EXPLORING THE ' ' FOR HISTORICAL
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ABSTRACT

Life today moves faster than ever before. As well as continued growth in traffic demand, the city traffic facing the growing challenges With the continuous expansion of the scale of Xi'an City, the transportation infrastructure presents a serious shortage of the worsening traffic is no longer suitable the socio-economic development of Xi'an and residents' needs. The suitable ways to solve the problem for Xi'an city, is improving the bus system, which is widely used in developing country. Thus this project it will determine the suitable bus route for the south part of Xi'an, and analysis of traffic flow for bus passenger demand based on consideration of users' time, cost and the flow of the pedestrian at the steps. The project can save the increase in travel time and helps lessen air pollution. This study can also can be applied for another similarly cities in China.

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CHAPTER 1

INTRODUCTION

1. 1 Introduction

Xi'an city is located in the middle of Yellow River in central Guan Zhong Basin Center in China geographic territory, the capital of Shaanxi Province, the world-famous historical and cultural city and international tourist city. This city is a typical ancient city. Xi'an is located in the middle of China, which city has made as the capital for the longest history, most dynasties and the greatest influence during whole China history. Xi'an has a large number of cultural heritage, and Xi'an city famous for its tourism and food. For example, the Terracotta Warriors, Horses Big Wild Goose Pagoda, and now the government try to build Xi'an as an international metropolis.

For a long time the capital designer follows the concept of Round Sky& Square Earth. As show figure 1.1(history map, nowadays is inside of City Wall), from figure 1.1 we can see here has no oblique line. The entire road is straightforward.

And in order to protect historical sites, and urban planning refer to the developed countries is not feasible, have to design a new system to support the development of an ancient city.

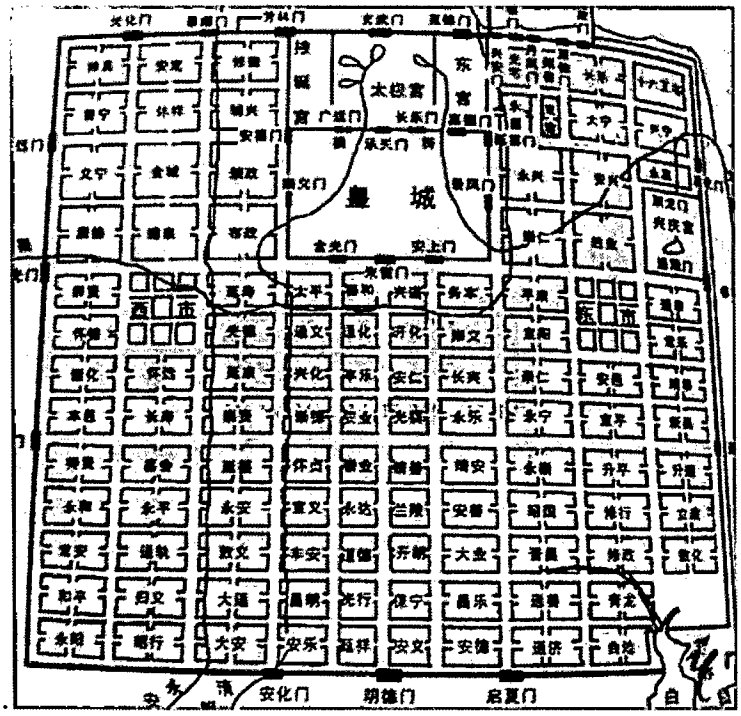

Figure 1.1 History maps, nowadays is inside of City wall

In 2010, the main city area of Xi'an has a population of 58,305,400 (7,642,500 household population), there are many ethnic and religious living around. They believe in Buddhism, Taoism, Islamism, Catholicism and Christianity, and they stay in an urban area has 10, 108 kilometers square. According to World population distribution level,

identified as level 1, with is higher population density. Transportation infrastructure however, can not to keep up with the rate of growth of traffic demand. Data show that there are 64.19% passengers travel by bus, 5.41% passenger travel by taxis, and 23.65% of pedestrian. It can be seen, public transport has a very important role in people's lives.

When we look at the transport system of the developed countries, although Japan has higher population density of 338 people per kilometer square. However, the Japan traffic system shows a very efficient operating system.

