BEFORE THE DUNEDIN CITY COUNCIL

IN THE MATTER OF of the Resource Management Act 1991

AND

IN THE MATTER OF A Notice of Requirement by the Otago Regional Council for a designation pursuant to section 168 of the Act in relation to a Central City Bus Hub (DCC Notice of Requirement: DIS-2017-1)

STATEMENT OF EVIDENCE BY DOUGLAS WEIR ON BEHALF OF THE OTAGO REGIONAL COUNCIL

6 OCTOBER 2017

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1. INTRODUCTION

QUALIFICATIONS AND EXPERIENCE

1.1 My name is Douglas Alexander Weir. I hold a Bachelor of Commerce (Transport and Logistics) degree from Lincoln University, obtained in 2004, a New Zealand Certificate in Engineering (Civil) from the Central Institute of Technology, obtained in 1989, and am a Chartered Member of the Chartered Institute of Logistics and Transport. I am a public transport policy and planning specialist, and hold the position of Sector Leader Public Transport with the firm TDG (Traffic Design Group Limited), a specialist transportation engineering consultancy.

1.2 I have been engaged in the specific field of public transport policy and planning for fourteen years. My experience includes public transport-focused roles in central and local government, and consulting roles advising New Zealand and international clients on all aspects of public transport. I have also participated in a wide range of public transport-related research through the NZ Transport Agency Research Programme.

1.3 An outline of projects in which I have been called upon to provide public transport policy and planning advice in recent times is included as **Appendix A**.

1.4 I confirm my obligations in terms of the Environment Court's Code of Conduct for Expert Witnesses contained in the Practice Note 2014. I confirm that the issues addressed in this brief of evidence are within my area of expertise. I confirm that I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

1.5 I have been engaged by the Otago Regional Council to prepare public transport planning evidence in relation to the Notice of Requirement for the proposed Central City Bus Hub.

2. SCOPE OF EVIDENCE

2.1 Within this evidence I provide an assessment of the design of the bus hub from a public transport network design perspective. I address the following matters:

2.1.1 Bus hub location and form; and

2.1.2 Bus stop requirements at the bus hub.

2.2 Other experts are covering different transportation related effects of the bus hub, including:

2.2.1 The layout and operation of the bus hub for road and public transport users, and effects on immediately adjacent intersections (Mr Andy Lightowler);

2.2.2 The local transport effects of the bus hub, including parking, pedestrian routes, and access to properties (Mr Andy Carr); and

2.2.3 The effect of the bus hub on the wider roading network (Mr Andrew Metherell).

2.3 I have identified two submissions, by Lyndon Weggery and Peter Dowden, which raise concerns in relation to the design of the bus hub from a public transport network design perspective. I address those concerns within my evidence.

2.4 I have read the Council Officer report and supporting memoranda. These do not identify any issues in relation to the design of the bus hub from a public transport network design perspective, and are not addressed further within my evidence.

3. EXECUTIVE SUMMARY

3.1 I have been engaged by Otago Regional Council to provide specialist public transport network design advice for the new bus network since April 2015.

3.2 That council is introducing what can be regarded as a 'best practice' public transport network to Dunedin, with a simplified but planned structure of direct bus routes, designed around key corridors and nodes.

3.3 The Central City Bus Hub is located at the heart of this network, providing direct passenger access to a wide range of city centre destinations, connections between services, and a timing point where services can pause. Its proposed location on Great King Street is conveniently located, easily accessible via the road network, well-oriented, and has sufficient space to accommodate all bus services in a logical way. It is therefore an ideal location for the bus hub.

3.4 The bus stop requirements of the hub are based on a complex set of constraints, and are closely linked to the bus route timetables with which they were simultaneously developed. The proposed arrangement, which consists of a bus stop on Moray Place and ten bus stops in the main urban public transport bus hub on Great King Street, has been found to best meet these requirements, under both the current timetable and a future growth scenario. I believe that it is a good choice that will operate well.

3.5 There is nothing in the submissions or the Council Officer report that suggests to me that there are fundamental public transport network design matters that need to be addressed.

3.6 I therefore consider that the proposed bus hub is appropriate for its required purpose and appropriate to implement.

4. INVOLVEMENT IN THE PROJECT TO DATE

4.1 I have been engaged by Otago Regional Council to provide specialist advice on public transport network timetabling, and other network design matters for the new bus network, on an ongoing basis since April 2015. The bus stop requirements at the bus hub have been an integral part of this work.

