

## The CarLina project by SEA, for Didcot

Additional comments to the Didcot Garden Town delivery plan, October 2017, from the preliminary studies to create a sustainable, car-free, ecological city in North West Valley Park

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## SEA

Systèmes Embarqués Aérospatiaux, in Paris, is an R&D laboratory active in the aerospace, industry and automotive sectors.

Our know-how is requested whenever too complex, heavy, expensive architectures need a serious refresh and we do that by getting to the very root of a problem, instead of trying to complexify it even more through expensive "improvements" which at best only help saving some time before reworks.

In 2013 SEA considered that its **AIDA** technology, successfully applied to industrial control systems with impressive reductions in complexity and cost, was mature enough to address more difficult, intricate, general problems with a preference toward those known for their excess complexity.

## Urban and peri-urban mobility

The issue of urban and peri-urban mobility, truly universal and of major impact, matched the SEA search with an ideal set of misstated problems, and a drift toward unreasonable costs and inconclusive corrections, invariably worsening over time.

## Quick analysis

Over a century, our urban environment has been shaped by and for "the automotive": individual and delivery, everything circulating on urban and peri-urban streets. Now this has become the main nuisance, with pollution on top, followed by enormous congestion, energy and money waste, disfigured territories etc.

So now we have to live in an environment made for the automotive, remove it, then reclaim its estate. This is our *CarLina* proposal and project.

## Why NWVP?

When questioned a few years ago about the possibility to provide the NWVP project with a car-free solution, SEA immediately saw something more than the usual urban transport demands.

This time it was not just providing a cheaper, higher capacity, and clean solution to some overcrowded megapolis. There was a project not mainly curing a troubled present but the enticing prospect of displaying a pilot where future cities would observe and learn how to solve what remains the most difficult issue nowadays: what should/could look like a sustainable city.

The NWVP project is not just about packing more people x value into an area. Sustainability requires very stringent requirements the town planning must, if not invent, at the very least not hinder the creation of. This is right where SEA is heading, in its domain of functional networks (mobility, information, water & fluids, energy etc.).

Pushing the ugly, inefficient, ruinous automotive (individual + delivery) away was the elementary step of a project in the 21<sup>st</sup> century, and we happen to be able, as it is a bit commented hereafter, to do that with a vastly superior set of services than cars can and will ever provide, now, cheaper than just making roads, in an ultimately clean way, and now.

But cars are not that important to us: they are just a marker of a regional inefficiency that we must solve if sustainability is to ever happen. This inefficiency is only partly a technical, and mostly the result of the missing statement of how we intend, and soon will be obliged, to live.

The NWVP team was kind enough to let us know about their remarks on the delivery plan, and we add below our own additions with hope to help those in charge of this complex reflection.

## Summary

- 1) Modern urban areas were extensively built around the automotive and cannot live without it.
- 2) The automotive is a major nuisance wherever and without any city making exception.
- 3) No existing public transport provide elementary services for a city to function:
  - a. Reaching everywhere, at walking distance of any house/shop/office
  - b. Being available 24/7 on as short a notice as one's own car
  - c. Carrying not only people (incl. the disabled) but goods, parcels, wastes, the emergencies...
- 4) Failing to care about this is enough to explain the automotive issue and why it seems unsolvable
- 5) ...or it is not automobiles, but their services that are vital to cities. *Incidentally, SEA has no problem with cars being used in rural areas.*
- 6) Logically, SEA designed a simple, light, cheap urban transport performing all the above like cars do (and actually much better) and it is all that was needed.