With the continuous expansion of the scale of Xi'an City, the transportation infrastructure presents a serious shortage of worsening traffic congestion which is no longer suitable for the socio-economic development of Xi'an and residents' needs. As well as continued growth in traffic demand, the city traffic facing the growing challenges. Travel by public transport is because it still the best and the most effectively way to promote the development of urban road traffic. Figure 1.2 shows the map of Xi'an City.

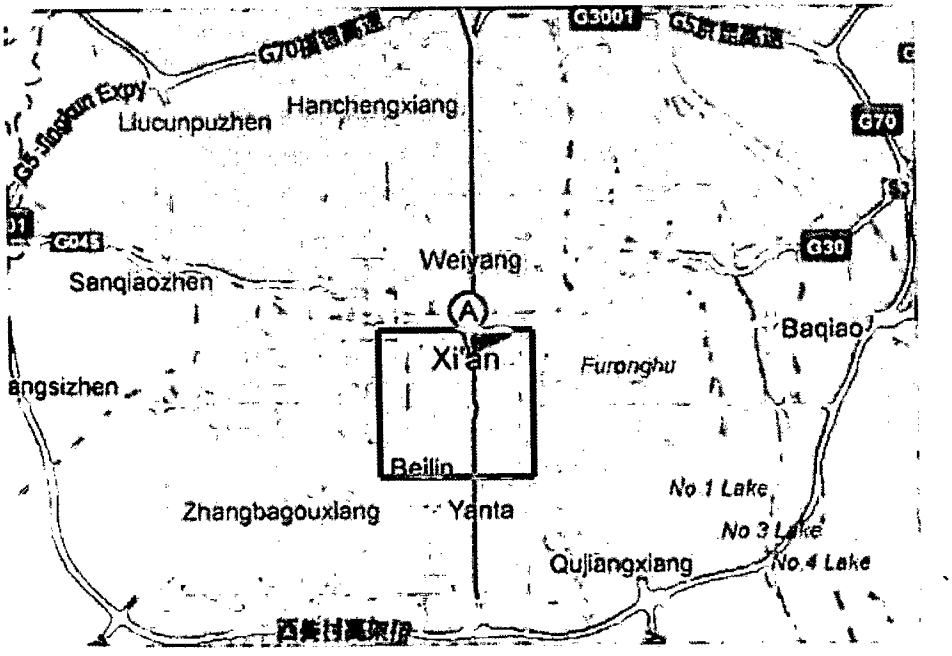

Figure 1.2 Map of Xi'an city

1.2 Study area

In figure 1.2, the area inside the box is the south of Xi'an, and the area chosen for the study. The study area is busiest section of Xi'an city.

This area has many historic buildings such as the Big Wild Goose Pagoda, City Wall Ruins, imitation Tang Dynasty buildings, as well as many new buildings, such as the musical fountain (the largest in Asia), the Provincial Library, and an International Exhibition Centre. In 2010 it received domestic tourists of 655,000 and 100, 000 overseas tourists, and all must be accounted for when proposing new bus route.

As a developing City, it has no light rail, even the subway just completed this year (because underground have lots of ancient tombs). So by bus is still the best way of travel, although figure 1.3 shows growing Xi'an vehicle ownership

