Clark County Taxicab Industry Analysis

Final Report

Prepared for the Nevada Taxicab Authority

Taxi Research Partners LLC
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List of common terms and definitions used

Term as used in this document	Acronym / abbreviation	Defintion	AKA
Application / Smartphone application	App	Service based computer program for use on smartphones. When applied to taxi industry most commonly related to vehicle booking services	
Barriers to use	Barriers	Physical, social or economic factors that prevent the use of a good or service (eg: taxi trip)	
Baseline (measurement)		An initial measurement against which further measurements may be compared	
Consumer Price Index	CPI	A comparative index measuring change in price for consumer goods typically based on a basket of goods	
Cost Element		Any constituent element in the calculation of costs, eg: costs of production	
Cost Model		A model specific to the measurement of cost	
Depreciation		The measurement of decline in capital value over the life of equipment, e.g.: loss of vehicle value over its life. Measured in this report using a straight line method.	
Diesel		Heavy Grade Petroleum Spirit	
Dispatch (Vehicle Dispatch)		The process and technologies associated with accepting and distributing booked trips to passengers	
Europay, Mastercard, Visa Technical standard	EMV	Current standards applied to payment processing security for most credit and debit cards	
Gasoline	Gas	Regular grade motor fuel Petroleum Spirit	Petrol, Benzine
Golden Triangle		Term used locally by taxi drivers to relate to the geographic area within the rough perimeter of: Airport, Strip and downtown Las Vegas.	
Industrial Price Index	IPI	A comparative index measuring change in price for a given industry or industry segment	
Infrastructure Costs		The cost of use of or access to basic infrastructure, may include licensing and pay for services necessary as a pre-requisite of production	
Initial charge (taxi)	Flag	Initial fee for use of a vehicle. May include an element of distance.	Flag Fall
Latent Demand		The potential demand for a trip that is suppressed or avoided as a result of a lack of service, or barriers to use.	
Limousine	Limo	Licensed vehicle may pick up in response to bookings by phone or app (subject to some restrictions)	Livery, Black Car, Car service
Liquified Petroleum Gas	LPG	Standard definition of all liquified gas used as fuel. Commonly used motor term for Propane.	Propane
Market Contestability		The extent to which competition exists in a market (that may be contested) whether in the form of direct competition or competition from service alternatives.	Contestable markets

Term as used in this document	Acronym / abbreviation	Defintion	AKA
Merchant Fee (Credit Card)		The amount paid to a processing company for the acceptance of a credit or debit card	
Mitigation Cost		The effective money value associated with the mitigation / removal of a cost or loss	
Model / Analytical Model		A standardized approach to analysis using comparative data on a repeatable basis	
Origin / Destination	O/D	The geographical points at the start and end of a trip	
Petroleum Administration for Defense Districts	PADD	Defined districts within the USA for statistical analysis of fuel price	
Public Convenience and Necessity	PCN	An approach used to define or justify provision of (taxi) services on the basis of demonstrated need	
Regulator	(NTA)	Regulatory authority, agency or department with oversight and legislative control over the taxi and/or transit / transportation provision. EG: Nevada Taxicab Authority (NTA)	
Retail Price Index	RPI	A comparative index measuring change in price for retail goods typically based on a basket of goods	
Scenario		Defined series of factors / policies that allow for a comparison between each in combination may include proposed 'solutions' that may be evaluated prior to application	
Target (measurement)		A follow up measurement used as a comparator to a baseline	
Taxi		Licensed vehicle may pick up in response to bookings by phone or app, at taxi stand and by hailing (subject to some restrictions)	Taxicab, Hackney Carriage
Taxi Fleet	Fleet	The total number of licensed taxis (typically medallions) that may operate within a fleet	
Taxi Parc	Parc	The actual or effective number of vehicles operating or available to operate. Common to fleet measurement but excluding: vehicles parked up, unavailable, or medallions issued but not allocated to a vehicle.	
Taxi Tariff	Tariff	Defined elements that (in combination) may be calculated to produce a fare. Typically includes time, distance and extras.	Taxi Fare / Fare Table
Transportation Network Companies	TNCs	Current term applied to app based transportation service providers such as Uber and Lyft, sometimes referred to as "Rideshare companies" though *rideshare* misrepresents some of the services provided. May pick up in response to app bookings only.	TNP, NTC

Executive Summary

Taxi Research Partners (TRP) have been engaged by the Nevada Taxicab Authority (the authority) to undertake a detailed review of taxi services in Clark County, including, but not limited to, those in the City of Las Vegas. We are grateful to the authority for this commission and acknowledge the significant time and input from the taxi industry and all stakeholders for their expertise and contributions to the work.

In this report we set out the findings of our study, surveys, data sources and conclusions specific to taxi fares, fare structure and the process of industry and fare review. The study concludes that costs of production have changed in the period since the last taxi fare update, and we propose a change in the rate of fare (taxi tariff) as a result. We also conclude that a number of changes to the structure of the taxi fare is appropriate, including the removal of Credit Card processing fees from the Taxi Fare table. We further conclude that changes to the measurement of costs, fuel types used to measure cost, and changes to the calculation of fuel price surcharges are appropriate. We also recommend that the method by which fares are updated be revised to include additional measures accounting for changes to authority costs and revenue.

It is our recommendation that the authority takes action on all of the factors highlighted above, update taxi fares in line with these, and update elements of the tariff and its calculation as summarized in this section, and set out in detail below.

It is our recommendation that the authority adopt the measures set out and tested in scenario 7b, including the recommendations: that the credit card fee be removed from the taxi tariff (fare table); and that the authority implements an increase in taxi fares of 1.99% to be applied at the next available opportunity. We also recommend that a number of structural changes be made to the method of measuring fare rate increase, and changes to the measurement and use of fuel price surcharges, set out in detail below.

<u>Aims and Methodology</u>

The study is intended to provide a review of the taxi market, including the impacts of associated market changes, such as the introduction of TNCs. The work includes the development of a taxi cost model as part of a wider market model, and allows for reporting outputs associated with taxi fares, taxi numbers and market structure. A primary element of the reporting has been to draw conclusions and recommendations on taxi fares and their assessment, set out in subsequent sections.

The study team considered it essential to develop a strong data led approach to this analysis which incorporates demonstrated and observed taxi trip data, a wide review of public opinions to taxis and their alternatives, and the view of stakeholders directly associated with or with an interest in taxi services.

Taxi trip data was requested and received from taxi companies in Clark County and set out detailed information on a large proportion of taxi trips made within the county. Full trip data was provided to the team by taxi companies and this has been fully incorporated into the analysis as set out in this report. It should be noted that trip data is commercially sensitive and was provided to the study team on the basis that no company nor individual traveller information be disclosed. As a result data is shown in aggregate form only in this report. All datasets used have been subsequently returned to the originating companies.

A detailed public survey was undertaken using both street intercept and on-line methodologies. Street intercept surveys were undertaken throughout the city using a computer tablet collection method. Tablet based collection methods are significantly more reliable than paper based methods of collection reducing transcription error and increasing the ease of use. An identical survey was undertaken using an on-line methodology with invitations printed and publicized, including an editorial in the Las Vegas Review Journal.

Stakeholder surveys were provided for taxi drivers, using both tablet and on-line methods; and for taxi companies using structured interviews. Structured Interviews were also undertaken with other stakeholders, hospitality and entertainment venues, and the authority itself. The team also carried out a series of workshops with the taxi industry and the authority allowing for detailed comments on each of the issues being addressed.

The combination of the above factors, data and links identified in public, stakeholder and industry interviews has allowed the development of the taxi market model, set out below. This allows, in turn, the testing of market scenarios, combinations of factors that reflect evolution in the market and/or changes in the regulation of the market.

Principal Conclusions

The study undertook a series of tests based on changes in the market, set out in section 6. The initial tests sought to identify costs, changes in costs and appropriate levels of fares, while later scenarios included more fundamental changes in market structure. It is our recommendation that the authority adopt the structure set out in scenario 7b. This relates to the following conclusions:

In respect of the level of taxi fares

On the basis of our analysis we have concluded that an **increase of 1.99% in taxi fares** is appropriate and should be applied to taxi fares as shown in section 7. This increase reflects changes in the measurement of fuel costs and the removal of credit card fees from the tariff.

We recommend that taxi **fares be defined as the maximum rates** that may be charged, allowing companies to offer lower fares or discounts if they believe it to be in their commercial interest so to do, see below.

In respect of future fare updates

The study recommends that a taxi market model be adopted as the basis for this and future reviews of taxi fare. We conclude that **a full analysis of fares should be undertaken annually**, on the basis of the application of the taxi market model.

We recommend that the costs calculated as target values in one review become baseline values used in the next review.

In respect of fuel price surcharges

The study recognized that a role can exist for fuel price surcharges in providing a short term response to temporary increases in the combined cost of fuel but should be of limited duration, and that the cost of fuel be measured according to **PADD-5-CA+LPG**[1]. We underline that the use of a fuel price surcharge is not synonymous with an increase in tariff nor should its application replace or be conflated with a tariff review.

We recommend that the **fuel price surcharge be related to a variation of price greater than 20% from baseline** over a period of 4 weeks (28 days) in the price of fuel measured against the level recorded at the time of each review (as a baseline for fuel cost changes). We also recommend that any ongoing fuel surcharge be removed at the earliest opportunity where fuel prices can be seen to have returned to or below baseline for a period of 28 days, and in all instances at the point of a new review as this cost element will be covered automatically and fully in the review itself.

[1] PADD-5-CA refers to a defined measure from the US Energy Information Agency. LPG fuel costs are obtained from US Department of Energy described in subsequent text.

In respect of Credit and Debit card fees

The study concluded that the existing fee did not appear to reflect the actual costs of accepting payment, and compared poorly against other locations with the majority of cities stating significantly lower rates or not allowing the charge at all. While the study did recognize that legitimate costs are incurred in accepting payment, by card and by other means, alternative methods exist to address this as a cost which are more effective and fairer on the traveling public, as set out in subsequent sections.

It is our recommendation that the **credit card fee be removed** from the Clark County taxi tariff as set out in scenario 7b.

In respect of app based competition

The study addressed the impacts of new technologies, and most significantly the impact of apps on the taxi industry. Apps offer both an opportunity and a threat to the industry, potentially offering a new method of attracting customers, but also facilitating new approaches to transport provision by others, most notably Uber and Lyft, both of which (appear to) offer similar services without constraints applied to fares, typically priced on the basis of what the market will bear.

Given the fact that some competitors have a greater freedom to vary fares, the uniform nature of the taxi tariff may actually act to limit price competition available to the taxi industry and may place both the traveling public and the taxi industry at a disadvantage[2]. This follows where the public Interest may not be best served where competitive pricing that may lead to lower fares is prevented; the operator interest not being served where this results in a loss of business to other modes of transport or reduction to the rate of growth that may otherwise follow from Price Elasticity of Demand (PED). That said, the study also recognized the significance and importance of the taxi fare in protecting the public from overcharging, particularly in circumstances where an open market would not do so, or result in increased and exploitative fares.

We therefore recommend the continued use of a defined fare structure (taxi tariffs), as discussed in this document, but that **taxi fares be applied as a maximum that may be charged**, allowing taxi companies to discount where they feel it is in their competitive interest to do so.

[2] NAC 706.471.3 allows for variable fares where *"public interest requires that they* [fares] *not be uniform"*

A potential benefit was identified where the taxi industry itself made greater use of apps. The study noted that the ability to book services via an app was considered a major benefit by some populations, but some taxi apps were felt to be uncompetitive or difficult to use.

In order to provide a more responsive app environment we propose extending and broadening the ability of the taxi industry to compete on price in this market segment. We recommend that app based bookings to taxis be permitted a more flexible approach than traditional hailed or ranking taxis, to include: **the ability to charge fully variable fares for app bookings only**, i.e.: fares different from those defined in the taxi rates; to retain credit card details as 'stored credit cards' subject to state of the art security processes, which may change over time; as well as the **ability to charge a cancelation fee** for trips booked but not made, charged directly to a customer's credit card provided sufficient notice of this charge be provided to customers making, or registering to make, app bookings

It was further concluded that taxi tariffs serve to protect the public from overcharging, particularly at times and in circumstances where few or no alternatives are available, such as may occur in the hailed market. This provides a justifiable basis for fares as maximum allowing price competition where the service provider feels that this may provide competitive advantage.

The study concludes that **the number of medallions currently available in Clark County is sufficient** to meet the demand for taxi services.

1. Rates and Fares Analysis

In this section we develop a structure allowing for the calculation of rates and fares for application to the taxi industry. The analysis is based on a cost model that includes impacts analysis and links to public and industry impacts, reported in more detail in subsequent sections this report.

1.1 Definition of taxi rates

Taxi rates, sometimes called tariffs, refer to the charges that may be made for taxi use, typically based on standard measurements and paid, by a passenger, on completion of her/his journey. The calculation is based on a tariff table which defines the base fees for units of distance, time and extras, see table 1.

The taxi fare is measured according to the constituent elements of the tariff using an approved measuring device, normally a taximeter, giving rise to the expression of 'a metered fare'.

Table 1 Current Taxi Tariffs, Clark County

Nevada Taxicab Authority		
FLAG	**Initial Activation of taximeter**	$3.50
DISTANCE	**Each additional 1/12 mile**	$0.23
TIME	**Waiting Time per hour**	$32.40
EXTRAS	**McCarran property pick up charge**	$2.00
FEES	**Credit / Debit card fee**	$3.00
TAX	**Tax applied to total fare**	3%

Source: Nevada Taxicab Authority website

1.1.1 Initial Activation of the Taximeter

The initial activation of the taxi meter, which can also be known as: initial fare, drop, flag drop, or simply 'flag', is intended to address the costs of a vehicle starting a trip, which may include time waiting for a trip, placement in a taxi rank (taxi line), or positioning costs incurred in getting to the starting point (trip origin) - effectively the fuel costs in traveling to a job.

Initial activation charges can have a greater or disproportionate impact on short journeys when compared with average and longer trips may represent the majority of a fare for trips below 2 miles. It is appropriate, therefore, to assess the actual costs incurred in the initial use of a vehicle in defining this element.

1.1.2 Distance charges

In addition to the initial charge, a significant majority of cities apply a standard approach to the measurement of fares based on time and distance. Distance, based on the actual distance driven with a passenger (live miles) is measured using an approved device (taximeter) and charged according to the number of distance increments travelled, multiples of $0.23¢ per 1/12th mile in the case of the current tariff in Clark County.

1.1.3 Time charges

Time charges are also included in many locations reflecting costs which are incurred where a vehicle is engaged but not moving, sometimes called opportunity costs. In most cities taxi time charges are made when a vehicle has a passenger but only when a vehicle is not moving[3], e.g.: where it is stuck in traffic etc. The combination of Initial activation, distance and time charges should provide, on aggregate, income that covers the costs of operation (trip production costs), and will be updated, in most circumstances, to reflect changes in those costs; though actual changes in tariff will include additional considerations, set out in subsequent parts of this report.

1.1.4 Extras and Fees

Extras and Fees relate to any additional charges that may be added to a fare in addition to the time and distance charges set out above. They typically relate to additional work that may be undertaken by a driver, or additional costs that are incurred in given circumstances. Extras applied in Clark County are set out below.

1.1.4.1 McCarran Property (Airport Fee)

A $2 charge is added to the metered fare for trips that originate at McCarran International Airport, including pick ups at the Airport Car Rental Center. This represents a straight pass through of fees paid by the driver to the airport for every pick up.

[3] In some locations this charge may also be made where a vehicle is moving very slowly.

1.1.4.2 Credit / Debit Card Fee

The authority authorizes vehicles to accept credit and debit cards for payment. Taxi companies incur costs for the handling of credit cards, being a combination of merchant fees (processing), charged to the taxi companies by receiving banks, and costs associated with installing equipment in the vehicle and its maintenance (equipment).

The current tariff sets a flat fee for credit or debit card use of $3 per trip, though this has been suggested to exceed the actual costs of both processing and equipment (***state audit).*** It is also noted that the processing of cash payments is also likely to incur costs to the taxi company which are not currently charged. The fee therefore may be greater than an actual pass through of costs, discussed in more detail below.

1.1.4.3 Taxes and other charges

Other charges may be made including the levy of tax and technology fees. These are a direct pass through of charges imposed on a trip by trip basis to the passenger. The concept is common in many cities, other examples include toll fees, bridge and crossing charges, though these are not applied in Clark County.

1.2 Baseline measurement and comparison

In order to develop a comparative cost model, a baseline measurement was taken. Baselines relate to the measurement of metrics at the outset of an analysis for comparisons between existing and future situations, and for comparisons between locations. Current values will allow for the identification of future changes to cost fundamentals. Baseline measurements also relate to the existing fare structures and the income that these create, see table 2.

Table 2 Calculated fares based on flag and distance

Taxi Fares Las Vegas, based on flag plus distance		*(equivalent per 1 mile)*	*Proportion of fare representing credit card fee*
1 Mile cash payment	**$6.45**	***$6.45***	
1 Mile using Credit Card	**$9.45**	***$9.45***	***31.75%***
2 Miles cash payment	**$9.29**	***$4.65***	
2 Miles using Credit Card	**$12.29**	***$6.15***	***24.41%***
5 Miles cash payment	**$17.82**	***$3.56***	
5 Miles using Credit Card	**$20.82**	***$4.16***	***14.41%***

Notes: Fares calculated without time elements. 3% Tax fee applied to total amount. Credit Card fee of $3.

Table 3 illustrates the fare rates for trips of 1 mile, 2 and 5 miles, based on charges applied to initial charge and distance alone. The third column illustrates the equivalent charge being paid for 1 mile, demonstrating that longer distance trips incur lower per mile costs.

A comparison between posted rates in Clark County and those charged in other locations suggests that Las Vegas charges higher fares than those in most other US cities, see table 3. The data may not allow a full comparison, in that it addresses a small sample of other cities and does not permit direct comparison as the factors influencing costs may differ significantly between locations, but does provide an indicative review. The table also includes a comparison between base taxi fares and those charged by Uber, measured using published UberX fare tables in summer 2016[4].

Table 3 Las Vegas Taxi Rates initial comparison

City	1 Mile	2 Miles	5 Miles	Comments	5 Miles paid by CC	UberX 5 mile fare
Honolulu			$21.05			$12.20
Cedar Rapids			$18.50			$7.70
Abiline			$18.00			$15.90
Las Vegas	$6.45	$9.29	$17.82	Airport surcharge $2.00	$20.82	
San Francisco	$5.70	$8.45	$16.70	Airport Surcharge $4.00		$13.70
Boston			$16.20			$13.35
Los Angeles	$5.25	$7.95	$16.05	Airport surcharge: $4 Airport Minimum $15 Airport - centre flat fare $46.50		$9.15
Albuquerque			$15.95			$9.75
Fresno			$15.16			$8.75
Charlotte			$15.00			$9.50
Cleveland			$14.95			$8.95
Philadelphia	$5.12	$7.42	$14.32	Airport surcharge $1.50 Airport Minimum $ 11.00 Airport - center flat fare $28.50		$10.10
Chicago	$5.25	$7.50	$14.25	Airport surcharge: $4 Published flat rates airport city for shared use	$14.68	$11.40
Austin			$14.19			$9.70

[4] UberX rates are based on rates published on the Uber website. Since the time of the first analysis Uber have moved from published tariffs to 'upfront fares' in which tariff details are not published. Upfront fares are subject to dynamic pricing and may be significantly higher than those shown in the table.

City	1 Mile	2 Miles	5 Miles	Comments	5 Miles paid by CC	UberX 5 mile fare
Houston	$4.75	$6.95	$13.55			$9.50
Baton Rouge			$13.50			$10.50
Baltimore			$12.60			$9.95
Birmingham, AL			$12.50			$12.65
Charleston SC			$12.50			$9.55
Atlanta	$4.25	$6.25	$12.25	Airport - downtown flat $30 Other published flat fares, including downtown zone $8		$8.90
Boise			$12.25			$11.05
Denver			$11.27			$10.30
Dallas	$3.85	$5.65	$11.05			$8.95
Detroit			$10.50			$9.30

Sources: Taxi data from published city ordnances. Uber data taken from Uber website, accessed May 2016

It is common in most cities that the city or taxi authority retains some control over the amounts that may be charged for the use of a taxi; being an economic control related to regulated competition, in which the authority facilitates competition within a market subject to a number of constraints.

Regulated competition exists across a the majority of industries, with a range of safety regulations commonly applied. Within the taxi industry these controls extend to price constraints (economic controls), discussed in this section; and other areas of regulation including quantity control and safety (quality controls).

While these controls may be discussed separately, their presence and impacts are, in fact, connected. These linkages are discussed in more detail in subsequent sections of this report.

1.3 Taxi Fare Model

Fare regulation exists and is applied, in a large number of cities, to the levels of fares that may be charged for taxi use. The levels of fares are typically subject to periodic update though the methods applied to that update and the process by which such an update is triggered may differ between locations.

Fare increases may be based on:

- An increase in costs identified by the trade, adopted by the authority and applied to the tariff,
- An increase in the general costs of living (CPI) applied to the tariff,
- An increase in the retail costs of an area (RPI) applied to the tariff, or
- A measure of the production costs of the taxi trade (IPI) applied to the tariff

The last method relates to an Industrial Price Index (IPI), also known as a Taxi Cost Index and is commonly applied in a large number of cities and can, in turn, reflect a variety of measures included in the identification of the production costs of each trip made.

The application of indices are made more complex in Clark County as a result of the differing ownership structures, in particular that Las Vegas taxis are owned by taxi companies who employ drivers, through a variety of contract types, rather than engage drivers as self employed independent contractors. The Clark County taxi employee structure can lead to additional costs being borne by the taxi company which are not seen in other cities, and results in fewer costs being borne by the driver, discussed in more detail below.

In our analysis we have developed a Taxi Fare model that allows for the identification of changes to the costs of production, borne (in the main part) by the Las Vegas taxi company(ies), allowing for the calculation of changes that may be appropriate to the taxi tariff. In subsequent sections we also address the impact of changes to the tariff on actual income. It should be noted that the majority of IPI reviews provide a top down analysis of costs that are then applied to the tariff. Top down analysis refers to the review of changes in cost elements that are then applied to an existing matrix of costs. Our analysis also applies a ‘bottom up’ element that assesses the levels of costs for each element. It is recommended that future tariff reviews are based on a top down approach completed annually, with a regular, but infrequent, bottom up review every 5 years, see the recommendations section of this document.

1.3.1 Purpose of the Taxi Fare Model

The Taxi Fare model is based on the calculation of trip production costs. The purpose of which is the identification of changes to costs that may be appropriate to application to tariff. It should be noted that direct application of such changes will not result in the direct recovery of any reductions in income as fare changes also impact on the number of trips being made, as might the levels of competition within the market.

It is also notable that a difference exists between company income and driver income. While the majority of trip production costs are borne by the company, changes in tariff might benefit the taxi company more than the driver. Conversely an increase in the level of competition may also

impact (negatively) on the company more than the driver.

It is noted that no one company will experience the same costs as any other. Driver costs and driver contracts also vary between companies with some companies covering 100% of all fuel costs, others sharing these with drivers. The following analysis addresses industry wide average costs, described in more detail in subsequent sections.

1.3.1.1 Taxi Industry Cost Structure

In common with other cities, the majority of income is created from taxi fares. In 2015 approximately 93% of all revenues arose from the taxi fare. A further 2% arise from advertising, and 4% from the credit card fee.

Costs are reported on an annual basis using a common structure set out in table 4, below. Industry wide costs are summarized by percentages of costs attributed to each element, with methodologies for their update set out in subsequent sections.

It is noted that a potential conflict exists between the need for individual companies to make commercial decisions regarding the financial and management structure of the company, and the intervention of a regulator in determining fare levels. This is further affected in the Las Vegas market given the status of drivers as employees in a competitive market for drivers. These conflicts are discussed in more detail in the 'application' section of this report.

Table 4 Cost categories as reported to Nevada Taxicab Authority (2013[5] and 2015)

Principal Category	Sub Category	Percentage of total cost 2013	Percentage of total cost 2015
Salaries and Wages	Officer Salaries	0.85%	4.65%
	Drivers Wages	46.49%	43.74%
	Dispatch Salaries	0.67%	1.30%
	Shop and garage salaries	2.59%	2.58%
	Management Salaries	2.22%	2.18%
	Other salaries	1.37%	1.20%
Expenses	General administrative expenses	2.15%	3.02%

[5] See section on baseline value, below

Principal Category	Sub Category	Percentage of total cost 2013	Percentage of total cost 2015
	Shop and garage expenses	0.93%	1.01%
	Dispatch expenses	0.27%	0.31%
	Operating expenses	6.25%	7.23%
	Vehicle Fuel (all types)	11.94%	9.36%
	Rent or lease equipment	0.07%	1.57%
	Rent or lease buildings	2.13%	2.28%
	Maintenance Equipment	3.11%	1.40%
	Maintenance Buidlings	0.13%	0.02%
Annualized Costs	Depreciation using straight line method		
	Taxicabs	3.23%	3.25%
	Other Equipment	0.42%	0.51%
	Advertising	0.16%	0.16%
	Consulting and professional fees	1.64%	1.16%
Insurance Costs	Insurance	8.85%	8.12%
Taxes / Other Costs	Operating Taxes	0.25%	0.67%
	Licenses	0.69%	0.79%
	Federal Income Expenses	0.00%	0.00%
	Other operating expenses	3.49%	3.36%
Interest	Interest Expense	0.12%	0.14%
Total		100.00%	100.00%

Notes:
Costs and percentages are calculated across all companies reporting to the Nevada Taxicab Authority, reported figures 2013 and 2015. Vehicle fuel costs are shown as a sum of all fuel types used.

