



Rialtas
na hÉireann
Government
of Ireland

Tionscadal Éireann
Project Ireland
2040



Iarnród Éireann
Irish Rail

ARUP



DART+
Coastal North

Appendix A - Detailed MCA table

Donabate Substation Optioneering MCA Matrix

Comparison Criteria Legend	
Significant comparative advantage over other options	
Some comparative advantage over other options	
Comparable to other options / neutral	
Some comparative disadvantage over other options	
Significant comparative disadvantage over other options	

		Economy								
Works Description	Summary of requirements	Option Number	Capital Expenditure (CAPEX): Construction, land acquisition, temporary works		OPEX:operational costs (IÉ or other entities), Technology advancements and future proofing / obsolescence		Train Operations Functionality/Economic Benefit		Traffic functionality and associated economic activities and opportunities	
			Qualitative appraisal of potential infrastructure costs of proposed options	Rationale	Qualitative appraisal of potential ongoing infrastructure maintenance costs of proposed options	Rationale	Qualitative appraisal of potential ongoing operational costs of proposed options	Rationale	Qualitative appraisal of potential wider benefits of proposed options	Rationale
			Estimate high level cost of construction of option Extent and type of 3rd party lands required permanently Extent and type of 3rd party land required temporarily for temporary works during construction		To offer good value for money. Cost to maintain the infrastructure over the whole life. Effects of infrastructure maintenance to services. Provision of ways of undertaking routine inspections and maintenance activities while minimising the effect on service to customers.		Potential improvement or deterioration of the operation conditions of the line (reduction or increase of the risk of interruption of service) Rolling stock & staff utilisation		Potential benefit to vehicular traffic flows in the vicinity of the works during construction and associated economic activities and opportunities in the vicinity Consideration of duration of traffic disruption and length of diversions To minimise the impacts on traffic and transportation during the construction and operational stages	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1		Construction of long access road required		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits		Minimal impacts to traffic functionality
		2		Construction costs are minimal, with a short access road required (when compared to Option 1)		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits		Access through residential estate during construction and impact on local traffic, pedestrian and cyclists expected.
		3		Construction costs are minimal, with a short access road required (when compared to Option 1)		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits		Impact on existing parking, pedestrians and cyclists at Park and Ride during construction
		4		Construction costs are minimal, with a short access road required (when compared to Option 1)		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits		Impact on existing parking, pedestrians and cyclists at Park and Ride during construction

Comparison Criteria Legend	
Significant comparative advantage over other options	
Some comparative advantage over other options	
Comparable to other options / neutral	
Some comparative disadvantage over other options	
Significant comparative disadvantage over other options	

Safety						
Works Description	Summary of requirements	Option Number	Employer's Safety		Public safety	
			Qualitative appraisal on the safety impacts on IE or railway staff	Rationale	Qualitative appraisal on the safety impacts on the public (road/rail/cycle/pedestrian)	Rationale
			To reduce safety risks associated with construction maintenance and operations. To reduce the potential for incidents or near-misses for IE/construction staff.		To reduce safety risks associated with passengers at platforms, public adjacent to the railway and road, pedestrian and cycle users at level crossings. To reduce the potential for accidents for members of the public/passengers on railway infrastructure. To reduce the potential for conflict between rail and road users.	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1		All options are comparable, with no differences between the options with regards to employer's safety		All options are comparable, with no differences between the options with regards to public safety
		2		All options are comparable, with no differences between the options with regards to employer's safety		All options are comparable, with no differences between the options with regards to public safety
		3		All options are comparable, with no differences between the options with regards to employer's safety		All options are comparable, with no differences between the options with regards to public safety
		4		All options are comparable, with no differences between the options with regards to employer's safety		All options are comparable, with no differences between the options with regards to public safety

Comparison Criteria Legend	
Significant comparative advantage over other options	Green
Some comparative advantage over other options	Light Green
Comparable to other options / neutral	Yellow
Some comparative disadvantage over other options	Orange
Significant comparative disadvantage over other options	Red