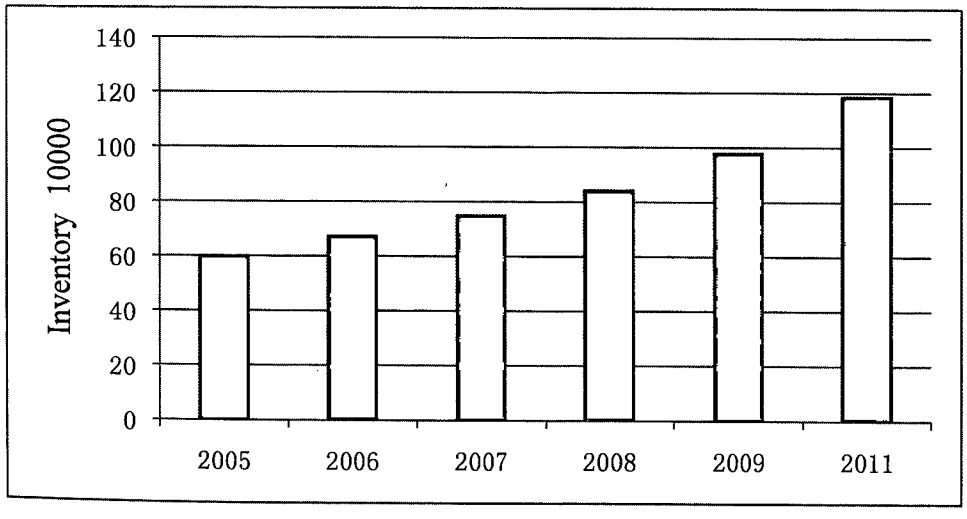

Figure 1.3 2005-2011 growth of Xi'an vehicle ownerships

The study area is depicted as figure 1.4. Figure 1.4 looks into specific study area comprising the transport route that connect indirectly all fire focal points, furthermore there are other attraction such as between stations 2 and 3, there is a liquid firework field, which is the largest liquid fireworks square in Asia.

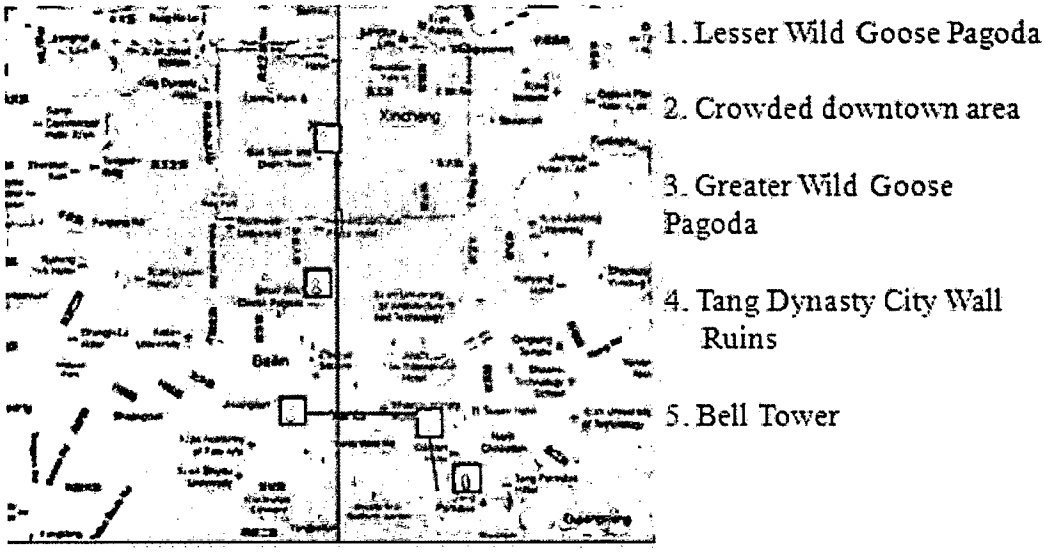

Figure 1.4 Study area

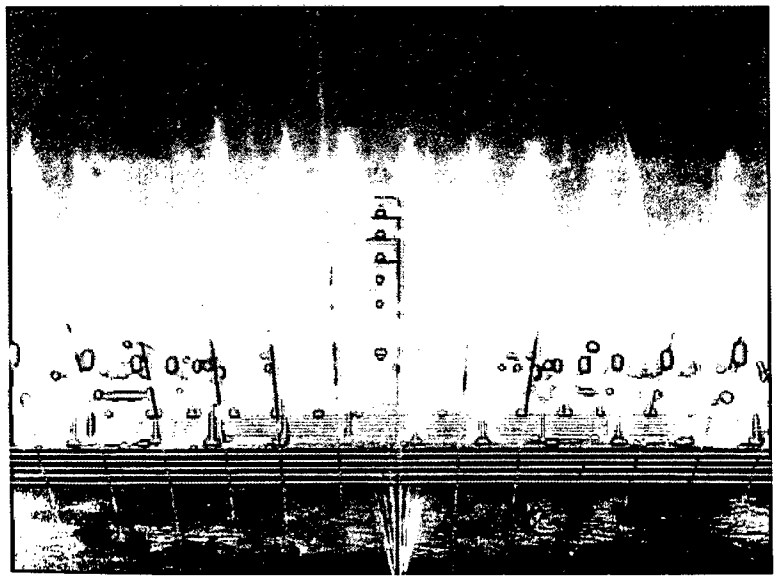

Figure 1.5 Xi'an liquid fireworks.