Of the categories reported in 2015, drivers wages (43.74%) and vehicle fuel costs (9.36%) represent the largest categories of expenditure. Other unavoidable costs such as vehicles (3.25%), Vehicle Insurance (3.93%) and License Costs (0.79%) represent a lower proportion of production but are essential in the provision of taxi services.

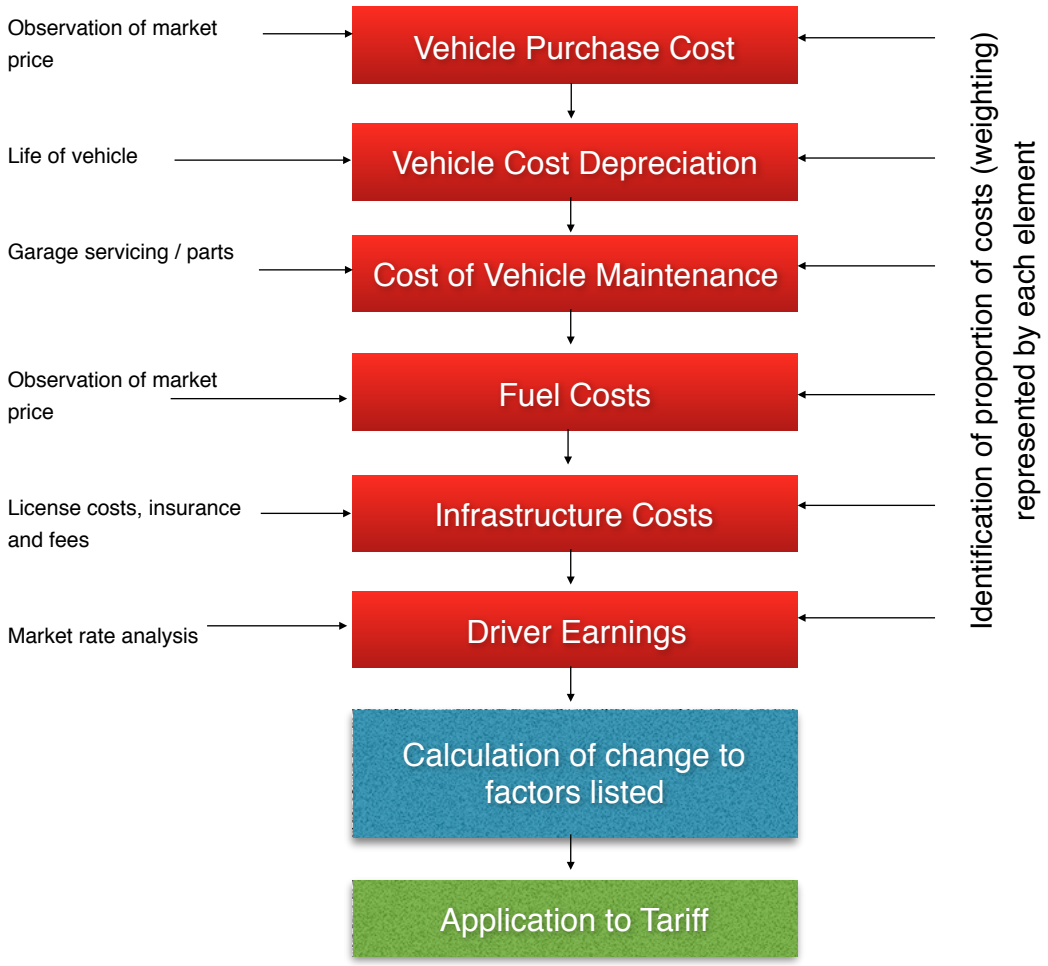
The inclusion of a wider range of costs in annual reporting is significant, and necessary in terms of transparency, but creates a more difficult choice in the extent to which an Industrial Price Index can be defined. The balance of costs also highlight the difference between taxi companies in Las Vegas and those in other US cities.

1.4 Definition of Clark County Industrial Price Index (IPI)

Despite some differences in the measures chosen between locations, the vast majority of analyses are based on a calculated index of changes in production costs (IPI). These provide a current indication of production costs but do not, in themselves, result in a change to the fares paid by customers. A change in fare requires a further series of steps including the calculation of impacts of the change (such as growth or decline in usage), and impacts on actual revenue. These are discussed under the application section in this report.

Figure 1 illustrates the most commonly applied structure for determining cost, and change in cost. The result is an index of costs allowing for the calculation of an Industrial Price Index.

Figure 1 Typical elements in a Taxi Cost Index (TCI)



Any measured change in the costs of any of the factors of production would have an impact on the index of costs in proportion to the weighting of each factor.

1.4.1 Review and development of the cost model

By comparing the cost categories reported to the authority, table 4, with the structures applied in TCIs elsewhere, figure 1, it is apparent that differences exist in the cost structures across locations. These differences suggest some adaptation and development of basic cost model are

appropriate in the Las Vegas market. Figure 2 sets out the structure proposed for adaptation including proposed sources of data appropriate to the model operation. The figure is set out in terms of descending proportion of costs.

Figure 2 Clark County Taxi Cost Index

Data Source / update:	Elements included	Weighting
Measure of comparative earnings	Driver Earnings	(43.74%)
Fuel Price Index (PADD5/ PADD5-CA+LPG)	Fuel Costs	(9.36%)
Stated insurance cost returns	Vehicle Insurance	(3.93%)
KBB Mean vehicle type and life	Vehicle Cost/Depreciation	(3.25%)
Measure of comparative earnings	Shop and Garage Salaries	(2.58%)
City lease rate index	Rent or Lease of buildings	(2.28%)
Basket of parts	Cost of Vehicle Maintenance	(1.4%)
Measure of comparative earnings	Dispatch Salaries	(1.3%)
Published authority license rates	Licenses	(0.79%)
Proposed new category	In vehicle equipment	N/A

While maintaining the primary elements included in the traditional Taxi Cost Index, shown in red, the Clark County model adds further cost elements that are necessary to the production of taxi trips, in yellow. The additional elements, such as the lease of buildings, garages and associated staffing costs relate to costs that appear to be required to the production of a trip in Las Vegas that might not occur in other locations, or be covered by other cost elements.

Not all costs are included in the index to allow for commercial pricing and competitive responses between companies, as discussed in the subsequent sections. It is noted that price competition may also exist in the market for drivers, see below.

1.4.1.1 Drivers Earnings Element

Drivers Earnings are the largest single cost reported by the industry to the authority. The element relates to wages paid by companies to drivers who are employed directly, marking a significant difference between taxi companies in Las Vegas and those in other cities. A market exists for drivers to move between companies, with a number of drivers reporting the choice to work with TNCs as well as taxi companies. The existence of alternative opportunities in TNCs (Uber and Lyft), further complicates the market by adding a layer of market contestability between taxi and TNC modes[6].

This said, a need exists for the costs of drivers wages to be accounted for in the analysis and setting of the taxi fare. The study recommends that drivers earnings are increased from the baseline in line with changes to occupational employment and wages rates for Transportation and Material Moving as recorded by the Bureau of Labor Statistics (Western Information Office)[7].

Significant market changes in employment need also be taken into account, but it is felt that these would be more appropriately addressed in the bottom up review which we recommend take place every 5 years. Table 5 illustrates the occupational mean incomes as recorded by the Bureau of Labor Statistics (BLS) for May 2015.

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[6] Contestable 'driving' markets are not new, the possibility of drivers switching from taxi driver to transit, limousine or freight driving having existed for as long as these options were offered in the Las Vegas market. The TNC market differs only in the extent of the demand for drivers and the relatively low barriers to entry, discussed in the text of this document.

[7] Available from: http://www.bls.gov/regions/west/news-release/occupationalemploymentandwages_lasvegas.htm Accessed September 2016

Table 5 Wages by major occupational group
(Las Vegas / Henderson / Paradise statistical area)

Major occupational group	**Las Vegas / Henderson / Paradise statistical area**
	Mean Wage rate / hour
Total, all occupations	$20.23
Management	$47.41
Business and Financial Operations	$30.41
Computer and Mathematical	$36.61
Architecture and Engineering	$37.68
Life, Physical, and Social Science	$34.87
Community and Social Services	$24.16
Legal	$46.76
Education, Training, and Library	$23.16
Arts, Design, Entertainment, Sports, and Media	$25.25
Healthcare Practitioner and Technical	$41.72
Healthcare Support	$16.30
Protective Service	$19.49
Food Preparation and Serving Related	$12.55
Building and Grounds Cleaning and Maintenance	$14.56
Personal Care and Service	$12.80
Sales and Related	$15.80
Office and Administrative Support	$16.81
Farming, Fishing, and Forestry	$14.71
Construction and Extraction	$23.39
Installation, Maintenance, and Repair	$23.63
Production	$16.26
Transportation and Material Moving	$16.97

Source: Bureau of Labor Statistics (*ibid*)

The reported mean wage for all Transportation and Material Moving workers in the Las Vegas area in May 2015 was recorded as $16.97. This does **not** represent an average wage within any single transport service, and thus should not be equated with a reasonable wage for a taxi

driver, but rather forms the baseline against which changes can be assessed from a baseline to a target year, see below.

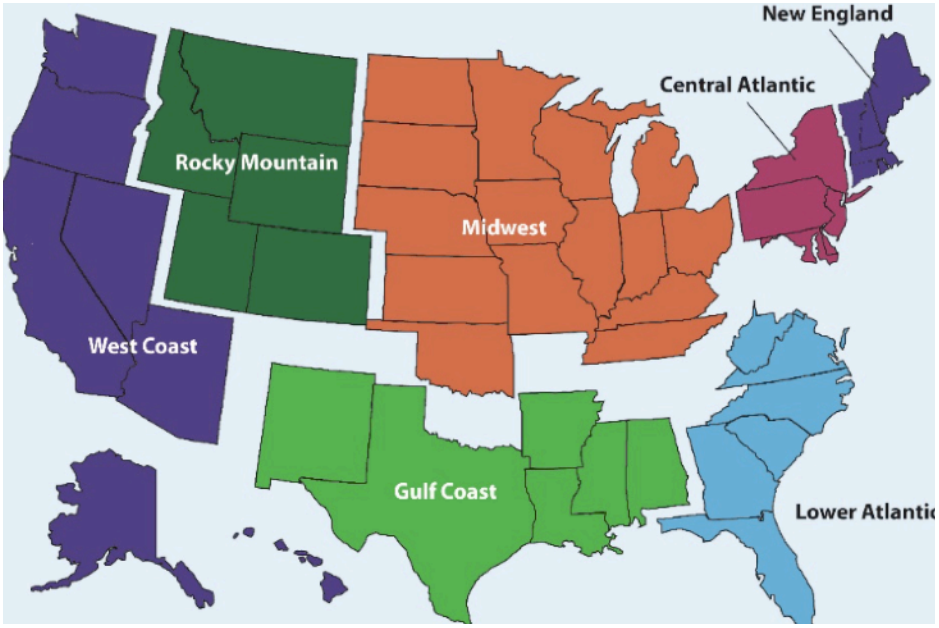
1.4.1.2 Fuel Costs Element

Vehicle Fuel costs (all types) represent the second largest costs to the taxi industry and can be subdivided between traditional gasoline / diesel and propane representing, in combination, 9.36% of costs to the industry in 2015, having dropped from 11.94% in 2013, mainly due to a decrease in the retail cost of gasoline.

The inclusion of fuel costs follows the same approach as set out for driver wage element, described above, though calculation is complicated by the mix of fuels and relative purchasing policies, which can differ by company, discussed below.

An initial approach was adopted using baseline and target values taken from a published source to establish change in the cost. In previous analysis the authority has used the Petroleum Administration for Defense District 5 (PADD5) measure, which relates to Gasoline product prices in West Coast states, see map 1, and is issued following a set formula by the US Energy Information Administration[8].

Map 1 PADD districts



Source: U.S. Energy Efficiency Administration

[8] Available at: https://www.eia.gov/dnav/pet/pet_pri_gnd_dcus_r50_w.htm, accessed September 2016

A concern may arise in that this measure relates to traditional gasoline and diesel fuels only, rather than all of the vehicle fuel types used in Clark County taxis. A further concern has been expressed in that PADD5 includes fuel prices in California which may have a disproportionate effect on the measured change, see table 6.

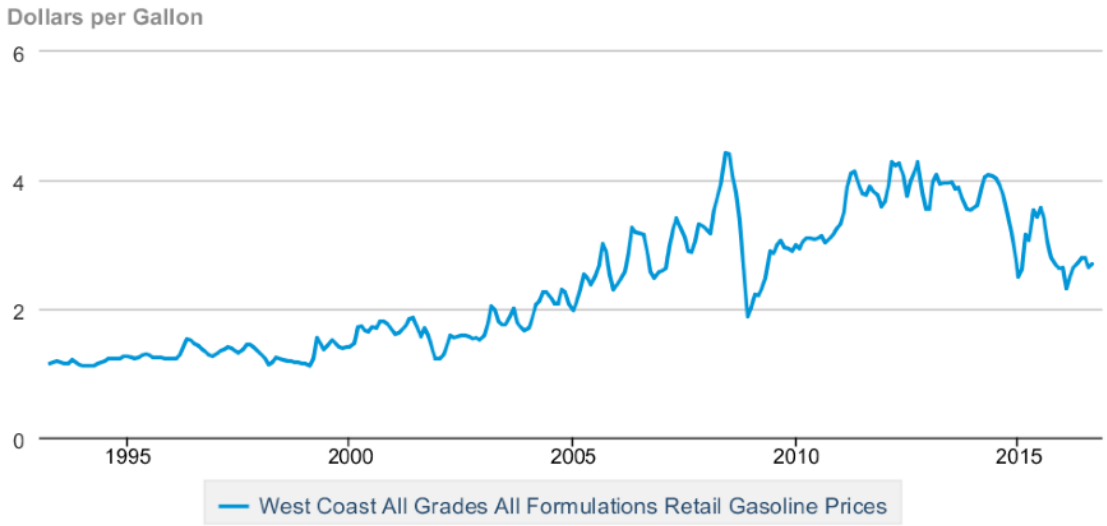
Table 6 Comparative change in fuel price 2014 - 2015 using PADD4 and PADD5

Mean Value Dollars / US Gal	PADD5	PADD4	Modified PADD 5 West Coast less CA
May 2014	$4.081	$3.57	$3.82
May 2015	$3.531	$2.73	$3.02
Percentage change	-13.48%	-23.42%	-20.90%

Sources: https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=EMM_EPM0_PTE_R50_DPG&f=M, https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=EMM_EPM0_PTE_R40_DPG&f=M, https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=EMM_EPM0_PTE_R5XCA_DPG&f=M

The choice of measurement shows a significant variation in the rate of price change between locations, and this may act to skew the accurate measurement of costs associated with fuel in the Taxi Cost Index. It is also noted that the actual price varies significantly from day to day, see figure 2, lending some credence to the use of a fuel surcharge method of application, though this is separate from the measure of change outlined here and discussed in more detail in the section related to application.

Figure 2 Chart of gasoline price fluctuations (PADD5)

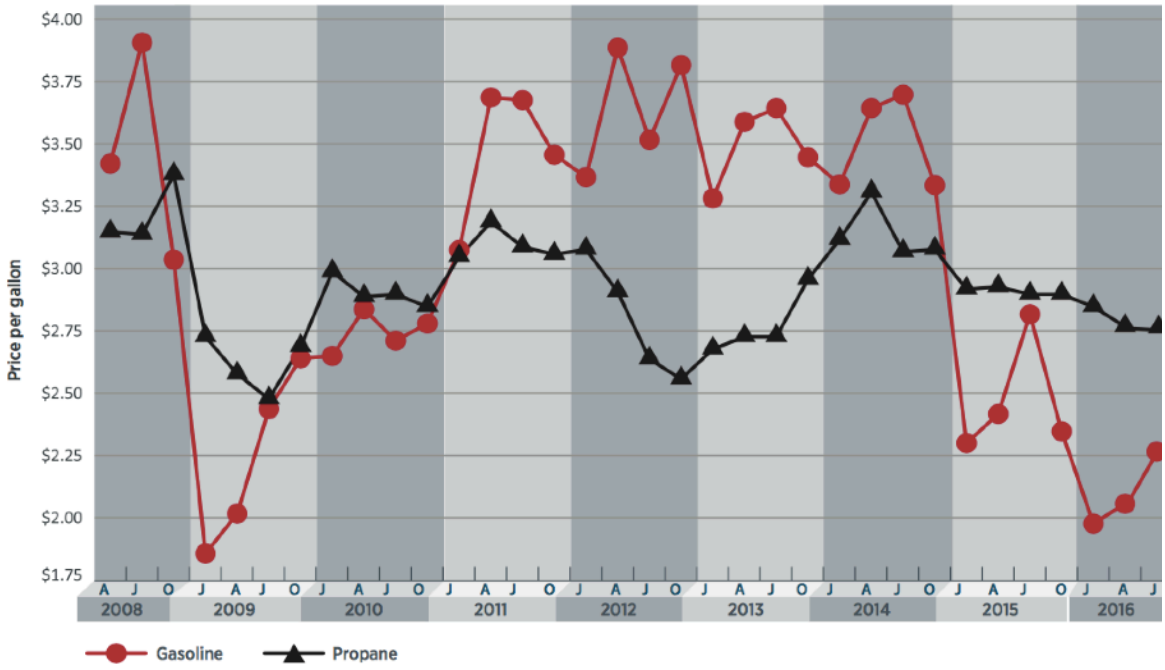


Source: U.S. Energy Efficiency Administration

The extent of fluctuations related to Gasoline, seen as peaks and troughs in figure 2, can relate to significant changes in the costs of fuel experienced in the taxi industry which may not be reflected in changes in taxi fares. In Clark County this has historically led to the use of fuel surcharges, though these are separate to the measurement of a general Taxi Cost Index.

It is also noteworthy that one company in particular uses Propane / Liquified Petroleum Gas (LPG)[9] as a road fuel. As LPG differs in source, purchase and storage, fluctuations to Gasoline prices may not be mirrored in the price of LPG, see figure 3. The price of LPG appears significantly more consistent over time when compared to the retail price of Gasoline.

Figure 3 Historical propane prices versus Gasoline



Source: US Department of Energy, Energy Efficiency and Renewable Energy, Clean Cities Alternative Fuel Price Report, July 2016
Notes: Illustrates US wide price average

Where bought on an open market[10] propane has been more expensive than gasoline per liquid gallon in the period from January 2015, and has not seen the same significant falls in cost compared to regular gasoline.

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[9] LPG is a generic group of LP gases that may be used as fuels, most commonly as Propane (C_3H_8)

[10] Filling stations do not always carry LPG / Propane, increasing the cost of open market purchase. Clark County taxi companies purchase and bunker bulk quantities which may include fuel options or discounts. The same opportunities may exist for road fuel gasoline bulk buy.

While it may be argued that the existing measure - PADD5 - is understood and relatively easily defined, the study team also felt it appropriate to test the impact of two alternatives, the retention of gasoline as a primary measure but using PADD5 **minus** CA; and the development of a fuel price index using PADD5 minus CA plus propane, see table 7.

The study team conclude that a more realistic measurement is based on the weighted cost of PADD5-CA with addition of LPG cost changes.The resulting scenarios are set out in section 6.

Table 7 Comparative Fuel price at time of fare change

$ / US GAL	July 2013	Oct 2014	July 2015	Oct 2015	July 2016
Gasoline PADD 5	$3.96	$3.52	$3.57	$2.79	$2.78
Gasoline PADD 5 minus CA	$3.80	$3.42	$3.14	$2.50	$2.55
Propane	$2.99	$3.21	$3.00	$2.96	$2.95

Sources: US Energy Information Administration; US Department of Energy Energy Efficiency and Renewable Energy
Notes: Dates shown reflect available comparable data sources most current at time of review
Measures reflect US Gallon of liquid fuel

1.4.1.3 Vehicle Insurance Elements

The need for current vehicle and driver insurance is a fundamental part of the provision, and costs of the taxi industry. Costs differ and are prone to increase from year to year in line with the market and perceived levels of risk. A number of methods exist in measuring changes in costs of insurance including the use of a 'typical driver' method in which the change in quoted costs for the same driver are taken from insurance companies and applied to the element.

This method results in a hypothetical driver cost that may not, in fact, mirror the actual costs of insurance experienced by the industry. It is therefore recommended that the Taxi Fare Model use actual costs as reported by the industry as part of their certified annual returns. In so doing the model will account for the verifiable costs as experienced by the industry in place of a theoretical cost.

1.4.1.4 Vehicle Cost and Depreciation Element

Taxi vehicles are an ongoing cost throughout the industry and are regularly replaced within a cycle or to reflect the end of their service life. Additional costs are also experienced through the life of the vehicle in terms of its maintenance, discussed below, and the depreciation cost

associated with a loss in the value of the vehicle on a year-by-year basis, effectively the cost of the vehicle over its life in service.

In developing a measure of vehicle cost it is proposed that the model consider changes in the retail purchase price of the newest vehicles within the fleet, in proportion to the total weighting of vehicles identified above. In so doing the calculation of fare change should facilitate the purchase of new vehicles in line with leading industry standards.

It is proposed that the calculation be based on the retail price in baseline and target years for the purchase of the most popular vehicle types, see table 8. A minimum proportion is included (10% of fleet) to ensure that the calculation is not unduly influenced by one off vehicle purchases, test vehicles etc. Independent MSRP prices taken from the Kelley Blue Book for the lowest price style with standard equipment for each of the vehicle types identified in Las Vegas[11]. While it is clear that the company may chose a higher specification of vehicle, the use of the same vehicle type in both baseline and target years ensures consistency between measurements.

Table 8 Change in vehicle purchase price (by proportion of fleet)

KBB New vehicle cost - from dealership on road		Cost Baseline	Cost Target Year
Mean vehicle value		$24,677.05	$26,223.72
Percentage change Baseline - Target	8.83%		

Source: Costs from KBB using base model MSRP

1.4.1.5 Shop and Garage salaries

In addition to a driver wage cost element, the study recommends the model includes a cost element for shop and garage salaries. The element recognizes that the structure of the Las Vegas industry differs from that seen in other US cities, with a far greater number of activities carried out in-house. These include vehicle maintenance and garaging that might typically be undertaken by third party mechanics in other locations. The study therefore includes these costs as part of the cost structure including the cost of labor, included here.

The study recommends using the same methodology in identifying changes to equivalent salaries as applied to the driver wage element. BLS statistics previously identified, see Table 5, would be applied to this cost element, using the ‘Installation, Maintenance and Repair’ values ($23.63 in May 2015).

[11] ZIpcode 89101 was used in the search

1.4.1.6 Rent or Lease of Buildings

The same differences in company structure between Las Vegas and other US cities also increase the need for taxi companies in Clark County to provide building, garaging and workshop space that may not be provided in other cities.

The study recommends that this cost is 'internalized', made part of the cost allocation, in much the same way as workshop and garage salaries are internalized in the preceding section. This requires the identification of changes to the cost of land and rent; though this measurement should not follow the speculative peaks and troughs of commercial property as this is more likely to be influenced by large scale downtown and strip construction than reflect changes in land values across the wider city.

The study team recommend the use of independent third party data showing Land Value nominal values, and have used the Lincoln Institute of Land Policy Land and Property Value database[12]. The change in values is identified between baseline and target years in the same way as in previous elements, and applied to the model.

1.4.1.7 Cost of Vehicle Maintenance

The study proposes a basket of parts approach to measuring the costs of vehicle maintenance based on commonly used parts for the three most popular vehicle types in both baseline and target years. Values identified in any one target year then become the baseline figures for the next analysis.

The proposed method recognizes that the actual maintenance needs of vehicles vary dependent on a wide range of factors, including driving style, location and traffic conditions. By adopting a standard basket of commonly used parts the analysis provides a consistent basis for the levels of change to be assessed. Vehicle maintenance labor is included in the shop and garage salaries sections set out above.

The use of a basket of parts is intended to provide a measure of the change in the price of parts rather than being a full or definitive list of all of the parts that may be used on all vehicles in the fleet. Basket of parts approaches are common in the measurement of change and are used in the measurement of Consumer Price Indices and Industrial Price measures around the world. The study team propose 13 parts that are either commonly replaced or represent a high cost

[12] Available at: http://datatoolkits.lincolninst.edu/subcenters/land-values/land-prices-by-state.asp, accessed September 2016

when replaced to include: Motor Oil, Tires, Brake Pads, Wiper Blades, Bulbs, Battery, Starter, Alternator, Radiator, shock absorbers, Struts, Steering Rack and Pinion, Steering box, Exterior body panel. Current prices have been obtained from industry suppliers, listed in the model, allowing for direct comparison of change in price from year to year.

In the initial review the team made use of reported changes in costs as set out in the company reports to the authority, though it is felt that a more accurate measure is possible in future analysis by making use of independent parts costs provided for OEM parts through the manufacturers.