Environment																		
Works Description	Summary of requirements	Option Number	Landscape and Visual Qualitative		Biodiversity		Noise and Vibration		Water resources		Archaeology, Architectural and Cultural Heritage		Geology & Soils		Agricultural and non-agricultural		Air Quality & Climate Change	
			Appraisal of landscape and visual impacts of options based on the sensitive viewpoints	Rationale	Qualitative appraisal on the impact on biodiversity	Rationale	Qualitative appraisal of the potential noise and vibration impact	Rationale	Qualitative appraisal on the potential impacts to surface ground or coastal waters	Rationale	Qualitative appraisal of the potential impacts of proposed options on potential sub surface archaeology and impact on foundations and above ground elements of architectural heritage	Rationale	Qualitative appraisal of the potential of the proposed options on waste and material resources including the reuse of site won materials.	Rationale	Qualitative appraisal of impacts on valued resources either from a human or natural origin with value arising for economic or cultural reasons. These assets can be existing utilities or non-renewable resources.	Rationale	Qualitative appraisal of air quality and climate impacts both on the operational and construction phases	Rationale
			<ul style="list-style-type: none"> To avoid / minimise impact on designated amenities, landscapes, protected trees or views. To avoid / minimise visual impact on properties & amenities. To avoid / minimise removal of trees / hedgerows. To avoid / minimise impact from light pollution. To provide opportunities to enhance the local amenity and green infrastructure. 		<ul style="list-style-type: none"> To ensure that the solution provided minimises the effects on biodiversity of the area and/or provides opportunities to enhance it. 		<ul style="list-style-type: none"> To provide a solution which ensures minimum levels of noise and vibration 		<ul style="list-style-type: none"> To minimise the impact or provide opportunities to enhance the quality of surface waters and associated floodplains, ground waters and coastal waters. 		<ul style="list-style-type: none"> To minimise the impact on cultural heritage such as on below ground archaeological remains, historic buildings (individual and areas), and historic landscapes and parks. 		<ul style="list-style-type: none"> To provide a solution which minimises total capital carbon. To minimise waste. 		<ul style="list-style-type: none"> To provide a solution which minimises total capital carbon. 		<ul style="list-style-type: none"> To provide a solution which comprises a reduction in greenhouse gas emissions. To ensure that the chosen solution preserves or enhances the local air quality 	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1	Green	Secluded setting requires relatively long access road. Potential for screening.	Orange	Some comparative disadvantage. Potential for indirect impacts on nearby designated sites (Malahide Estuary SAC, SPA, and pHNA, and Rogerstown Estuary SPA, SAC and pHNA), include potential for water quality impacts or disturbance to birds, also new lighting which could impact on birds. Closer to SAC/SPA than other options but would likely be similar impacts on designated sites with other options. Potentially some tree/hedgerow removal for access road required and grassland removal for substation location, with potential for impacts on birds, bats, small mammals, and invertebrates.	Green	Furthest from any sensitive receptors	Yellow	Zone C - limited flood risk. Access road required increasing flood and surface water impact. Located along the perimeter of a 250m buffer, 500m location accuracy well used for agricultural and domestic use and classified as 'good'.	Green	There are no recorded monuments located in vicinity of this proposed substation. There is a greenfield potential to reveal below ground archaeological features. This option is located immediately to the south the Donabate Distributor Road currently under construction. Finds or features of an archaeological significance may have been revealed during this process but have not been recorded yet in the public record. This area is noted as agricultural fields on the historic OS mapping. There are no features of architectural heritage interest in the vicinity of this option.	Orange	There is potential for loss of topsoil/growing soil. The location for the proposed works will require the construction of an access road thereby generating earthworks.	Orange	Some comparative disadvantages over other options because this option is located on agricultural land.	Yellow	No operational air quality or climate impacts. Slightly preferred due to greatest separation from sensitive receptors - potential for minor dust impacts during the construction phase. No real differentiator.
		2	Green	Close to residential properties but views mitigated by presence of road embankment. Potential for screening.	Orange	Some comparative disadvantage. Potential for indirect impacts on nearby designated sites (Malahide Estuary SAC, SPA, and pHNA, and Rogerstown Estuary SPA, SAC and pHNA), include potential for water quality impacts or disturbance to birds, also new lighting which could impact on birds. Closer to SAC/SPA than other options but would likely be similar impacts on designated sites with other options. Some habitat removal required, good quality grassland (from street view) and likely some treelines/hedgerows. Also adjacent to bridge with bat roosting potential.	Orange	Close to sensitive residential receptors	Yellow	Zone C - limited flood risk. Short access road increases flood and surface water impacts slightly. Located within the 250m buffer, 500m location accuracy well used for agricultural and domestic use and classified as 'good'.	Green	There are no recorded monuments located in the vicinity of this proposed substation. There is a greenfield potential to reveal below ground archaeological features. This option is located immediately to the north the Donabate Distributor Road currently under construction. Finds or features of archaeological significance may have been revealed during this process but have not been recorded yet in the public record. This area is noted as agricultural fields on the historic OS mapping. There are no features of architectural heritage interest in the vicinity of this option.	Orange	There is potential for loss of topsoil/growing soil. The location for the proposed works will require the construction of an access road thereby generating earthworks.	Orange	Some comparative disadvantages over other options because this option is located on agricultural land.	Yellow	No operational air quality or climate impacts. Least preferred due to proximity to sensitive receptors - potential for minor dust impacts during the construction phase. No real differentiator.
		3	Orange	Impact on green space with trees and potential impact to trees on boundary with graveyard.	Green	Some comparative advantage. Potential for indirect impacts on nearby designated sites (Malahide Estuary SAC, SPA, and pHNA, and Rogerstown Estuary SPA, SAC and pHNA), include potential for water quality impacts or disturbance to birds, also new lighting which could impact on birds. Slightly further from European sites from Options 1&2. Removal of mature hedgerow and trees has the potential to impact birds, bats, and small mammals. Substation very close (c. 10m) to high potential bat roost building across the road (old church?) - will need to be determined if bats roosting here.	Orange	Close to sensitive residential receptors	Yellow	Zone C - limited flood risk. No access road required minimizing increased flood risk.	Orange	There are no recorded monuments located in vicinity of this proposed substation. There is a greenfield potential to reveal below ground archaeological features in the grassed area and possible foundations or remnants of structures (now demolished) shown on the 1st edition six-inch OS mapping and later editions. This site is located immediately to the west of Donabate Cemetery which is of cultural heritage significance. The proposed location adjoins Donabate cemetery NIAH 11336016. There is potential for damage to the cemetery.	Green	There is potential for excavation of made ground/contaminated land. From a geology and soils perspective, it is preferable to have the works done in a previously developed site/built-up area	Green	Some significant advantages over other options because this option is not located on agricultural land.	Yellow	No operational air quality or climate impacts. Slightly less preferred due to proximity to sensitive receptors - potential for minor dust impacts during the construction phase. No real differentiator.
		4	Orange	Located within existing station carpark but close to residential properties.	Green	Significant comparative advantage over other options. Potential for indirect impacts on nearby designated sites (Malahide Estuary SAC, SPA, and pHNA, and Rogerstown Estuary SPA, SAC and pHNA), include potential for water quality impacts or disturbance to birds, also new lighting which could impact on birds. However, further away from designated sites than other options (1&2), also little - no vegetation removal required (from satellite view) as habitats primarily look like hard standing/artificial in nature.	Orange	Close to sensitive residential receptors	Yellow	Zone C - limited flood risk. No access road required minimizing increased flood risk.	Orange	Partially located within the zone of notification for a recorded monument, an enclosure (DU012 067), located in Beaverstown townland. The site was revealed through test excavation (Hagen 2006). Potential to reveal subsurface archaeology at this location. There are no architecturally sensitive features in this location. There is a potential impact on setting of adjoining heritage structures but it is minor.	Green	There is potential for excavation of made ground/contaminated land. From a geology and soils perspective, it is preferable to have the works done in a previously developed site/built-up area	Green	Some significant advantages over other options because this option is not located on agricultural land.	Yellow	No operational air quality or climate impacts. Slightly preferred due to greatest separation from sensitive receptors. No real differentiator.

Comparison Criteria Legend	
Significant comparative advantage over other options	
Some comparative advantage over other options	
Comparable to other options / neutral	
Some comparative disadvantage over other options	
Significant comparative disadvantage over other options	

Accessibility & Social Inclusion						
Works Description	Summary of requirements	Option Number	Accessibility		Social Inclusion	
			Qualitative appraisal of capacity of options to facilitate the movement of people (either within, on to or across the rail system)	Rationale	Qualitative appraisal of capacity of options to provide ease of access for the mobility and visually impaired	Rationale
			Capacity of options to facilitate the movement of people (either within, on to or across the rail system) Impact on the wellbeing of the passenger and public. Positive impact on passenger and public experience. Improve accessibility to key facilities, such as employment, education, transport and healthcare to satisfy transport demand for all trip types.		Positive impact towards vulnerable groups Improvement of accessibility to public transport facilities, in particular from deprived geographic areas.	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.
		2		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.
		3		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.
		4		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.