## An expectable city

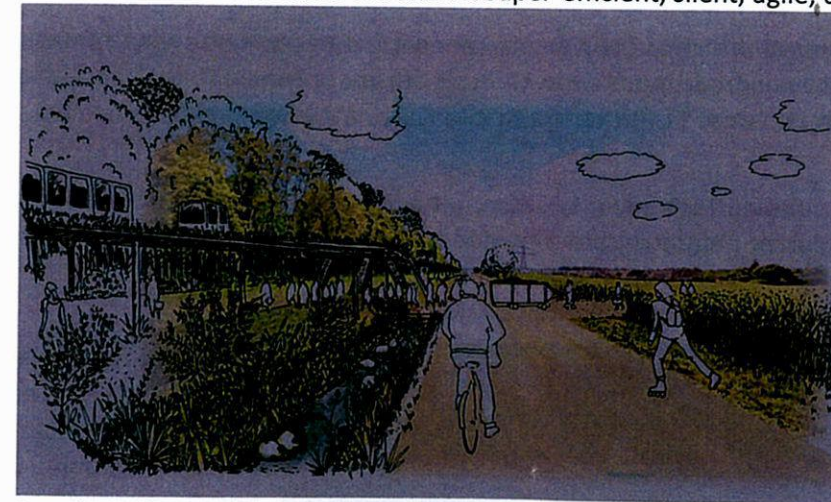
In a world summoned to achieve sustainability (or die), cities would be places where:

- 1) One can hardly see a car, or in a Museum, as a symbol of the Unsustainable era.
- 2) As a result, people are no longer threatened by cars and the common areas revert to civilization.
- 3) Bicycles are encouraged but not to the point of running over pedestrians

...with that we have just repeated some universal mantras. Let's now add the missing link for that:

- 4) For any distance farther than what walking and biking allow,
- 5) Under rain, wind and snow,
- 6) To carry ponderous things, say up to a thousand pounds and some 10km away,
- 7) To carry them over the last hundred meters,

...let's build a machine. We want it super-efficient, silent, agile, discreet, powerful, sustainable, cheap.



People walk a few hundred between houses and "stations".

Bikes don't have priority over pedestrians (nothing has).

Stations are hardly more than stair, but a lift allows the disabled and loads to come up/down.

Wheelchairs and freight go quietly "walked" by on (possibly) assisted chariots, don't have a priority.

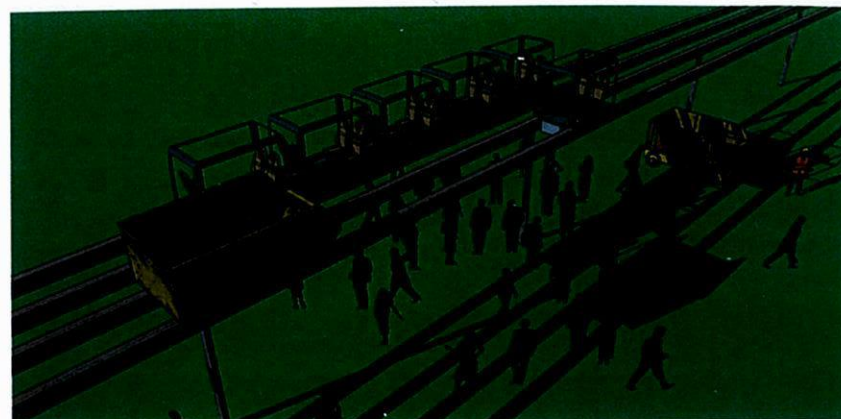
Here we didn't figure cars because they are no longer required. They typically park somewhere in a place reachable using the network.

This illustration was drawn for the Plateau de Saclay, in the southern Paris area, and resembling what will be installed.



## What does a CarLina network look like

### Trackways



Automatic platforms, like the yellow one carrying the rubble skip, circulate over (in) a network of light, cheap, industry standard beams of stainless steel. They are fitted with, here, passenger cabins, or skips, or everything imaginable within a standard format.