1.4.1.8 Dispatch Salaries

Similar to Drivers Wages and Shop & Garage salaries, dispatch salaries are an internalized cost in the Las Vegas taxi industry. The study proposes the use of the same BLS dataset referenced above, assigning the change in value of Sales and Related staff.

1.4.1.9 License costs

This element relates to the costs of permits required for the operation of taxi services in Clark County, and are closely associated with the funding of the authority itself, set out in more detail in subsequent sections.

It is proposed that operating license / permit or other costs associated with the regulation of taxis be increased to reflect the actual change in charges made.

1.4.1.10 In-Vehicle Equipment Cost

The study proposes the development of a new cost element, being the identification of costs associated with in-vehicle equipment. In vehicle equipment includes Information terminals for the driver (Driver Information Monitor - DIM), and a screen and card payment facility located in the rear of the vehicle (Passenger Information Monitor - PIM).

The provision of DIM and PIM terminals are essential to most dispatch systems as well as supporting Credit Card payment and providing information services to the passenger; and therefore a legitimate cost of production, but have been excluded from assessment in many city reviews.

Current practice in Las Vegas appears to be that the cost of processing equipment (DIMs / PIMs) has been subsumed into a relatively high Credit Card processing fee, but this has attracted criticism as appearing to be excessive in relation to the actual cost of processing cards (rather than the actual cost of equipment plus merchant fees). The development of an In-vehicle Equipment Cost element to the tariff would allow for the avoidance of charges that may appear excessive at first sight. This is discussed in greater detail in section 2 of this report.

1.4.1.11 Other Costs

A number of other costs are reported to the authority by taxi companies under the heading 'Expenses', and include, but are not limited to: Management Salaries, Advertising, etc. These are correctly part of the operation of the taxi companies, but fall within a commercial and competitive market between companies.

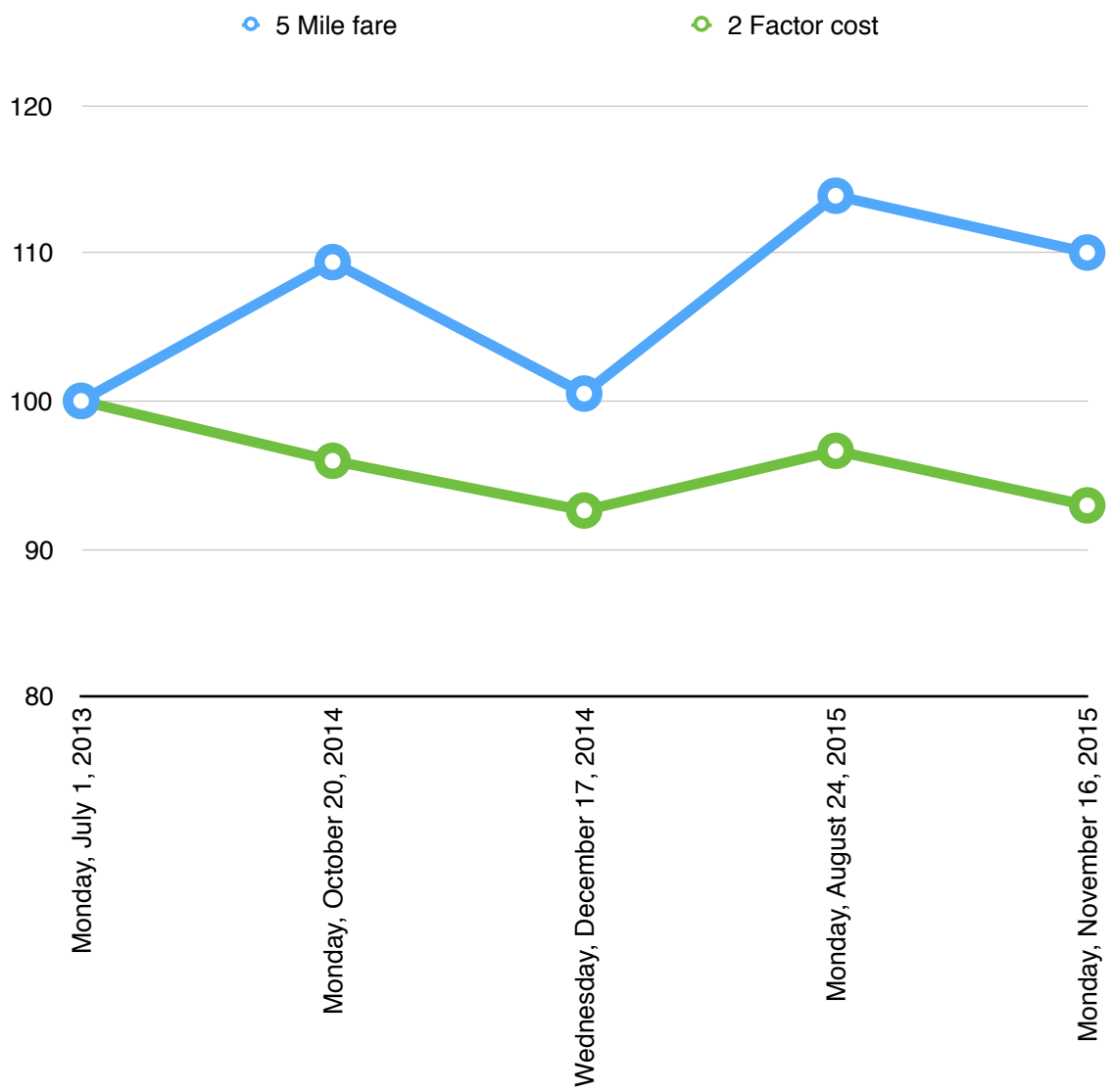
The study recommends that these costs are not controlled under the auspices of the fare review, but remain separate and within the control and competitive decisions of the companies themselves.

1.5 Synthesis - Taxi Cost Model

In the preceding sections we set out nine primary elements in determining changes in the costs of production for Las Vegas taxi services. These are measured on the basis of change in costs from a Baseline (point in time), to a Target (point in time). Each point should allow for consistent measurements of the same values, where the same methods of measurement an be applied, and should occur at regular intervals, for example where official statistics are produced every 2 months. Changes to the calculation methods used in the calculation of official statistics must be taken in to account, as should any variation in availability of costs (eg: BLS change in reporting prior to 2012). The application of a fuel price surcharge to a fare does not represent a full new calculation of fare, simply an addition to it, and should not influence the definition of the baseline.

Recent changes in taxi fares have included the application or removal of fuel price surcharge, and have therefore been discounted as baselines. Figure 4 illustrates the correlations between initial costs measured on a 2 point scale, and taxi fares, measured using drop and distance values for a 5 mile trip, without additional credit card or airport fees. The diagram suggests a separation of costs and fares in the period since 2013, though the relationship between these has leveled since August 2015. It is also noted that BLS data is presented in differing formats prior to 2013.

Figure 4 Comparison rate of cost to fare change[13]



The rate of fare appeared to have changed disproportionately to production costs with a steeper increase resulting from the fare rate changes in October 2014, and August 2015 than may be justified on the basis of a review of costs, with stabilization arising from the fare changes applied in November 2015.

Tables 9 - 11 illustrate changes in costs since 2013 using consistent measurements from government and agency statistics, and stated OEM values, incorporating PADD 5, PADD 5 -

[13] The measurement of a two factor cost relates to the change in costs directly associated to labor and fuel costs, being the two largest elements in the current calculation.

CA, and PADD 5 - CA + LPG respectively. The same calculation method is applied in each of tables 9 - 11, the different tables reflect differing approaches to fuel cost calculation.

The measurement of costs does not represent a precise value that is experienced by all companies in Las Vegas, as the actual costs and income reflect commercial decisions made within the companies themselves and the nature of the contracts agreed in each. It does represent, however, a justified measure of the rate of change across the industry, and is thus a realistic method by which changes in the levels of tariff may be assessed. It is noted that the calculation of changes in production costs reflect a first step in a process described in more detail in subsequent sections.

Table 9 Cost Model spreadsheet using PADD-5[14][15]

Item	PC weight in company returns target	Model Weighting	Percentage change Baseline - target	Effective change applied to total
Drivers Earnings	43.74%	63.7%	-0.53%	-0.34%
Fuel Costs PADD 5	9.36%	13.64%	-32.02%	-4.37%
Vehicle Insurance	3.93%	5.73%	-14.45%	-0.83%
Vehicle cost / depreciation	3.25%	4.74%	6.27%	0.30%
Shop and Garage salaries	2.58%	3.76%	-0.30%	-0.01%
Rent or lease of buildings	2.28%	3.32%	20.38%	0.68%
Cost of Vehicle Maintenance	1.40%	2.04%	22.13%	0.45%
Dispatch Salaries	1.30%	1.89%	-1.25%	-0.02%
License Costs	0.79%	1.15%	0.00%	0.00%
Totals	68.63%	100.00%		-4.14%

Sources:
Wages: http://www.bls.gov/regions/west/news-release/2014/pdf/occupationalemploymentandwages_lasvegas_20140516.pdf
Fuel: https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=EMM_EPM0_PTE_R50_DPG&f=M

[14] Excludes costs associated with in vehicle equipment, see section 2.

[15] Percentage weighting refers to the proportion of a total that any one element reflects in that total value. This can be illustrated in table 9 in that Drivers Earnings reflect 43.74% of the total company costs as expressed in the company returns for the target year (cell B2). Model weighting is the proportionate value of the same measure in the modeled assessment. The total illustrates the weighted change of all elements listed between the baseline and target measurements.

Table 10 Cost Model spreadsheet using PADD 5 minus CA

Item	PC weight in company returns target	Model Weighting	Percentage change Baseline - target	Effective change applied to total
Drivers Earnings	43.74%	63.7%	-0.53%	-0.34%
Fuel Costs PADD 5 - CA	9.36%	13.64%	-35.25%	-4.81%
Vehicle Insurance	3.93%	5.73%	-14.45%	-0.83%
Vehicle cost / depreciation	3.25%	4.74%	6.27%	0.30%
Shop and Garage salaries	2.58%	3.76%	-0.30%	-0.01%
Rent or lease of buildings	2.28%	3.32%	20.38%	0.68%
Cost of Vehicle Maintenance	1.40%	2.04%	22.13%	0.45%
Dispatch Salaries	1.30%	1.89%	-1.25%	-0.02%
License Costs	0.79%	1.15%	0.00%	0.00%
Totals	68.63%	100.00%		-4.58%

Table 11 Cost Model spreadsheet using PADD 5 minus CA plus LPG

Item	PC weight in company returns target	Model Weighting	Percentage change Baseline - target	Effective change applied to total
Drivers Earnings	43.74%	63.7%	-0.53%	-0.34%
Fuel Costs PADD 5 - CA Gasoline	4.76%	6.94%	-32.02%	-2.22%
Fuel Costs PADD 5 - CA Propane	4.60%	6.70%	-1.34%	-0.09%
Vehicle Insurance	3.93%	5.73%	-14.45%	-0.83%
Vehicle cost / depreciation	3.25%	4.74%	6.27%	0.30%
Shop and Garage salaries	2.58%	3.76%	-0.30%	-0.01%
Rent or lease of buildings	2.28%	3.32%	20.38%	0.68%
Cost of Vehicle Maintenance	1.40%	2.04%	22.13%	0.45%
Dispatch Salaries	1.30%	1.89%	-1.25%	-0.02%
License Costs	0.79%	1.15%	0.00%	0.00%
Totals	68.63%	100.00%		-2.08%

1.5.1 Definition of Baseline and Target values

For the purposes of this analysis baseline values are taken from the point of the fare application in July 2013, and applied to current fare rates. It is our recommendation that future baseline values are taken from the target values included in this analysis.

It should also be noted that the measurement of changes in costs, for example where fuel prices may rise, do not necessarily result in a linear increase in costs experienced by the industry. In the case of fuel actual changes in price may be offset by changes in vehicle fuel efficiencies; with similar mitigating or aggravating factors applying in other cost areas.

1.5.2 Cost model application

The Taxi cost model provides an indication of the change in the costs of production for taxi services that has resulted between the baseline year and the target. In the initial review it is observed that the actual costs may have fallen, primarily as a result of a falling in the cost of fuel. The measured change in Industrial Prices (IPI) reflects changes in the (taxi) supply side of the market. It does not address issues affecting demand, which will also impact on the use of taxis, and the ability of a taxi company to make money. In a simple illustration, while the cost of providing a taxi journey may have dropped, a diversion of passengers from taxis to other modes will also have had the effect of reducing the levels of revenue to the industry, which in turn affect the ability of a company to operate commercially.

Structural issues are also significant in deterring both the levels of fare, and the structure by which it is charged. These include, but are not limited to: The balance between Initial charge, time and distance charges; whether fuel surcharges are levied and in what circumstances; and the charging of extras including technology fees and additional charges for payment by Credit Card. These issues are discussed in the next section.

2. Tariff Structure

In the preceding section we set out a method by which changes in the costs of production can be identified, a method related to the Industrial Price Index. We also noted that the measurement of an IPI addresses production costs on the supply side, but would also need to be considered alongside changes in the demand for taxi services, and structural issues including the format of the taxi tariff itself. In this section we assess the structure of the tariff, including some of the issues that have been raised in relation to actual costs versus charged amounts such as the fee for using credit cards, fuel surcharges and other fees.

2.1 Current Tariff Elements

Clark County taxi fares are calculated on the basis of a taxi tariff that reflects elements included in a large number of cities in the USA and internationally. These include:

- Initial charge (Drop)
- Charges for distance travelled
- Charges for time whilst in service but not moving
- Surcharges and fees:
    - Airport Pick Up (NOT Drop Off)
    - Credit and Debit Card processing fees
    - Fuel surcharge (not currently applied)

In addition a per trip fee is levied and paid directly to the Nevada Taxicab Authority.

The structure of the Clark County tariff is broadly consistent with those seen in the majority of other cities in its basic structure. Airport charges are frequently levied, are set by the airport and usually fall outside the control of the licensing authority, as is the case at McCarran International airport.

The choice to apply credit card fees to the tariff is less common, and the amount charged in Clark County significantly exceeds that seen in other locations, though this may be less excessive than it appears insofar as the fee includes cost of in-vehicle equipment, see next section. Fuel surcharges also differ between locations, and these are further reviewed below.

2.1.1 Credit / Debit Card Fees

The acceptance of credit cards has been an ongoing issue in the taxi industry in a number of cities. The universal acceptance of credit cards remains an issue in some locations, though all taxis in Clark County are equipped for and required to accept card payment.

One of the issues affecting card acceptance is the fact that card transactions require the use of equipment that is not directly associated with the provision of the journey. Associated equipment can range from simple additions to mobile phones, such as 'Square[16]' to complex in vehicle fixed equipment (PIMs) capable of handling a variety of payment and card types. Fixed PIMs are required in Clark County, typically in vehicle back seat monitors, that can be used for a variety of functions, in addition to credit card acceptance, including advertising and public information videos.

As a result of the additional processes involved in card acceptance, a number of cities, but by no means all, permit the charging of an additional fee where card payments are made. The concept, which is sometimes known as a 'convenience charge' is not limited to the taxi industry, and is visible in some other industries including higher card payment charges at some gasoline pumps, and in some on-line payments. it is also noted that many banks levy a 'disloyalty fee' for the use of ATM machines outside their own network, related to the additional costs experienced by the bank for the use of machines in another bank's network. Fees can range significantly, where charged, with the highest charges for taxi based transaction outside Clark County around 5%, see table 12 below.

The current permitted fee for credit card acceptance in Clark County is $3 per transaction, which could be directly compared to a maximum of $0.75¢ for the same transaction in the most expensive city identified in our review. A majority of cities do not permit additional charges for credit card acceptance, but many include the costs of processing into the tariff, as discussed below.

Table 12 Review of city Credit Card Fees

City	Acceptance	Amount permitted
Berlin, Germany	Must accept Credit and Debit cards using Visa or MasterCard networks (EMV) plus EU Maestro/Eurocheque payment systems	EUR 1.50 fixed surcharge
Chicago	Must accept CC	Max 3%

[16] Square is quoted as an example of a payment processing technology, there are a number of market competitors at all levels of complexity. Credit card swaps associated with mobile phones tend not to allow for full EMV or Chip and Pin payment types.

City	Acceptance	Amount permitted
Dublin, Ireland	Discressional but must accept if advertised as accepting	Max as per merchant fee
Edinburgh, Scotland, UK	Required. Authority does not specify equipment type.	5% of total fare
London, England, UK	Required, authority requires PIM capable of accepting Swipe, Chip and PIN (EMV) or Contactless (Near Field Payment)	Can not charge fees
Los Angeles	Taxis Must accept Credit cards. All vehicles to use PIMs	Can not charge fees
Paris, France	Must accept cards, must provide EMV reader in vehicle	Not defined
San Diego	Must accept CC	Can not charge fees
San Francisco	Must accept CC	Fee capped at 3.5%
Washington DC	must accept	Can not charge extra

Sources: City and local authority licensing departments / departmental website and city code accessed on-line
Notes: Fees for credit card use may differ where vehicles booked via apps

While it is noted that a number of cities do allow for processing costs to be passed on in the form of charges, the majority address the cost of payment processing differently. It should also be noted that alternative payment methods, most commonly cash payments, also carry inherent processing costs associated with staffing, cash handling and physical losses that are far less likely where payments are made by card.

Public and stated political opinion also appear to be unfavorable in terms of the amount of the fee that is levied, which visibly exceeds that marginal processing costs. Merchant fees for cards can vary by bank and service provider but is currently quoted by VISA as 1.51% plus $0.10¢ for US transactions[17] for a card swipe payment using fixed equipment. This would result in a credit card processing cost of $0.33¢ for a $15 taxi fare, though it is noted that this cost does not include the costs of equipment used in that transaction, which may be provided at a fee, depending on merchant service provider. Stand alone equipment processors, such as Square, may charge up to 2.75% for a transaction inclusive of merchant fees.

Despite the difference between the $3 charged to the passenger for using a card and the headline cost of a merchant fee per transaction, it would appear reasonable that the actual costs of in-vehicle equipment (PIM / DIM) be included in the calculation and update of fare. We suggest, however that, rather that the cost of this equipment being obscured within a global

[17] Referenced from: https://www.cardfellow.com/credit-card-processing-fees/, accessed October 2016

‘credit card fee’, it be separated out as a self standing element within the calculation of costs. This would give rise to the proposed additional cost element “In Vehicle Equipment” included in figure 2, above. By incorporating this cost fully into the calculation of production costs the tariff could, in theory, remove all (or the main part) of the credit card fee, though the measurement of equipment cost is complex as it involves allocating a depreciation and maintenance value to equipment already installed. This is discussed at the conclusion of this section.

Given the criticism of the current credit card fee, the change to allocated costs would be likely to promote a positive response toward the taxi as compared with other forms of similar transportation, and even this element of the competitive playing field. It is also arguable whether the actual cost of card transaction ($0.33¢) should be included as an extra fee in the tariff table as this in itself may appear unfavorable in a competitive market. Moreover as the costs and risks of handling cash may exceed this value it is arguable that this cost should also be subsumed into the tariff.

In undertaking this analysis it is our conclusion that the presence of a $3.00 credit card fee in the tariff is harmful to the competitive position of the Las Vegas taxi industry. We do note, however, that genuine costs are associated in the provision of equipment required and updates to this equipment come at a cost to the industry that need be included in the identification of tariff.

The appropriate level of ‘in-vehicle equipment cost’ is calculated for the target year on the basis of a mitigation value, being the transfer of (some) of the current income associated with credit cards from income to cost calculations. We have tested two methods appropriate to this, set out below. While the mitigation value is included as a set amount for the target year its value should be updated to reflect changes in equipment that follow from the natural replacement cycle of in-vehicle DIMS and PIMS, and any change in the level of equipment that may be mandated by the authority from time to time.

<u>Mitigation Cost, high value:</u>

A high mitigation value is calculated using the current income from credit card fees as representative of the costs of equipment provision, using a total amount for credit card fee income taken from the 2015 taxi company returns to the authority: effectively that the current income associated with credit card acceptance fees is considered accurately to reflect the full cost of their acceptance.

This provides the calculation, based on reported income ($16,997,412) of 4.36% of all income to taxi companies at the time of reporting. This figure is applied to scenario 2, see section 6.2,

below. The inclusion of a high value mitigation results in a fare increase of 2.21% for the period from the last increase to present.

Mitigation Cost, low value:

It is arguable, however, whether the high mitigation value can be justified against the actual ongoing costs of equipment use, maintenance and any service costs. In the period since the last fare review and this analysis credit card use has grown significantly, increasing the income to the taxi company associated with the $3 fee to an extent that may not have been envisaged at the time of the 2013 fare review.

In the period since 2013 the income associated with the credit card acceptance fee has increased from $4,877,521, to $16,997,412, an increase from 1.4% of the total revenue to taxi companies, to the last reported 4.36%. While the increase in use will undoubtedly result in some change to the levels of merchant fees due for accepting card payment, this may not reflect the three fold increase in the actual fee income taken in this way.

The low cost mitigation calculation is based on the use of the income associated with credit card acceptance in 2013 as being reflective of the cost of provision, see section 6.3. The inclusion of the low value mitigation as part of the wider calculation results in a fare decrease of 2.32%.

Mitigation Cost, mid value

In reality the actual costs of accepting cards are likely to sit between those measured in 2013 and the income resulting from the continued charging of $3/transaction currently. In proposing a mid value mitigation cost we are not seeking to justify a cost associated with a worst case scenario, but rather to reflect a realistic amount that would reflect merchant fees that may be negotiated by taxi companies with their banks plus the legitimate cost of equipment that is required under regulation.

The period between 2013 and present has seen an increase in the numbers of vehicles from 2410 (all medallion types) to 3530. Credit card use has also increase in the period, increasing the levels of merchant fees, but allowing for a spread of fixed costs across a higher number of transactions.

The calculation is complicated, however, by the observation that no single cost model exists in respect of payment for equipment or merchants costs within the trade. A variety of contractural arrangements were presented to us in our review reflecting different agreements between taxi companies and the providers of in vehicle equipment. Different companies appear to have

differing methods of paying for equipment in vehicle, and some differences were also noted in relation to the fees that are paid for merchant services.

The mid point value is arrived at by adapting the income reported in the 2013 report by applying factors associated with, increases in the fleet size (fixed equipment costs) and numbers of payments made using credit cards (variable transaction costs).

Fleet Size

The size of the fleet directly impacts on the total costs of equipment as each vehicle is required to be equipped with equipment (fixed cost). It is observed that actual numbers of medallions have increased from 2410 in 2013 to 3530 at present[18]. We have applied a factor in line with the total number of medallions increasing the cost from its 2013 level in proportion to the numbers of vehicles that need be equipped now.

Merchant Fee

We have applied a further cost associated with a merchant fee of 3% in addition to the equipment cost. The choice of 3% is felt to represent an industry typical cost for merchant fees and is in addition to the cost of equipment.

The impact of a mid-range mitigation cost are tested in section 6.4. The inclusion of the mid value mitigation as part of the wider calculation results in a fare decrease of 0.13%[19].

Mitigation Cost, alternatives

In scenario 7, section 6 of this report, we develop an alternative method of removing credit card processing fees based on the principal of a single payment processing fee. The option is based on the development of a percentage charge that is then applied to all trips to cover the costs of any form of payment, including the costs associated with handling cash, as well as the loss of income associated with the removal of the current credit card fee.

[18] The nature of some medallions has also changed from restricted medallions to county wide medallions.

[19] This figure does not include the addition of authority costs, set out in Scenario 5, section 6.5.

Review of options

In line with the options set out above we propose that the current costs of mandated equipment and credit card processing be identified as a cost to the industry and included in the calculation of the tariff table, in accordance with the concept of mid range mitigation cost. We recommend the use of a mid-range mitigation value, as set out in section 6.4. At the same time as this additional cost is incorporated we recommend that the charge for credit / debit card use be completely removed from the tariff table.

The impacts of this change are likely to be limited in terms of costs to the industry, and may result in a more positive benefit from improved customer responses. We recommend that the removal of the credit card fee be implemented at the same time as the cost of equipment is added to the calculation of tariff. This would, at the outset, be based on the measured income associated with the credit card fee, which may be suggested to equate the costs to the industry of the equipment, including historic investment therein, and therefore result in zero loss to the industry at the time of its application. Future reviews would then increase this cost in line with actual costs of new equipment that may be mandated from time to time.