Comparison Criteria Legend	
Significant comparative advantage over other options	
Some comparative advantage over other options	
Comparable to other options / neutral	
Some comparative disadvantage over other options	
Significant comparative disadvantage over other options	

		Integration										Physical Activity		
Works Description	Summary of requirements	Option Number	Adaptability in the future		Transport Integration		Land use integration		Geographical Integration		Government policy Integration		Walking / cycling opportunities	
			Qualitative appraisal of capacity of options to cater for future projects or aspirations	Rationale	Qualitative appraisal of the options and their impact on integration with other transport modes	Rationale	Qualitative appraisal of the options and their impact on integration with land use policies	Rationale	Qualitative appraisal of the options and their impact on integration with geographical polices	Rationale	Qualitative appraisal of the options and their impact on integration with geographical and government polices	Rationale	Qualitative appraisal of the options and their impact to enable walking and cycling opportunities in a safer environment for the communities along the route	Rationale
			Ability to continue to function successfully despite future changes in circumstances		Scope for and ease of interchange between modes New interchange nodes and facilities Reduce waking and wait times associated with interchanges Integration with the cycle networks Modal shifts figures during construction and operations Changes to journey times to transport nodes Impact on the operation of the other transport services both during construction and in operation stage		Consistency with land use strategies, regional and local plans		Potential to impact on external links during construction Potential to impact on external links during operations Consideration for any community severance impacts		Integration with national and international plans and policies		To enable walking and cycling opportunities in a safer environment in the communities along the route To create a healthy environment conducive to active travel Connectivity to adjoining cycling and pedestrian facilities Enhanced connectivity between key attractions/trip generators related to active modes Diversion, duration and impact on journey times and potential to create a negative modal shift (e.g. people opt to drive instead of walk or cycle)	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1	All options are comparable - options of substation locations do not impact the adaptability in the future in this area		Minimal impacts on transport integration		This option is the least favourable due to the High Amenity zoning		All of the options are infrastructural buildings adjoining a railway line and are considered neutral.		All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.		All options are comparable - options of substation locations do not impact the walking and cycling opportunities in this area.	
		2	All options are comparable - options of substation locations do not impact the adaptability in the future in this area		Minimal impacts on transport integration		This option is zoned residential. A substation is acceptable.		All of the options are infrastructural buildings adjoining a railway line and are considered neutral.		All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.		All options are comparable - options of substation locations do not impact the walking and cycling opportunities in this area.	
		3	All options are comparable - options of substation locations do not impact the adaptability in the future in this area		Impact on existing parking, pedestrians and cyclists at Park and Ride during construction		This option is zoned town centre. A substation is acceptable. However, a more high density use would be more appropriate		All of the options are infrastructural buildings adjoining a railway line and are considered neutral.		All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.		All options are comparable - options of substation locations do not impact the walking and cycling opportunities in this area.	
		4	All options are comparable - options of substation locations do not impact the adaptability in the future in this area		Impact on existing parking, pedestrians and cyclists at Park and Ride during construction		This option is zoned town centre. A substation is acceptable. However, a more high density use would be more appropriate		All of the options are infrastructural buildings adjoining a railway line and are considered neutral.		All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.		All options are comparable - options of substation locations do not impact the walking and cycling opportunities in this area.	

Rush and Lusk Substation Optioneering MCA Matrix

Significant comparative advantage over other options
Some comparative advantage over other options
Comparable to other options / neutral
Some comparative disadvantage over other options
Significant comparative disadvantage over other options

Economy										
Works Description	Summary of requirements	Option Number	Capital Expenditure (CAPEX): Construction, land acquisition, temporary works		OPEX:operational costs (IÉ or other entities), Technology advancements and future proofing / obsolescence		Train Operations Functionality/Economic Benefit		Traffic functionality and associated economic activities and opportunities	
			Qualitative appraisal of potential infrastructure costs of proposed options	Rationale	Qualitative appraisal of potential ongoing infrastructure maintenance costs of proposed options	Rationale	Qualitative appraisal of potential ongoing operational costs of proposed options	Rationale	Qualitative appraisal of potential wider benefits of proposed options	Rationale
			Estimate high level cost of construction of option Extent and type of 3rd party lands required permanently Extent and type of 3rd party land required temporarily for temporary works during construction		To offer good value for money. Cost to maintain the infrastructure over the whole life. Effects of infrastructure maintenance to services. Provision of ways of undertaking routine inspections and maintenance activities while minimising the effect on service to customers.		Potential improvement or deterioration of the operation conditions of the line (reduction or increase of the risk of interruption of service) Rolling stock & staff utilisation		Potential benefit to vehicular traffic flows in the vicinity of the works during construction and associated economic activities and opportunities in the vicinity Consideration of duration of traffic disruption and length of diversions To minimise the impacts on traffic and transportation during the construction and operational stages	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1		All options are comparable with costs		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits		Loss of car parking spaces
		2		All options are comparable with costs		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits		No car parking spaces lost
		3		All options are comparable with costs		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits		Loss of car parking spaces

Significant comparative advantage over other options
Some comparative advantage over other options
Comparable to other options / neutral
Some comparative disadvantage over other options
Significant comparative disadvantage over other options

Safety						
Works Description	Summary of requirements	Option Number	Employer's Safety		Public safety	
			Qualitative appraisal on the safety impacts on IE or railway staff	Rationale	Qualitative appraisal on the safety impacts on the public (road/rail/cycle/pedestrian)	Rationale
			To reduce safety risks associated with construction maintenance and operations. To reduce the potential for incidents or near-misses for IE/construction staff.		To reduce safety risks associated with passengers at platforms, public adjacent to the railway and road, pedestrian and cycle users at level crossings. To reduce the potential for accidents for members of the public/passengers on railway infrastructure. To reduce the potential for conflict between rail and road users.	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1		All options are comparable, with no differences between the options with regards to employer's safety		All options are comparable, with no differences between the options with regards to public safety
		2		All options are comparable, with no differences between the options with regards to employer's safety		All options are comparable, with no differences between the options with regards to public safety
		3		All options are comparable, with no differences between the options with regards to employer's safety		All options are comparable, with no differences between the options with regards to public safety