4.2 I was not involved in the processing of identifying the location of the bus hub or the physical routing of the bus routes, which predated my involvement in the project, although I have provided some subsequent advice on those matters.

5. NETWORK DESCRIPTION

5.1 Otago Regional Council is introducing what can be regarded as a 'best practice' public transport network to Dunedin. This takes a network-based approach, with a simplified but planned structure of direct bus routes, which provide consistent hours of service and frequency, matched to route function and demand.

5.2 The network makes increased use of through-routing, to enable some passengers to travel beyond the city centre without needing to change buses, which is both convenient for passengers and an efficient use of resources.

5.3 The network has been designed around key corridors and nodes. The primary node is located at the Central City Bus Hub, where all bus routes other than the orbital Ridge Runner and some feeder routes meet. Secondary nodes are located at 'super stops' at key suburban points, where several routes connect.

5.4 Timetables have been designed around current requirements, but are structured to accommodate higher frequencies in the future if justified by demand. They have also been designed to provide a regular frequency where routes overlap, particularly on the key corridors between the bus hub and super stops.

6. BUS HUB LOCATION AND FORM

6.1 The Central City Bus Hub is located at the heart of the public transport network. It has a triple function:

6.1.1 To provide direct passenger access to as many city centre destinations within a reasonable walk (up to 10 minutes) as possible;

6.1.2 To facilitate connections between services, and thus facilitate cross city travel, to central city fringe and suburban destinations; and

6.1.3 To provide a timing point where services can pause, to prevent early running and thus improve convenience and reliability.

6.2 The area to the immediate north of the Octagon lies at the heart of the city centre. This catchment contains many destinations that bus passengers are likely to want to access, either for work or other purposes, including the main retail area around George Street, two supermarkets, the public library, and the hospital. A wider radius around this point includes a wide range of other destinations, such as the Otago University School of Dentistry, cinemas, Otago Girls High School and the casino. The appeal of this area as a destination is reflected in on-street parking charges and restrictions.

6.3 The proposed bus hub location on Great King Street, between Moray Place and St Andrew Street, places the primary bus node close to the heart of the city centre, and within a reasonable walk of the above destinations, as shown in the aerial photograph in **Appendix B**. This makes it very attractive as a location, offering convenient access that will encourage public transport use, as is a priority in several planning documents including the 2013 Dunedin City Integrated Transport Strategy.

6.4 The central location is easily accessible from different directions via the road network.

6.5 The north-south orientation of Great King Street is an advantage, since most bus routes pass through the central city on a north-south alignment. This ensures that the routes follow a relatively direct path, which makes them efficient to operate and legible for passengers.

6.6 The location has sufficient space to accommodate all routes within the hub, and for them to use it in a logical way. Northbound/westbound through route services can use the western side of the street, and southbound/eastbound services the eastern side of the street, while terminating routes can be

accommodated on either side of the street. This arrangement is legible and facilitates connections between services, following best practice public transport network design principles.

7. BUS STOP REQUIREMENTS AT THE BUS HUB

7.1 The bus hub bus stop requirements are based on a complex set of constraints, and are closely linked to the bus route timetables with which they were simultaneously developed. These are that:

7.1.1 Services must operate to a clock face timetable on each route, with departures at standard headways (intervals), which vary according to the time of day (higher at peak times and lower at off-peak times), but are consistent throughout the day and week, so that the timetable is intuitive to passengers;

7.1.2 Services on different routes that operate on the same corridor should operate on consistent headways, to provide a balanced frequency on that corridor;

7.1.3 Services must arrive and depart the bus hub at different times where possible, so that the impact on the road network is minimised;

7.1.4 All services on each route should use the same bus hub bus stops throughout the day and week where possible, to make the bus hub as legible as possible for passengers, with through routes using the same pair (northbound/westbound and southbound/eastbound), and terminating routes using a single bus stop;

7.1.5 Different routes can share the same bus hub bus stops to maximise the efficiency of the bus hub, but a minimum two-minute gap should be allowed between departing and arriving services (more where possible) to account for travel time variability and minimise the chance of any clash; and

7.1.6 Services must have sufficient dwell time at the bus hub, to allow time for passengers to board and alight, provide a buffer for any late running, and prevent early running. This is particularly important for the through routes.

7.2 The requirements are complicated by the differing headways of the bus routes, which include 15, 20, 30, 40 and 60-minute headways, depending on the route, day of week, and time of day, with some services operating outside of these standards. Services that follow a 20/40-minute headway cycle cannot use the same bus stops as those on a 15/30/60-minute cycle.