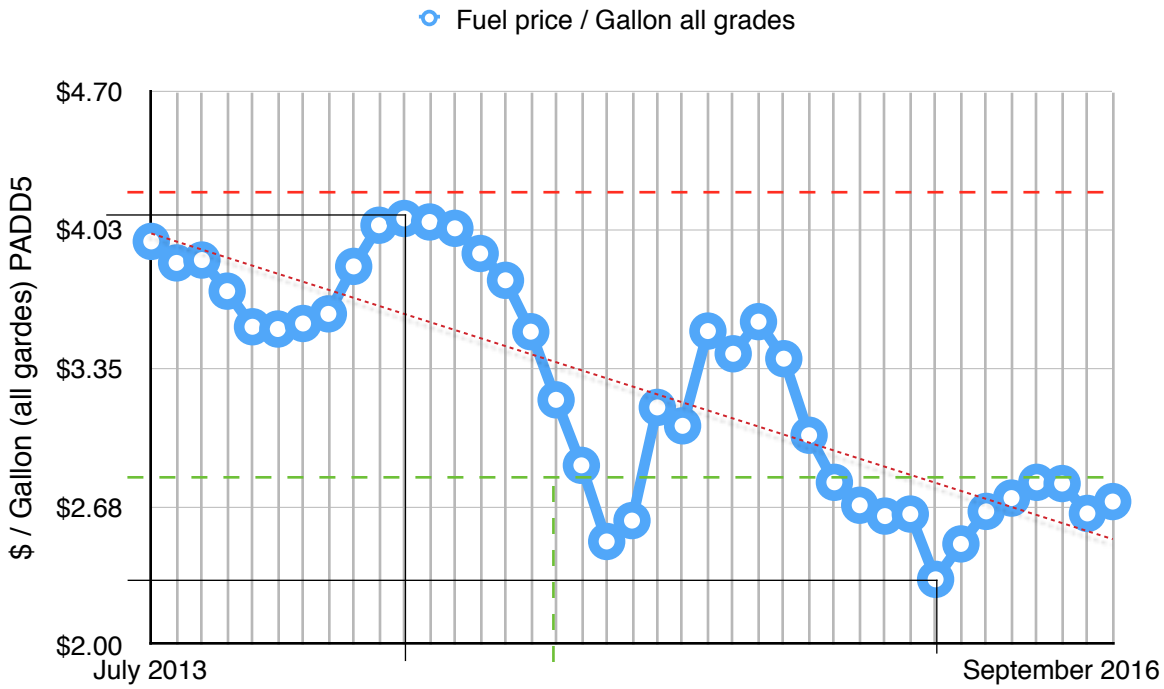
The change should result in a zero sum gain, and should not, therefore, justify any change in contract costs to the taxi driver.

2.1.2 Fuel Surcharges

The concept of a fuel surcharge relates to a temporary increase in taxi fares applied to offset a change in the price of fuel that significantly exceeds the cost of fuel at the time of tariff calculation. Fuel surcharges are rare but are applied in some locations, including Las Vegas, subject to specific conditions for introduction and removal, discussed below.

Fuel prices are, by their nature, volatile and highly dependent on international markets. Changes in gasoline prices can be rapid with significant spikes represented by peaks and troughs in price, see figure 5, below. The rapidly changing nature of gasoline prices can present a challenge in measuring and determining changes in costs experienced in the taxi industry, and such changes may negate a more measured approach to the Taxi Cost Index.

Figure 5 Gasoline price changes, July 2013 to present



Source: Data from US Energy Information Administration

Figure 5 illustrates the extent of gasoline price volatility in the period since the tariff change in 2013, with highest prices recorded in May 2014, at $4.08 / gallon, and a lowest price in February 2016, at $2.31 / gallon, though a lower amount of fluctuation is noted for propane.

The graph also includes the threshold for application and removal of fuel surcharges (red and green dashed lines) illustrating that, despite the fluctuation in fuel prices in the period, the actual costs have not exceeded the threshold for surcharge implementation at any stage since the last fare review. Indeed the cost of fuel has only exceeded the amount measured at the time of the last increase on four occasions (10% of the time). It is also noted that, while fuel costs represent a significant part of the costs of providing a taxi, any change in cost of fuel will not have an equal impact on the cost of operation. Thus a $0.40¢ increase in fuel costs might result in a $0.05¢ increase in actual costs to the taxi company. The inverse is also true, a reduction in fuel costs will result in an equally muted fall in costs.

Fuel surcharges have received a mixed response from the taxi industry and its regulators across the USA, with only a small number of cities applying the charge see Table 10. It may also be seen as a disproportionate charge, dependent on the nature of its application, with locations choosing to apply a single surcharge regardless of distance particularly impacting shorter

journeys, often those taken by individuals on a low income, though this impact is avoided in Clark County as the surcharge is applied on a basis of measured distance having an equal impact across all users.

Table 13 City by city approaches to fuel surcharges

City	Trigger	Application
Philadelphia	Change in fuel price	Variable amount defined on fuel price
Los Angeles	Removed from statute	
Atlanta	Fuel price above $2.90 >14 days	Single charge applied to trip cost
Washington DC	Removed from statute	

Source: Regulator / Authority Responses

The argument in favor of a fuel surcharge relate to temporary changes in tariff that reflect the potential for large shifts in gasoline prices. Significant changes in this cost can impact negatively on the profitability of a company, though it may equally be argued that changes are correctly recognized and accounted for in a frequent fare review. Part of the issue may relate to the relatively long periods between changes in the taxi fare in Las Vegas. It may also be argued that the threshold values adopted for fuel surcharges may become increasingly abstract as the costs of fuel change in the long run. In short the threshold values adopted more than 12 months previously may no longer remain valid for future application.

In seeking to resolve the issues associated with the use of a fuel surcharge, the team felt it appropriate to address a number of fundamental issues. It was felt undesirable that a fuel price surcharge should replace or act as a surrogate for a detailed taxi fare review. The surcharge considered a cost with a relatively low impact on the total costs of the industry and it was felt this should not replace the need for a more detailed analysis. The surcharge should also reflect the aggregate change in price of fuel, including propane, as this was a constituent in the industry cost.

It was also noted that fuel prices have continued to remain below their costs at the time of the last price increase, and were therefore not appropriate for new application in that period. This said, the surcharge was in place for 16 months during the period, where it may be argued that the previous tariff increase should have accommodated actual costs of fuel.

It is also noted that the threshold for the removal of fuel surcharges falls significantly below the price of gasoline measured at the point of last fare increase. This appears to be at odds with the purpose of a fuel surcharge, being the accommodation of temporary increases in the cost of fuel above the rate measured at the point of review. It is our conclusion that, where applied, fuel

price surcharges should be removed at such time as the fuel price returns to or falls below the price measured at the time of the last review.

The team recognize that an approach to temporary increases in cost can be appropriate to the correct operation of the taxi market and are included in the pricing mechanisms of some providers of competing services. As a result we recommend that the authority retain a mechanism by which significant changes in fuel costs are addressed but only where these:

- Are likely to have a significant impact on the operating costs of the taxi industry, felt to be in excess of a 20% variation in the price of fuel
- Do not respond to day to day fluctuations, to be triggered where fuel price increases in excess of 20% above baseline are sustained for a period of 28 days (4 weeks) or longer
- Do not, or would not naturally be adjusted by a tariff review underway at the time of the increase
- Can be removed as the price of fuel falls below that measured at the time of the last fare review. In line with the desire to avoid unnecessary fluctuations we recommend that the authority remove fuel surcharges after a period of four weeks (28 days) within which period the fuel price remains below the baseline level.
- Be measured on the aggregate cost of road fuel using the weighted value of PADD5-CA plus LPG cost.

2.2 Per trip additional charges

In addition to the tariff elements discussed above the authority also places a per trip charge and technology fee on all fares. A state excise taxi, which is passed directly to the Department of Taxation, is also added. The per trip charges are linked to the funding mechanisms for the authority and specific authority technology projects outlined in section 4 of this report.

3. Vehicle / Medallion Allocations

In this section we address regulations affecting Quantity Control, effectively the numbers of taxi medallions, known as licenses in some jurisdiction, that may be issued at any one time. Quantity control is one of three primary areas of regulation, alongside Quality and Economic controls. The application of quantity control is a form of market intervention defined by a regulator, often justified on the basis of the public interest. The most common form of this control is a direct limit to the numbers of vehicles permitted to operate, usually achieved by placing an upper limit (cap) on the numbers of medallions issued, thus affecting and restricting supply. The issue of quantity control relates directly to long-standing arguments as to whether the markets perform better under controlled competition (regulation) or market forces (de-restriction).

Properly speaking, supply restrictions can be identified as barriers to market entry. However, the policy restricting medallion numbers differs significantly from fitness for purpose requirements which can be identified as quality controls. The policy restricting entry can be seen as controversial and is limited, in some locations, to circumstances where no negative impact will result from the policy itself. The policy of medallion constraints may also be affected by the actions of competitors in and to the market. These include, in the USA, the growth of the TNC market, represented by Uber and Lyft in the case of Las Vegas. TNCs are broadly uncontrolled in terms of the numbers of vehicles that they operate, often in direct competition to the taxi industry, complicating traditional methods of identifying and allocating taxi licenses.

3.1 Traditional approaches to vehicle allocation

A series of scientific approaches have developed over time to the allocation of vehicle licenses in the taxi industry. The majority of which relate to the measurement of demand on the part of the regulator and a measured response to any shortfalls in supply that may be identified. Variations of this exist in some locations whereby an onus falls on an operator, or intending operator, to demonstrate a demand for services, a process commonly referred to as convenience and necessity analysis. Both approaches involve the identification of a shortfall, or lack of service, that would be addressed by the addition of further licenses to the taxi fleet.

3.1.1 Unmet / underserved demand

A common form of analysis relates to the measurement of demand, specifically the presence (or absence) of Significant Unmet Demand (SUD). The precise definitions of Significance of Unmet

or Underserved Demand may vary between locations dependent on the primary methods of taxi engagement (hailed versus dispatched), as service level expectations and methods of measurement may differ; but is assumed in this method to reflect a low level of service, or extended waiting time, if compared to a survey based analysis of service expectations.

SUD analysis has developed, in some locations around the observation of existing service levels, a process which has been aided and enhanced by the systematic collection of trip data, which allow for the precise measurement of levels of service, including measured delays between time of requesting and time of receiving service. These measures can be compared against stated expectation to provide an indication of shortfall that may, in theory, be satisfied by an increase in the numbers of taxis available with the taxi parc. It is noted that a difference exists between the total numbers of vehicles (taxi fleet) and the total numbers of vehicles available at any one time (the taxi parc). While the allocation of licenses affects the total fleet, it may have a more limited impact on the taxi parc, and thus result in a more limited impact than at first anticipated.

Observation may also be limited in that it uses quantitative data to establish actual use (patent demand), rather than hidden or suppressed demand (latent demand). The measurement of unmet demand is based on the estimation of desirable (reported) service levels compared with measured delivery levels, and excludes potential trips that may be currently suppressed.

3.1.2 Latent Demand

The nature of SUD analysis, set out above, has led to a number of critiques focused on the need to include latent as well as patent demand. Amongst these the UK Department for Transport (DfT) proposed a number of approaches to extend the basic model. The issue of latent (suppressed) demand had been largely absent in the previous model.

Latent demand was defined as relating to the numbers of potential passengers choosing not to use a taxi , for example as a result of perceived delay or difficulty in getting a taxi when required. The same report also identified an issue in the measurement of peaked demand, set out below.

3.1.3 Peaked Demand

A further issue arises in respect of the asynchronous nature of taxi demand. The market for taxis differs in many areas from more traditional transport modes and includes notable peaks in demand at weekends. Weekend night times tend to be the highest point in demand for taxis with many cities seeing a dominance of taxi use in the night-time market.

The night time peak is difficult to accommodate well within the overall patterns of taxi supply, as the overall number of taxis reflects an equilibrium between daytime and night time use.

Increased numbers of vehicles with a fleet sufficient to meet night time peaks may also result in a glut of supply during off peak daytime hours creating a larger problem to a company balancing the extent of supply with costs of provision. In short, proving the numbers of vehicles required at night may result in an underused asset during some daytime periods. This is particularly notable where the company makes decisions of supply across all time periods for all of its drivers, the Las Vegas model, rather than allowing decisions of supply to fall under the control of individual self employed contractors.

3.1.4 Public Convenience and Necessity (PCN)

A further approach to determining need for additional supply can relate to the PCN method applied in a number of US cities. In this approach the taxi companies themselves need present evidence of demand for service, with a similar methodology applied in the case of TNCs seeking to serve Las Vegas.

A variety of different approaches may be taken to the PCN approach which appear to vary between locations and differing applications, but are typically based on the identification of locations where taxi services are reported, or can be demonstrated, to have long wait times - similar to the basic SUD approach. The argument then follows that introduction of new vehicles to the market would have the effect of solving this shortfall.

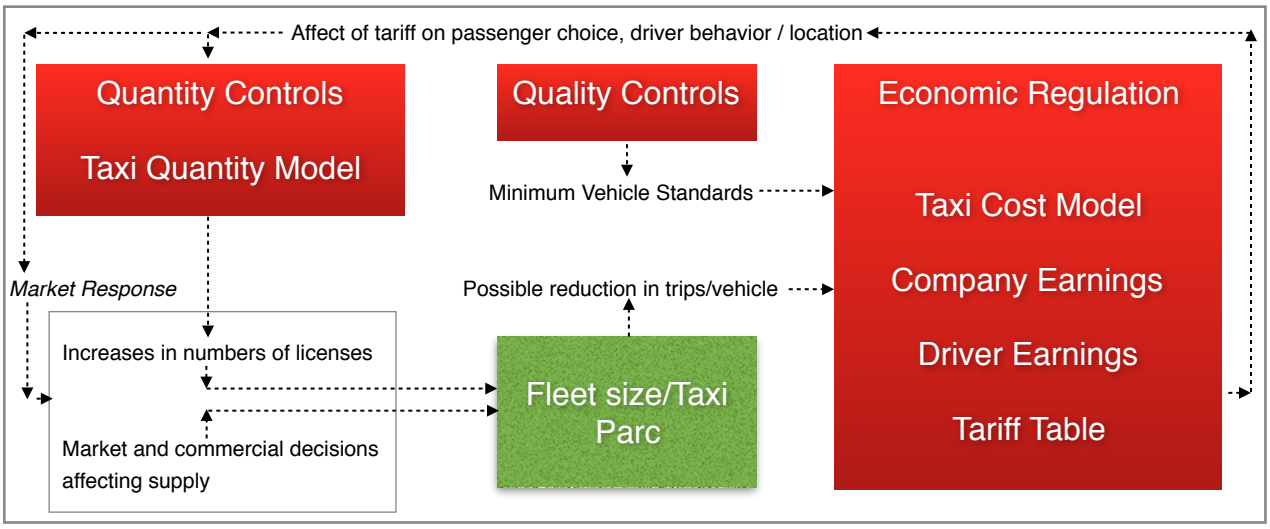
A similar approach was forwarded by TNCs in developing initial services, arguing that levels of service to suburban areas of the city was insufficient - effectively the introduction of TNCs could address shortfalls in the market not well served by taxis at that time.

3.2 Application of Taxi Quantity Models

The use of a taxi quantity model has validity where a market is constrained, allowing the regulator to determine an effective change to the number of licenses that may be required to meet demand. The model does not work in isolation, however, as changes in one form of regulatory control may impact on the operation of other regulations, see figure 6, and is of

limited or no benefit in an open market, where market entry occurs at the discretion of the operator[20] rather than the regulator[21].

Figure 6 Interaction between quantity and other regulatory elements



The identification of linkages, shown in figure 6, sets out the relationships between differing areas of regulation. Quantity controls affect the numbers of vehicles in the fleet (but not necessarily the number of vehicle in the taxi parc) which may in turn affect the numbers of trips available to each vehicle, which may in turn affect the determination of tariffs, and by extension passenger and driver choice.

Figure 6 also illustrates the potential for company based market responses following, or instead of, regulator definition of license number. As an example, where an excess of licenses exists company decisions will affect the supply of vehicles, rather than the actual numbers of licenses available. This may also be influenced by the numbers of direct alternatives, particularly TNC vehicles, with a number of cities reporting lower take up of licenses.

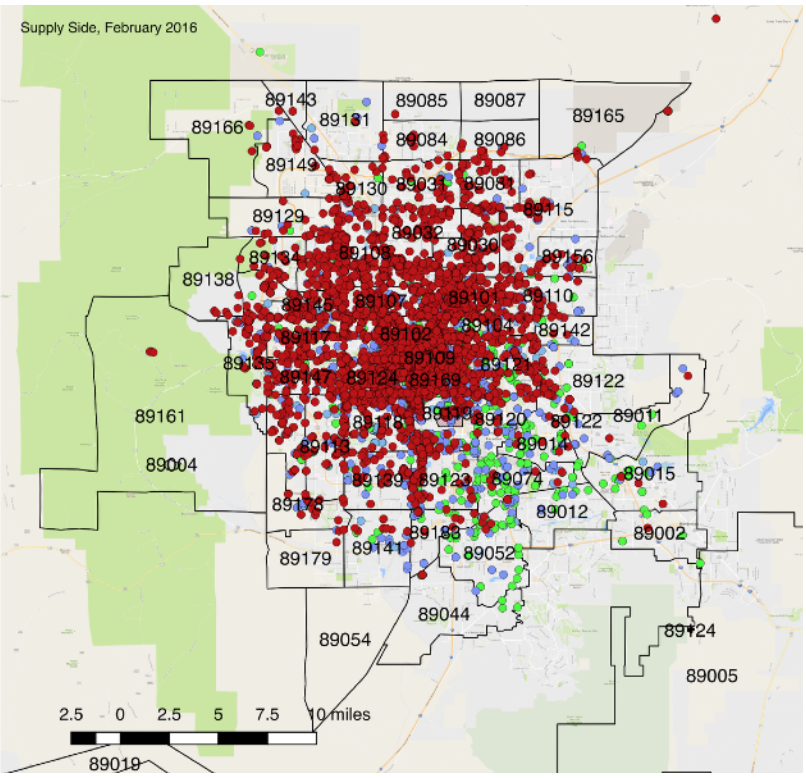
[20] In an open market, or a market where an excess number of licenses exist, levels of actual supply within the taxi parc reflect direct market pressures. These have been argued to include Market Failure in some texts.

[21] A number of locations apply strict controls on quality regulation, including London, UK; which may act as a surrogate form of market constraint in place of a direct cap on numbers.

3.3 Current service levels

The study applied a synthetic demand model using a combination of supply data, illustrated below, and demand information collected from a public survey, set out in detail in subsequent sections. Trip data from operating companies was used to identify the patterns of supply over four weekly periods representing Winter, Spring, Summer and Fall patterns of demand, illustrated in the maps below.

Map 2 Taxi trip supply, Feb 2016

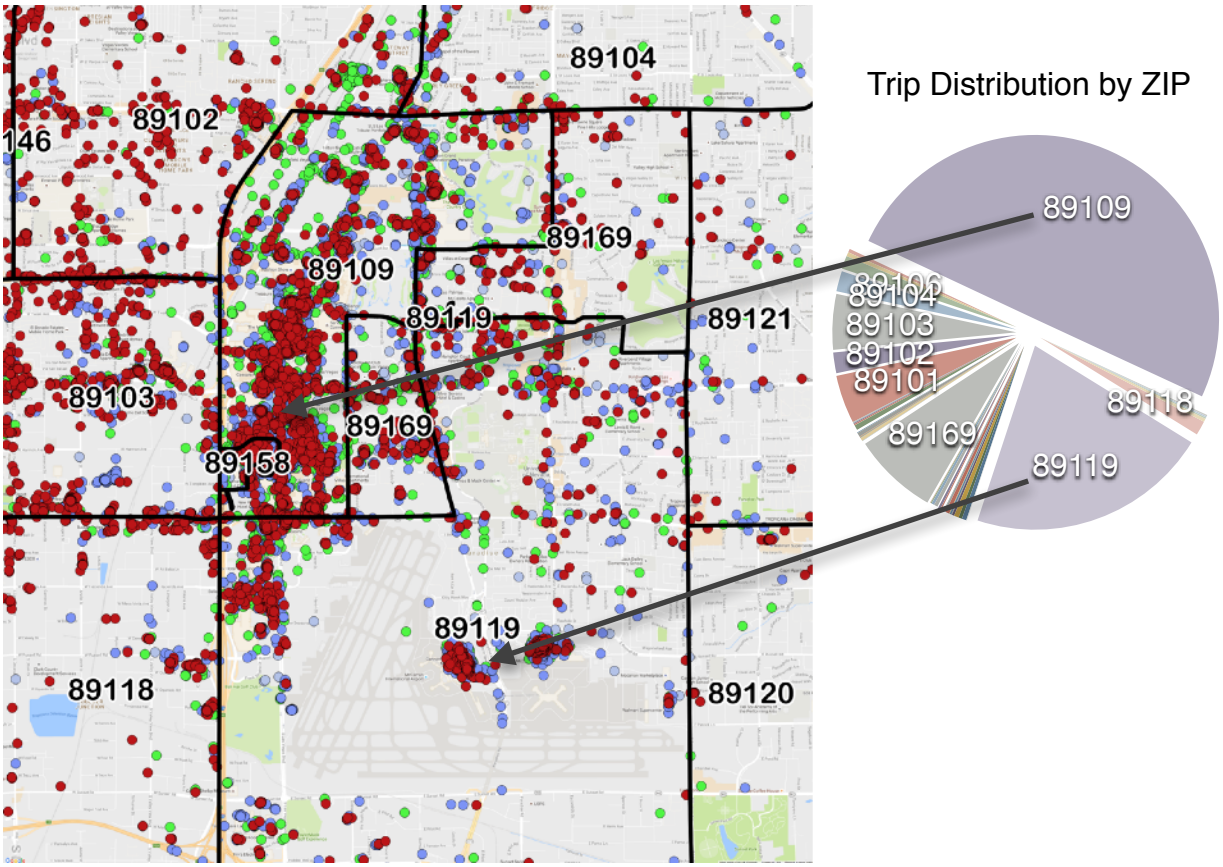


Map 2 suggests that supply is reasonably spread across most Clark County Zip Codes at most times, though there are significant areas of concentration in the strip area and at McCarran International Airport, illustrated in more detail in Map 2. Trip origins in some areas, particularly those further from the downtown core, are concentrated along radial routes and most likely reflect the availability of services making returns to the downtown area. Some zip code areas

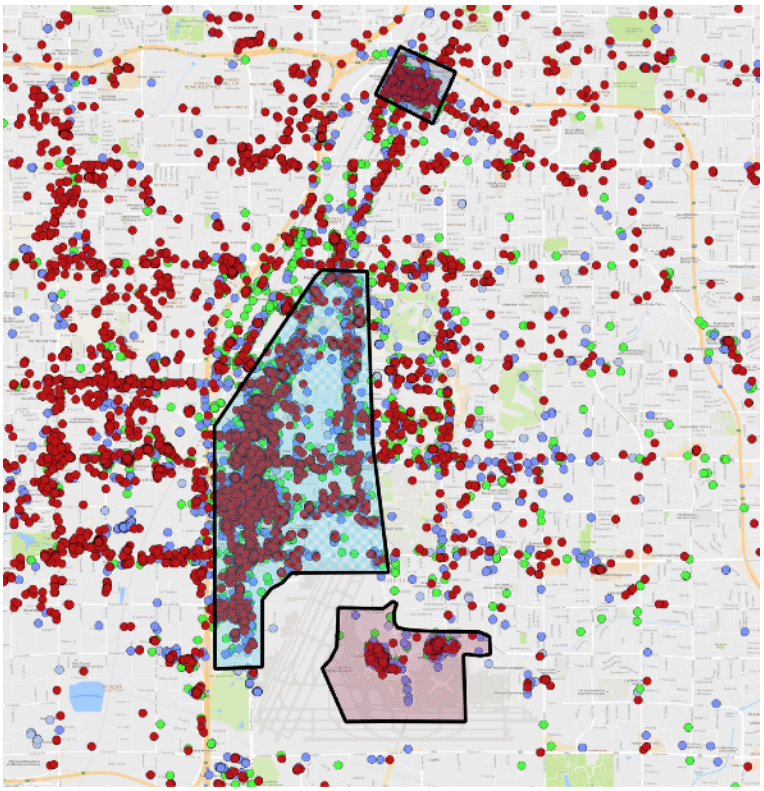
are notably less well served, such as 89054, 89044 etc., though this does not, in itself, reflect a lack of supply as these areas have low and very low population densities, reflected in a lack of demand.

Supply within the City of Las Vegas itself is focused on central areas with two distinct areas of concentration, illustrated in Map A2. Zipcodes 89109, roughly equating the strip and an area known as the Golden Triangle; and 89119, which fully encloses the Airport, account for close to 75% of all trip origins in February 2016.

Map 3 Downtown core, areas of concentration, Feb 2016

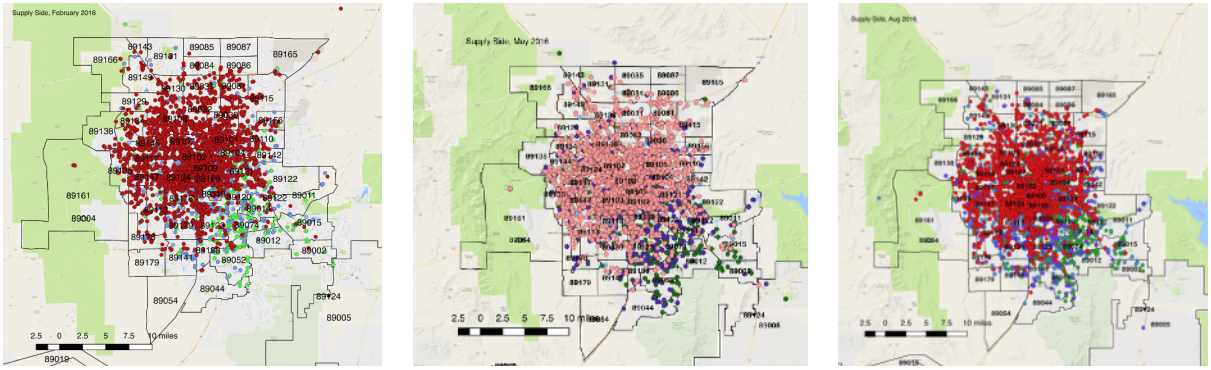


Map 4 McCarren Airport, Golden Triangle and Downtown concentrations, Feb 2016



The spread of supply remains consistent across all time periods, see map 5, though the levels of demand show some levels of seasonality, reducing the effectiveness of a permanent change in license numbers as a solution to service shortfalls.

