

Report Summary

The Pottstown-King of Prussia corridor on the outskirts of Greater Philadelphia, Pennsylvania, has a congestion problem and commuters have little other option but to wait it out in their cars. The Pottstown Expressway is an ideal site for the investigation into congestion relief options as it has a combination of a clear and obvious congestion issue, it experiences both high and low temperature extremes, there is both a railway and water way running parallel to it, there is adequate verge space. This coupled with the potential for the community of Pottstown to benefit from additional economic development and job creation options that can flow from appropriately designed transit services means it is worthy of serious consideration. For instance a key feature of shared transit is that it aggregates travelers to create nodes of economic and social activity around station precincts, along with increasing the value of surrounding land. This is important as rather than just a congestion management issue the provision of effective transit services can be an economic development opportunity, however what option best suits the 422?

In order to inform efforts to answer this question, the Pottstown Area Health & Wellness Foundation provided a grant to allow a team of researchers led by Internationally Renowned Expert and Author, Professor Peter Newman, the IPCC Coordinating Lead Author for Transport, to undertake a high-level overview of congestion relief options. The team identified 10 possible congestion relief options and undertook an investigation based on the following criteria: cost, effectiveness, development potential, environmental benefits, and job creation potential, as summarized in Table 1.

Table 1: Summary of Findings of Research into Congestion Options

Options	Overall Cost	Effectiveness	Development Potential	Environmental Benefits	Job Creation Potential
A. HOV Lanes	Low	Little	None	Minor	None
B. Shuttle Bus	Low	Low	Very little	Some	Small
C. Fast Ferries	High	Low	Some	Some	Medium
D. Air Transport	High	Low	None	Negatives	Small
E. Monorail	High	High	Some	Considerable	Medium
F. Trackless Trams	Low	High	Considerable	Considerable	Large
G. Commuter Rail	Low	High	Considerable	Considerable	Large
H. Car Pooling	Low	Some	None	Some	None
I. Tele-commuting	Low	Some	None	Some	None

Based on the findings, including discussions with various stakeholders, it seems that the most promising option for the Pottstown Expressway would be a combination of 'Commuter Rail' along the corridor supported by a system of 'Trackless Trams' feeding passengers into the train stations from each side of the corridor (or even a complete Trackless Tram system along the 422 if the rail option is not available). In order to build on this finding, it is recommended that further investigation be undertaken to explore implementation considerations with stakeholders, including identify innovative financial models.

Background

The Pottstown Expressway is the section of US422 between Pottstown and King of Prussia, and this is part of the commuter route from Pottstown to Philadelphia as shown in Figure 1. The Pottstown Expressway is an ideal site for the investigation into congestion relief options as it has a combination of a clear and obvious congestion issue, it experiences both high and low temperature extremes, there is a railway and water way running parallel, and the verge is not fully built out.