Significant comparative advantage over other options
Some comparative advantage over other options
Comparable to other options / neutral
Some comparative disadvantage over other options
Significant comparative disadvantage over other options

Environment																		
Works Description	Summary of requirements	Option Number	Landscape and Visual Qualitative		Biodiversity		Noise and Vibration		Water resources		Archaeology, Architectural and Cultural Heritage		Geology & Soils		Agricultural and non-agricultural		Air Quality & Climate Change	
			Appraisal of landscape and visual impacts of options based on the sensitive viewpoints	Rationale	Qualitative appraisal on the impact on biodiversity	Rationale	Qualitative appraisal of the potential noise and vibration impact	Rationale	Qualitative appraisal on the potential impacts to surface ground or coastal waters	Rationale	Qualitative appraisal of the potential impacts of proposed options on potential sub surface archaeology and impact on foundations and above ground elements of architectural heritage	Rationale	Qualitative appraisal of the potential of the proposed options on waste and material resources including the reuse of site won materials.	Rationale	Qualitative appraisal of impacts on valued resources either from a human or natural origin with value arising from economic or cultural reasons. These assets can be existing utilities or non-renewable resources	Rationale	Qualitative appraisal of air quality and climate impacts both on the operational and construction phases	Rationale
			<ul style="list-style-type: none"> To avoid / minimise impact on designated amenities, landscapes, protected trees or views. To avoid / minimise visual impact on properties & amenities. To avoid / minimise removal of trees / hedgerows. To avoid / minimise impact from light pollution. To provide opportunities to enhance the local amenity and green infrastructure. 		<ul style="list-style-type: none"> To ensure that the solution provided minimises the effects on biodiversity of the area and/or provides opportunities to enhance it. 	<ul style="list-style-type: none"> To provide a solution which ensures minimum levels of noise and vibration 		<ul style="list-style-type: none"> To minimise the impact or provide opportunities to enhance the quality of surface waters and associated floodplains, ground waters and coastal waters. 		<ul style="list-style-type: none"> To minimise the impact on cultural heritage such as on below ground archaeological remains, historic buildings (individual and areas), and historic landscapes and parks. 		<ul style="list-style-type: none"> To provide a solution which minimises total capital carbon. To minimise waste. 		<ul style="list-style-type: none"> To provide a solution which minimises total capital carbon. 		<ul style="list-style-type: none"> To provide a solution which comprises a reduction in greenhouse gas emissions. To ensure that the chosen solution preserves or enhances the local air quality 		
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1	Significant comparative disadvantage over other options	Location is close to residential properties, has direct impacts on garden boundaries, some with mature trees, and will be difficult to adequately screen	Some comparative advantage over other options due to construction related impacts. Potential for indirect impacts on nearby designated sites (Rogerstown Estuary SPA, SAC and pNHA), include potential for water quality impacts or disturbance to birds, also new lighting which could impact on birds. If noise generated is higher than what currently exists, further disturbance to birds may occur. Location is partially on artificial ground (carpark?), but may require some vegetation removal of hedgerows adjacent, impacts on birds, bats, small mammals. If additional lighting required could disturb bats commuting and foraging along this hedgerow.	Closest to residential receptors		All options comparable		There are no recorded monuments in the vicinity of the proposed substation. There is the potential to reveal subsurface archaeological finds and deposits during any ground breaking works associated with the construction of the site. Located in what is currently a car park, no features of architectural heritage sensitivity in this location.		Proposed work is on IE land. Minimal impacts from a Geology & Soils perspective.		Comparable to other options because all options located on non-agricultural land		No operational air quality or climate impacts. Similar distance to sensitive receptors for potential dust impacts during construction. No real differentiator.		
		2	Significant comparative advantage over other options	Location is distant from residential properties facing railway and station, with good screening on northern, eastern and southern boundaries	Some comparative disadvantage over other options. Potential for indirect impacts on nearby designated sites (Rogerstown Estuary SPA, SAC and pNHA), include potential for water quality impacts or disturbance to birds, also new lighting which could impact on birds. If noise generated is higher than what currently exists, further disturbance to birds may occur. Vegetation removal significantly more for this option than others, impacts on birds (ground and tree nesting), potentially bats if trees removed or extra lighting required, and mammals.	Not as close to residential receptors as Option 1, but closer than Option 3		All options comparable		There are no recorded monuments in the vicinity of the proposed substation. There is the potential to reveal subsurface archaeological finds and deposits during any ground breaking works associated with the construction of the site. The proposed site is a greenfield site with no known architectural heritage features.		Proposed work is on IE land. There is potential for loss of topsoil/growing soil.		Comparable to other options because all options located on non-agricultural land		No operational air quality or climate impacts. Similar distance to sensitive receptors for potential dust impacts during construction. No real differentiator.		
		3	Significant comparative advantage over other options	Location is distant from residential properties but is visually open from R128 road. Compound would impact some young trees and would be visually intrusive within existing carpark.	Some comparative advantage over other options. Potential for indirect impacts on nearby designated sites (Rogerstown Estuary SPA, SAC and pNHA), include potential for water quality impacts or disturbance to birds, also new lighting which could impact on birds. If noise generated is higher than what currently exists, further disturbance to birds may occur. Vegetation removal of low quality hedgerow habitat within the station carpark, however already a very disturbed area so potential impacts would be low. Potential for bat roosts in buildings adjacent to works area. Will need to be assessed for suitability and evidence of bat roosts.	Furthest from residential receptors		All options comparable		There are no recorded monuments in the vicinity of the proposed substation. There is the potential to reveal subsurface archaeological finds and deposits during any ground breaking works associated with the construction of the site. Located in what is currently a car park, no features of architectural heritage sensitivity in this location. No direct negative impact anticipated. Potential visual impact.		Proposed work is on IE land. Minimal impacts from a Geology & Soils perspective.		Comparable to other options because all options located on non-agricultural land		No operational air quality or climate impacts. Similar distance to sensitive receptors for potential dust impacts during construction. No real differentiator.		

Significant comparative advantage over other options
Some comparative advantage over other options
Comparable to other options / neutral
Some comparative disadvantage over other options
Significant comparative disadvantage over other options

Accessibility & Social Inclusion						
Works Description	Summary of requirements	Option Number	Accessibility		Social Inclusion	
			Qualitative appraisal of capacity of options to facilitate the movement of people (either within, on to or across the rail system)	Rationale	Qualitative appraisal of capacity of options to provide ease of access for the mobility and visually impaired	Rationale
			Capacity of options to facilitate the movement of people (either within, on to or across the rail system) Impact on the wellbeing of the passenger and public. Positive impact on passenger and public experience. Improve accessibility to key facilities, such as employment, education, transport and healthcare to satisfy transport demand for all trip types.		Positive impact towards vulnerable groups Improvement of accessibility to public transport facilities, in particular from deprived geographic areas.	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.
		2		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.
		3		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.