Map 5 Comparative supply locations by season

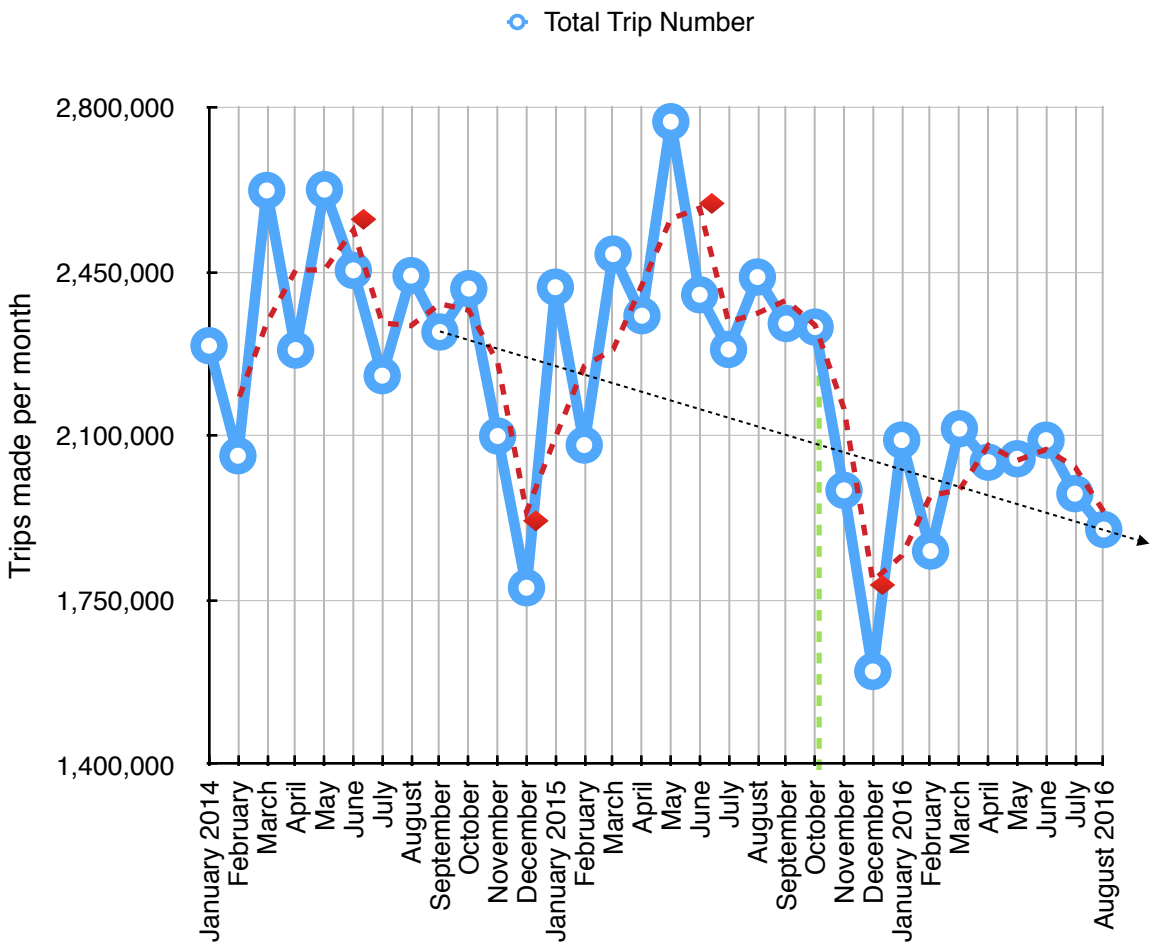


Feb 2016 May 2016 Aug 2016

Source: Company trip data

Notes: Trip data was not available for Fall 2016. Data from Nov 2015 was provided but not applied as it was felt not to include wide scale impacts arising from TNCs.

Figure 7 Change in trip number, Jan 2015 - Aug 2016



Source: Nevada Taxicab Authority

Figure 7 illustrates the total number of trips by month in the period from January 2014 to present. The table illustrates a number of key factors influencing taxi use, both in terms of seasonality, and the impact of direct competitors to the taxi.

The chart illustrates actual trip number, shown by the constant blue line, as reported to the authority by taxi companies. We have added a linear trend line, shown in black, from August 2014 to August 2016 suggesting an overall decline in the numbers of trips being made between these two points, despite a number of significant peaks, discussed below.

The chart also includes a moving average trend line, shown by the broken red line, allowing the identification of seasonal peaks, as opposed to month by month fluctuations. Summer peaks are

observed around June in both 2014 and 2015, with a distinct winter trough in December. The impact of TNCs can also be noted in trip numbers from fall of 2015, with a deeper winter trough than experienced in previous years, and significantly muted summer peak in 2016. Indeed trip numbers in Summer 2016 remained at about 70% of those recorded in previous years, and showed no sign of seasonal peaking experienced in other periods.

Figure 8 Impact of medallion number on values

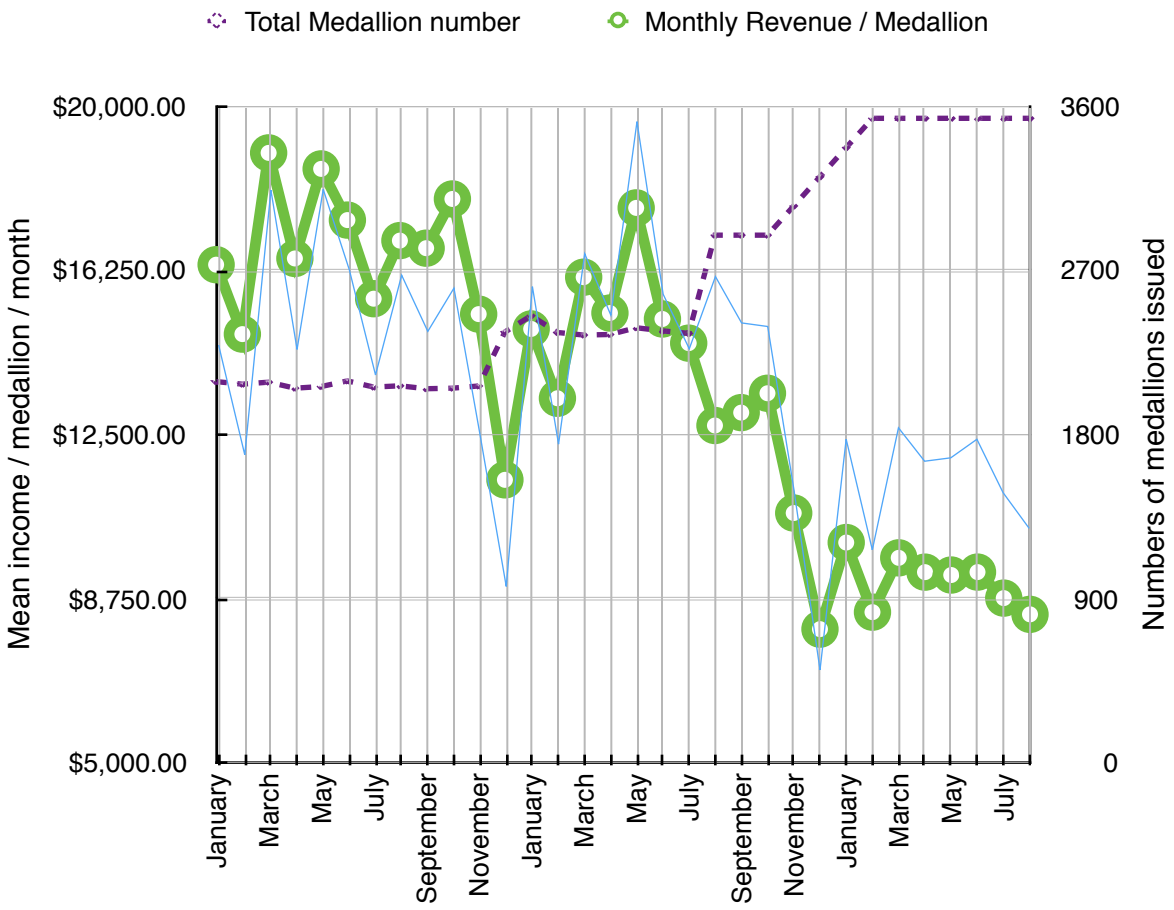


Figure 8 plots the relative incomes achieved by each medallion in the period from January 2014 to present. The income values are seen to increase during seasonal peaks in line with an increase in the numbers of trips being made (shown in blue), but fall more rapidly than a decline in trip numbers in the period since October 2015. Actual numbers of medallions have three major points of increase, illustrated by the dashed purple line. It should also be noted that the monthly earning value of a medallion may differ from any concept of a transferable value, with market valuations of medallions being significantly higher than their short term earning potential and often reflecting a speculative valuation rather than real earning or administrative cost values.

Where change in monthly earning values exceeds the rate of change measured for trip numbers (lie on or above the rate indicated in the trip line) it may be suggested that an excess demand exists. Changes in medallion numbers in November and December 2014 appear to have stabilized the equilibrium between supply and demand. In contrast increasing the number of medallions in July 2015 appears to have the inverse effect resulting in oversupply that stabilized in October of the same year. Increased medallion numbers culminating in the current supply in February 2016 also appear to have created an over supply of vehicles in the fleet.

Although the relationship between trip number and medallion value does appear to have stabilized it remains significantly below both its 2014 value and median rate throughout the period with only limited evidence of any potential for recovery. In short, the introduction of TNCs to the Las Vegas market has had a long term impact on the values of taxi medallions that appear not to be recoverable on the basis of standard taxi operating practices - effectively the taxi industry appears to achieved a new market equilibrium[22]. Given this fact, and in the absence of a more fundamental change to the structure of the taxi industry in Las Vegas, it is concluded that no further medallions are required within the city at the time of writing.

3.4 Impacts of Structural Change

In the preceding section it was concluded that the taxi market had achieved a new equilibrium with 3530 medallions issued. Current service levels reflect the equilibrium between taxis demanded and the level of service that can be commercially provided from the existing industry. While shortfalls and additional demand may be apparent, particularly within the suburban areas of the city, the current industry would be unlikely to provide additional services. Indeed it might be suggested as unlikely that any further taxi medallions would provide improvement to existing service levels, but rather contribute to a decline in revenues per vehicle within the existing industry - which may in turn have a negative impact on the quality of services offered.

To achieve a meaningful change in the levels of service and supply, reflecting a shift in the point of equilibria within the industry and amongst competing services, is likely to follow only from a structural change to the industry. Structural changes are not unknown within the market for Vehicles For Hire, the most recent example being the development and emergence of Transportation Network Companies such as Uber and Lyft. The presence of TNCs in the market has impacted significantly upon the market, not least in perceptions of service levels, and an

[22] Current market equilibria can be volatile and impacted by changes both within the taxi industry and TNC competitors, discussed in section 3.4.

overall increase both in the numbers of vehicles available within the city, and the number of trips made globally across all forms of vehicle for hire[23].

Continued shifts in the equilibrium between demand for vehicles for hire and supply of taxi services are likely to occur as the TNC companies develop new service types or extend existing categories[24]. This said, not all structural reforms relate to developments in the TNC market with similar structural changes including the removal of geographical limitations from restricted taxi licenses, and the potential for changes arising from fare structure. These are discussed in detail below.

3.4.1 TNC service development

This section specifically addresses the issue of new service types and new service providers. It is apparent that the introduction of TNCs to the Las Vegas market has had a significant impact on the traditional taxi market. While the market does appear to have returned to a level of equilibrium, a number of significant further changes may be anticipated, see table 14.

Table 14 Examples of app service types by approximate licensing classification[25]

X Class / shared	X Class	Taxi	Limited markets	Premium (Limousine)	Accessible
Uber Pool	Uber X	Uber Taxi	Uber for Hire	Uber Select	Uber Access
Uber Hop	Uber XL	Uber Cab	Uber Wine	Uber Black	Uber Assist
Lyft Line	Uber X Beaches	Uber T	Uber Wine XL	Uber Premium	Uber WAV
Lyft CarPool	Lyft	Curb Taxi	Uber Pedal	Uber Lux	Uber T WAV
	Lyft Plus	UpTop	Uber Ski	Uber Lux XL	Lyft accessible vehicle dispatch
	Uber GO	Taxi Hail	Uber Ski XL	Uber SUV	

Source: Website data from TNC and taxi companies

[23] Some debate exists between operators as to the extent of total market growth and proportionate impact on the taxi industry. While it may be observed that the total numbers of trips by Vehicles for Hire (Taxi, Limousine and TNC) have increased, a lack of operational data from TNCs result in the fact that it is not possible to establish the exact nature of this growth or its precise location.

[24] Shifts may accompany new service types, such as the introduction of UberXL, September 2015; price reductions - Uber headline fares dropping 30% in November 2015, or partnerships between TNCs, Taxis or other transportation modes.

[25] List is not exhaustive. Excludes non-passenger transportation products, eg: Uber Eats, Uber Rush, Uber Ice, Uber Kitten etc.

Table 14 illustrates the range of app services and product types currently offered in North America. While not all services are offered in all markets, it may be anticipated that some additional services will be offered in the Las Vegas market. As new products are introduced to the market it is reasonable to suggest a further shift in the demand curve. It is noted that not all app services relate to TNCs alone.

3.4.2 Geographically distinct licensing

In section 3.3 we identified that a majority of all taxi supply occurs in the central areas of Las Vegas, with approximately 75% of all trips originating at the airport or the Golden Triangle. The remaining 25% of taxi trips appear well distributed within the city and its inner suburbs, though service levels in outlying suburbs can be far less frequent or require significantly longer waiting times.

A previous solution had been to issue geographically specific licenses, examples of which permitted services to the West of the I15 etc. Similarly some licenses had been limited to specific times of day, thereby tailoring the supply of services to identified areas of demand or to times of day where more trips were being made. While beneficial, once issued a license retained a wide geographical area, while demand patterns can change depending on factors affecting trip origin, to an extent that may reduce or eliminate the benefit of licenses already issued. Moreover, as trips may originate within the boundaries of a restricted license many destinations may be outwith these limitations, requiring a driver to travel back without passenger, or refuse passengers.

A further issue exists in that the current numbers of licenses, which are valid throughout Clark County, appear to exceed the number required to meet demand for services, the opportunity to develop new licensing categories based on either geography or time of service appear limited. A more appropriate response may relate to a commercial initiative by an existing taxi company to establish and become known for providing services in suburban locations. This may also be allied to fare based initiatives, discussed in the next section.

3.4.3 Taxi Fare changes

A third structural change is felt to relate to the taxi tariff. TNC providers can offer a significant discount when compared to traditional taxis for many journeys, though not all. Issues may also exist in public perceptions of taxi costs, including the levels of fees associated with the use of credit cards and the general levels of fares. A similar issue had existed in terms of the levels of TNC ‘Surge Pricing’ though this may have been overcome through the introduction of ‘upfront pricing’ by the largest TNC operator.

In previous sections we concluded that it may be beneficial to remove the credit card fee from the taxi tariff, internalizing the cost of all financial transactions, by card or cash, into the calculation of the fare itself.

We would also recommend that taxi companies be allowed and encouraged to discount fares. This would level the playing field in terms of an ability to compete on price. We would also recommend that app based services, including taxis booked by app, be allowed to vary the fare both down and up as felt appropriate to the market. Hailed, stand and traditional dispatch services would remain within the defined tariff, though this would be classified as a maximum fare.

4. Authority Revenue Sources

The final element in determining the taxi tariff relates to funding of the Nevada Taxicab Authority itself. The authority maintains a staff of sixty-three (63 no.) positions[26] with associated operating costs, reporting total expenditures of $7 million[27] in the financial year 2013 - 2014 and $11 million in the financial year 2014 - 21015.

A significant proportion of the authority revenues arise from the trade, and are likely to be impacted by changes affecting the trade, e.g.: numbers of vehicles will affect the amount associated with medallion fees; numbers of trips made by taxi will impact on income associated with trip charges. As the numbers of trips made by taxi is currently declining, so the levels of income to the authority may also decline.

4.1 Review of the authority budget

The Nevada Taxicab Authority budget is published by the Department of Business and Industry and has been incorporated into the taxi market model as described below. By incorporating the costs and revenues of the authority itself it is possible to calculate effects of changes both in terms of the impact of a decline in trips on the authority; and of changes in the authority itself on costs that would need to be borne by the industry through license and ancillary fees.

Table 15 sets out revenue streams to the authority directly associated with the numbers of licenses issued and/or numbers of trips being made, effectively the revenue streams most likely to be affected by a change in the demand for taxi services. Rounded values are included for financial years 2013-14 and 2015-16[28].

Table 15 Resources allied to industry performance and use[29]

$ x 1000	2013 - 14	2015 - 16
Medallions	228	228
Driver Permits	185	185

[26] A reduced number of staff is anticipated and set out in the FY18 submission of the authority.

[27] Figures are rounded up to nearest million. Actual figures 2013 - 14 $6,711,041; Work program 2014 - 15 $10,936,690

[28] Full financial details are included on the State website leg.state.nv.us. Figures quoted for 2013 reflect actual income. Figures quoted for 2015 reflect entries for 'Governor Recommended' amounts. Full accounts are included in the market model.

[29] Includes Miscellaneous program fees and other associated fees

$ x 1000	2013 - 14	2015 - 16
Fingerprint/associated Fees	102	80
Application Fees	2	2
Trip Charge	5,476	5,642

Source: NV Department of Business and Industry.
Notes: Table provides an extract of the revenues, not all revenues are shown. Figures are rounded and shown as $/1000. 2013-14 figures are taken from the actual amounts; 2015-16 figures are taken from 'Governor Recommends' classifications.

It is noted that the majority of income and resources are considered to remain constant when compared, resources associated with Fingerprint fees are shown to drop, while those associated with trip based charges increase. Changes in the market may further affect these, reducing the actual amounts raised in these categories, which may in turn place a pressure on the authority budget, discussed below.

Table 16 sets out the key expenditures that may also be affected by the numbers of vehicles and trips being made. As in table 12 these are rounded and shown for financial years 2013-14 and 2015-16. It is noted that the income and costs shown in tables 15 and 16 are NOT EXCLUSIVE and are an abstract from published accounts only.

Table 16 Expenditures allied to industry performance and use

$ x 1000	2013 - 14	2015 - 16
Personnel	4,133	4,888
Operating Expenses	377	524
Fingerprinting fees	76	80

Source: NV Department of Business and Industry.
Notes: Table provides an extract of expenditures, not all expenditure items are shown. Figures are rounded.

4.2 Application to the Taxi Cost Model

Having identified that some elements of the authority budget that are likely to vary to reflect changes in the operating conditions, a method of incorporating such changes was developed and applied to the taxi cost model, allowing the authority to account for both changes resulting from a decline in taxi trips, and the impacts of changes to the operating practices, staffing etc., within the authority itself.

The model has the authority revenues incorporated on the same baseline and target concept as applied for other elements, allowing the authority to account for changes in income in line with numbers of trips made, and impacts in operating practices on basis of scenarios, discussed in more detail in section 6.

5. Public Taxi Use and Opinion Survey

The final element in setting out options for model application is the identification of current choices made by the public in using taxis and other Vehicles for Hire. The analysis of public taxi use and opinions allows the model to account for choices made (and likely to be made) as well as any preference for service development. Members of the public were canvassed in the Summer of 2016 across the city and county, including street intercept surveys and an on-line survey that was heavily publicized in the city and through local media. Local papers carried articles highlighting the survey on two occasions, and the team received a high level of responses as a result.

The survey was anonymous and aimed to characterize the habits and attitudes of a traveling public that use several types of vehicles which included: personal cars, rental cars, buses, taxis, limousines and TNC vehicles from Uber/Lyft. We have set out the primary results below.

5.1 Socio-Economic status of respondents

Nearly 60% of respondents willing to reveal their age were 26 – 55 years of age; 14% of respondents declined to reveal their age. Approximately 85% of respondents chose to disclose their ethnic/racial affinity, with the largest group, at 42%, identifying themselves as Caucasian/ White, followed by 15% Black/African Americans and 15% who declined to answer.

55% of respondents preferred not reveal their household income with the second largest group declaring a household income of $50,000 – $75,000.

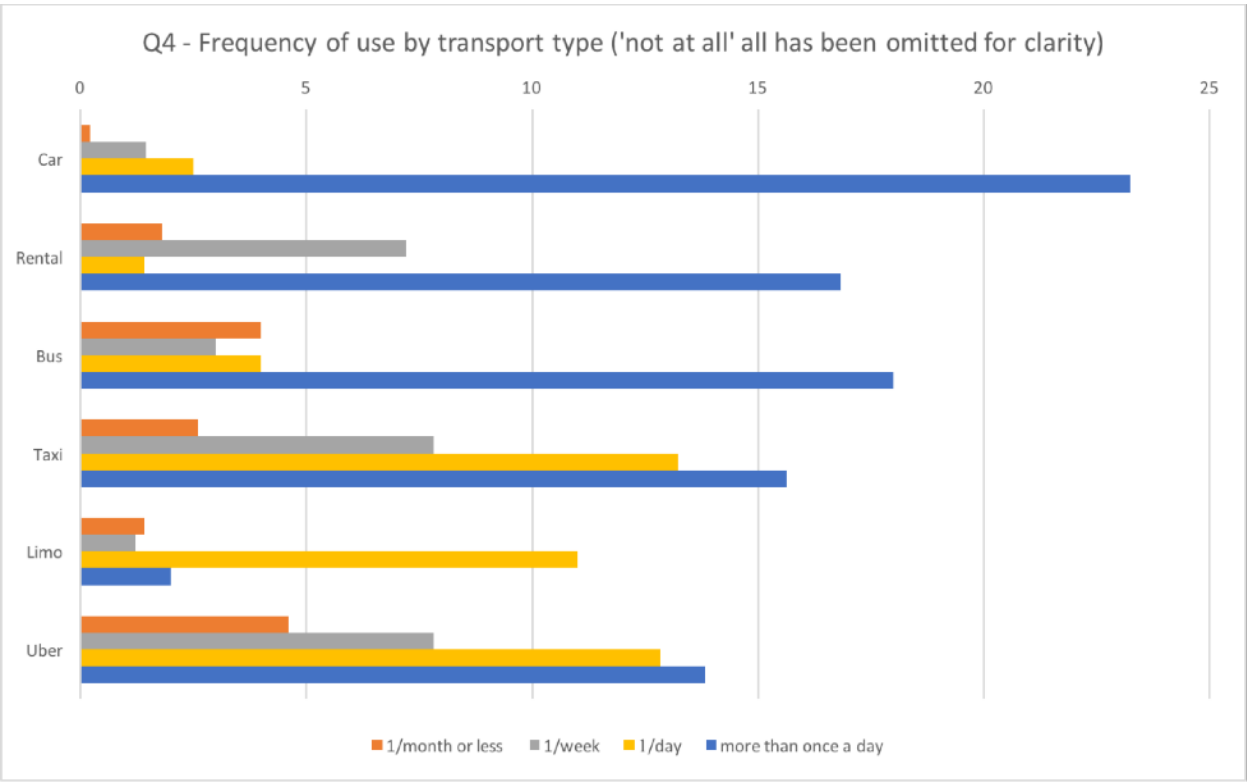
The largest group of respondents (62%) were vacationing visitors to Las Vegas, staying mainly for a weekend (34%) or full week (40%). Business visitors comprised 21% of respondents; 12% of respondents live and work in Las Vegas/Clark County. Approximately 21% of all visitors were from outside the USA.

5.2 Frequency of vehicle use

73% of respondents claimed they do not use their own cars for traveling in Las Vegas / Clark County. Of the remaining 27% of respondents, who did use a car, 85% were local residents using their car frequently, and a significantly small number of visitors who had driven to Las Vegas, see chart 1. Rental cars, local buses, taxis, limos and TNCs are used most often more

than once a day, although taxis, limos and TNCs are used just once a day more often than own vehicles, rentals and buses.