1.3 Problem Statement

Despite the high and constant passenger demand, Bus service is in poor conditions as there is no direct service provided for the historical buildings in the study area and it is troublesome not only for the foreign tourists but also for the demotic.

1.4 Objective

The objective of the study area is set to be as follows:

(1) To identify an ideal concept of a bus route of the ancient city this can ease the movement of tourists for an historical site.

(2) To explore the potential of providing bus service for the historical site.

1.5 Summary

This chapter introduced the general situation of Xi'an city, the problem statement, objective, and the scopes of study. The next chapter will look into the literature review of bus system in the study area in particular.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, review of related articles published by accredited scholars and study were summarized. This chapter is divided into sections. The first section covered the literature review on variables and second part covered the theoretical of upgrade the bus system.

It includes the advantage of bus transport, coverage area and ridership of the bus services, all the elements above will be discussed in this chapter.

2.2 Advantage of bus transport

Transportation is the movement or transfer of people, animals and goods from one location to another. It can be classified into three basic categories based on the type of operation and usage. They are private, for-hire and public or common carrier transportation. Private transportation consists of privately vehicles that operated by owners for their own use or individual travels independently most common in this mode include motorcycle, bicycle and walking in this category. For-hire passenger transportation also called as par transit. The most important feature of public transport is that it is accessible to the users (Kenneth, 2005). The most common in this mode include bus, light rail transit and rapid transit.

Bus transport has the larger capacity, and land area to occupy is smaller. The transport department passes the implementation of "priority to the development of public. Transport policy", and guide people abandoned the vehicle on the multiplication, and thus reduce the volume of traffic at the same time expand service capacity, an effective ways solve congestion.

2.3 Bus system

Bus systems play a major role in the provision of public transport. It can take many forms, varying in distance covered and types of vehicle used, and base on suitable line length and schedules. System may be operated by public or private companies, and be provided using bus fleets of various sizes.

2.3.1 Line length

The length of the line is the most basic indicators of a bus line, directly affect the trip time, and indirectly determine the number of equipped vehicles. Depends on China (Urban Road Traffic Planning and Design) recommended values of the length of the bus lines is 8 ~ 12km. To determine a reasonable line length based on the size of cities and traffic distribution. The average length of the line is generally base on the diameter of the small urban area, diameter of a medium-sized city area, radius of the metropolitan area to determine; or passenger residents to determine the average trip distance, and then take the average travel distance of 2 to 3 times. Suburban lines should not be in-depth city center, transfer station outer at the convergence of the Ring and urban public transport lines.

2.3.2 Bus station

A bus station is a structure where city or intercity buses stop to pick up and drop off passengers. It is larger than a bus stop, which is usually simply a place on the roadside, where buses can stop.

As an important component of the bus system, public transport stations contact with passengers and public transport. How to design a better public transport stations, is become more attention by citizens. In order to provide comprehensive, accurate and efficient transport information more and more. The role of the bus schedule is show as follow.

1) The bus is an important sign.

2) Marked the local name of the station.

The bus schedules have less humanization design in China. Beijing bus station stop, a very obviously problem is not provide driving directions, and this is very easily to cause passengers to take the wrong way bus; some of the city's bus schedule does not show. Site name of the bus station; make the bus stop information of the transmission of so far been low efficiency, in fact, it's just need to make some little changes. Everything will become better.

Location of the passengers to waiting for the bus is direct impact on the efficiency of the bus, if the stop sign shows the poor identify performance, and passengers wants to look carefully at the bus information, Back and forth looking for the bus near the stop sign, makes Crowd, thus the efficiency is low; the other hand, passengers waiting for the bus location. Also delay time into the car.

A bus station is a structure where city or intercity buses stop to pick up and drop off passengers. It is larger than a bus stop, which is usually simply a place on the roadside, where buses can stop. It may be intended as a terminal station for a number of routes, or as a transfer station where the routes continue

2.3.3 Set of bus stop

Generalized bus station has two concepts, including field and station. Field refers to the parking lot, the maintenance field; station refers to station stops, the first and last stop, and the hub station.

Field general also can be used for the first and last stop, and the hub station, the few lines combined in the capability allows Hold Area case. The docking site set directly

determines the average number of away from the station, but also affect the scope of services of the line, one-way running time, and the average walking distance of the customer, level of service is vital significance to a bus line.