Comparison Criteria Legend	
Significant comparative advantage over other options	
Some comparative advantage over other options	
Comparable to other options / neutral	
Some comparative disadvantage over other options	
Significant comparative disadvantage over other options	

		Integration										Physical Activity		
Works Description	Summary of requirements	Option Number	Adaptability in the future		Transport Integration		Land use integration		Geographical Integration		Government policy Integration		Walking / cycling opportunities	
			Qualitative appraisal of capacity of options to cater for future projects or aspirations	Rationale	Qualitative appraisal of the options and their impact on integration with other transport modes	Rationale	Qualitative appraisal of the options and their impact on integration with land use policies	Rationale	Qualitative appraisal of the options and their impact on integration with geographical polices	Rationale	Qualitative appraisal of the options and their impact on integration with geographical and government polices	Rationale	Qualitative appraisal of the options and their impact to enable walking and cycling opportunities in a safer environment for the communities along the route	Rationale
			Ability to continue to function successfully despite future changes in circumstances		Scope for and ease of interchange between modes New interchange nodes and facilities Reduce waking and wait times associated with interchanges Integration with the cycle networks Modal shifts figures during construction and operations Changes to journey times to transport nodes Impact on the operation of the other transport services both during construction and in operation stage		Consistency with land use strategies, regional and local plans		Potential to impact on external links during construction Potential to impact on external links during operations Consideration for any community severance impacts		Integration with national and international plans and policies		To enable walking and cycling opportunities in a safer environment in the communities along the route To create a healthy environment conducive to active travel Connectivity to adjoining cycling and pedestrian facilities Enhanced connectivity between key attractions/trip generators related to active modes Diversions, duration and impact on journey times and potential to create a negative modal shift (e.g. people opt to drive instead of walk or cycle)	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1		All options are comparable - options of substation locations do not impact the adaptability in the future in this area		Loss of car parking spaces		This option is zoned R2/rural cluster. A substation is permissible.		All of the options are infrastructural buildings adjoining a railway line and are considered neutral.		All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.		All options are comparable - options of substation locations do not impact the walking and cycling opportunities in this area.
		2		All options are comparable - options of substation locations do not impact the adaptability in the future in this area		No car parking spaces lost		This option is zoned P1/Green Belt. A substation is permissible.		All of the options are infrastructural buildings adjoining a railway line and are considered neutral.		All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.		All options are comparable - options of substation locations do not impact the walking and cycling opportunities in this area.
		3		All options are comparable - options of substation locations do not impact the adaptability in the future in this area		Loss of car parking spaces		This option is zoned R2/rural cluster. A substation is permissible.		All of the options are infrastructural buildings adjoining a railway line and are considered neutral.		All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.		All options are comparable - options of substation locations do not impact the walking and cycling opportunities in this area.

Skerries South Substation Optioneering MCA Matrix

Comparison Criteria Legend	
Significant comparative advantage over other options	
Some comparative advantage over other options	
Comparable to other options / neutral	
Some comparative disadvantage over other options	
Significant comparative disadvantage over other options	

		Economy								
Works Description	Summary of requirements	Option Number	Capital Expenditure (CAPEX): Construction, land acquisition, temporary works		OPEX:operational costs (IÉ or other entities), Technology advancements and future proofing / obsolescence		Train Operations Functionality/Economic Benefit		Traffic functionality and associated economic activities and opportunities	
			Qualitative appraisal of potential infrastructure costs of proposed options	Rationale	Qualitative appraisal of potential ongoing infrastructure maintenance costs of proposed options	Rationale	Qualitative appraisal of potential ongoing operational costs of proposed options	Rationale	Qualitative appraisal of potential wider benefits of proposed options	Rationale
			Estimate high level cost of construction of option Extent and type of 3rd party lands required permanently Extent and type of 3rd party land required temporarily for temporary works during construction		To offer good value for money. Cost to maintain the infrastructure over the whole life. Effects of infrastructure maintenance to services. Provision of ways of undertaking routine inspections and maintenance activities while minimising the effect on service to customers.		Potential improvement or deterioration of the operation conditions of the line (reduction or increase of the risk of interruption of service) Rolling stock & staff utilisation		Potential benefit to vehicular traffic flows in the vicinity of the works during construction and associated economic activities and opportunities in the vicinity Consideration of duration of traffic disruption and length of diversions To minimise the impacts on traffic and transportation during the construction and operational stages	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1		Option 1 is located on a land requiring minimal excavation and no large civil infrastructure		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits
		2		Option 2 is located on a land requiring minimal excavation and no large civil infrastructure		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits
		3		Option 3 involves construction of a retaining wall		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits

Comparison Criteria Legend
Significant comparative advantage over other options
Some comparative advantage over other options
Comparable to other options / neutral
Some comparative disadvantage over other options
Significant comparative disadvantage over other options

Safety						
Works Description	Summary of requirements	Option Number	Employer's Safety		Public safety	
			Qualitative appraisal on the safety impacts on IE or railway staff	Rationale	Qualitative appraisal on the safety impacts on the public (road/rail/cycle/pedestrian)	Rationale
			To reduce safety risks associated with construction maintenance and operations. To reduce the potential for incidents or near-misses for IE/construction staff.		To reduce safety risks associated with passengers at platforms, public adjacent to the railway and road, pedestrian and cycle users at level crossings. To reduce the potential for accidents for members of the public/passengers on railway infrastructure. To reduce the potential for conflict between rail and road users.	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1		All options are comparable, with no differences between the options with regards to employer's safety		All options are comparable, with no differences between the options with regards to public safety
		2		All options are comparable, with no differences between the options with regards to employer's safety		All options are comparable, with no differences between the options with regards to public safety
		3		All options are comparable, with no differences between the options with regards to employer's safety		All options are comparable, with no differences between the options with regards to public safety

Comparison Criteria Legend	
Significant comparative advantage over other options	
Some comparative advantage over other options	
Comparable to other options / neutral	
Some comparative disadvantage over other options	
Significant comparative disadvantage over other options	