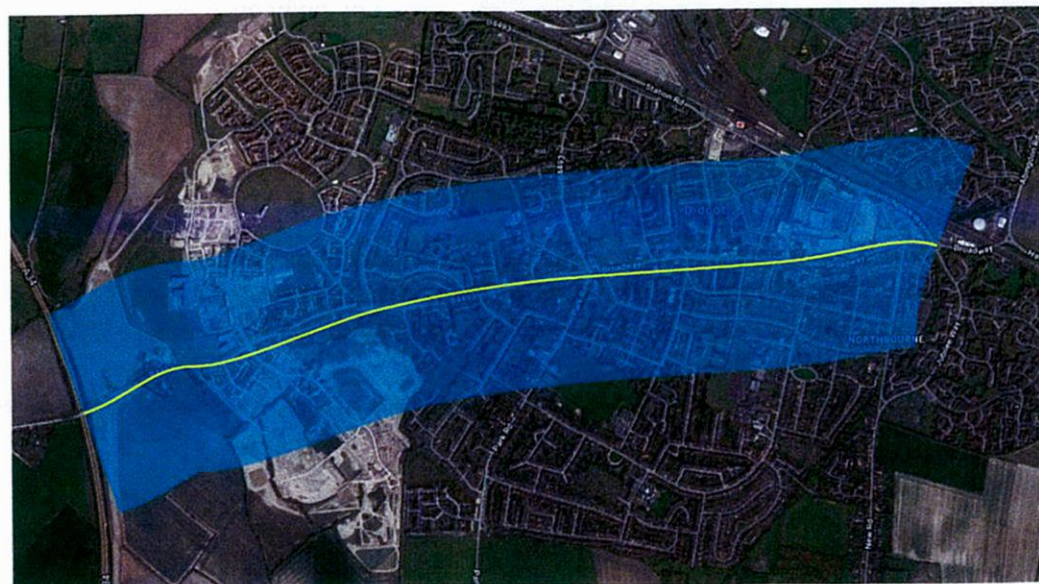
Once down-lifted, skips (/wheelchairs/etc.) are moved to/from destination on a variant of the platforms, equipped with ground tires.

Walking slowly to/from the final destination may seem slow, and it actually is, but the entire trip on the elevated tracks is generally much quicker than with automotive solutions.

### "Ground segment"

Before describing more metal, the all-important half of the CarLina concept is to have not only a transport function, but its way of covering a strip a few hundred meters wide, through the use of banal chariots, or assisted like the one shown above, gently following its user. In the car-free cities CarLina allows, pedestrians have all priority, even over a one-ton chariot.

The coverable distance from a station is cultural. Let's say it is 300m, a notion consistent with a garden-city project. Since ANY automotive function, except nuisances, are provided in a CarLina system, in a band 300m aside a CarLina line no cars are necessary, even from a speed point of view. Let's now have a look at an ideal Didcot where a hypothetical CarLina trackway exist along Broadway, to Harwell:



Highlighted is the area aside our supposed CarLina line where no service would be better provided using automotive solutions.

(graphic approximation)

For reference, the line depicted is 3.5km long, cost some 3.5ME, are covered in about 5mn.

Before we step back to hardware details,

one can get on this example a glimpse of how the car-free city concept is all but a matter of complexity, high costs, future technologies, and city planning genius.

### CarLina pods

A CarLina pod is made of an autonomous platform and some load, the most typical of which being passenger cabins and freight. The passenger pod is built on top of the platform by the local people, according to their style and culture. In New Delhi they told us our rickshaw-like pods was ideal. In Lapland they'll be likely more protective.

A CarLina pod:

- carries 4 passengers
- provide 3500 km.passenger per day like about 40 cars would
- is specified to run 1 million km before decommissioning
- costs about 25k£
- consumes as much energy as an electric bike per passenger
- over its lifetime it provides the same service as several thousand cars
- is designed for local construction, maintenance, repair, evolution and even redesign.

This is not to be read as an advertisement, just an indication that we have some serious tool to now consider the mobility over an urban area and its surroundings.

### Stations

To reach the elevated tracks, stairs are used and lifts for the disabled and loads, but in NWVP, with the complicity of our Architect we managed to have most stations (a half-dozen is enough) on a level and as accessible as an elevator. In the same quality-oriented town design, the terrain and trackways are integrated quite seamlessly.

Hereafter our comments, following the Delivery Plan structure, with some excerpts from the NWVP team document.



# The Garden Town Proposal

## Chapter 1

## Chapter 2

## Chapter 3

## Chapter 4

### 5. The infrastructure needed to support growth of the town

#### 5.1 Transport infrastructure

##### 5.1.1 A connected future

We promote an urban mobility system to both provide:

- efficient long distance mobility with freight carrying
- freeing a maximum area for pedestrian and bicycles

##### 5.1.2 An established movement pattern

The essentially unstructured circulation scheme around Didcot, which is the primary generator of automotive traffic, is an opportunity to create an ideal network without spending fortunes in adhering to an existing road system.