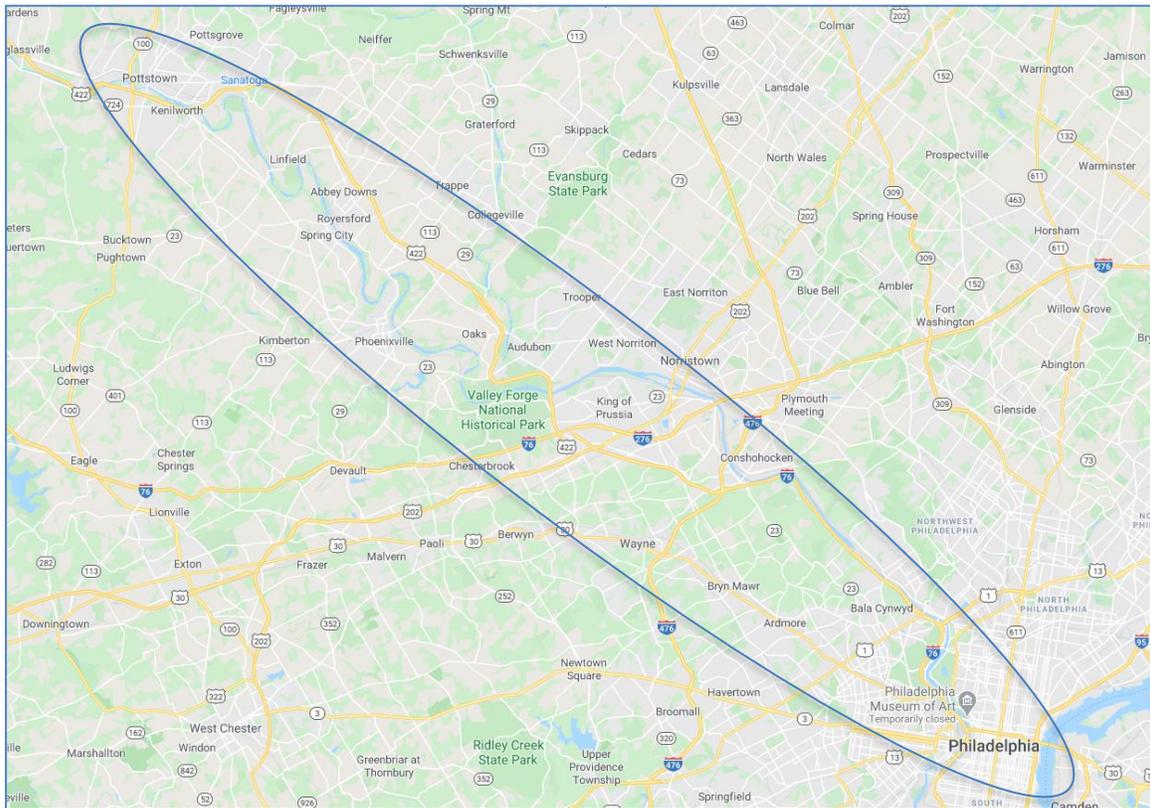


Figure 1: The Pottstown-Philadelphia Corridor

The following factors have an influence on the type of congestion management methods used on the Pottstown Expressway:

- *Clear and obvious congestion issues:* The Pottstown experiences high traffic volumes during morning and evening peak hours, causing extensive delays across the two general-purpose lanes in each direction. The 25.3 mile strip can take commuters up to 2 hours to travel during periods of heavy congestion creating significant community pressure to investigate potential technological and policy-based solutions in reducing traffic congestion along the expressway.
- *Experiences both high and low temperature conditions:* In January on average the coldest temperatures can reach as low as -15°F (-28°C) with snow experienced between November and March, and in July on average the warmest temperatures can reach as high as 115°F (46.1°C). This presents an opportunity to consider the full range of likely temperatures from sub-zero conditions in winter (with the route being salted and plowed when snowfall reaches a height of 3-inches) to sweltering heat in summer, a successful solution would need to work in extreme weather conditions,

conversely this presents an opportunity to investigate a strategy that is seasonally flexible. The need to consider such weather conditions increases the likelihood of this case study to be applicable in locations with similar issues.

- *A private railway running alongside:* The established private railway line provides the potential for congestion relief without constructing a new rail line, assuming suitable arrangements can be agreed with the private operator. This presents the opportunity to develop mutually beneficial public private partnerships which may encourage urban innovation and development in the region, this would be in addition to reducing congestion and travel times along the expressway. The Pottstown Expressway could provide a leading example of how both private and public interests can be met to both improve mobility and attract new development to the area. Such outcomes are just not possible with options which have a limited long term effect on private vehicle use and as such have an upper limit to their value, for example increasing the number of lanes, or encouraging off peak travel times.
- *A river running alongside:* The Schuylkill River runs through Pottstown, Norristown and then directly into Philadelphia. The length between Pottstown and Norristown is just under 30 miles. Assuming appropriate infrastructure, a non-stop transit with an average ferry speed of 28 knots would take approximately 55 minutes and is closely comparable to current transit times along the US422 by car. There are a number of bridges, dams, and narrow pathways within this section of the river that would need to be assessed as part of consideration of a ferry service.
- *The motorway is not built out:* This presents the opportunity to investigate additional vehicle lanes, say for the provision of a dedicated tram or shuttle service, without requiring compensation to private land owners surrounding the expressway, and weighing the efficiency gains this strategy could produce against the economic and environmental costs through flora and fauna damage or habitat destruction. The expressway does have a series of bridges that would need to be augmented should such services be provided.

Given the range of factors that need to be considered the Pottstown Expressway presents an ideal case study to inform similar congestion relief investigations across the United States. Coupled with the potential for the communities across the Country to benefit from additional economic development and job creation options that can flow from appropriately designed transit services means it is worthy of serious consideration. For instance a key feature of shared transit is that it aggregates travelers to create nodes of economic and social activity around station precincts, along with increasing the value of surrounding land. This is important as rather than just a congestion management issue the provision of effective transit services can be an economic development opportunity, however what options are best suited?