2.3.4 Passenger demand

Passenger demand is the foundation of the bus lines; line scale is reasonable or not. It is depends on the adapt ability to the traffic demand. Passenger distribution in each site directly determines the site utilization, passenger turnover, as well as public transport enterprise profitability.

2.3.5 Numbers of car distribution

Because of there has a limit of bus send off and arrive speed. Once the length determine, the departure interval is depends on car distribution. Not only consider the operation cars, but also have to obligate 1 ~3 cars as a preparation cars. If set the peak value of the departure interval requirements is T, delivery speed is **V**. Unidirectional lines on the maximum section traffic is **Q**. **Numbers of car distribution:**

$$N = 2\ (L / V T + B)$$

B is a single direction originating station reserved number of vehicles.

2.3.6 Traffic Volume

The traffic volume studies were conducted to determine the number, movements, and classifications of roadway vehicles at a given location. These data could help identify critical flow time periods, determined the influence of vehicles on vehicular traffic flow or documented traffic volume trends (Traffic 3 Volume Counts). The number of vehicles passing a point or entering an intersection will be used by engineer in the analysis of roadway operations (Green & Kentucky, 2002).

2.3.7 Traffic Count

Manual observation and automatic recording were two basic methods in traffic count that stated and each has their use and effectiveness depending on the type of information needed for analysis (Green & Kentucky, 2002). Manual counting can be carried out on the site in small sample with simply based on visual examination and judgments by individual observers in short periods (Zheng & Mikea, 2012). Automatic counts were used for volume data that did not require complex classifications of vehicles and long periods counts (Green & Kentucky, 2002). Manual counting method was cheaper than automatic recording because manual counts may not required equipments such as mechanical count boards and electronic count boards for counting the vehicles (Traffic 3 Volume Counts).

2.3.8 Improvement measurement

The following table summarizes the existing problems of bus system in Xi'an

Table 2.1 Improvement measurement

Scale of bus route		Problem	Solution
Length of route	Too long	High requirement of bus distribution, Excess waiting time, Full-load ratio too high, Low level of comfort and punctuality rate	Truncate into link sets
	Too short	Low level of scale efficiency, occupy resources, Cost- Efficiency ratio high	Appropriately Extend on each side
Number of bus stop	Too many	High berthing time, Decrease the delivery speed, The number of brake and start increase, Oil consuming, High pollution, decrease the comfort rate	Cancel or merge unnecessary bus stops
	Too few	Low bus stop cover rate, just consider big bus stop, Increase passenger walking distance	To transform into express plus low speed shuttle bus
Passenger demand	Too big	Transport capability cannot fulfil the demand, High Full-load ratio, High congestion degree, Low level comfort rate	Increase depart frequency, Change the type of the bus
	Too small	Trip without achieving the bus transport capability, Waste transport capability, Loss in profit	Consider cancelling or change the route
Number of bus distributio n	Too many	Waste transport capability in normal time, The buses in some of route standing idle in peak time. Lack of transport capability in some routes	Intelligent scheduling the bus between different routes
	Too few	Lack of transport capability, Long departure interval, Long passenger waiting time	Increase the bus distribution or change to branch line

2.3.9 Application for a grid network

Confidence obtained from the selected article traffic statistics, based on the flow of people around the bus stop 500m, the diameter of the bubbles and the flow is proportional to choose to delete the point 2 and point 11, in order to redo ce the length of the route and later this method will be using it to get the new different lines, that can be chosen.