Chart 1 Frequency of use by transport type



Source: Public Surveys
Notes: Excludes responses indicating mode 'not used at all'

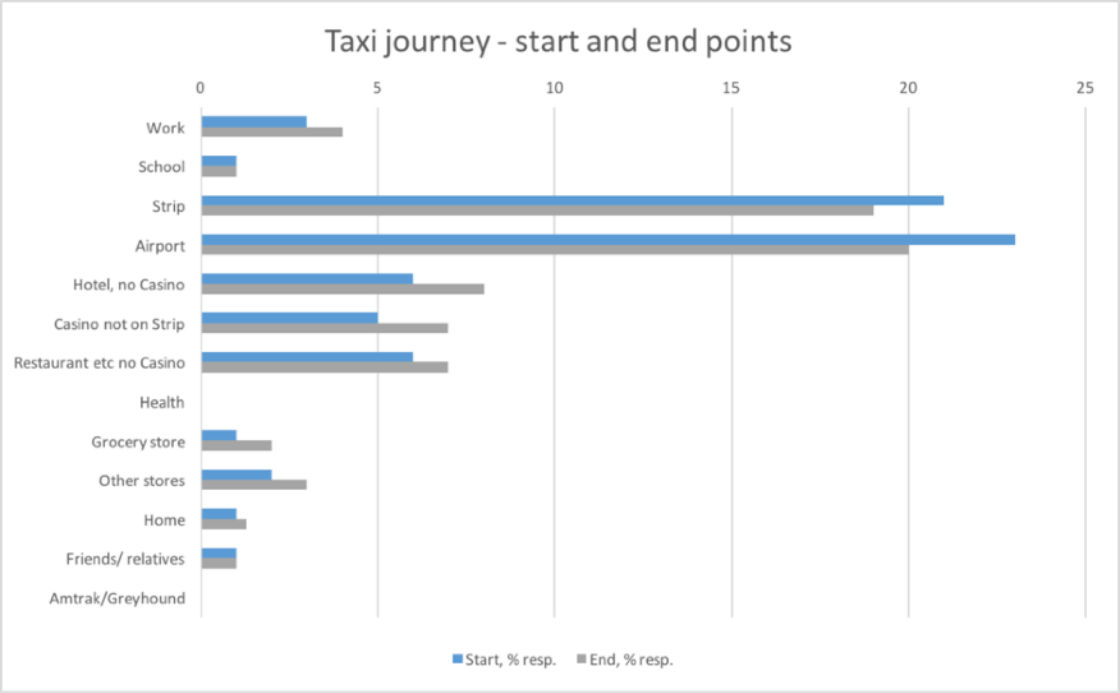
5.3 Trip Characteristics

The concept of trip purpose relates to the reason why a trip is made, whether for work, leisure, to access shopping, education etc. Trips can be individual or shared with others, and can be made as a single purpose or to serve a number of different events, such as going from home to a store and then on to work. The latter (trip chaining) is more associated with private vehicle use than with either taxi or transit. In undertaking our review we also felt it appropriate to identify trip characteristics, whether traveling to hotels on the strip, or away from it; whether traveling to/from entertainment venues within a casino or separate, as each of these may influence both the form of transport taken and the method of its engagement.

5.3.1 Taxi Trips

Taxi journeys were mainly used for traveling to and from the Strip or the Airport. Trips from the Strip accounting for 40% of all trips, although a slightly higher percentage is recorded in revealed trip data (see preceding sections). Between 8% and 5% of trips were made to hotels without casinos, casinos off the Strip, and restaurants and other entertainment facilities NOT located in casinos. Trips to and from work, home, school, shopping activities registered less than 7% of all trips made by taxis, see chart 2.

Chart 2 Taxi trip purpose by start and end points



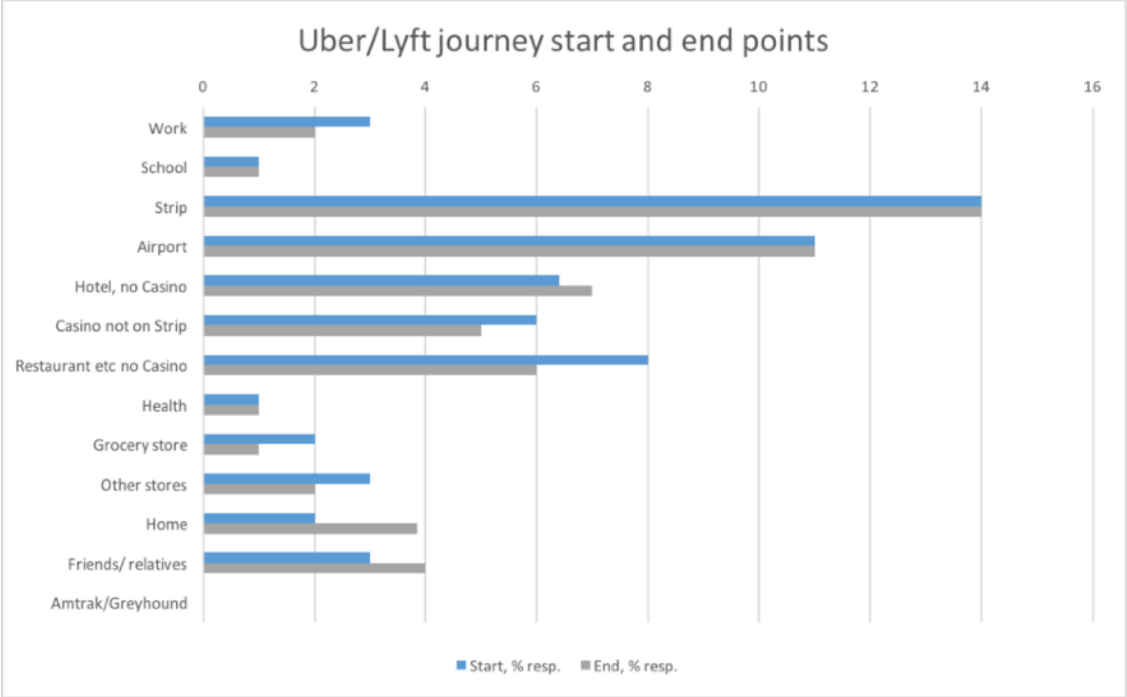
Source: Public Surveys

5.3.2 TNC Trips

Patterns associated with TNC trips (Uber/Lyft) were also identified to allow for contrast against trips made by taxi. Chart 4 sets out the same data for TNCs as collected for taxis based on trip origin and destination. TNC journeys appear concentrated on the Strip or the Airport in much the same way as seen for taxis, with a slightly higher concentration of TNC trips in hotel and off-strip casinos. Between 4% and 8% of TNC trips were made to hotels or entertainment venues not located in casinos, suggesting that TNC services may be preferred at these venues over taxis.

Trips to and from work, home, school, shopping activities registered less than 12% of all trips made by TNCs.

Chart 3 TNC trip purpose by start and end points

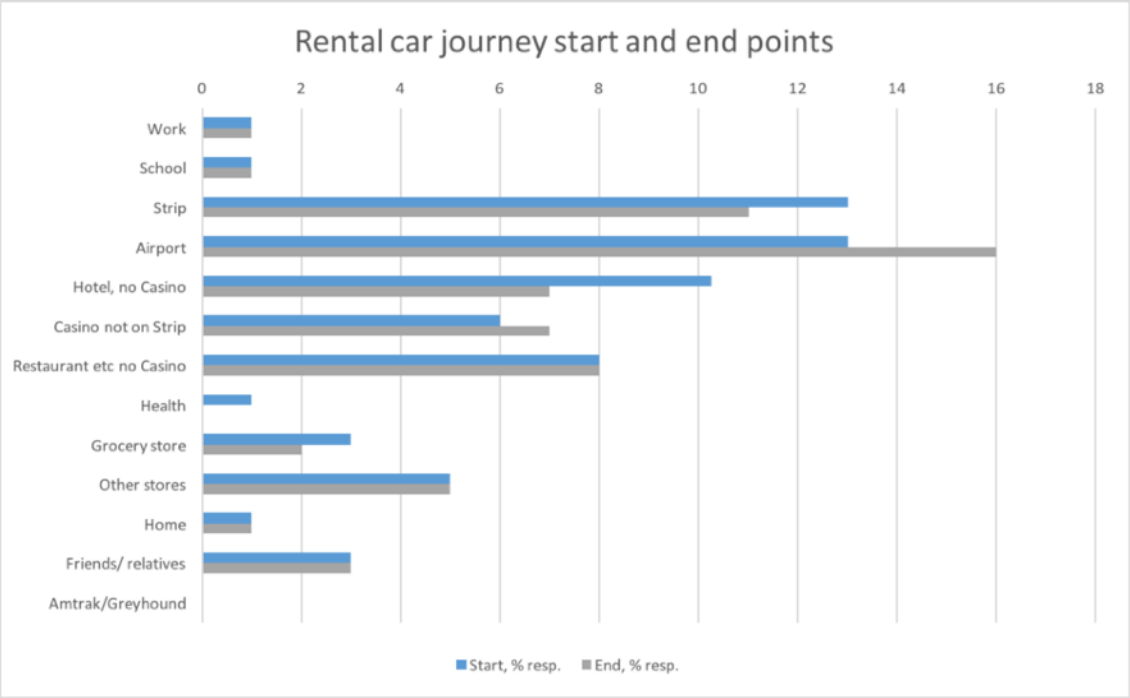


Source: Public Surveys

5.3.3 Car Trips

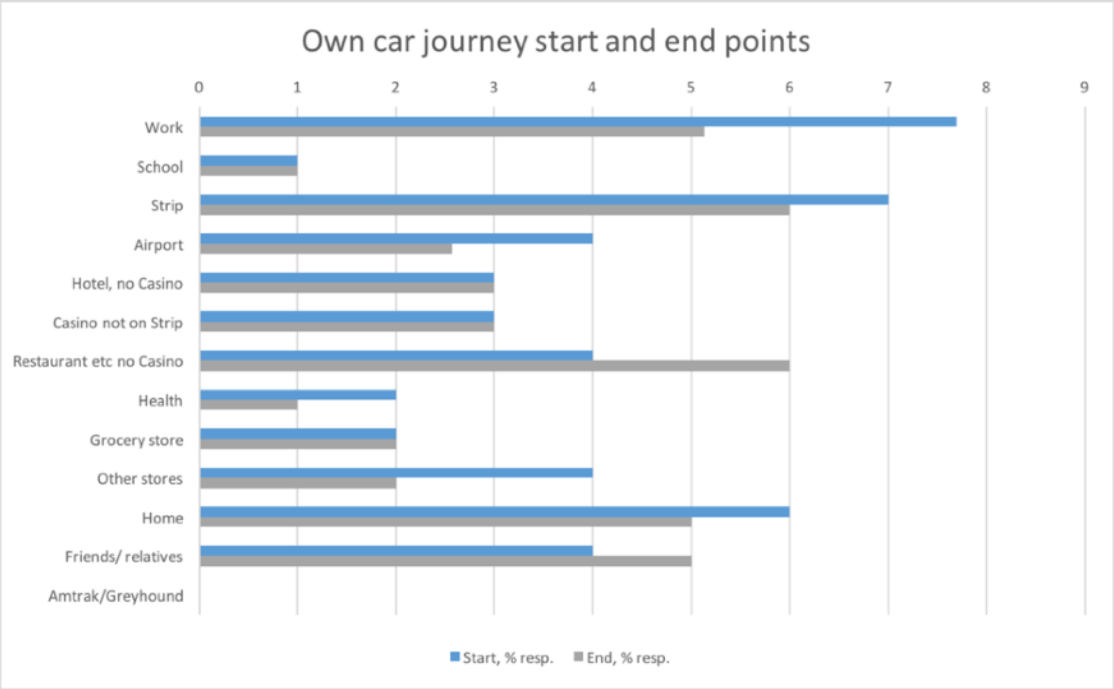
Car based options were also recorded, including rental car trips, chart 4, and trips made by private car, see chart 5.

Chart 4 Rental Car trip purpose by start and end points



Source: Public Surveys

Chart 5 Private Car trip purpose by start and end points



Source: Public Surveys

5.4 Trip Experience

The public survey also sought passenger experiences in terms of trip quality and likelihood to reuse a service.

Respondents were also asked to grade the quality of vehicle presentation, the service provided by the driver, and a willingness to use the service again. The response allowed for respondents to grade their experience from A-F where:

A. The vehicle was well presented / fully appropriate, the vehicle was clean and comfortable and the driver was appropriate, I would be happy to use this vehicle again,

B. The vehicle was functional, but was not completely clean and/or the driver's appearance could be better, I would be OK using this vehicle again,

C. The vehicle was poorly presented, was not clean and/or the driver's appearance was poor, I would hesitate to use this vehicle again,

D. The vehicle and/or driver were very poorly presented, I would not use the vehicle again, D

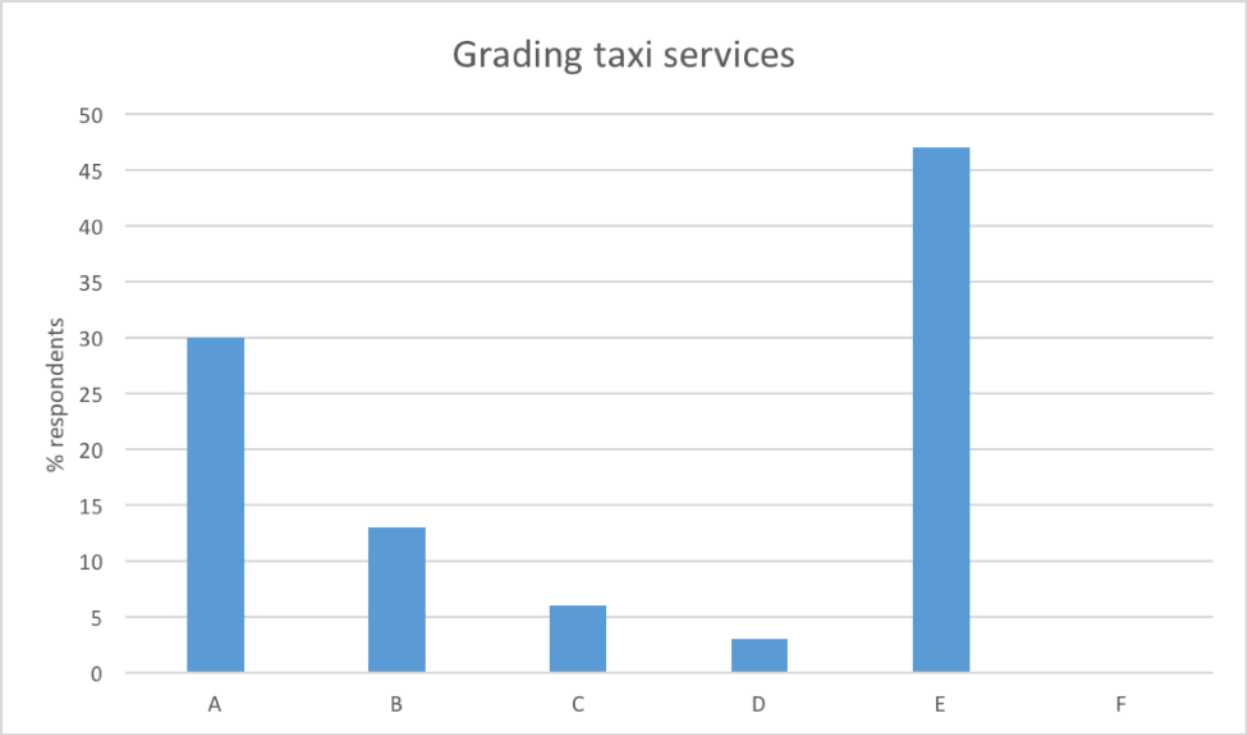
E. I have not used a taxi or do not wish to answer this question, E

F. If you had difficulty using the vehicle, or were unable to use it, please describe the circumstances

5.4.1 Service quality, Taxis

Chart 6 sets out the responses in response to trip experience using a taxi.The majority of taxi users were fully satisfied (column A) or had relatively minor criticisms (column B). No respondents reported difficulty using the vehicle (column F).

Chart 6 Respondent satisfaction with taxi services



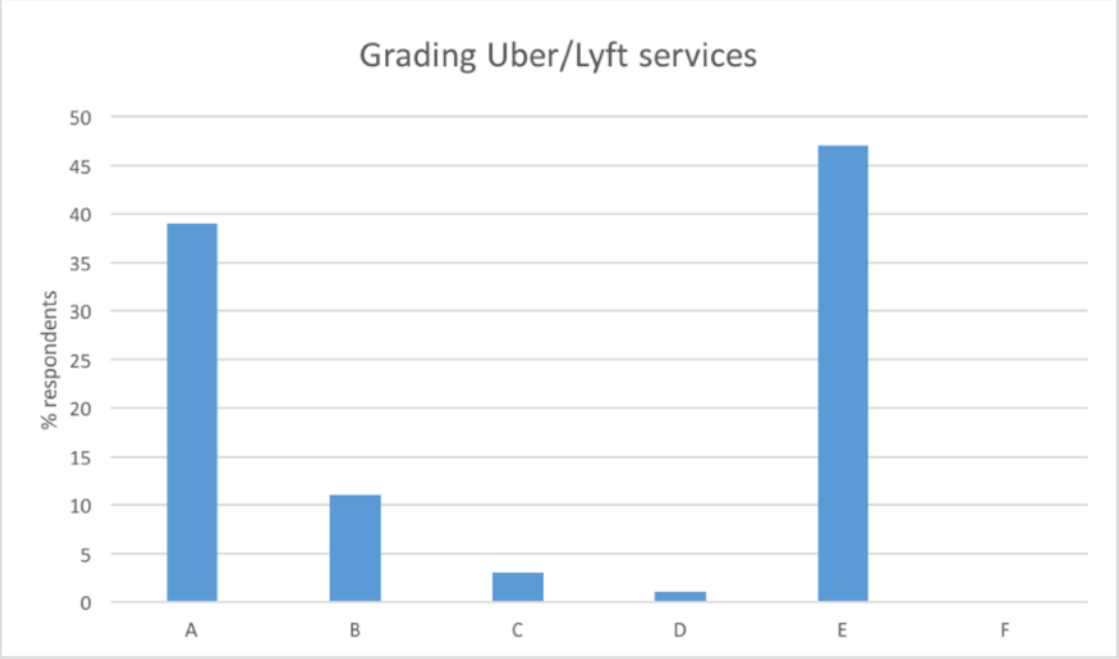
Source: Public Surveys

5.4.2 Service quality, TNC

Respondents were asked to grade the quality of TNC trip experiences in the same way as for taxis (described above).

Approximately 53% of respondents that used TNC services were either fully satisfied (column A) or expressed minor criticism of the service (column B), being a, marginally, better response than that associated with taxi use, see chart 7.

Chart 7 Respondent satisfaction with TNC services



Source: Public Surveys

5.5 Service response times

Perception of response times provides a further indication of the public view of service levels. Perceived, rather than actual, response times were considered the best indicator as it is likely to be the perception of waiting times that informs choice of mode[30].

Respondents were asked about their expectations and experience of the time lapse between booking a taxi or TNC vehicle and its arrival.

Chart 8 shows similar expectations for the time from booking to arrival for both taxis and TNC vehicles.

For both taxis and TNC vehicles approximately 90% of respondents felt the vehicle should arrive within 5 minutes of booking, see chart 8.

[30] Perceptions can contrast with actual service times, discussed in more detail below.

Chart 8 Desirable and reported waiting times, Taxi / TNC

Source: Public Surveys

The number of respondents stating a desirable waiting time of 5 minutes or less was slightly higher for taxis than for TNCs, effectively that expectations of taxi services were above those of TNCs, which lies in sharp contrast to reported expectations in other cities, where TNCs are often expected to deliver a prompter service than taxis[31]. Reported performance suggested that a slightly better service level was felt to be delivered by TNCs than that of taxis. In effect more was expected of taxis though a marginally worse service was felt to be delivered[32].

5.6 Barriers to use

A further element of the public survey was developed to identify the reasons why individuals chose NOT to use a particular service.

[31] See: Windsor, Ontario 2016; Houston 2014

[32] Reported service quality (that *felt* to be delivered) often falls below actual service quality (that *measured* as being delivered. Data was received from taxi companies illustrating a higher level of service than that perceived. No operational data was made available to the study from TNCs.

Respondents were provided with a series of options and asked to rate concerns from 1 – 5, as to why they did not take a taxi, a bus or use a TNC vehicle for their last trip in Clark County. The statements for rating were the same for each vehicle type, see below, and have been set out side by side for each question, from chart 9, below.

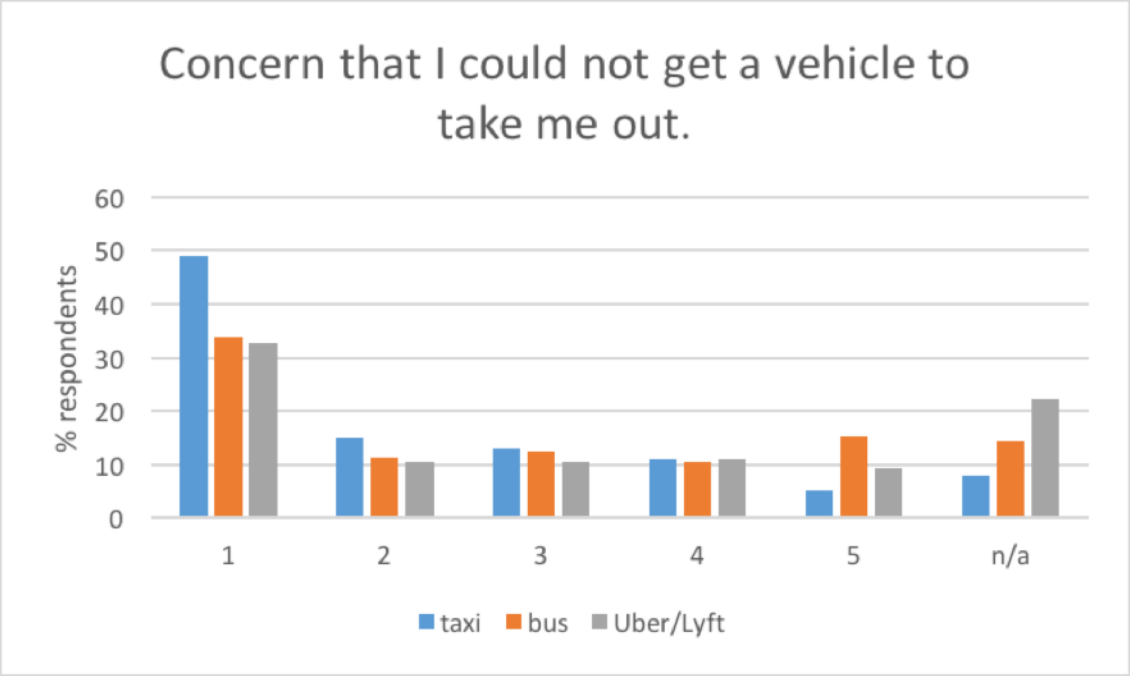
Question format:

> "Thinking about the last trip you could have but did not take a (vehicle type). Please rate the following statements against a score matrix (see below)
>
> Concern that I could not get a vehicle to take me out.
> Concern that I could not get a vehicle to bring me back.
> Concern that the vehicle would not be suitable to my needs.
> Concern that the driver would not be able to provide the service I need.
> Concern that I would have to wait a long time for a vehicle.
> Concern that the trip would cost too much.
> Concern about my safety.

Score Matrix:

1. Did not apply
2. Minor concern, did not prevent use
3. Concern, may occasionally prevent use
4. Strong concern, reduced my use
5. Serious concern, prevented my use

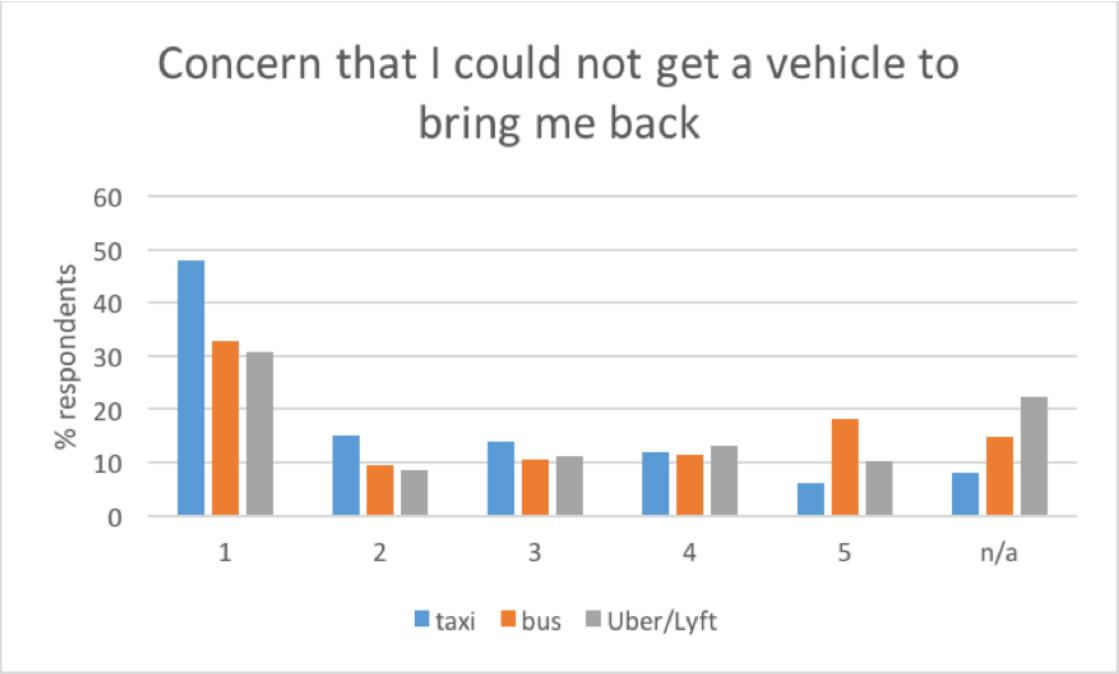
Chart 9 Comparative scores by mode: availability of vehicle for outbound trip



Source: Public Surveys

Most respondents felt questions about the availability of vehicles for outward bound trips did not prevent use and very few registered serious concern (score 5), with the highest lack of concern recorded for taxis. This suggests that nearly 50% of respondents did not consider this concern as a relevant reason for not taking a taxi. Relatively few respondents cited serious concerns for not taking a taxi.

