in turn give a 200m length of segregated facility for the cyclists.

3.2.24 8100 RHS – No Raised Crossing and Segregated Cycle Track

OBSERVATION / PROBLEM IDENTIFIED	Un-constructed raised crossing to enter the segregated facility (also missing on site).
IMPLICATION	Cyclists use the carriageway, and are at risk of being hit by turning vehicles.
SOLUTION	All auditors agreed that raised crossing as per standard design in 80mm thick red colour CC tiles was an essential requirement for the bicycle infrastructure and can easily be constructed at all free turning locations including this one. Sandeep added that the design of a raised crossing is included in the drawings for this location already available with Rites. If the same is followed along with other solutions of developing segregated tracks ahead and behind (see points above) then a safe and usable facility can be developed with higher chances of used.

3.2.25 8080 RHS – No Raised Crossing and Segregated Cycle Track

OBSERVATION / PROBLEM IDENTIFIED	Raised crossing missing. Cyclists in conflict with entering and exiting traffic from left – Jangpura.
IMPLICATION	Unsafe. Cyclists would never use the segregated facility.
SOLUTION	All auditors agreed that raised crossing as per standard design in 80mm thick red colour CC tiles was an essential requirement for the bicycle infrastructure and can easily be constructed at all free turning locations including this one. Sandeep added that the design of a raised crossing is included in the drawings for this location already available with Rites. If the same is followed along with other solutions of developing segregated tracks ahead and behind (see points above) then a safe and usable facility can be developed with higher chances of used.

4 ANNEXURE : SIDE PUNCTURES ALONG THE BRT CORRIDOR.

A detailed exercise was undertaken by TRIPP, IIT-Delhi to mark the side punctures on the BRT corridor from Ambedkar Nagar to Delhi Gate Junction. The side punctures include :

- Access to side property.
- Petrol Pumps / Gas stations
- Side lanes to residential areas.
- Entry/Exit to service lanes
- Side roads
- Junctions for turning traffic.

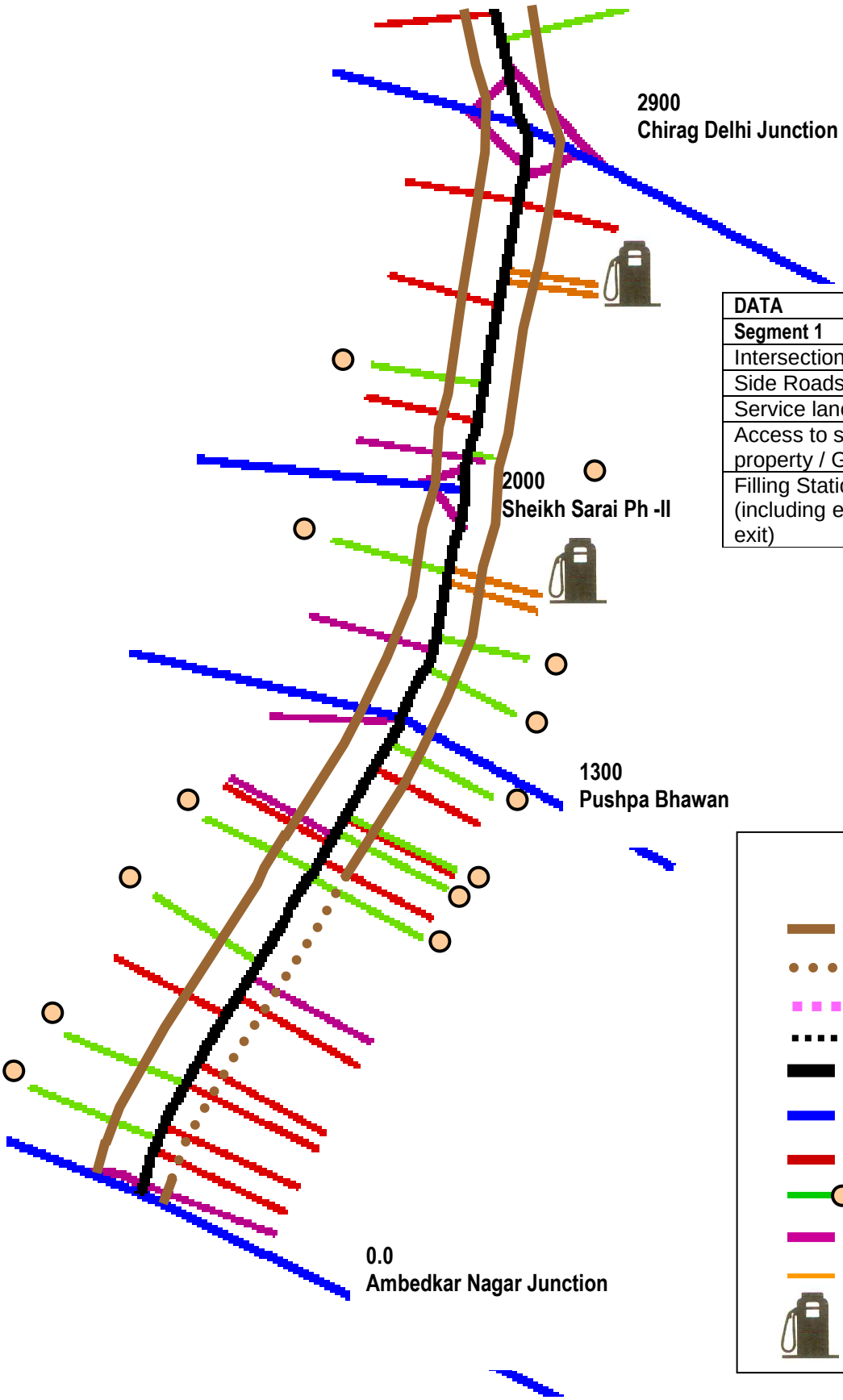
The data indicates the number of punctures with their character between various junctions and from Ambedkar Nagar to Delhi Gate Junctions. These punctures are frequent and many cannot be rationalised, which implies as obstructions in the efficiency of the side bus lane.