7.3 Three bus hub bus stop arrangements have been assessed for both the current timetable and a potential future higher-frequency network timetable. Each allows for a bus stop on Moray Place (or other nearby location) for long-distance bus services, and either six, five or four bus stops in each direction on Great King Street for urban bus services. My evidence relates to the main Great King Street site, which was the focus of my analyses, with the three arrangements on this street being described in the subsequent parts of this evidence as the twelve, ten and eight-stop options.

7.4 The twelve-stop option provides the most flexibility and reliability, but cannot be fully accommodated within the proposed bus hub location without the closure of some driveways, and has consequently been discounted.

7.5 The eight-stop option is unable to comply with all the requirements listed in Paragraph 7.1, and has significant legibility and reliability impacts, and has also been discounted.

7.6 The ten-stop option generally meets the requirements, and I believe that it is a good choice that will operate well. The gap between some arriving and departing services is marginal at some time periods, but it is acceptable and can be managed operationally by bus operators.

7.7 Under this arrangement, each bus stop is used by between six and eleven services per hour during peak times under the current timetable. Each service pauses for between two and six minutes.

7.8 Total dwell time is highest in off-peak, evening and weekend periods, when running times are shorter and frequency is lower, requiring longer through route stops and terminating route layovers. Under the current timetable, each bus stop is expected to be used for an average of 19 minutes per hour during peak times and 24 minutes per hour during off-peak times, increasing to 20 and 29 minutes respectively under the potential higher-frequency network timetable.

7.9 Differing frequencies mean that up to four services use the bus hub in each direction at any one time under the current timetable. This increases to up to five in each direction under the potential higher-frequency network timetable.

7.10 Some terminating services are scheduled to lay over at other locations between runs, to manage bus hub capacity and minimise the number of buses waiting there.

7.11 The ten-stop option therefore makes an effective and efficient use of the available space, under both the current timetable and the future growth scenario, and this option has consequently been incorporated into the proposed bus hub arrangement.

8. SUBMISSIONS

Lyndon Weggery

8.1 The submission of Lyndon Weggery has raised concerns about the impact of the bus hub on residents/ratepayers, particularly the loss of carparks on Great King Street, and suggests that more consideration be given to alternative locations (e.g. The Exchange).

8.2 I appreciate that the loss of carparks will have some impact on existing users of Great King Street, but it should be noted that the reallocated road space will

continue to be used by residents/ratepayers, in the form of bus passengers. It can be argued that the street will be much more effectively used than at present, given the use of this location as a gateway to the central city.

8.3 As I have outlined, the number of bus stops within the bus hub is based on a complex set of constraints, which reflect the requirements of best practice public transport network design and the public transport needs of the whole city.

8.4 I assessed several bus hub bus stop arrangements for the main Great King Street site that will be used by urban public transport services, for both the current and a potential future higher-frequency network timetable, including an eight-stop option that would require two fewer bus stops and consequently enable some parking to be retained. I found this to be inferior to the ten-stop option that has been incorporated into the proposed bus hub arrangement, with significant passenger legibility and bus service reliability impacts. The eight-stop option was therefore discounted.

8.5 I was not involved in the process of identifying the location of the bus hub, which predated my involvement with the project. However, I believe that the proposed location is a very good solution from a bus network design perspective, providing a high level of access to the heart of the central city, while being operationally efficient. There may be other locations than could be suitable alternatives, but these would need to be located in or north of the Octagon, and none are apparent other than George Street itself. The Exchange is too far south of the main activity centre to be effective, and would either require southern passengers to change buses at that point, or the use of two separate bus hubs with overlapping services. Neither would be passenger-friendly or efficient.

Peter Dowden, Bus Users Support Group Otepoti Dunedin

8.6 The submission of Peter Dowden for Bus Users Support Group Otepoti Dunedin has observed that buses spend more time waiting than loading/unloading passengers at some central city stops, while another George

Street bus stop, which can take 2-3 buses at a time, seems able to cope with all passing bus traffic. Based on these observations, the submitter suggests that the bus hub can be halved in size, and that such an outcome would be more efficient than the proposed arrangement.

8.7 As the submitter has correctly recognised, the longer dwell times relate to timing points within the timetables. Unfortunately, the existing George Street/Princess Street bus stops adjacent to the Octagon do not have sufficient capacity, and buses must be held back at preceding stops while they wait for downstream services to clear the stops around the Octagon. This results in unnecessary congestion and delays to services. The provision of a bus hub with sufficient capacity to accommodate all services will resolve this issue, and consequently provide a better passenger experience.