Chart 10 Comparative scores by mode: availability of vehicle for return trip

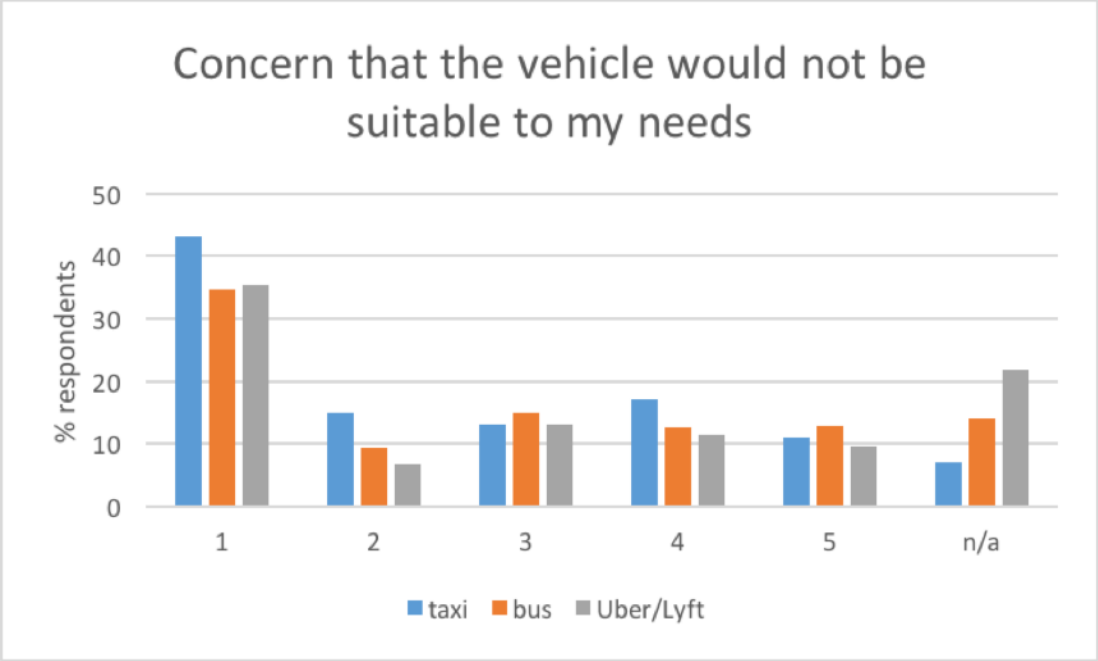


Source: Public Surveys

A similar trend is also seen when rating concerns about vehicle availability for the return journey, see chart 10, These trends possibly suggest that decisions not to use taxis are not based on concerns about their availability.

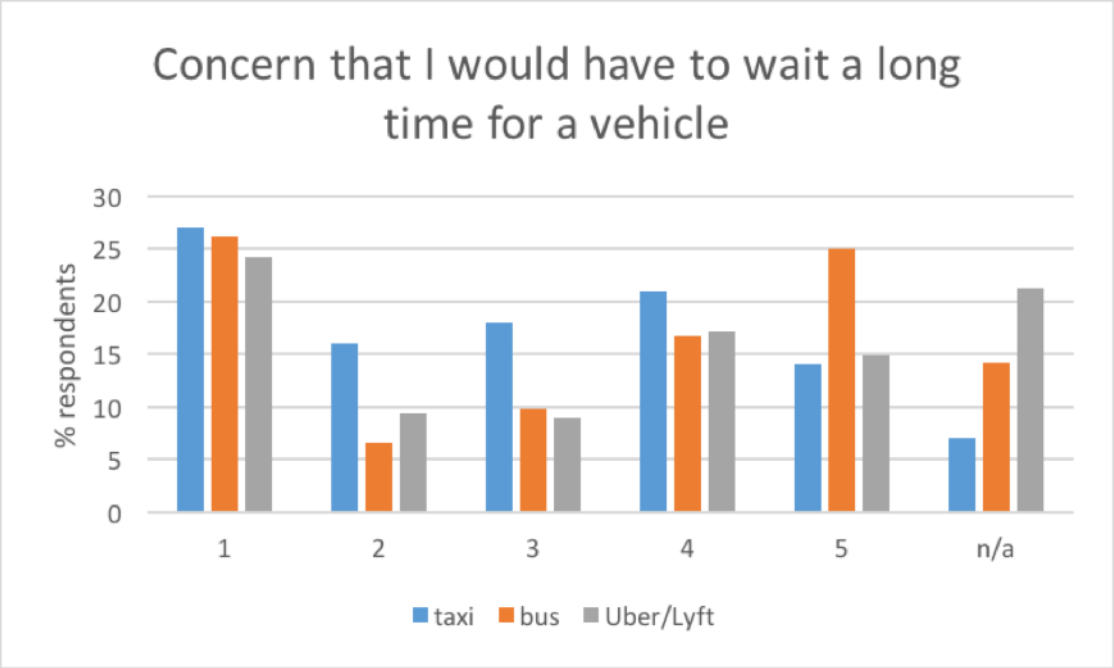
Suitability can also be cited as a reason for not traveling. Chart 11 illustrates responses to the question whether a vehicle would be suitable to the needs of the passenger. Although there is a slightly higher level of concerned passengers for this category, the actual response rate suggesting that a lack of suitable vehicles would prevent travel was lower than the preceding categories, see chart 11.

Chart 11 Comparative scores by mode: vehicle suitable to passenger needs



Source: Public Surveys

Chart 12 Comparative scores by mode: long wait times

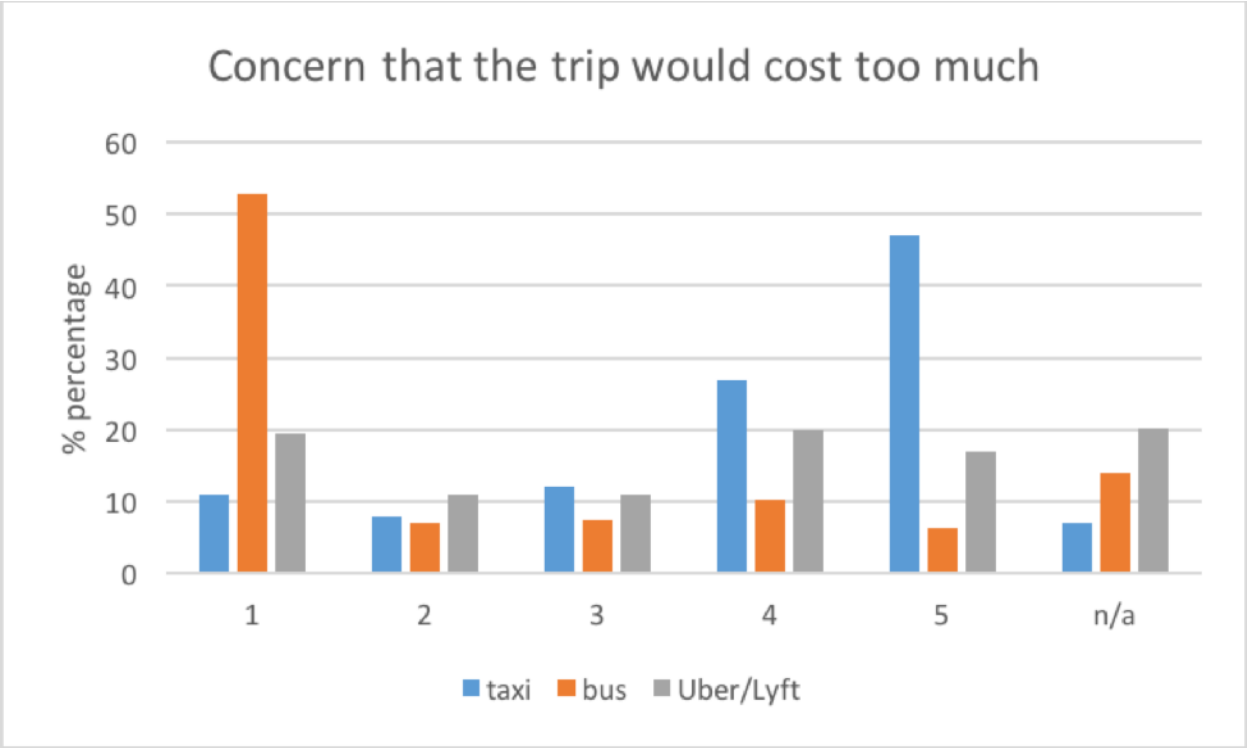


Source: Public Surveys

Concerns about a long wait for a vehicle appeared to be significant part of the decision not to use a certain vehicle type, see chart 12.

The public survey suggested trip cost to be a large factor against the use of individual modes, see chart 13. High trip costs, or an uncertainty over cost, was a significantly greater barrier to use of taxis that any other vehicle type. It is notable that the same concerns were expressed by TNC users, as observed in the gray bars increasing from left to right (values 2, 3 and 4), but this concern had a far lesser impact on preventing travel than the same response for taxi users.

Chart 13 Comparative scores by mode: trip cost



Source: Public Surveys

5.7 Public Response Comparison and Review

Survey responses in Clark County demonstrate distinct patterns in terms of public perceptions of transport mode choice. The patterns observed include trip purpose, origin and destination, which appear broadly similar between taxis and TNCs. A lower proportion of all TNC trips originate on the strip or at the airport compared with taxi services, with a slightly increased use from entertainment, casinos and hotels located away from the strip when compared to taxi trips, which may be indicative of an asynchronous use of service by type across the city, but is not of

sufficient magnitude to draw conclusion in relation to a 'preferred mode' or that one mode is more available than another.

More significant differences are observed for home based trips (those originating from or traveling to a private residence) or for trips to Visit Friends and Relations (VFR), which tend to be suburban trips. On balance it may be suggested that TNC services do provide a more local trip pattern while taxis tended to be more widely used in tourist areas, though the actual differences are small.

It was also noted that customer satisfaction patterns were relatively similar between taxis and TNCs. 70% of active users graded Uber or Lyft at highest level of satisfaction compared to 57% of active taxi users. Bus services were also included on the survey but did not receive a sufficiently high number of responses to be statistically reliable.

1.8% of active TNC users reported poor service experiences in Las Vegas that would prevent them using TNCs again, contrasted to 6% of taxi users.

Taxi users reported higher expectations of taxi service arrival times, but also reported a lower level of actual service provision.

Although responses appear more negative toward taxi services than TNCs, the grading given to taxis are noticeably higher than observed in a number of other cities[33]. A dichotomy arises between a strong taxi service developed in Clark County over time, and the impacts of new market entrants, TNCs, on the short term market equilibrium. This should not suggest that zero adaptations to new market conditions are necessary, but equally that benefits exist from the basic structures of the taxi market.

The most significant issue reported as a reason for not traveling by any mode was the cost of that mode, or uncertainty of the cost. Taxis scored significantly worse in relation to cost as a barrier to travel than TNCs, with a number of respondents highlighting cost uncertainty, lack of clarity or poor understanding of fares as an issue. Earlier versions of some TNC apps provided estimates of trip costs with some newer versions stating an exact trip cost ahead of travel. By comparison taxi fares are published on a basis of distance and time, requiring some knowledge of both to estimate fares in advance[34].

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[33] Source: TRP studies in Houston, Windsor and Washington DC

[34] Some taxi apps provide trip fare estimates.

6. Model application to Clark County

In our study we have sought to identify factors impacting on taxi use in Clark County, related to the taxi tariff, levels of supply and other factors influencing the taxi market. In section 3, above, we concluded that an equilibrium point had been achieved for taxi services operating alongside other forms of Vehicle for Hire. It was also concluded that there was no additional benefit to issuing new taxi medallions at the time of writing.

It was noted that some structural changes may result from the taxi market itself responding to its competitors, such as the commercial development of suburban services. This might also extend to centralized or shared booking platforms. In section 3.4 we set out a number of additional structural changes in which the authority has a role.

In section 4 it was also identified that changes in the numbers of trips would also impact on the income to the industry and its regulator which in turn would affect the costs reflected in the tariff table and impact of taxi fares.

In this section we set out a number of model runs defined as scenarios. The basic structure of each model run is consistent and based on parameters set out below. Each progressive scenario then considers impacts that would arise in a given situation, described in detail in subsequent sections.

I. Tariff reviews can result in any one of: an increase, a decrease or no change in taxi tariff.

II. That the tariff be updated on the basis of changes in the costs of production in the period from the previous update (baseline) to date (target). We would also anticipate that this review would normally take place once a year commencing 12 months from the application of this recommendation.

III. That the tariff be based on repeatable measurement of costs and changes thereto, as set out above.

IV. That the concept of fuel surcharges be retained but be applied only where the cost of fuel increases more than 20% above the cost measured at the time of the review, and that any surcharge be removed if and when the price of fuel falls to or below that in force at the time of the review. Fuel surcharges would automatically be removed from the tariff at the point of the next review as the measurement of fuel costs will be updated to the level prevalent at that time.

V. That the measurement of fuel price remain consistent between reviews using the same source in both baseline and target years, recommended to be PADD5-CA+LPG, except where otherwise shown.

VI. That fares set at the time of the review are defined as maximums that may be charged.

VII. That each review reset the baseline for the next review to the level measured as target whether a fare increase is applied or not.

Table 17 Scenario Overview

	Scenarios												
	1	**2**	**3a**	**3b**	**4a**	**4b**	**5a**	**5b**	**6**	**7a**	**7b**	**7c**	**8**
Cost Elements	9 elements	9 elements	10 elements	10 elements	10 elements	10 elements	10 elements	10 elements	9 elements	11 elements	11 elements	11 elements	12 elements
Fuel Cost	PADD5	PADD5-CA+LPG	PADD5	PADD5-CA+LPG	PADD5	PADD5-CA+LPG	PADD5	PADD5-CA+LPG	PADD5-CA+LPG	PADD5	PADD5-CA+LPG	PADD5-CA+LPG	PADD5-CA+LPG
Credit Card Fee	No change	No change	Removal	Removal	Removal	Removal	Removal	Removal	Removal	Removal	Removal	Removal	Removal
In vehicle equipment	N/A	N/A	Mitigation cost (High)	Mitigation cost (High)	Mitigation cost (Low)	Mitigation cost (Low)	Mitigation cost (Mid)	Mitigation cost (Mid)	N/A	Mitigation cost (Mid)	Mitigation cost (Mid)	N/A	Mitigation cost (Mid)
Payment processing fee	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Added to all trips at 2.36%	N/A	N/A	Added to all trips at 2.36%	N/A
Adjustment to authority revenue	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Added to cost model 0.0878%	Added to cost model 0.0878%	Added to cost model 0.0878%	Added to cost model 0.0878%
Marketing budget costs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Added to cost model 5%
Impact on fares	-4.14%	-2.08%	+2.08%	+4.01%	-2.28%	-0.25%	-0.07%	+1.91%	-2.08%	+0.02	+1.99%	-2%	+8.41%

6.1 Scenario 1 Do minimum

The do minimum scenario tests the market on the basis of minimum changes to its operation. The scenario acknowledges that market changes have occurred as a result of TNC operation, with these changes being integrated within the calculation on the basis of observed reductions in the numbers of trips being made, and change in revenue and costs as reported by taxi companies to the authority.

The concept of fuel cost surcharges are maintained in the scenario, but a change is made to the methods of its calculation, set out in the parameters above. The scenario proposes that fuel cost

surcharges be based on deviation from the cost of fuel measured in the baseline, and come into effect when the cost of fuel increases in excess of 20% of the baseline amount. The surcharge would be removed if and when the price returns to or below the baseline. The baseline resets at the point of each review to that measured on each subsequent review (new baseline / resetting the baseline).

The scenario maintains all other factors constant, allowing for the calculation of a base change in cost between the baseline (previous fare adjustment), and target (current) cost, see Table 18. As a result of this calculation it can be observed that the actual costs of production have dropped by 4.14%, with the largest change in the period related to the cost of fuel. It should be noted that this drop is not impacted by the change in fuel cost surcharge method.

Table 18 Scenario 1, Measured change - Cost of Production[35]

Item	PC weight in company returns target	Model Weighting	Percentage change Baseline - target	Effective change applied to total
Drivers Earnings	43.74%	63.7%	-0.53%	-0.34%
Fuel Costs	9.36%	13.64%	-32.02%	-4.37%
Vehicle Insurance	3.93%	5.73%	-14.45%	-0.83%
Vehicle cost / depreciation	3.25%	4.74%	6.27%	0.30%
Shop and Garage salaries	2.58%	3.76%	-0.30%	-0.01%
Rent or lease of buildings	2.28%	3.32%	20.38%	0.68%
Cost of Vehicle Maintenance	1.40%	2.04%	22.13%	0.45%
Dispatch Salaries	1.30%	1.89%	-1.25%	-0.02%
Medallion Costs	0.79%	1.15%	0.00%	0.00%
Totals	68.63%	100.00%		-4.14%

On the basis of the Do Minimum scenario a recommendation could be drawn that the taxi tariff (taxi fare) should be reduced by 4.14%.

[35] See table 9, above, for a description of weighting calculation

6.2 Scenario 2 PADD 5 - CA + LPG

The second scenario retains the same fundamental calculations as defined in the preceding scenario but adopts a new fuel formula based on the weighted use of PADD 5 minus CA plus weighted use of an LPG measure. LPG statistics are also related to the West Coast region, as defined by the US Department of Energy, but can not be subdivided further, see table 19.

Table 19 Scenario 2, Measured change - Cost of Production, revised fuel costs

Item	PC weight in company returns target	Model Weighting	Percentage change Baseline - target	Effective change applied to total
Drivers Earnings	43.74%	63.7%	-0.53%	-0.34%
Fuel Costs PADD 5 - CA Gasoline	4.76%	6.94%	-32.02%	-2.22%
Fuel Costs PADD 5 - CA + Propane	4.60%	6.70%	-1.34%	-0.09%
Vehicle Insurance	3.93%	5.73%	-14.45%	-0.83%
Vehicle cost / depreciation	3.25%	4.74%	6.27%	0.30%
Shop and Garage salaries	2.58%	3.76%	-0.30%	-0.01%
Rent or lease of buildings	2.28%	3.32%	20.38%	0.68%
Cost of Vehicle Maintenance	1.40%	2.04%	22.13%	0.45%
Dispatch Salaries	1.30%	1.89%	-1.25%	-0.02%
License Costs	0.79%	1.15%	0.00%	0.00%
Totals	68.63%	100.00%		-2.08%

The inclusion of all fuel costs, including propane, leads to a more subdued reduction in cost, mainly as a result of the relative stability of LPG costs over the time period. On the basis of the revised Do Minimum scenario a recommendation could be drawn that the taxi tariff (taxi fare) should be reduced by 2.08%.

6.3 Scenario 3a Credit Card Fee mitigation (high rate) PADD5

In the following scenarios (scenarios 3 - 6) we address the potential of removing or replacing the current fee associated with Credit Card use. The amount charged as a 'Credit Card Fee' in Las Vegas appear significantly higher than those charged in other cities, and is documented in the state audit as exceeding cost.

Although often overlooked, the actual costs of accepting payments of any type, including those made in cash, tend to be greater than the costs of merchants fees alone. This difference can relate to costs of in-vehicle equipment, in the case of credit and debit cards, generally a cost for all taxis; and the cost of cash handling including armored van services where large sums are involved.

In this scenario we assess the impacts of removing credit card fees altogether, and replacing these with a new cost category associated with in-vehicle equipment. In scenario 6 we look at alternatives to an 'in-vehicle equipment' cost. The move is cost neutral in terms of actual cost / loss but rather allocates the cost of equipment to a defined category. The move has the potential to provide a win-win, by removing what may be perceived as an excessively high charge and replacing it with a measurable cost element that directly mirrors the equipment required, and any update that may be required in the future, see Table 20.

Scenario 3a and 3b differ in terms of the treatment of fuel costs. 3a addresses fuel cost using PADD5; 3b using a modification to PADD 5 minus CA plus LPG. This pattern is repeated in scenarios 4a and 4b; 5a and 5b etc.

This scenario (3a) adds the following criteria to the test:

VIII. That the tariff existing at the time of this review be updated to remove reference to Credit Card fees, with the current costs internalized in the cost structure of the model

IX. That the cost of in-vehicle equipment, is incorporated as a cost of production, including PIMs capable and required for Credit Card acceptance

Table 20 Scenario 3a, Replacement of Credit Card fees (High Rate) PADD5

Item	PC weight in company returns target	Model Weighting	Percentage change Baseline - target	Effective change applied to total
Drivers Earnings	43.74%	59.9%	-0.53%	-0.32%
Fuel Costs	9.36%	12.82%	-32.02%	-4.11%

Item	PC weight in company returns target	Model Weighting	Percentage change Baseline - target	Effective change applied to total
Vehicle Insurance	3.93%	5.38%	-14.45%	-0.78%
Vehicle cost / depreciation	3.25%	4.45%	6.27%	0.28%
Shop and Garage salaries	2.58%	3.53%	-0.30%	-0.01%
Rent or lease of buildings	2.28%	3.12%	20.38%	0.64%
Cost of Vehicle Maintenance	1.40%	1.92%	22.13%	0.42%
Dispatch Salaries	1.30%	1.78%	-1.25%	-0.02%
Medallion Costs	0.79%	1.08%	0.00%	0.00%
In vehicle equipment (New category)	4.36%	5.97%		5.97%
Totals	72.99%	100.00%		2.08%

The removal of the credit card fee from the tariff table is achieved by internalizing the costs of in-vehicle equipment, which is appears as an additional category in the calculation, above. As a result of this change a tariff increase of 2.08% is measured.

6.4 Scenario 3b Credit Card Fee mitigation (high rate) PADD5-CA+LPG

Scenario 3b repeats the same calculation as applied in 3a, with an updated fuel calculation, described above

Table 21 Scenario 3b, Replacement of Credit Card fees (High Rate) PADD5-CA+LPG

Item	PC weight in company returns target	Model Weighting	Percentage change Baseline - target	Effective change applied to total
Drivers Earnings	43.74%	59.9%	-0.53%	-0.32%
Fuel Costs PADD 5 - CA Gasoline	4.76%	6.52%	-32.02%	-2.09%
Fuel Costs PADD 5 - CA + Propane	4.60%	6.30%	-1.34%	-0.08%
Vehicle Insurance	3.93%	5.38%	-14.45%	-0.78%

Item	PC weight in company returns target	Model Weighting	Percentage change Baseline - target	Effective change applied to total
Vehicle cost / depreciation	3.25%	4.45%	6.27%	0.28%
Shop and Garage salaries	2.58%	3.53%	-0.30%	-0.01%
Rent or lease of buildings	2.28%	3.12%	20.38%	0.64%
Cost of Vehicle Maintenance	1.40%	1.92%	22.13%	0.42%
Dispatch Salaries	1.30%	1.78%	-1.25%	-0.02%
Medallion Costs	0.79%	1.08%	0.00%	0.00%
In vehicle equipment (New category)	4.36%	5.97%		5.97%
Totals	72.99%	100.00%		4.01%

The removal of the credit card fee from the tariff table at high rate and the use of a revised fuel formula results in a measured increase in costs, see table 21, that suggest a tariff increase of 4.01% is appropriate.

6.5 Scenario 4a Credit Card Fees (low rate) PADD5

In section 2.1.1 we proposed that the impacts of a variety of differing mitigation rates be tested. In this section we adopt a low mitigation cost rate, reflecting the costs as correlated to the income from credit card fees measured in the 2013 taxi fare review. These are applied in table 22, below.

Table 22 Scenario 4a, Replacement of Credit Card fees (Low Rate) PADD5

Item	PC weight in company returns target	Model Weighting	Percentage change Baseline - target	Effective change applied to total
Drivers Earnings	43.74%	62.6%	-0.53%	-0.33%
Fuel Costs	9.36%	13.39%	-32.02%	-4.29%
Vehicle Insurance	3.93%	5.62%	-14.45%	-0.81%
Vehicle cost / depreciation	3.25%	4.65%	6.27%	0.29%
Shop and Garage salaries	2.58%	3.69%	-0.30%	-0.01%
Rent or lease of buildings	2.28%	3.26%	20.38%	0.66%
Cost of Vehicle Maintenance	1.40%	2.00%	22.13%	0.44%
Dispatch Salaries	1.30%	1.86%	-1.25%	-0.02%
Medallion Costs	0.79%	1.13%	0.00%	0.00%
In vehicle equipment (New category)	1.25%	1.79%		1.79%
Totals	69.88%	100.00%		-2.28%

The application of the low rate mitigation would result in a fare decrease of 2.28%, though this decrease may not fully account for the increases in merchant fee associated with a higher level of credit card use.

6.6 Scenario 4b Credit Card Fees (low rate) PADD5-CA+LPG

Table 23 illustrates the impact of scenario 4a with modified fuel calculation. The application of the low rate mitigation with modified fuel costs results in a fare decrease of 0.25%.