Based on the cycle audit, the type of bicycle infrastructure as seen on site has been marked on the graphic and therefore implications and obstruction to a cyclists can be easily seen.

The findings can be inferred in the following categories:

1. Length of **segregated Cycle track** ensures safety and segregation from buses and other traffic on the carriageway.
2. Length of **painted cycle lanes** along with the bus lane on the carriageway.
3. The length of the **Cycle track constructed at rear** i.e. behind the footpath.
4. The length of **mixed traffic** – no form of bicycle infrastructure.

SEGMENT 1
AMBEDKAR NAGAR (Chainage 0.0)- CHIRAG DELHI JUNCTION (Chainage 2900)



DATA	
Segment 1	**0.0 m - 2900 m**
Intersections	4
Side Roads	14
Service lanes	12
Access to side property / Gates	13
Filling Stations (including entry and exit)	4

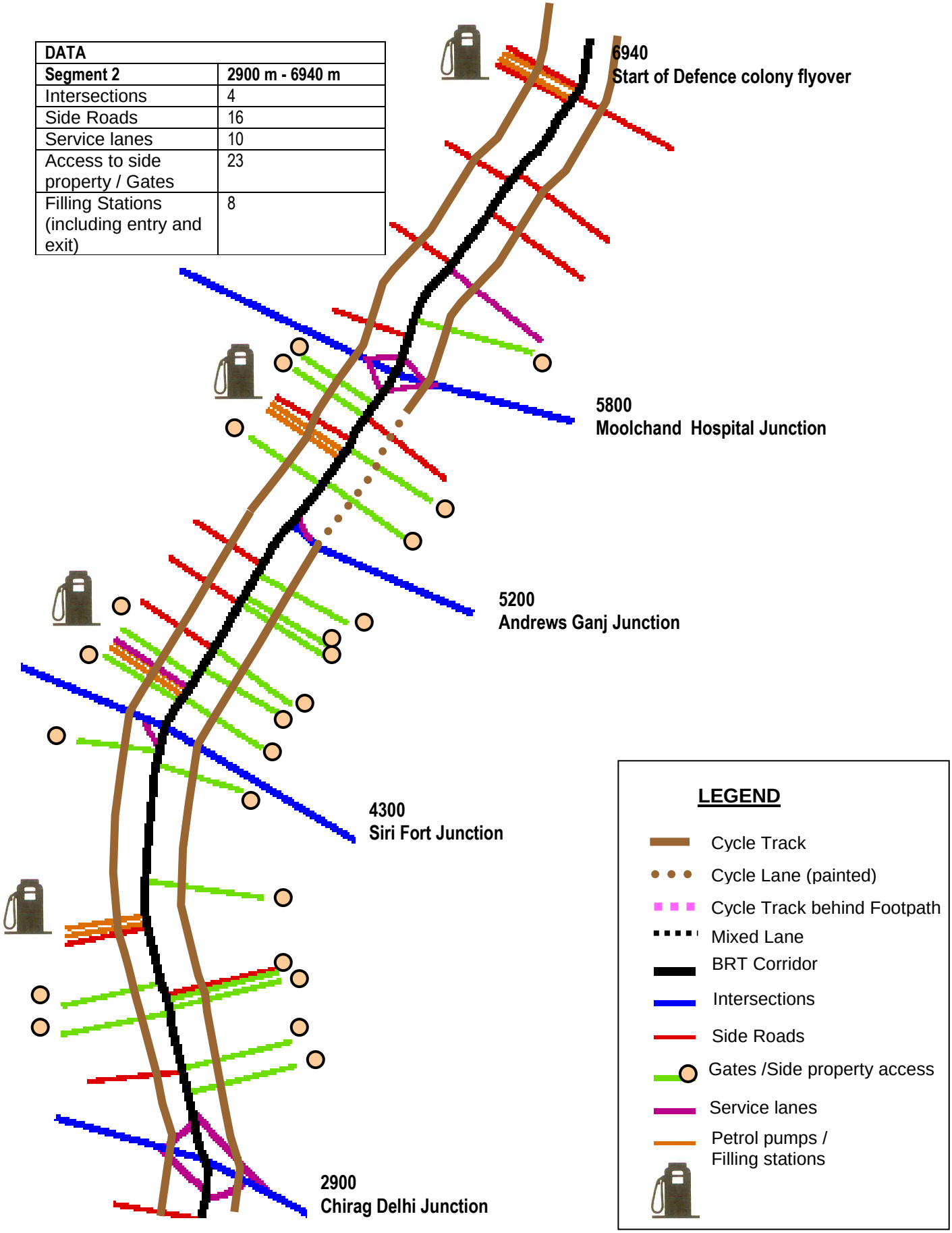
LEGEND

- Cycle Track
- Cycle Lane (painted)
- Cycle Track behind Footpath
- Mixed Lane
- BRT Corridor
- Intersections
- Side Roads
- Gates /Side property access
- Service lanes
- Petrol pumps / Filling stations