Environment																		
Works Description	Summary of requirements	Option Number	Landscape and Visual Qualitative		Biodiversity		Noise and Vibration		Water resources		Archaeology, Architectural and Cultural Heritage		Geology & Soils		Agricultural and non-agricultural		Air Quality & Climate Change	
			Appraisal of landscape and visual impacts of options based on the sensitive viewpoints	Rationale	Qualitative appraisal on the impact on biodiversity	Rationale	Qualitative appraisal of the potential noise and vibration impact	Rationale	Qualitative appraisal on the potential impacts to surface ground or coastal waters	Rationale	Qualitative appraisal of the potential impacts of proposed options on potential sub surface archaeology and impact on foundations and above ground elements of architectural heritage	Rationale	Qualitative appraisal of the potential of the proposed options on waste and material resources including the reuse of site won materials.	Rationale	Qualitative appraisal of impacts on valued resources either from a human or natural origin with value arising from economic or cultural reasons. These assets can be existing utilities or non-renewable resources	Rationale	Qualitative appraisal of air quality and climate impacts both on the operational and construction phases	Rationale
			<ul style="list-style-type: none"> To avoid / minimise impact on designated amenities, landscapes, protected trees or views. To avoid / minimise visual impact on properties & amenities. To avoid / minimise removal of trees / hedgerows. To avoid / minimise impact from light pollution. To provide opportunities to enhance the local amenity and green infrastructure. 		<ul style="list-style-type: none"> To ensure that the solution provided minimises the effects on biodiversity of the area and/or provides opportunities to enhance it. 		<ul style="list-style-type: none"> To provide a solution which ensures minimum levels of noise and vibration 		<ul style="list-style-type: none"> To minimise the impact or provide opportunities to enhance the quality of surface waters and associated floodplains, ground waters and coastal waters. 		<ul style="list-style-type: none"> To minimise the impact on cultural heritage such as on below ground archaeological remains, historic buildings (individual and areas), and historic landscapes and parks. 		<ul style="list-style-type: none"> To provide a solution which minimises total capital carbon. To minimise waste. 		<ul style="list-style-type: none"> To provide a solution which minimises total capital carbon. 		<ul style="list-style-type: none"> To provide a solution which comprises a reduction in greenhouse gas emissions. To ensure that the chosen solution preserves or enhances the local air quality 	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1		Location is remote from residential property but intrusive in agricultural landscape		Comparable to other options due to construction related impacts. This option would require removal of hedgerow/treeline for the TSS and possibly for access road (difficult to tell from figure provided), with potential for impacts on birds, small mammals and bats. Access road adjacent to bridge with low potential for roosting bats. Additional lighting required for TSS has potential for disturbance impacts on bats, wintering birds (if using agricultural lands for foraging), and other mammals.		Furthest from any residential receptors		All options comparable		There are no recorded monuments in the vicinity of the proposed substation. There is the potential to reveal subsurface archaeological finds and deposits during any earthmoving works associated with the construction of the substation. Located in an agricultural ploughed field. Aerial photography notes a darkened semi-circular patch of soil (135m north-south and 48m east-west) to the south of the proposed substation area, this should be investigated by archaeological test trenching. A historic underpass is indicated at this location and further investigation is required to establish the architectural heritage value of this structure. It is anticipated that the magnitude of impact on the designed landscape would be low resulting in a Negative, slight impact on the architectural heritage value of the site.		There is potential for loss of topsoil/growing soil. The location for the proposed works will require the construction of longer access road thereby generating more earthworks.		This has significant comparative disadvantages because this option is located on land with a medium-high sensitivity enterprise and requires a long entrance road on agricultural land		No operational air quality or climate impacts. Similar distance to sensitive receptors for potential dust impacts during construction. No real differentiator.
		2		Location is close to residential property		Comparable to other options due to construction related impacts. This option would require removal of hedgerow/treeline for the TSS and possibly for access road (difficult to tell from figure provided), with potential for impacts on birds, small mammals and bats. Access road adjacent to bridge with low potential for roosting bats. Additional lighting required for TSS has potential for disturbance impacts on bats, wintering birds (if using agricultural lands for foraging), and other mammals.		Close to residential receptors		All options comparable		There are no recorded monuments in the vicinity of the proposed substation. There is the potential to reveal subsurface archaeological finds and deposits during any earth moving works associated with the construction of the substation in this agricultural field. It is on the site of the former gate lodge of Hackettstown House. There are possible remains of this structure indicated on the current OS maps for the site, and on aerial photographs. A sub-station in this location would negatively impact on the former designed landscape of Hackettstown House. Due to the proposed location, which corresponds to an historic entrance to the demesne, it is anticipated that the magnitude of impact would be low. Overall, this option would have a Negative, Slight impact on the architectural heritage value of the site.		There is potential for loss of topsoil/growing soil. The location for the proposed works will require the construction of an access road thereby generating earthworks.		This has some comparative advantages because this option is located on agricultural land with a medium-high sensitivity enterprise		No operational air quality or climate impacts. Less preferred compared to option 1 for potential dust impacts during construction. No real differentiator.
		3		Location is well screened by roadside vegetation and remote from residential properties		Comparable to other options due to construction related impacts. Vegetation removal required for TSS installation, and access road. Disturbance/displacement impacts on birds, bats, mammals. TSS location adjacent to bridge with low potential for roosting bats. Additional lighting required for TSS has potential for disturbance impacts on bats, wintering birds (if using agricultural lands for foraging), and other mammals.		Close to residential receptors		All options comparable		There are no recorded monuments in the vicinity of the proposed substation. There is the potential to reveal subsurface archaeological finds and deposits during any earth moving works associated with the construction of the substation. Located in an agricultural field in Milverton townland where there is a tradition of burials in 'stone coffins' being revealed (DU005-032). Also a fragment of human skull (NMI 1986:140) was found as a surface find in a ploughed field in Milverton known as 'Daines Burial Ground'. A sub-station in this location would negatively impact on the setting of the bridge. It is anticipated that the magnitude of impact would be low. This option would also negatively impact on the complex of early nineteenth century farm buildings to the east of Golf Links Road bridge. The farm buildings would be screened by the railway line and existing mature trees. It is anticipated that the magnitude of impact would be Low. Overall, this option would have a Negative, Slight impact on the architectural heritage value of the site.		There is potential for loss of topsoil/growing soil. The location for the proposed works will require the construction of an access road thereby generating earthworks.		This has some comparative advantages because this option is located on agricultural land with a medium sensitivity enterprise		No operational air quality or climate impacts. Less preferred compared to option 1 for potential dust impacts during construction. No real differentiator.