##### 5.1.3 Existing traffic flows

Automotive traffic essentially passing through Didcot. The best choice would be NOT to improve its throughput, and spend much less money in a powerful Harwell-Didcot-Culham local network.

##### 5.1.4 A new movement pattern (Oxford-Cambridge)

Harwell-Didcot-Culham are not concerned

The Science Bridge and east-west corridor appear detrimental to Didcot, bringing only high costs and trouble and no positive service. Creating a ROAD only to join Milton Park to homes south of A4130 looks especially irrelevant. This function exists with much cheaper/better service with our CarLina light bridge.

Roads with a "strategic" qualifier should circumvent Didcot, especially East and North.

#### Traditional, low capacity option:



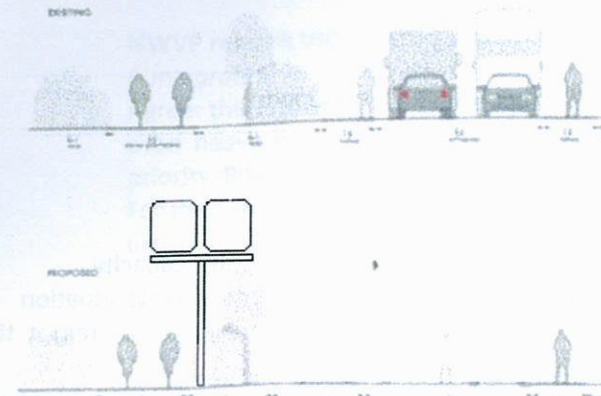
In the arrangement shown, bikers are well treated, not pedestrians.

The way they interact remains undefined.

The automotive nuisance is traditional = total:

1. Large dedicated area
2. Inefficiency: max a couple thousands persons / lane / hour, min (jam) a couple hundred
3. unstoppable trend toward ultimate congestion
4. Pollution, noise, large energy consumption
5. Large urban planning works required to accommodate a town map around streets map

#### Sustainable, high capacity option:



In the second arrangement, bikers are treated the same, pedestrians turned back into dwellers. The way they interact is much easier to define. Bike lanes no longer consume new areas. The automotive nuisance is just removed:

1. All the road area is liberated or was just not spent (with the associated high costs)
2. Efficiency: 24/7 service much higher, guaranteed speed, zero traffic jam, >30k pass/h capacity
3. Congestion is definitely solved and forgotten. Traffic can be efficiently controlled and sized.
4. Zero pollution & noise, energy consumption kept to the theoretical minimum
5. Unconstrained urban planning
6. No service usually expected from the road is missing
7. Trackways are even modifiable, to evolve in a flexible manner with the city.
8. "Garden Town" compatibility is built-in.



5.1.5 Increased investment in public transport  
CarLina network provide enhanced services compared with Buses

5.1.6 Enhanced cycling opportunities  
CarLina + bike + walk → total mobility  
Elevated CarLina bridges cost less than pedestrian/bike due to smaller max load.

5.1.7 Technology and the future  
CarLina is based upon the following operating modes:  
- all missions are automatically performed upon **electronic scheduling**  
- btw these are **autonomous** vehicles today, the guided kind: much cheaper, safe, high capacity  
- we don't have to **model** the traffic: we perform the scheduled one – opposed, controllable situation  
- **parking**: we eliminate parking issues within the territory, keep cars at the boundaries (eg at the A34 roundabout)  
- **autonomous vehicle route**: creates many problems (much more difficult to cross by pedestrians): **not needed**.  
In the example shown, Culham-Didcot = 5.5km | 6M€ | 6mn | reminder: high capacity. The railway bridge can be used to cross the river Thames, no engineered structure is necessary.  
The Harwell link, about 7km/7M€/8mn is even more interesting since it would highly value the Broadway backbone and B4493.  
Note that in page 127, a CarLina line is compatible with "Existing" (in fact doesn't even need the pedestrian lane to exist), with "improved", and makes the "autonomous vehicle route" unnecessary.

**NWVP remark I – the railway**  
(Reviving the railway, bring the service to Milton Park)  
The CarLina concept fully complies with this view

**NWVP remark II – Car-Clubs**  
(carpooling)  
The CarLina concept fully complies and interacts with carpooling at its boundaries and both solutions are mutually helpful and create a cheap, consistent regional-scale sustainable system.