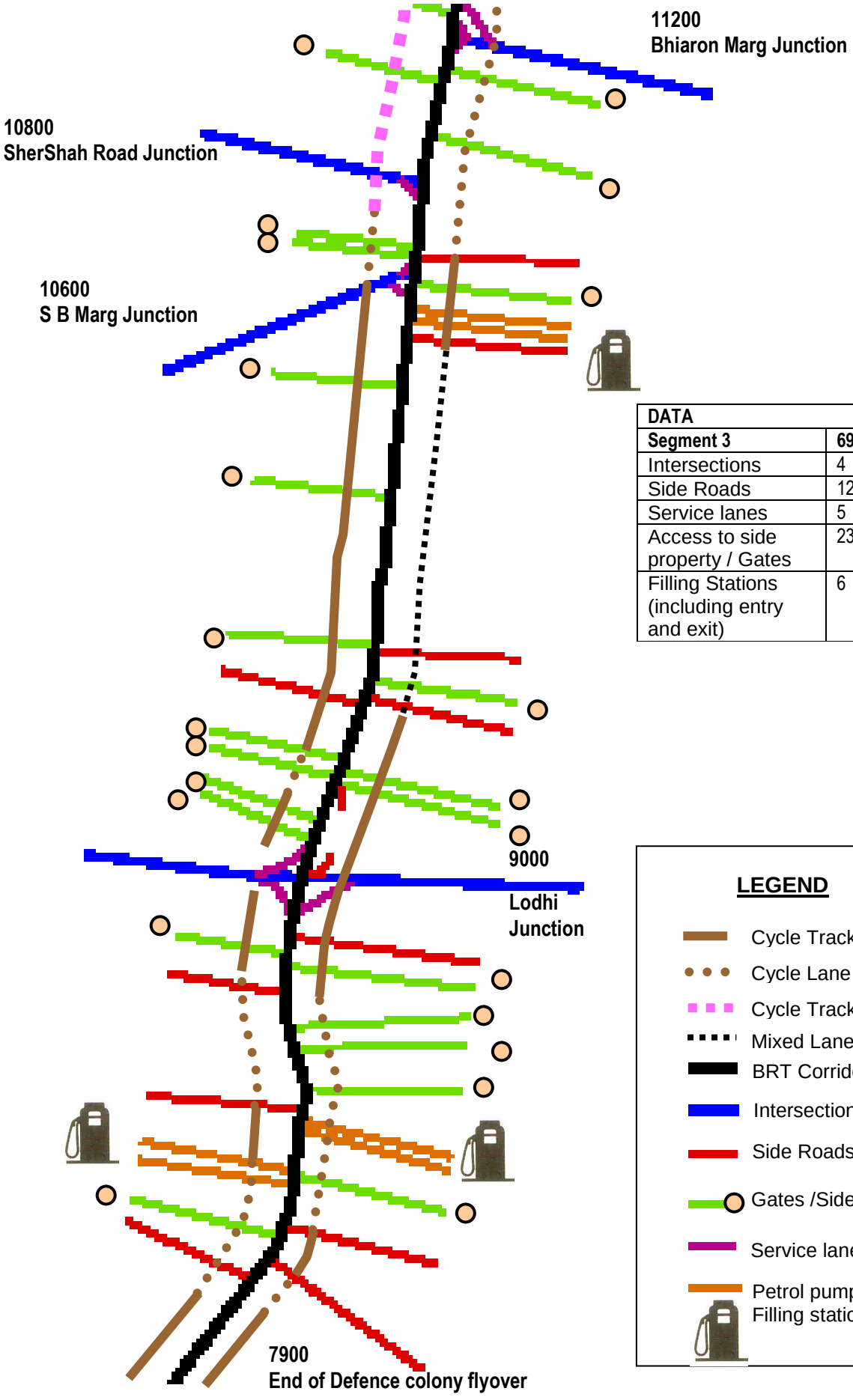
SEGMENT 2

Chirag Delhi Junction (Chainage 2900) to Defence Colony Flyover (Chainage - 6940)

DATA	
Segment 2	**2900 m - 6940 m**
Intersections	4
Side Roads	16
Service lanes	10
Access to side property / Gates	23
Filling Stations (including entry and exit)	8



SEGMENT 3
Defence colony Flyover (end) (Chainage 7900) to Bhairon Marg (Chainage - 11200)