Potential Congestion Relief Options

Given the range of factors summarized above there are a number of potentially viable options for congestion relief along the Pottstown Expressway. Such options are focused on reducing the number of commuters travelling along the corridor at peak times, or increasing the efficiency of travel along the corridor even without a reduction in demand, as such most options are not mutually exclusive, whilst they have been analyzed as separate options, as is often the case the most effective solution is likely to

incorporate a combination of strategies that work in synergy. The options chosen for consideration as part of this study are:

- Option A: High Occupancy Vehicle (HOV) Lanes
- Option B: Shuttle Bus Services
- Option C: Shared Water Transport (Fast Ferries)
- Option D: Shared Air Transport
- Option E: Single Rail Overhead Service (Monorail)
- Option F: Trackless Trams
- Option G: Restoration of passenger rail services
- Option H: Car-pooling
- Option I: Tele-commuting

In order to investigate each of the options the research team selected four key criteria: cost and effectiveness, development potential, environmental benefits and employment potential:¹

- *Cost and Effectiveness:* Cost is always going to be an issue in transport planning and infrastructure delivery, especially when capital is heavily dependent on government. Hence the cost of various congestion relief options needs to be clearly understood and justified. Benefits of transport related expenditure are typically expressed in terms of time savings which directly translate into economic and social outcomes. Along with this, there are multiple benefits related to health and safety related to reducing car dependence that are increasingly being considered.
- *Development Potential:* In addition to direct economic benefits and social outcomes, transit is also being recognized as a shaper of cities in ways that not only reduce car dependence but enable urban regeneration to create vibrant economic centers around stations and along corridors. If done with early developer involvement transit corridors can activate development potential in synergy with the transit services to create economic development and jobs.
- *Environmental Benefits:* The importance of local and global environmental issues has grown to the extent that they now must be addressed in any transport strategy. Local environmental issues are usually about destruction of local places to make way for transport infrastructure, noise created by construction and vehicles, and negative impacts on air quality that affect community health, while globally the main issue is reducing growing volumes of greenhouse gas emissions.
- *Employment Potential:* It is essential that any investment in infrastructure enables longer term job creation, especially in the wake of the impact of the COVID-19 pandemic. If done effectively, providing transit services can create new development, as outlined above, that will create new ongoing jobs, rather than just construction, as in road widening. Hence, transit options are particularly good at enabling employment through activating urban regeneration which is a large source of job growth in design, building and construction and then afterwards in attracting knowledge economy jobs due to the agglomeration activity around density of centers.

¹ For a detailed explanation refer to: Newman, P. and Kenworthy, J. (2015) *The End of Automobile Dependence: How Cities are Moving Beyond Car-based Planning*, Island Press, Washington DC.

Summary of Key Findings

Based on a review of case studies and reports around the implementation of congestion relief options the following lessons have been distilled as relevant to informing options for the Pottstown Expressway:

1. The option to provide an additional lane for traffic in both directions rarely delivers lasting congestion relief and comes at a very high cost (some \$30 million per mile) compared to other more effective options and as such it was not investigated. Such a response may provide short term benefits to reducing congestion but in a very short time it simply moves the congestion problem further down the highway network to create further bottle necks, with congestion levels building back up over time to where it was before.
2. Although HOV lanes and shuttle buses are widely used they seem to provide little value as an option along a heavily congested corridor. HOV lanes for instance are often underutilized or are not properly policed leading to limited congestion relief and complaints of higher congestion in non-HOV lanes. Shuttle buses are commonly used for transit services such as airport transfers however have not been successfully used for mainstream commuter travel other than in cities like Manila and Jakarta where their jitneys provide demand-responsive services but leave most city streets highly chaotic.
3. Fast Ferries have been shown to have a minor ability as an option for peak congestion relief if there is a river running alongside the motorway, such as the Schuylkill River that runs along the 422 all the way into Philadelphia. However ferries rarely come close to land based transit services in their ability to attract passengers and in this particular case it would be capital intensive as bridges and dams along the waterway would need to be upgraded to allow the ferry to pass by.
4. Air Transport options using new technology electric planes and drones are likely to be an expensive and risky option with minimal impact on congestion. Despite a recent focus in this area current options would create negative environmental issues along with noise and air traffic control concerns. Regarding development potential this form of transit is more likely to scatter development than aggregate it.
5. Elevated Monorail, Trackless Trams and Commuter Rail on the freight line are all good options worth further consideration in terms of the time savings value they can create, their ability to shape development around stations, and provide a range of environmental benefits, while creating jobs due to their ability to create density where it can help create jobs. However the capital cost varies with an Elevated Monorail costing around \$80m per mile due to its elevated concrete and steel construction; Commuter Rail around \$8m per mile for carriages and station upgrades, as the rail track is already there; and the Trackless Tram around \$5m per mile as it does not require much infrastructure other than adequate road space.²
6. Car Pooling and Tele-commuting have long been advocated as if implemented effectively they can deliver some value and should be encouraged as a complementary measure to the provision of more direct transit services such as those mentioned above. These non-infrastructure options are focused on reducing car use and provide some benefits in terms of reduced greenhouse gas emissions but are likely to do little to attract development and help create jobs in the corridor.

² These are estimates only for comparison purposes.