**NWVP remark III – Buses**  
(limitations of buses)  
Agree: buses suffer severe limitations that CarLina was designed to overcome. No 24/7, long wait, not carrying goods, not available everywhere, even on a small territory like Harwell-Didcot-Culham. The NWVP remark that Buses get stuck in the traffic is clever and seldom mentioned.

**NWVP remark IV – Trams**  
(Relevance of)  
From the CarLina point of view things are different. Trams are very expensive, suffer severe limitations due to the traffic (contrary to what NWVP says), and consume large trackways area and surroundings, all limitations we designed to get rid of at more than an order of magnitude less deployment cost and even more at operating.

**NWVP remark V – Current projects**  
(Garden Line & Backhill Lane)  
On Garden Line: there is an ideal combination on such pedestrian/cycle lanes in going together with a CarLina line, because it would deliver the complimentary tool to provide total mobility, without resorting to the cumbersome, very expensive, low capacity, unfriendly ground autonomous pods.

**NWVP remark VI – Mopeds**  
(on nuisance)  
Agree – a marker of deficient urban mobility. Since we are proposing a high-capacity yet silent town area mobility solution, the noisy vehicles would be even more of a nuisance in it.

**NWVP remark VII – cycle toys**

(on nuisance)  
Toys should be allowed wherever they don't interfere with public mobility.

**NWVP remark VIII – Cycling networks**  
(- integration to a town plan)  
Agree: this is a matter of priority. We see pedestrians having top priority. Workers walking with the even heavy loads the automatic network brings are considered pedestrians as well with equal priority. Bikers must give priority.  
For the rest, we don't even discuss or claim any priority for the automatic network. This should make urban planning well... easy.

**NWVP remark IX – autonomous vehicles**  
(grounded or elevated)  
We chose the elevated option for bringing all advantages and no disadvantage.  
We consider "autonomous cars" a hoax, enormous waste of money and time, likely not feasible, long term, and an enormous threat to urban planning because it will inevitably force towns to park and restrict pedestrians, the exact opposite of the "garden town" idea.  
The guided variant represented by several vendors is less dangerous since its functional nuisance is confined. However the very high cost, very low service and real estate-hungry side remain.

**NWVP remark X – monorail**  
(pros & cons)  
For an elevated transport, being "monorail" is just an aesthetic option which summarizes as follows:  
- If large coaches are used, it is a train. Elevating it is costly and largely restricts its access and trackways flexibility, hence its overall interest.  
- If miniature pods are used it may be ideal – cheap and potent - and that is what we have chosen.  
- CarLina could be presented as the optimized, modern, much enhanced services vision of a monorail, adding a town-planning contribution.

**NWVP remark XI – cable car**  
(pros & cons)  
Respectfully, we'd say 'totally unrealistic'.

**NWVP remark XII – Walkability**  
(pros)  
Agree. This is the urban planning goal in a CarLina project, and we help and rationalize it significantly.

**NWVP remark XIII – Elevated walkway**  
(pros)  
We strongly disagree with this concept. People belong to their town ground. Having them walk in specific corridors is a major surrendering to the automotive invader. And it is extremely expensive. Pedestrian skywalks are dimensioned for high max loads (a cheering crowd) and cost a lot. We definitely think that elevating all in a light transport is the by far ideal combination.

5.1.8 Transport infrastructure phasing

5.2 Grey infrastructure

5.2.1 Utilities  
Note: CarLina network very sober transportation mode (designed for sustainability)

5.2.2 Waste  
CarLina automatically delivers 24/7 freight, parcels, skips etc. makes it a natural tool to handle wastes.

5.2.3 Energy and renewables  
Low energy transport mode, compatible with spread renewable energy sources.

5.3 Blue infrastructure

5.3.1 Flood risk and sustainable drainage  
Intrinsically immune. The efficient network to remain fully operational upon flood and other disasters.