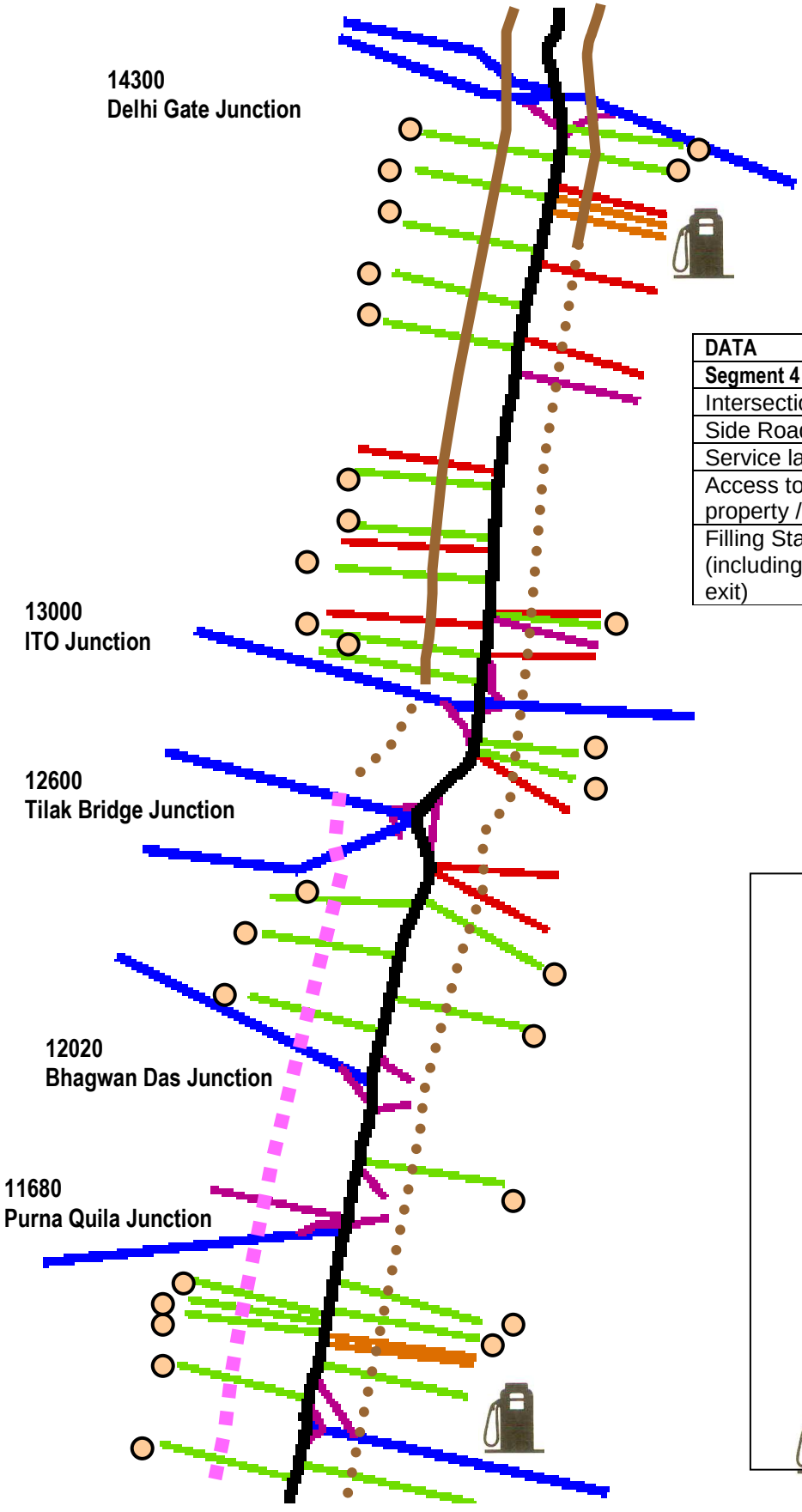
DATA	
Segment 3	**6940 m – 11200m**
Intersections	4
Side Roads	12
Service lanes	5
Access to side property / Gates	23
Filling Stations (including entry and exit)	6

LEGEND

- Cycle Track
- Cycle Lane (painted)
- Cycle Track behind Footpath
- Mixed Lane
- BRT Corridor
- Intersections
- Side Roads
- Gates /Side property access
- Service lanes
- Petrol pumps / Filling stations

SEGMENT 4

Bhairon Marg (Chainage - 11200) to Delhi Gate Intersection (Chainage 14300)



DATA	
Segment 4	**11200 m – 14300m**
Intersections	6
Side Roads	11
Service lanes	18
Access to side property / Gates	29
Filling Stations (including entry and exit)	4

LEGEND

- Cycle Track
- Cycle Lane (painted)
- Cycle Track behind Footpath
- Mixed Lane
- BRT Corridor
- Intersections
- Side Roads
- Gates /Side property access
- Service lanes
- Petrol pumps / Filling stations

Data of Side Openings on the BRT Corridor: Ambedkar Nagar – Delhi Gate Intersection – LEFT HAND SIDE

*NMV Infrastructure as per Cycle Audit on 19th & 26th June'09 and 1st July'09 from Moolchand to Delhi Gate Junction.