Conclusion and Recommendations

Based on the initial findings it seems that the option best suited for further investigation for the Pottstown Expressway would be a combination of Commuter Rail along the corridor supported by a system of Trackless Trams feeding passengers into the train stations from each side of the corridor (or even a complete Trackless Tram system along the 422 if the rail option is not available); such a system could be complemented by appropriate non-infrastructure options to reduce overall demand. Together such a portfolio of options stands to not only be an effective response to growing congestion levels but also an economic development mechanism, a model that would likely be of interest in other areas of extreme congestion along motorways.

The combination of a rapid commuter rail service with fixed stations that are interconnected with 21st century tramlines bringing in commuters, stands to not only provide effective commuter travel but also provide significant opportunities to raise land values at stations, attracting new development. The resulting land developments can enable both short- and long-term job creation in a range of sectors with residents having ready accessibility to a range of services and attractions built around station precincts and along the tram route (much like Paris over the centuries such a boulevard approach may be the economic renewal option that many cities have been looking for).

Hence the opportunity to create a Trackless Tram corridor leading to a rapid Commuter Rail service along the corridor, through Norristown, and right into Philadelphia, will provide an historic urban regeneration opportunity. And rather than being developed just by transit authorities such an approach can be created with a range of stakeholders from the start, such as developers, businesses in the corridor, government agencies, and community groups to create mutual benefits. This combination of options should enable a public private partnership's approach that can provide the funding and financing for delivering the infrastructure. These issues should be discussed publicly to enable the strength of the arguments to be refined and a detailed Master Plan can then be created to enable delivery.

In order to finance such a Trackless Tram corridor it will be important to work closely with developers along the route in order to attract private funding given the greater transit services can activate greater development opportunities. This is done by harnessing the available land development opportunities and stakeholder expertise in the corridor and integrating new transit services to create station precincts that generate new value from enhanced land development opportunities. This may involve a route that runs from the train station along East High Street, around into Beech Street then back to the station along Mannatawny Street. This initial route would service a number of shops, shopping centers (Wawa...) schools (Wyndcroft, Hill School, Government Agencies (DoT, Postal Service, etc), the Hospital, etc. while also increasing the development potential of lots along the route.

There are several existing procurement mechanisms that can be used or adapted to this model of transit development with different components of the procurement process (for example, real estate development, infrastructure delivery) able to be either internal to the overall planning entity or procured through contracts with an external parties. For instance a private sector dominated approach involves delivering transit projects in a manner that takes advantage of land development and draw on other forms of own-source revenue as a source of capital funding and profitability for the project. This approach was

the early history of rail, for example in Japan's railway-centred conglomerates,³ many of the tramways and street car lines laid down in the late nineteenth and early twentieth centuries,⁴ and substantial parts of the London Underground.⁵ There has been a re-emergence of co-developed real estate and transit services, with two recent examples being the Brightline in Florida and the CLARA proposal in Australia.

- *Brightline, Florida:* Leveraging the private sector opportunities around new stations the Brightline rail project in Florida is 100% privately funded⁶ and has been developed in partnership with the local and county governments and the local community. The project links Miami to Fort Lauderdale and West Palm Beach using a relatively fast train (160 km/h). The first phase of the project opened in late 2017, with plans to extend the line to Orlando Airport. Project finance was raised through a mixture of debt, bonds and equity. Private developers did not seek public subsidies or grants other than federal low-interest bonds in order to provide a risk guarantee.
- *Private Fast Rail, Australia:* A private sector consortium has proposed a new rail project in Australia to link a number of capital cities on the east coast with a fast rail service. The consortium, 'Consolidated Land and Rail Australia' (CLARA), proposes to raise finance for the transit infrastructure solely through real estate sales at the various regional station locations. CLARA's proposal is to initially connect Sydney, Canberra and Melbourne with a high speed rail line with eight stations.⁷ The company has begun to acquire rural farming land around the intended stations locations and anticipates that the sale of such land will avoid the need to request public funding.



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³ Cervero, R. (1998) The Transit Metropolis - A Global Inquiry. Washington DC: Island Press.

⁴ Culpepper-Cooke, T., Gunzburg, A., Pleydell, I. and Brown, D. (2010) Tracks by the Swan: the electric tram and trolley bus era of Perth, Western Australia. Perth Electric Tramway Society Inc. Mount Lawley, W.A.

⁵ Levinson, D. (2008) Density and dispersion: The co-development of land use and rail in London. J. Econ. Geogr, 8, 55-77.

⁶ Renne, J. L. (2017). Make Rail (and Transit-Oriented Development) Great Again. Housing Policy Debate, 27(3), 472-475.

⁷ CLARA (2016) The CLARA Plan, Consolidated Land and Rail Australia Pty Ltd.