Comparison Criteria Legend
Significant comparative advantage over other options
Some comparative advantage over other options
Comparable to other options / neutral
Some comparative disadvantage over other options
Significant comparative disadvantage over other options

Accessibility & Social Inclusion						
Works Description	Summary of requirements	Option Number	Accessibility		Social Inclusion	
			Qualitative appraisal of capacity of options to facilitate the movement of people (either within, on to or across the rail system)	Rationale	Qualitative appraisal of capacity of options to provide ease of access for the mobility and visually impaired	Rationale
			Capacity of options to facilitate the movement of people (either within, on to or across the rail system) Impact on the wellbeing of the passenger and public. Positive impact on passenger and public experience. Improve accessibility to key facilities, such as employment, education, transport and healthcare to satisfy transport demand for all trip types.		Positive impact towards vulnerable groups Improvement of accessibility to public transport facilities, in particular from deprived geographic areas.	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.
		2		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.
		3		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.

Comparison Criteria Legend	
Significant comparative advantage over other options	
Some comparative advantage over other options	
Comparable to other options / neutral	
Some comparative disadvantage over other options	
Significant comparative disadvantage over other options	

Integration													Physical Activity	
Works Description	Summary of requirements	Option Number	Adaptability in the future		Transport Integration		Land use integration		Geographical Integration		Government policy Integration		Walking / cycling opportunities	
			Qualitative appraisal of capacity of options to cater for future projects or aspirations	Rationale	Qualitative appraisal of the options and their impact on integration with other transport modes	Rationale	Qualitative appraisal of the options and their impact on integration with land use policies	Rationale	Qualitative appraisal of the options and their impact on integration with geographical policies	Rationale	Qualitative appraisal of the options and their impact on integration with geographical and government policies	Rationale	Qualitative appraisal of the options and their impact to enable walking and cycling opportunities in a safer environment for the communities along the route	Rationale
			Ability to continue to function successfully despite future changes in circumstances		Scope for and ease of interchange between modes New interchange nodes and facilities Reduce waking and wait times associated with interchanges Integration with the cycle networks Modal shifts figures during construction and operations Changes to journey times to transport nodes Impact on the operation of the other transport services both during construction and in operation stage		Consistency with land use strategies, regional and local plans		Potential to impact on external links during construction Potential to impact on external links during operations Consideration for any community severance impacts		Integration with national and international plans and policies		To enable walking and cycling opportunities in a safer environment in the communities along the route To create a healthy environment conducive to active travel Connectivity to adjoining cycling and pedestrian facilities Enhanced connectivity between key attractions/trip generators related to active modes Diversions, duration and impact on journey times and potential to create a negative modal shift (e.g. people opt to drive instead of walk or cycle)	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1	All options are comparable - options of substation locations do not impact the adaptability in the future in this area	All options are comparable - options of substation locations do not impact transport integration in this area.	All options are comparable - options of substation locations do not impact transport integration in this area.	Option 1 is zoned G4/Green Belt. A substation is permissible.	All of the options are infrastructural buildings adjoining a railway line and are considered neutral.	All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.	All options are comparable - options of substation locations do not impact the walking and cycling opportunities in this area.					
		2	All options are comparable - options of substation locations do not impact the adaptability in the future in this area	All options are comparable - options of substation locations do not impact transport integration in this area.	All options are comparable - options of substation locations do not impact transport integration in this area.	Option 2 is zoned G4/Rural. A substation is permissible.	All of the options are infrastructural buildings adjoining a railway line and are considered neutral.	All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.	All options are comparable - options of substation locations do not impact the walking and cycling opportunities in this area.					
		3	All options are comparable - options of substation locations do not impact the adaptability in the future in this area	All options are comparable - options of substation locations do not impact transport integration in this area.	All options are comparable - options of substation locations do not impact transport integration in this area.	Option 3 is zoned P1/Green Belt. A substation is permissible.	All of the options are infrastructural buildings adjoining a railway line and are considered neutral.	All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.	All options are comparable - options of substation locations do not impact the walking and cycling opportunities in this area.					

Skerries North Substation Optioneering MCA Matrix

Comparison Criteria Legend
Significant comparative advantage over other options
Some comparative advantage over other options
Comparable to other options / neutral
Some comparative disadvantage over other options
Significant comparative disadvantage over other options

		Economy								
Works Description	Summary of requirements	Option Number	Capital Expenditure (CAPEX): Construction, land acquisition, temporary works		OPEX:operational costs (IÉ or other entities), Technology advancements and future proofing / obsolescence		Train Operations Functionality/Economic Benefit		Traffic functionality and associated economic activities and opportunities	
			Qualitative appraisal of potential infrastructure costs of proposed options	Rationale	Qualitative appraisal of potential ongoing infrastructure maintenance costs of proposed options	Rationale	Qualitative appraisal of potential ongoing operational costs of proposed options	Rationale	Qualitative appraisal of potential wider benefits of proposed options	Rationale
			Estimate high level cost of construction of option Extent and type of 3rd party lands required permanently Extent and type of 3rd party land required temporarily for temporary works during construction		To offer good value for money. Cost to maintain the infrastructure over the whole life. Effects of infrastructure maintenance to services. Provision of ways of undertaking routine inspections and maintenance activities while minimising the effect on service to customers.		Potential improvement or deterioration of the operation conditions of the line (reduction or increase of the risk of interruption of service) Rolling stock & staff utilisation		Potential benefit to vehicular traffic flows in the vicinity of the works during construction and associated economic activities and opportunities in the vicinity Consideration of duration of traffic disruption and length of diversions To minimise the impacts on traffic and transportation during the construction and operational stages	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1		Due to the level changes, a number of retaining walls need to be construction around the substation and access road		Maintenance of the retaining walls and access road required		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits
		4		Located on agricultural land therefore no significant retaining walls required.		Maintenance of the access road		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits

Comparison Criteria Legend
Significant comparative advantage over other options
Some comparative advantage over other options
Comparable to other options / neutral
Some comparative disadvantage over other options
Significant comparative disadvantage over other options