S.no	Chainage	Opening	distance between two consecutive openings	NMV
1	0	Dr. Ambekar Nagar Junction		
2	20	Free left - IN	20	
3	140	acess to service lane / dustbin	120	
4	300	GATE - Pushp Vihar Quarters	160	
5	510	Left Road to Pushp Vihar-3	210	
6	670	GATE - Left Turn Road	160	SEGREGATED
7	940	Sewerage Pumping Station Gate	270	
8	1020	Left Turn Road	80	
9	1040	entry to service lane	20	
10	1380	service lane - exit	340	
11	1400	Pushpa Bhawan Junction	20	
12	1600	service lane - entry	200	
13	1800	GATE	200	SEGREGATED
14	1980	Free Left Turn - OUT	180	
15	2020	Sheikh Sarai Ph-II Junction	40	
16	2050	Free left - IN	30	
17	2100	Access to service lane	50	
18	2200	Left Turn Road to Residential Area	100	
19	2300	Residential Area Gate	100	SEGREGATED
20	2500	Left Turn Road	200	
21	2780	Left Turn Road	280	
22	2920	Free Left Turn - OUT	140	
23	2980	Chirag Delhi Junction	60	
24	3040	Free left turn - IN	60	
25	3280	Left Turn Road to Residential Area	240	
26	3480	Private Road Gate	200	
27	3580	Private Road Gate	100	
28	3760	Left Turn Road	180	SEGREGATED
29	3780	Petrol Pump Entry	20	
30	3800	Petrol Pump Exit	20	
31	4340	DDA Park Gate	540	
32	4380	Free Left Turn - OUT	40	
33	4420	Siri Fort Junction	40	
34	4520	Gate - police station	100	
35	4540	service lane	20	
36	4550	Petrol Pump Entry	10	
37	4570	Petrol Pump Exit	20	SEGREGATED
38	4580	service lane	10	
39	4620	India Oil Gate	40	
40	4730	Sadiq Nagar/Indian School Gate	110	

S.no	Chainage	Opening	distance between two consecutive openings	Status of NMV as per audit
41	4900	Left Turn Road	170	SEGREGATED
42	5050	Left Turn Road	150	
43	5380	Gate	330	
44	5480	Petrol Pump Entry	100	
45	5520	Petrol Pump Exit	40	
46	5560	Left Turn Road	40	
47	5640	Residential Area Gate	80	
48	5700	Dy-Commissioner's Office Gate	60	
49	5740	Free Left Turn - Moolchand Jn.	40	
50	5800	Moolchand Jn.	60	
51	5870	Free left turn - IN	70	SEGREGATED
52	5950	Left Turn Road	80	
53	6220	Left Turn Road	270	
54	6540	Left Turn Road	320	
55	6880	Left Turn Road	340	
56	6885	Petrol Pump Entry	5	
57	6920	Petrol Pump Exit	35	
58	6930	Left Turn Road	10	PAINTED CYCLE LANE
59	7940	Left Turn	1010	
60	8060	Gate	120	
61	8200	Petrol Pump Entry	140	
62	8230	Petrol Pump Exit	30	
63	8380	Left Turn CGO	150	
64	8380 - 8700			
65	8700	Left turn Road	320	SEGREGATED
66	8810	Gate	110	
67	8900	Free left turn - OUT	90	
68	9000	Lodhi jn.	100	
69	9100	Free left turn - IN	100	PAINTED CYCLE LANE
70	9120	Blind School Gate	20	SEGREGATED
71	9170	Blind School Gate	50	
72	9280	Blind School Gate	110	
73	9340	Oberoi hotel Gate	60	PAINTED CYCLE LANE
74	9500	Left turn Road to India gate	160	
75	9640	GATE - supreme nursery	140	SEGREGATED
76	9960	Left Road Kaka nagar resi.	320	
77	10030	GATE	70	
78	10320	GATE	290	
79	10570	Free left turn - OUT	250	
80	10600	SB Marg jn.	30	
81	10630	Free left turn - IN	30	PAINTED CYCLE LANE
82	10640	Old fort Gate	10	
83	10680	Old fort Gate	40	
84	10680 - 10800			Cycle Track Behind Footpath
85	10800	Free left turn - OUT	120	