8.8 However, the operation of the proposed bus hub can't be directly compared with the current arrangement, as hub will combine several functions that are currently spread over several locations. As I have outlined in Paragraph 5.1, these include providing direct passenger access to the central city and facilitating connections between services, similarly to the submitter's George Street example, and providing a critical timing point, similarly to the other bus stops noted.

8.9 As I note in Paragraphs 7.3 and 7.4 above, the bus hub bus stop requirement is designed around complex set of constraints, which reflect the requirements of best practice public transport network design and the public transport needs of the whole city. An arrangement with fewer bus stops than the ten proposed has been assessed, but was found to be inferior to the ten-stop option that has been incorporated into the proposed bus hub arrangement, with significant passenger legibility and bus service reliability impacts. I would therefore not recommend reducing the number of bus stops.

8.10 It is important to reiterate that I assessed the bus hub for both the current and a potential future higher-frequency network timetable. The latter is not excessive, incorporating service enhancements where they are most likely to

be desirable in the foreseeable future, but it inherently requires more bus stop capacity than the current timetable. This assessment was important to ensure that the bus hub and wider public transport network can respond efficiently to future demand without requiring major bus hub redesign or spill over into neighbouring streets.

9. CONCLUSION

9.1 In conclusion, I consider that the proposed Central City Bus Hub design is appropriate for its required purpose.

9.2 As I have set out, it incorporates the principles of best practice public transport network design, and is well-located, providing a high level of access to the heart of the central city, while being operationally efficient. Its bus stop requirements are integrally linked to the bus route timetables and other important constraints, and have been tested to ensure that the bus hub is workable under both the current timetable and a future growth scenario.

9.3 There is nothing in the submissions or the Council Officer report that suggests to me that there are fundamental matters that need to be addressed, and I believe that the proposed bus hub arrangement remains appropriate to implement as planned.

Appendix A – Recent Public Transport Policy and Planning Advisory Experience

Public Transport Policy

- Total Mobility Review for Waikato Regional Council
- Access and Mobility Programme Business Case for Waikato Regional Council
- Wellington Transport Indicative Business Case for Local Government Commission
- Regional Public Transport Plan Advice for NZ Transport Agency
- Public Transport Operating Model Operational Policy for NZ Transport Agency
- SuperGold Card Free Public Transport Review for NZ Transport Agency
- Farebox Recovery Policy Review for NZ Transport Agency
- Regional Public Transport Plan for Greater Wellington Regional Council

Public Transport Planning

- Invercargill Public Transport Review for Invercargill City Council
- Advanced Bus Options for Auckland Central and Airport for NZ Transport Agency and Auckland Transport
- Palmerston North Bus Network Review Business Case for Horizons Regional Council
- Hutt Valley Public Transport Review for Greater Wellington Regional Council
- Wellington City Bus Review for Greater Wellington Regional Council
- Rail & Connecting Bus Timetable Development for Greater Wellington Regional Council
- Public Transport Options Assessment for Gisborne District Council

Public Transport Infrastructure

- Drury Rail Station Location Study for Kiwi Property Group

- Palmerston North-Wellington Rail Passenger Business Case for Horizons Regional Council and Greater Wellington Regional Council
- Westgate Town Centre Bus Interchange for Auckland Transport
- Te Atatu Peninsula Bus Priority and Network Optimisation for Auckland Transport
- Silverdale Park and Ride and Bus Station Design Philosophy for Auckland Transport
- Bus Transit to Domestic Terminal Forecourt for Auckland International Airport
- Electronic Ticketing System Enhancement Business Case for Environment Canterbury
- Christchurch Bus Interchange Facilities Business Case for Environment Canterbury
- Wellington Public Transport Spine Study for Greater Wellington Regional Council
- Bunny Street Bus Interchange for Greater Wellington Regional Council

Public Transport Research

- Economic Benefits of Park and Ride for NZ Transport Agency
- Pricing Strategies for Public Transport for NZ Transport Agency
- Economic Appraisal of Public Transport Service Enhancements for NZ Transport Agency
- Improving Bus Service Reliability for NZ Transport Agency
- Experience with the Development of Off-Peak Bus Services for NZ Transport Agency
- Econometric Models for Public Transport Forecasting for NZ Transport Agency
- Experience with Value-for-Money Urban Public Transport Enhancements for NZ Transport Agency
- Public Transport Network Planning: A Guide to Best Practice in New Zealand Cities for NZ Transport Agency.

Appendix B – 10 Minute Walking Catchment for the Proposed Bus Hub