#### 5.4 Social infrastructure

##### 5.4.1 Introduction to social infrastructure

The light automatic network has a strong potential to deliver 24/7 mobility to young & elder

##### 5.4.2 Education

The CarLina system is designed for local deployment, skill acquisition and maintenance

##### 5.4.3 Healthcare facilities & healthy active lifestyles

##### 5.4.4 Cultural and leisure facilities

##### 5.4.5 Masterplan response

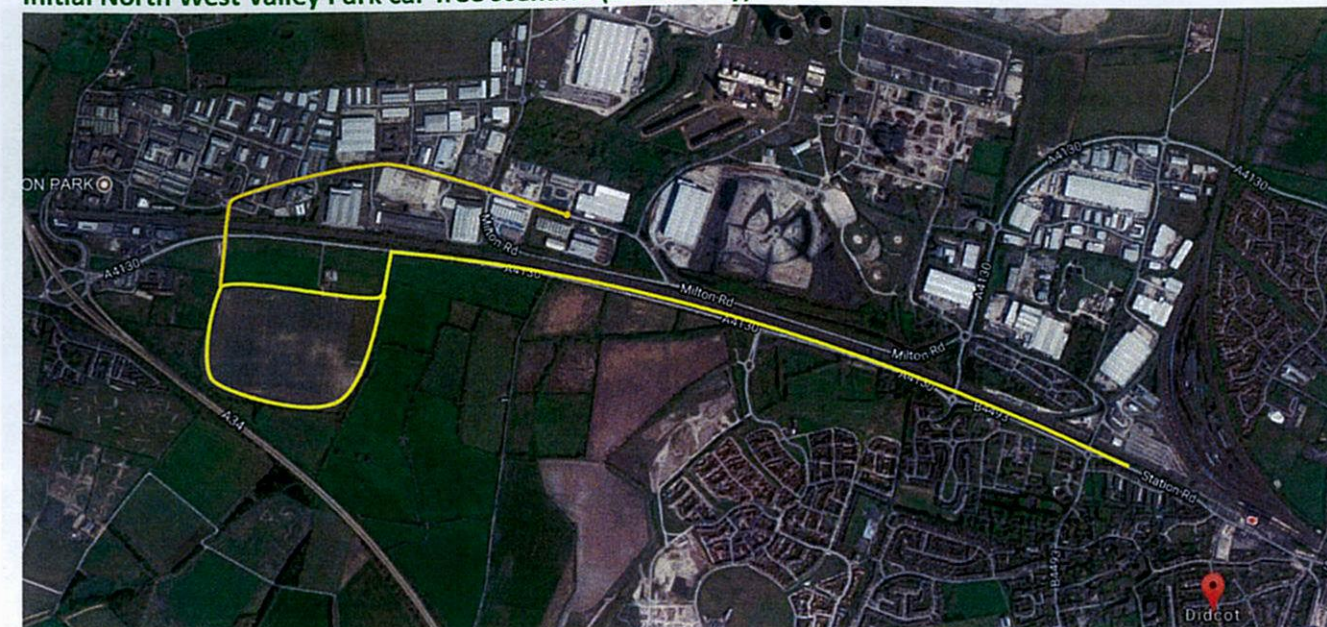
##### 5.4.6 Conclusions

CarLina was designed to provide spectrum of cheap/efficient/sustainable urban organization relevance.

The apparently difficult issue, from the Garden Town presentation, in thinking the Didcot area as car-free, can be quite easily solved if a clear separation is made between:

- the crossing (East-West) traffic, which should obviously be diverted or impeded, and
- the traffic corresponding to true local needs, to be favorably and much better served with a walk / bike / light automatic combination where cars can be left outside of a large perimeter.

Initial North West Valley Park car-free scenario (2015 study)



At first, it was only intended to provide NWVP with a clean, sustainable, very efficient transport system.

The one in yellow was enough to satisfy all needs at NWVP with a quick (4mn / no wait) link to the railway station. In orange a junction is made with Milton Park.

The NWP-Didcot link costs about 5M€ all-inclusive, with enough vehicles for 800 homes, ultimate sustainability and a quality much higher than usual transports including individual cars.

The Milton junction as figured above costs about 1M£ alone (without the A4130 bridge) and 1mn more.

Interestingly, the CarLina bridge over the A4130 is pretty light visually, mechanically and financially with less than 100k£. Such bridges are lighter than pedestrian ones, because the max load is lower.



# A more consistent Didcot scheme including NWVP (2017 study)



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