86	10800 - 10840			
87	10840	Shershah Road jn.	40	
88	10890	Free left turn - IN	50	Cycle Track Behind Footpath
89	11120	DDA Park Gate	230	
91	11300	GATE	180	
92	11450	NIC Club area Gate 1	150	
93	11470	NIC Club area Gate 2	20	
94	11490	NIC Club area Gate 3	20	
95	11680	Purana Quila jn.	190	
96	11700	Free left turn - IN	20	Cycle Track Behind Footpath
97	11710	Service lane	10	
98	12000	Free left turn - OUT	290	
99	12020	Bhagwan Das Road jn.	20	
100	12140	Supreme Court Gate	120	Cycle Track Behind Footpath
101	12310	Supreme Court Gate	170	
102	12440	Supreme Court Gate	130	
103	12620	Tilak Marg jn.	180	
104	12680	Free left turn - IN	60	PAINTED CYCLE LANE
105	12860	Free left turn - OUT	180	
106	12940	ITO jn.	80	
107	13000	I. N. Science Acadmy Gate	60	SEGREGATED
108	13060	I. N. Science Acadmy Gate	60	
109	13120	Left Turn Road	60	
110	13220	GATE	100	
111	13300	Left Turn Road	80	
112	13320	Manak Bhawan Gate	20	
113	13440	Head Post office Gate	120	
114	13460	Left Turn Road, Kotla Marg	20	
115	13750	MAMC Gate	290	
116	13840	MAMC Gate	90	
117	13960	MAMC Gate	120	
118	14100	LNJP Hospital Gate	140	
119	14180	LNJP Hospital Gate	80	
120	14180 - 14250			PAINTED CYCLE LANE
121	14250	Free left turn - OUT	70	PAINTED
122	14320	Delhi Gate jn.	70	

Data of Side Openings on the BRT Corridor: Ambedkar Nagar – Delhi Gate Intersection – RIGHT HAND SIDE

*NMV Infrastructure as per Cycle Audit on 19th & 26th June'09 and 1st July'09 from Moolchand to Delhi Gate Junction.

S.no	Chainage	Opening	distance between two consecutive openings	NMV
1	0	Dr. Ambekar Nagar Junction		
2	20	access to market	20	SEGREGATED
3	120	Left Turn Road to Residential Area	100	
4	185	Left Turn Road to Residential Area	65	SEGREGATED
5	310	Left Turn Road to Residential Area	125	
6	370	Left Turn Road to Residential Area	60	
7	560	Left Turn Road to Residential Area	190	
8	620	Left Turn Road	60	
9	930	Left Turn Road to Residential Area	310	
10	980	Left Turn Road to Virat Marg	50	
11	1060	Delhi Jal Board	80	SEGREGATED
12	1100	Left Turn Road	40	
13	1130	Gate	30	
14	1260	Left Turn Road	130	
15	1380	Shopping Center Gate	120	
16	1400	Pushpa Bhawan Junction	20	
17	1550	Gate	150	SEGREGATED
18	1630	Gate	80	
19	1750	Petrol Pump Exit	120	
20	1800	Petrol Pump Entry	50	
21	2110	entry to service lane	310	
22	2120	Jahanpanah City Forest Gate	10	
23	2560	Petrol Pump Exit	440	
24	2600	Petrol Pump Entry	40	
25	2770	Left Turn Road	170	
26	2800	Free left turn - IN	30	
27	2980	Chirag Delhi Junction	180	
28	3030	Free Left Turn - Chirag Delhi Jn.	50	SEGREGATED
29	3200	DDA Park Gate	170	
30	3300	DDA Park Gate	100	
31	3500	Indane Gas Company Exit	200	
32	3520	Indane Gas Company Entry	20	
33	3540	Left Turn Road	20	
34	3920	DDA Park Gate	380	
35	4300	DDA Park Gate	380	
36	4440	Siri Fort Jn.	140	
37	4540	Disaster Management Center Gate	100	SEGREGATED
38	4660	Gate	120	
39	4730	Jal Suvidha Kendra Gate	70	