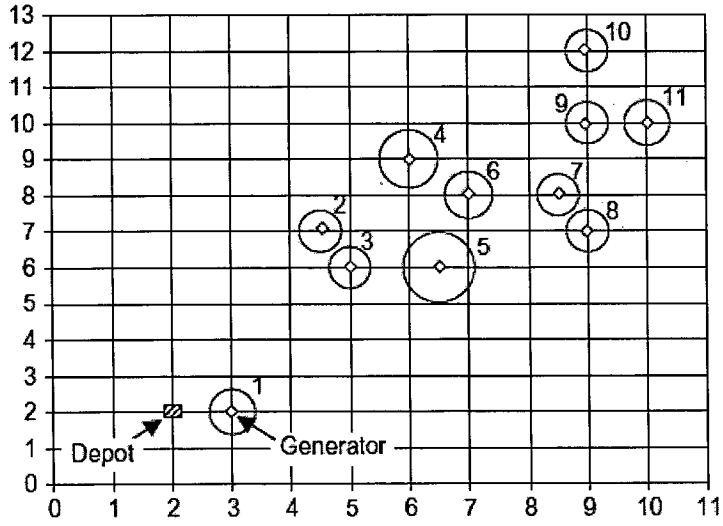

Figure 2.1 Public transport node layout and passenger demand

Form the node layout and passenger demand, can get several route options. So it can use as design. Public transport node layout and passenger demand. The numbers of people around the bus stop within 500m radius.

The road system consists of a regular grid network in this application. Locations of nominated generators are shown in Fig. 3.2. Distance measurements are in km units. The bus depot is assumed to be at the location (2, 2). The two terminal locations have been nominated as Nodes 1 and 10. The demand distribution is shown using the bubble diagrams. The total amount of outbound trips from each node is proportional to the

diameter of bubbles. Five route options have been considered and their layouts. The first route option is derived from the nearest neighbor method for a route from Node 1 to Node 10. Route Option 2 removes Nodes 2 and 4 from the stop sequence to reduce the length of the route. One of the nodes eliminated is a one with relatively large demand. The software is able to detect that and suggest the best insertion point to the next trial route for that particular node. This suggestion has been accepted in Option 3 where Node 4 is brought back to the route. In Option 4, the Node 2 is brought back to the route. However, this time Node 2 is located at a different place in the bus route, between Nodes 1 and 3. The final route option considered removes Node 11 from the route to reduce the route length and slightly improve route directness. The cost parameters selected for the analysis. Notation used in the context of formulation 1 is also indicated. Typical values applicable for a bus operation are selected for the purpose of this analysis.

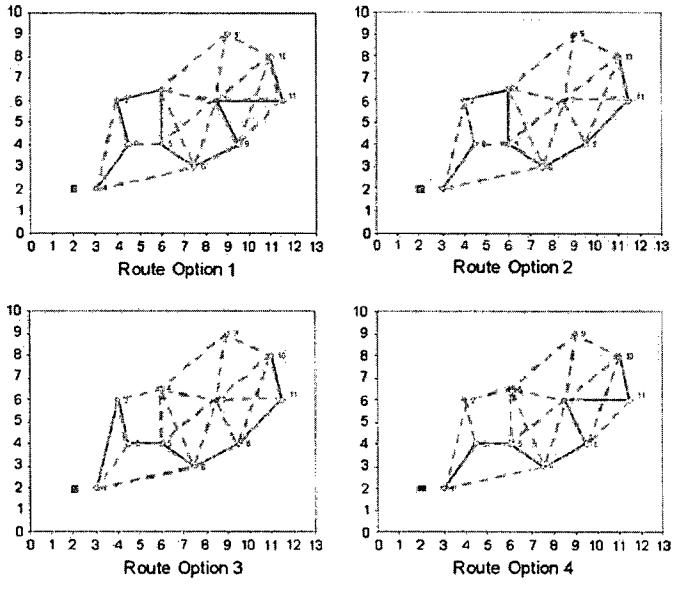

Figure2. 2 Four route options for the network with limited number of road links

When a particular node is eliminated from the route, passengers from that node have to walk to reach the nearest node to use the bus service. Therefore passengers traveling between this node pair (the one that is not served directly and the node nearest to that on the route) have completed their journey as they reach the bus route. Similarly, another category of passengers who do not have a sensible reason to use the bus route are those who find their boarding stop and egress stop are the same according to a particular route layout. The above factors contribute to the differences among the sum of passenger demand reported in Fig. 3.3. Values of passenger-km which has a more pronounced dip with Option 2 are also reported in the same diagram.

The next application of the computational process was on a network with a limited number of road links. The radius of circles is proportional to assumed passenger demand from the nodes. Coordinates of nodes and the adjacency matrix to specify the road links enabled the software to identify the road network. Link distances are computed assuming direct links between nodes (i.e. not the grid distance). It has been specified that the bus route is from Node 1 to Node 10.

Following figure shows computed costs for the different route scenarios. There is no access cost (walk to a neighboring node where service is available) required for route options where all nodes are served by the bus route.