

Connecting the airport Bern-Belp to the public transport system

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Abstract—The airport Bern-Belp is located approximately 6 km southeast of the city centre of Berne. Nowadays, travelling to the airport is felt to be inconvenient due to the duration and the need to change from a train to a bus. For the case of an increase of passengers travelling from Bern-Belp, development concepts were designed. A tramway extension is proposed as the best variant. For this concept the corridor evaluation, alignment, route planning, and operational concept have been realised. The goal of improving the connection of the airport to the public transport system was reached. The travel time from Berne main station to the airport has been reduced from around 30 minutes to 20 minutes.

Keywords—Airport Bern-Belp, development, route planning, tramway extension

I. INTRODUCTION

The airport Bern-Belp serves mainly Berne with scheduled and charter flights (public transport) and flights in the service of the Swiss Confederation [1]. Nowadays people have to take the train from Berne main station to Belp and change to the connecting bus which takes 27 to 37 minutes, depending on the amount of stops the train makes and the transfer time. Many people experience this to be inconvenient. In comparison, Zurich Airport can be reached within 80 minutes, even though there are around 100 km in between. In contrast to the airport Bern-Belp, Zurich Airport offers direct intercontinental flights, which leads to more time being required e.g. for boarding, which in turn should increase the attractiveness of the airport Bern-Belp [2] [3].

Within the scope of this work, several development concepts are elaborated which improve the connection of the airport to the public transport system. For the best concept the alignment and the route planning are realised. Additionally, the best route planning is considered more in-depth.

II. METHODS

A. Demand

The number of travellers from and to Bern-Belp amounted to 176'045 in the year 2016 [4]. Assuming an increase of around 80%, the number of 320'000 travellers per year results. Hence, 260 travellers will fly from or to Bern-Belp per day.

With this, an expansion of the public transport cannot be justified. Thus, a quarter-hourly connection is needed for the attractiveness of the airport as a destination for the travellers and as workplace.

B. Procedure

First, the existing means of transport around the airport are analysed to keep construction costs low by integrating existing infrastructure systems. With this aspect in mind, the different development concepts are designed and compared to several factors like travel time and track length.

The further steps are: corridor evaluation, alignment and route planning [5].

III. RESULTS

A. Development concepts

Figure 1 shows all the designed development concepts. Red are all tramway and green all suburban railway methods.

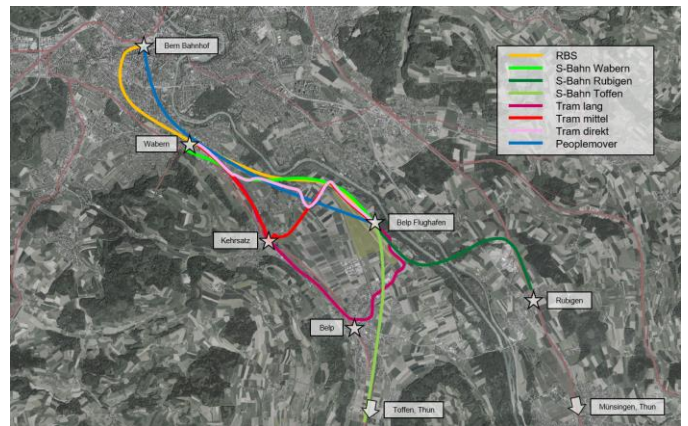


Figure 1: General map with all development concepts. Map source: [6], edited.

Because of the comparably short track length, no need of expensive engineering structures and its higher realizability in comparison to all the other variants, the variant *tramway direct* (pink in Figure 1) has been chosen as the best.

B. Corridor evaluation

For the chosen development concept, the area has been analysed within different criteria such as topography, building development and geology. Based on this data, some corridors were determined and evaluated.

C. Alignment

Several alignments within the chosen corridor were designed and evaluated. In this process special care has been taken to separate the lanes for motorised private transport from the tramway line.

D. Route selection

The selected route can be seen in Figure 2. In the process (as far as possible) special care has been taken to ensure that there are wide bends with big radii.

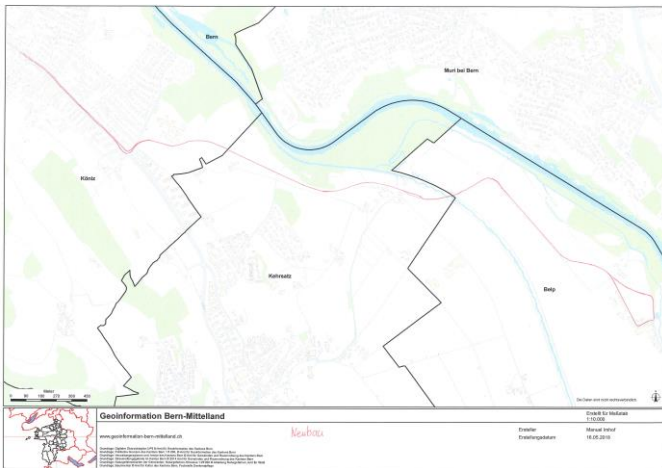


Figure 2: General map of the planned route. Map source: [7], edited.

E. More in-depth consideration of the best variant

1) Service concept

It is assumed that the existing timetable of the tramway line 9 (which operates until the current terminus) is considered as fixed and will not be changed. There are five movements of trams per hour that are extended to the airport. From the elaborated route planning results a duration of barely 8 minutes for the extension.

2) Crossing facility

Between the current terminus and the station at the airport result two crossing points. One of them is in the terminal loop at the airport, and the other one is in the city of Wabern, where the tramway line is still double tracked. In normal operation, there won't be any trouble of crossing two trams. If the tram in the direction of the airport is late however, the other tram has to wait and gains delay. To avoid this, there will be built a crossing facility on the main, single-tracked track. This can be used in case of delays, otherwise the crossing takes place at the terminal loop.

3) Safety

It is necessary to install light-signal systems at some places where there is shared space between motorised private transport and the tramway line. In addition, St. Andrew's crosses are needed at points where the tramway line crosses a country road. Train control installations are needed at the points where the tramway line changes from double to single tracked.

IV. DISCUSSION

The goal of improving the connection of the airport Bern-Belp can generally be achieved. The travel time from Berne main station can be reduced to 20 minutes.

Without more flights operating from Berne Airport, the financial investment will barely be worth it.

In the normal case, a tram has more stations per track length than in the planned route. Maybe it would be better if a means of transport was chosen that has a higher velocity instead of a high acceleration and stopping power, e.g. a light rail vehicle. That would have to be examined in a separate study.

V. CONCLUSION

Of all the analysed development concepts, the tram is optimal. The efforts can be kept low in comparison to the other concepts, thus it is an economical variant. With the planned route, a direct and fast connection could have been finalised. Whether the financial investment would be worth it has to be estimated with a detailed cost-benefit analysis.

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