S.no	Chainage	Opening	distance between two consecutive openings	Status of NMV as per audit
40	4900	Pumping Station Gate	170	SEGREGATED
41	4930	Meter Workshop Gate	30	
42	5020	DJB Gate	90	
43	5220	Andrew's Gunj Jn.	200	
44	5250	Free Left Turn - Andrew's Gunj Jn.	30	PAINTED CYCLE LANE
45	5400	KV School Gate	150	
46	5520	College of Nursing Gate	120	
47	5640	Left Turn Road	120	
48	5820	Moolchand Junction	180	
49	5880	Free left turn - OUT	60	SEGREGATED
50	6000	Moolchand Hospital Gate	120	
51	6200	Left Turn Road	200	
52	6420	Left Turn Road	220	
53	6580	Left Turn Road	160	
54	6900	Left Turn Road	320	
55	8000	Left Turn Road Jangpura R.	1100	PAINTED CYCLE LANE
56	8100	Left Turn Road Jangpura R	100	
57	8230	Gate	130	
58	8340	Petrol Pump Exit	110	
59	8360	Petrol Pump Entry	20	
60	8450	Vacant Land Gate	90	
61	8560	Crematorium Place Gate	110	
62	8620	Creamatorium Place Gate	60	
63	8780	Gate Temple	160	
64	8860	Road	80	SEGREGATED
65	8860 – 8920			
66	8920	Free left turn - IN	60	PAINTED CYCLE LANE
67	9000	Lodhi jn.	80	
68	9275	Gate	275	SEGREGATED
69	9280	Left Road,Under Bridge	5	
70	9300	Gate - Vacant Land	20	
71	9520	Left Turn Road,DPS	220	
72	9560	Gate DPS	40	
73	9620	Exit Service Lane Sunder N	60	MIXED LANE
74	9620 - 10440			
75	10440	Entry to Sevice Lane S.N.	820	SEGREGATED
76	10480	Petrol Pump Exit	40	
77	10520	Petrol Pump Entry	40	
78	10580	Gate	60	PAINTED CYCLE LANE
79	10660	Zoo Entry/ Exit	80	
80	10980	Gate	320	
81	11150	Gate	170	
82	11200	Free left turn - IN	50	
83	11240	Bhairon Mrg Junction	40	

84	11280	Free left turn - OUT	40	PAINTED CYCLE LANE
85	11360	Free left turn - OUT	80	
86	11380	Entry to Masjid	20	
87	11420	Petrol Pump Exit	40	
88	11460	Petrol Pump Entry	40	
89	11500	Pragati Maidan Gate	40	
90	11560	Pragati Maidan Gate 3-4	60	
91	11700	Pragati Maidan Gate 5 - EXIT	140	
92	11810	Pragati Maidan Gate 5 - ENTRY	110	
93	11840	Pragati Maidan Gate 6	30	
94	11960	Pragati Maidan Exit Ser L	120	
95	12080	Pragati Maidan Entry S.L	120	
96	12220	Pragati Maidan Gate 8	140	
97	12440	P.M. Appu Ghar Gate 9	220	
98	12520	road to DMRC station	80	
99	12535	left turn Road	15	
100	12560	Free left turn - IN	25	
101	12620	Tilak Marg jn.	60	PAINTED CYCLE LANE
102	12720	Free left turn - OUT	100	
103	12845	Hans Bhawan Gate	125	
104	12847	Left Turn Road	2	
105	12860	Institute of Engineer's Gate	13	
106	12940	ITO jn.	80	Cycle Track behind Footpath.(Major Detour for cyclists)
107	13040	Free left turn - OUT	100	
108	13060	Left Turn Road	20	
109	13140	Entry to Service Lane	80	
110	13150	GATE	10	
112	13160	Left Road nr. G. M.hall	10	
113		13160 - 13700		PAINTED CYCLE LANE
114	13700	Entry to Sevice Lane	540	SEGREGATED
115	13780	Left Road Saheed Park	80	
116	13940	Left Road Open land	160	
117	14060	Petrol Pump Exit	120	
118	14100	Petrol Pump Entry	40	
119	14200	Ambedkar Stadium Gate	100	
120	14240	Ambedkar Stadium Gate	40	
121	14245	Free left turn - IN	5	PAINTED CYCLE LANE
122	14320	Delhi Gate jn.	75	