Table 23 Scenario 3, Replacement of Credit Card fees (Low Rate) PADD5-CA+LPG

Item	PC weight in company returns target	Model Weighting	Percentage change Baseline - target	Effective change applied to total
Drivers Earnings	43.74%	62.6%	-0.53%	-0.33%
Fuel Costs PADD 5 - CA Gasoline	4.76%	6.81%	-32.02%	-2.18%
Fuel Costs PADD 5 - CA + Propane	4.60%	6.58%	-1.34%	-0.09%
Vehicle Insurance	3.93%	5.62%	-14.45%	-0.81%
Vehicle cost / depreciation	3.25%	4.65%	6.27%	0.29%
Shop and Garage salaries	2.58%	3.69%	-0.30%	-0.01%
Rent or lease of buildings	2.28%	3.26%	20.38%	0.66%
Cost of Vehicle Maintenance	1.40%	2.00%	22.13%	0.44%
Dispatch Salaries	1.30%	1.86%	-1.25%	-0.02%
Medallion Costs	0.79%	1.13%	0.00%	0.00%
In vehicle equipment (New category)	1.25%	1.79%		1.79%
Totals	69.88%	100.00%		-0.25%

6.7 Scenario 5a Credit Card Fees (mid rate) PADD5

The mid range scenario is based on a mitigation cost developed from the 2013 credit card fee income with additional factors associated with vehicle number and numbers of transactions, see table 24.

Table 24 Scenario 5a, Replacement of Credit Card fees (Mid Rate) PADD5

Item	PC weight in company returns target	Model Weighting	Percentage change Baseline - target	Effective change applied to total
Drivers Earnings	43.74%	61.2%	-0.53%	-0.32%
Fuel Costs	9.36%	13.11%	-32.02%	-4.20%
Vehicle Insurance	3.93%	5.50%	-14.45%	-0.80%
Vehicle cost / depreciation	3.25%	4.55%	6.27%	0.29%
Shop and Garage salaries	2.58%	3.61%	-0.30%	-0.01%
Rent or lease of buildings	2.28%	3.19%	20.38%	0.65%
Cost of Vehicle Maintenance	1.40%	1.96%	22.13%	0.43%
Dispatch Salaries	1.30%	1.82%	-1.25%	-0.02%
Medallion Costs	0.79%	1.11%	0.00%	0.00%
In vehicle equipment (New category)	2.79%	3.91%		3.91%
Totals	71.42%	100.00%		-0.07%

The use of a mid-range mitigation rate results in a measured reduction in costs of 0.07%.

6.7 Scenario 5b Credit Card Fees (mid rate) PADD5-CA+LPG

Table 25 illustrates the cost changes where Credit Card fees are mitigated at a mid rate with the use of a revised fuel cost model.

Table 25 Scenario 5b, Replacement of Credit Card fees (Mid Rate) PADD5-CA+LPG

Item	PC weight in company returns target	Model Weighting	Percentage change Baseline - target	Effective change applied to total
Drivers Earnings	43.74%	61.2%	-0.53%	-0.32%
Fuel Costs PADD 5 - CA Gasoline	4.76%	6.66%	-32.02%	-2.13%
Fuel Costs PADD 5 - CA + Propane	4.60%	6.44%	-1.34%	-0.09%
Vehicle Insurance	3.93%	5.50%	-14.45%	-0.80%
Vehicle cost / depreciation	3.25%	4.55%	6.27%	0.29%
Shop and Garage salaries	2.58%	3.61%	-0.30%	-0.01%
Rent or lease of buildings	2.28%	3.19%	20.38%	0.65%
Cost of Vehicle Maintenance	1.40%	1.96%	22.13%	0.43%
Dispatch Salaries	1.30%	1.82%	-1.25%	-0.02%
Medallion Costs	0.79%	1.11%	0.00%	0.00%
In vehicle equipment (New category)	2.79%	3.91%		3.91%
Totals	71.42%	100.00%		1.91%

The use of a mid-range mitigation rate results in a measured increase in costs of 1.91%.

6.8 Scenario 6 Modified fuel PADD5-CA+LPG alternative payment costs fee

Scenario 6 adopts a differing approach to the removal of credit card fees. The scenario maintains the objective to remove the credit card fee from the tariff, but tests the impacts of replacing the existing fee (flat rate of $3 per credit / debit card transaction), with a Payment processing fee applied as a percentage of fare to all trips. For the purpose of this calculation we

have maintained the revised fuel cost calculation which applies PADD5 minus CA, with an additional cost for Propane use.

The resulting calculation has two parts, the calculation of costs without credit card equipment (table 26), and the separate calculation of the payment processing fee, see table 27.

Table 26 Scenario 6, Removal of Credit Card Processing

Item	PC weight in company returns target	Model Weighting	Percentage change Baseline - target	Effective change applied to total
Drivers Earnings	43.74%	63.7%	-0.53%	-0.34%
Fuel Costs PADD 5 - CA Gasoline	4.76%	6.94%	-32.02%	-2.22%
Fuel Costs PADD 5 - CA + Propane	4.60%	6.70%	-1.34%	-0.09%
Vehicle Insurance	3.93%	5.73%	-14.45%	-0.83%
Vehicle cost / depreciation	3.25%	4.74%	6.27%	0.30%
Shop and Garage salaries	2.58%	3.76%	-0.30%	-0.01%
Rent or lease of buildings	2.28%	3.32%	20.38%	0.68%
Cost of Vehicle Maintenance	1.40%	2.04%	22.13%	0.45%
Dispatch Salaries	1.30%	1.89%	-1.25%	-0.02%
Medallion Costs	0.79%	1.15%	0.00%	0.00%
Totals	68.63%	100.00%		-2.08%

Table 27 Scenario 6, calculation of payment processing fee

	Income	Cost	Percentage
Gross Fare Revenue	$410,902,249.00		
CC Processing Cost estimate		$9,693,864.00	
CC Cost estimate as percentage of y			2.36%
Cash Processing Cost estimate		$0.00	
Cash Cost estimate as percentage of y			0.00%
Total Payment Processing Fee			2.36%

Cost source: Company returns 2015

Notes: Processing cost based on mid rage estimate, see section

Using the 2013 credit card fee income level of $4,877,521, being $2,023 per vehicle, multiplied by the current numbers of vehicles arrives at an amount of $7,144,252.75, though this number does not reflect an increase in the number of credit cards, which has the impact of increasing the merchant fee elements as a percentage of all costs and potentially having some impact on other costs such as transmission, chargeback and maintenance.

This is complicated by differing reporting methodologies between companies, which suggest a total cost of $9,693,864 based on an estimate of the number of credit card transactions at around 5.5 million trips where card was used as payment[36].

As cash handling costs are currently not identified as a separate cost to the company[37], these are shown as zero in the calculation.

The adoption of the alternative fee based system for all payment transactions results in a base fare reduction of 2.08%. This would be immediately lost to the additional fee spread across all trips of 2.36%, resulting in an effective increase in rates paid by all passengers.

6.9 Scenario 7a - Authority Revenues, mid mitigation, PADD5

In the following section we test an additional range of scenarios addressing changes in authority revenue that follow from changes in the market. It can also be used to account for changes within the authority, such as changes in staffing, on the costs passed on to the trade through fees charged and included in the Taxi Cost Model.

As in previous sections the model includes a number of alternatives (7a, 7b, and 7c) which address differing options being:

7a - Authority revenue calculation with Mid range CC Mitigation using PADD5
7b - Authority revenue calculation with Mid range CC Mitigation using PADD5-CA+LPG
7c - Authority revenue calculation using PADD5-CA+LPG plus alternative Payment processing fee

In this scenario (7a) we calculate the impact of a reduction in the number of trips as these are likely to impact on the revenue received by the authority. The calculation illustrates the amount by which the tariff need change to ensure a zero cost gain, effectively the point at which the

[36] Differences exist in the reporting of credit card fees

[37] The cost of handling cash payments are currently not listed as a separate item, and are covered within the company financial reports under existing staff categories.

authority budget is covered, and that additional costs experienced by the taxi trade are included in the tariff maximum.

The scenario adds the following criteria to the test:

X. That authority revenues directly associated with trip number and fleet size are included in the assessment of taxi tariff

XI. That the authority budget retains a zero cost gain in which changes do not impact negatively on the revenue of the authority.

Table 28 Scenario 7a - Maintaining authority revenue PADD5[38]

Item	PC weight in company returns target	Model Weighting	Percentage change Baseline - target	Effective change applied to total
Drivers Earnings	43.74%	61.2%	-0.53%	-0.32%
Fuel Costs	9.36%	13.11%	-32.02%	-4.20%
Vehicle Insurance	3.93%	5.50%	-14.45%	-0.80%
Vehicle cost / depreciation	3.25%	4.55%	6.27%	0.29%
Shop and Garage salaries	2.58%	3.61%	-0.30%	-0.01%
Rent or lease of buildings	2.28%	3.19%	20.38%	0.65%
Cost of Vehicle Maintenance	1.40%	1.96%	22.13%	0.43%
Dispatch Salaries	1.30%	1.82%	-1.25%	-0.02%
Medallion Costs	0.79%	1.11%	0.00%	0.00%
In vehicle equipment (New category)	2.79%	3.91%		3.91%
Increase to offset loss in authority revenue				0.0878%
Totals	71.42%	100.00%		0.02%

Table 28 demonstrates that the combination of the change in costs set out in scenarios 1 and 2, together with the inclusion of costs associated with maintaining authority budgets,

[38] See Table 9, above, for a description of weight calculation

results in a negligible increase in the costs of operation over the period since the last taxi fare increase (baseline), and the current review (target).In order to maintain a tariff in line with the change in costs of operation, it can be concluded that an increase of 0.02% is calculated, though it is unlikely that this would translate in to a meaningful change in fares.

6.10 Scenario 7b - Authority Revenues, mid mitigation, PADD5-CA+LPG

Table 29 illustrates the impact of using the revised fuel cost model applied to the authority revenues model developed above.

Table 29 Scenario 7b - Maintaining authority revenue PADD5-CA+LPG

Item	PC weight in company returns target	Model Weighting	Percentage change Baseline - target	Effective change applied to total
Drivers Earnings	43.74%	61.2%	-0.53%	-0.32%
Fuel Costs PADD 5 - CA Gasoline	4.76%	6.66%	-32.02%	-2.13%
Fuel Costs PADD 5 - CA + Propane	4.60%	6.44%	-1.34%	-0.09%
Vehicle Insurance	3.93%	5.50%	-14.45%	-0.80%
Vehicle cost / depreciation	3.25%	4.55%	6.27%	0.29%
Shop and Garage salaries	2.58%	3.61%	-0.30%	-0.01%
Rent or lease of buildings	2.28%	3.19%	20.38%	0.65%
Cost of Vehicle Maintenance	1.40%	1.96%	22.13%	0.43%
Dispatch Salaries	1.30%	1.82%	-1.25%	-0.02%
Medallion Costs	0.79%	1.11%	0.00%	0.00%
In vehicle equipment (New category)	2.79%	3.91%		3.91%
Increase to offset loss in authority revenue				0.0878%
Totals	71.42%	100.00%		1.99%

Scenario 7b suggests an increase in costs that result in a fare increase of 1.99%

6.11 Scenario 7c - Authority Revenues PADD5-CA+LPG, alternative payment

Tables 30 and 31 illustrate the impact of using the revised fuel cost model applied to the authority revenues model developed above with the addition of a revised payment processing fee.

Table 30 Scenario 7c - Maintaining authority revenue PADD5-CA+LPG alternative payment processing fee

Item	PC weight in company returns target	Model Weighting	Percentage change Baseline - target	Effective change applied to total
Drivers Earnings	43.74%	63.7%	-0.53%	-0.34%
Fuel Costs PADD 5 - CA Gasoline	4.76%	6.94%	-32.02%	-2.22%
Fuel Costs PADD 5 - CA + Propane	4.60%	6.70%	-1.34%	-0.09%
Vehicle Insurance	3.93%	5.73%	-14.45%	-0.83%
Vehicle cost / depreciation	3.25%	4.74%	6.27%	0.30%
Shop and Garage salaries	2.58%	3.76%	-0.30%	-0.01%
Rent or lease of buildings	2.28%	3.32%	20.38%	0.68%
Cost of Vehicle Maintenance	1.40%	2.04%	22.13%	0.45%
Dispatch Salaries	1.30%	1.89%	-1.25%	-0.02%
Medallion Costs	0.79%	1.15%	0.00%	0.00%
Increase to offset loss in authority revenue				0.0878%
Totals	68.63%	100.00%		-2.00%

Table 31 Scenario 7c, calculation of payment processing fee

	Income	Cost	Percentage
Gross Fare Revenue	$410,902,249.00		
CC Processing Cost estimate		$9,693,864.00	
CC Cost estimate as percentage of y			2.36%
Cash Processing Cost estimate		$0.00	

	Income	Cost	Percentage
Cash Cost estimate as percentage of y			0.00%
Total Payment Processing Fee			2.36%

Notes: Payment processing costs as per scenario 6

Scenario 7c suggests an increase in costs that result in a fare decrease of 2%, though this would be offset by an additional fee of 2.36% per transaction.

6.12 Scenario 8 - Authority Revenues PADD5-CA+LPG mitigation + marketing

A further scenario was developed adding an additional cost associated with marketing. Effectively providing an opportunity to develop an advertising and marketing budget of 5% of total costs supported by the income created from fares. Table 32 illustrates the impact of applying a 5% additional cost using the factors already identified including a fuel cost based on PADD5-CA+LPG, removal of credit card fees based on mid-rate mitigation and the inclusion of authority cost factors.

Table 32 Scenario 8 - Addition of a marketing budget cost

Item	PC weight in company returns target	Model Weighting	Percentage change Baseline - target	Effective change applied to total
Drivers Earnings	43.74%	57.2%	-0.53%	-0.30%
Fuel Costs PADD 5 - CA Gasoline	4.76%	6.23%	-32.02%	-1.99%
Fuel Costs PADD 5 - CA + Propane	4.60%	6.02%	-1.34%	-0.08%
Vehicle Insurance	3.93%	5.14%	-14.45%	-0.74%
Vehicle cost / depreciation	3.25%	4.25%	6.27%	0.27%
Shop and Garage salaries	2.58%	3.38%	-0.30%	-0.01%
Rent or lease of buildings	2.28%	2.98%	20.38%	0.61%
Cost of Vehicle Maintenance	1.40%	1.83%	22.13%	0.41%
Dispatch Salaries	1.30%	1.70%	-1.25%	-0.02%
Medallion Costs	0.79%	1.03%	0.00%	0.00%

Item	PC weight in company returns target	Model Weighting	Percentage change Baseline - target	Effective change applied to total
In vehicle equipment (New category)	2.79%	3.65%		3.65%
Marketing budget cost (New category)	5.00%	6.54%		6.54%
Increase to offset loss in authority revenue				0.0878%
Totals	76.42%	100.00%		8.41%

As the development of a marketing budget represents a new cost not previously included in the calculations it results in a relatively high increase in tariff, of 8.41% This may be felt to be in excess of a rate that is desirable and is likely to have impacts on the numbers of trips made by price sensitive passengers above the rate of increased use that the advertising may encourage.

It is not, therefore, a scenario that is recommended for direct application. It may be reasonable, however, to propose a longer term approach to marketing development, wither as a graduated cost introduced over time, or as a commercially led initiative addressed by the companies themselves in line with measured increases in customers that may result from effective marketing.

7. Transfer to Tariff / Taxi Fares

In the preceding sections we have set out a method by which a change in the total cost of providing taxi services may be calculated. The measured change is expressed as a percentage in inclusive costs from a baseline to a target year, with the exception of scenarios in which an alternative payment processing fee is proposed, see below.

We have used a consistent modeling process to test the impacts of a range of scenarios, described in detail in section 6, above. While it is noted that a number of options exist we recommend that taxi fares be updated in line with Scenario 7b, which allows that fares be defined as maximum amounts; that in-vehicle equipment and credit card merchant fees be treated as a cost element; and that fees to the authority be included and updated. Alternative approaches may also be appropriate for consideration, and are set out in section 7.5, below.

Further modifications are also recommended for future analysis, including a change to the processes by which fuel surcharges are applied, set out in the conclusion, below.

The resulting calculation of costs (detailed in scenario 7b) indicates that there has been **an increase in the production costs for Clark County taxi services of 1.99%.** In this section we set out our recommended method of applying changes in cost to the tariff.

7.1 Approaches to tariff application

It is reasonable to suggest that measured change in costs, defined in preceding sections, be recovered from changes to the taxi tariff, increasing the amount of income produced through farebox[39] in proportion to the change in costs measured.

It is worth noting, however, that an increase may impact some elements of the tariff disproportionately and have a greater impact to some trips and some user groups than others. This is particularly noted in the case of Initial charges (drop) and credit card fees which represent a far higher proportion of the fare charged for shorter journeys, compared with longer ones, see table 2, section 1.2. Any increase to the initial charge would also be likely to impact disproportionately on shorter trips.

[39] Farebox revenue refers to revenue collected in vehicle, via an app or stored credit card, or by voucher or similar payment, for trips made. The term originates from the use of a cash box for holding monies accepted (the physical farebox).

7.2 Transfer of cost to tariff

In light of the observation of a disproportionate effect it is our conclusion that increases to fares be applied through the two primary elements, time and distance charges. We recommend that the flag drop be altered only in the instance of a decrease in costs, as is the case in this analysis. In instances where fares increase we recommend that this be applied through time and distance alone.

7.3 Removal of Credit Card Fees

It is our conclusion that the current fee for use of a credit or debit card is disproportionate to the actual costs associated. It is accepted that there is a cost associated with the provision of in-vehicle equipment, which is used, in part, for credit card acceptance, but this also may not justify the amount of the current fee. It is also noted that costs associated with the handling of cash payments are not currently included as an element in the calculation of fare.

It is our recommendation that credit card fees be removed completely from the Clark County taxi tariff, with the measured costs to the industry included in the base fare.

7.4 Proposed Taxi Fares, Clark County

As a result of the application of a 1.99% increase in tariff the following fare table is proposed for the period from November 2016 - November 2017, or earliest point possible thereafter.

Table 33 Proposed Taxi Tariffs, Clark County

Nevada Taxicab Authority		
FLAG	**Initial Activation of taximeter**	$3.50
DISTANCE	**Each additional 1/14 mile**	$0.20
TIME	**Waiting Time per hour**	$33.04
EXTRAS	**McCarran property pick up charge**	$2.00
~~**FEES**~~	~~**Credit / Debit card fee**~~	Removed
TAX	**Tax applied to total fare**	3%

Notes: Figures are rounded to nearest 1¢.

7.5 Alternative Taxi Fares, using Payment Processing Fee concept

In the preceding sections we set out the impact of a change based on mitigation costs of equipment being included in the cost calculation. In this section we set out the impact on fare of a Payment Processing Fee applied as a percentage to the tariff, as set out in scenario 7c.

Table 34 Taxi Tariffs, Clark County with Payment Processing Fee

Nevada Taxicab Authority		
FLAG	**Initial Activation of taximeter**	$3.50
DISTANCE	**Each additional 1/10 mile**	$0.27
TIME	**Waiting Time per hour**	$31.75
EXTRAS	**McCarran property pick up charge**	$2.00
~~**FEES**~~	~~**Credit / Debit card fee**~~	Removed
FEES	**Payment Processing Fee**	2.36%
TAX	**Tax applied to total fare**	3%

Notes: Figures are rounded to nearest 1¢.

8. Conclusions

In undertaking this analysis we have identified the primary costs associated with the operation of taxi services in Clark County, Nevada. The study identifies methods by which such costs can be measured and applied to the taxi fare (taxi tariff). The study also draws conclusions as to the most effective methods of transferring measured changes to tariff.

On the basis of analysis that includes updates to the measurement of costs, particularly the inclusion of propane as a fuel cost measure (LPG), use of PADD5 minus CA plus LPG, and the mitigation of equipment cost, it is our conclusion that the total costs of operating a taxi have risen by 1.99%.

The issue of credit card fees was considered in detail, see subsequent sections, as were a number of methods of addressing the actual level of cost experienced by the industry in payment processing and these are set out below.

8.1 Tariff review and frequency of analysis

The study proposes a taxi market model as the basis for this and future reviews of taxi fare. We recommend that such reviews are undertaken regularly, and identify key benefits of undertaking the analysis at 12 month intervals on the anniversary of the previous review.

We recommend that the costs calculated as target values in one review become the baseline for the next review, effectively resetting baseline values following each review. We recommend that baseline values are reset whether a change in taxi fare is implemented or not.

8.2 Scenarios / Scenario building

Our initial recommendations are based on the incorporation of three elements: changes in production costs; internalization of the credit card fee, see section 7.4; and the measurement of authority revenue costs, set out in the scenarios described in section 6.

We recommend that the inclusion of these elements remain consistent between this review and the next, but encourage the development of additional scenarios that reflect any additional changes that may occur between reviews.

8.3 Fuel Surcharges

The team recognize that there is a role for fuel price surcharges in providing a short term response to temporary increases in the cost of fuel. The surcharge should be of limited duration, however, and respond to specific circumstances that will change over time. We also feel that the fuel surcharge should not become a replacement for or surrogate to the operation of a full tariff review of the type set out in this report.

It is our conclusion, therefore, that fuel surcharges be related to variation in the price of fuel measured against the level recorded at the time of each review (as a baseline for fuel cost changes). We also recommend that any ongoing fuel surcharge be removed at the point of a new review as this cost element will automatically be fully covered in the review itself. We conclude that a fuel surcharge should be applied only in the following circumstances:

- That the fuel price surcharge be applied where the cost of fuel increases to a price at or above 20% of the rate measured at the time of the last review for a continuous period of 28 calendar days,
- That the amount of fuel price surcharge remain at the rate currently applied, subject to the above threshold,
- That the fuel price surcharge is removed where the cost of fuel falls to a level at or below the rate measured at the time of the last review for a period of 28 calendar days,
- That the cost of fuel be measured according to the weighted PADD-5-CA+LPG measured fuel cost index
- That no new fuel price surcharge be applied where a taxi fare review is underway or likely to be initiated within a period of 28 calendar days

8.4 Credit Card Fee

The issue of the current fee associated with credit cards has been brought up in a number of reviews of the industry, including state audit of the Taxicab Authority.

Credit Card fees are included as an extra for a number of goods and services, and are largely presented as a method of offsetting the additional costs of accepting credit and debit cards when compared to cash. A visible example of this relates to higher prices charged for gasoline when paying by card at some filling stations. A number of arguments exists in relation to the charge which the study has considered, including the actual costs of equipment in a mobile environment may be higher than in other industries. This said, in-vehicle equipment is a cost that may be better demonstrated as a stand-alone cost in its own right. It is also noted that the level of the credit card fee currently charged is significantly above the actual costs of merchant

processing where the cost of in-vehicle equipment is discounted. The team also recognizes that cash handling has a cost, and additional risks that payment by cards do not face.

It is our recommendation that the credit card fee be removed from the Clark County taxi tariff. In drawing this conclusion we recommend the authority accommodate the costs of payment processing either as an additional cost element associated with in-vehicle equipment (the move from current income to operational cost), or the adoption of an additional fee for all payment processing as part of the tariff.

The move from 'current income' to 'operational cost' results in a zero sum gain to the industry, and directly allies any future change in the requirement for updated equipment to the level of the tariff. This would more closely link the costs required by authority policies on in-vehicle equipment to the amount of income received by the industry.

The alternative is based on the creation of a differing fee, using a percentage of all trips. While the study team recommend the use of the initial approach, the creation of an in-vehicle equipment cost category; we also recognize that both approaches have merit, and have provided calculations in respect of each.

8.5 Fare Variation / App based bookings

In the final section we recommended a number of changes in the way that the taxi tariff be updated and applied. It is our conclusion that price competition may be reduced or prevented, in some instances, by an inability of a taxi company to compete on price. this does not reduce the importance of a meter of the public to be protected against overcharging, but may be better served where the fare is defined as a maximum. We therefore recommend that current regulations be updated to allow for price competition below a defined maximum. This does not change a 'metered fare' but would allow a company to offer discounts to that fare, in circumstances where t is felt in the commercial interest of the company to do so.

A similar argument exists in relation to apps providing booking to taxis, but extends to include market visibility and flexibility, discussed below.

The ability to book vehicle for hire services via an app was considered a major benefit by some respondent populations. Some apps, particularly those providing bookings to taxis , but taxi were felt to be uncompetitive, however; or simply not used by a significant proportion of app users.

In order to provide a more responsive environment we recommend that "app based bookings" be permitted a more flexible approach to fares than traditional hailed or ranking taxis.

It is our recommendation that taxi trips accepted via app be able to:

- Charge a market rate fare that is not limited to fare levels included in the tariff table. Effectively that taxi app bookings be able to compete on price and able to increase or decrease fare as felt to be appropriate, but only where such fares and the basis of their calculation be made known to the passenger prior to travel,
- Retain credit card details as ‘stored credit cards’ subject to current state of the art security processes including the use of EMV verification when this functionality is available in the wider taxi market
- Charge a cancelation fee for trips booked but not made, charged directly to a customer’s credit card provided sufficient notice of this charge be provided to customers making, or registering to make, app bookings

8.6 Taxi Tariff as a maximum

In line with the previous section, we conclude that taxi tariffs serve to protect the public from overcharging, particularly at times and in circumstances where few or no alternatives are available, such as may occur in the hailed market. This provides a justifiable basis for fares as maxima, but should not preclude the opportunities for price competition in more competitive market segments, or indeed in the hailed market where a taxi company may wish to compete on price.

We therefore recommend that all taxi companies be allowed to compete on price below the defined tariff where the company feels that this would be in their competitive interest.