Safety

Works Description	Summary of requirements	Option Number	Employer's Safety		Public safety	
			Qualitative appraisal on the safety impacts on IÉ or railway staff	Rationale	Qualitative appraisal on the safety impacts on the public (road/rail/cycle/pedestrian)	Rationale
			To reduce safety risks associated with construction maintenance and operations. To reduce the potential for incidents or near-misses for IÉ/construction staff.		To reduce safety risks associated with passengers at platforms, public adjacent to the railway and road, pedestrian and cycle users at level crossings. To reduce the potential for accidents for members of the public/passengers on railway infrastructure. To reduce the potential for conflict between rail and road users.	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1		All options are comparable, with no differences between the options with regards to employer's safety		All options are comparable, with no differences between the options with regards to public safety
		4		All options are comparable, with no differences between the options with regards to employer's safety		All options are comparable, with no differences between the options with regards to public safety

Comparison Criteria Legend	
Significant comparative advantage over other options	
Some comparative advantage over other options	
Comparable to other options / neutral	
Some comparative disadvantage over other options	
Significant comparative disadvantage over other options	

Environment																		
Works Description	Summary of requirements	Option Number	Landscape and Visual Qualitative		Biodiversity		Noise and Vibration		Water resources		Archaeology, Architectural and Cultural Heritage		Geology & Soils		Agricultural and non-agricultural		Air Quality & Climate Change	
			Appraisal of landscape and visual impacts of options based on the sensitive viewpoints	Rationale	Qualitative appraisal on the impact on biodiversity	Rationale	Qualitative appraisal of the potential noise and vibration impact	Rationale	Qualitative appraisal on the potential impacts to surface ground or coastal waters	Rationale	Qualitative appraisal of the potential impacts of proposed options on potential sub surface archaeology and impact on foundations and above ground elements of architectural heritage	Rationale	Qualitative appraisal of the potential of the proposed options on waste and material resources including the reuse of site won materials.	Rationale	Qualitative appraisal of impacts on valued resources either from a human or natural origin with value arising for economic or cultural reasons. These assets can be existing utilities or non-renewable resources	Rationale	Qualitative appraisal of air quality and climate impacts both on the operational and construction phases	Rationale
			<ul style="list-style-type: none"> To avoid / minimise impact on designated amenities, landscapes, protected trees or views. To avoid / minimise visual impact on properties & amenities. To avoid / minimise removal of trees / hedgerows. To avoid / minimise impact from light pollution. To provide opportunities to enhance the local amenity and green infrastructure. 		<ul style="list-style-type: none"> To ensure that the solution provided minimises the effects on biodiversity of the area and/or provides opportunities to enhance it. 		<ul style="list-style-type: none"> To provide a solution which ensures minimum levels of noise and vibration 		<ul style="list-style-type: none"> To minimise the impact or provide opportunities to enhance the quality of surface waters and associated floodplains, ground waters and coastal waters. 		<ul style="list-style-type: none"> To minimise the impact on cultural heritage such as on below ground archaeological remains, historic buildings (individual and areas), and historic landscapes and parks. 		<ul style="list-style-type: none"> To provide a solution which minimises total capital carbon. To minimise waste. 		<ul style="list-style-type: none"> To provide a solution which minimises total capital carbon. 		<ul style="list-style-type: none"> To provide a solution which comprises a reduction in greenhouse gas emissions. To ensure that the chosen solution preserves or enhances the local air quality 	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1	Further from more residential receptors		Some comparative disadvantage due to construction related impacts. Potential for disturbance from light/noise to birds species feeding on nearby Barnageera Bay Beach (not designated area). Vegetation removal for TSS - potential for habitat loss and disturbance impacts on birds, bats, mammals. Access road in potentially disturbed area so may not cause any additional habitat loss for this. Option is adjacent to underbridge, which may have bat roosting potential. However from Google Street View, roosting potential is low.		Further from more residential receptors		All options comparable		This option is located in Barnageeragh townland where subsurface archaeological features and finds have been revealed through development projects. As such this option is considered to have the potential to reveal sub-surface archaeological features and preconstruction investigation will be required to be carried out. Option 1 is located beside the railway bridge (UBB 53) over Barnageeragh Road is included in Fingal County Council's Record of Protected Structures (FCC RPS 878). No direct negative impact anticipated. There is a potential indirect or visual impact the magnitude of which is low. It is anticipated that the proposed location would have a Negative, Slight impact on the architectural heritage value of the site.		There is potential for loss of topsoil/growing soil since in agricultural land. The location for the proposed works will require the construction of a retaining wall and an access road thereby requiring more excavation works and generating considerable earthworks		Some comparative advantages for this option which is not located on agricultural land.		Good separation from nearest sensitive receptors avoiding potential air quality impacts during the construction phase.	
		4	Closer to residential receptors		Some comparative advantage to other option due to construction related impacts. Very little to - no scrub/hedgerow/tree removal for this option (TSS or access road). Potential for bird related disturbance in agricultural field i.e. ground nesting birds, and wintering birds.		Closer to residential receptors		All options comparable		This option is located in Barnageeragh townland where subsurface archaeological features and finds have been revealed through development projects. As such this option is considered to have the potential to reveal sub-surface archaeological features and preconstruction investigation will be required to be carried out. The proposed site for Option 4 is a greenfield site with no known architectural heritage features. It is anticipated that the magnitude of impact from option 4 on the setting of the historic structures would be negligible. No other buildings or features of architectural heritage interest were identified which could be impacted by a proposed sub-station at this location		There is potential for loss of topsoil/growing soil since in agricultural land. The location for the proposed works will require the construction of an access road thereby generating earthworks. Possibility of encountering alluvial deposits based on geological maps.		Some comparative disadvantage for this option which is located on agricultural land.		Located closer to sensitive receptors potentially resulting in air quality impacts during the construction phase.	

Comparison Criteria Legend
Significant comparative advantage over other options
Some comparative advantage over other options
Comparable to other options / neutral
Some comparative disadvantage over other options
Significant comparative disadvantage over other options

Accessibility & Social Inclusion						
Works Description	Summary of requirements	Option Number	Accessibility		Social Inclusion	
			Qualitative appraisal of capacity of options to facilitate the movement of people (either within, on to or across the rail system)	Rationale	Qualitative appraisal of capacity of options to provide ease of access for the mobility and visually impaired	Rationale
			Capacity of options to facilitate the movement of people (either within, on to or across the rail system) Impact on the wellbeing of the passenger and public. Positive impact on passenger and public experience. Improve accessibility to key facilities, such as employment, education, transport and healthcare to satisfy transport demand for all trip types.		Positive impact towards vulnerable groups Improvement of accessibility to public transport facilities, in particular from deprived geographic areas.	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.
		4		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.

Comparison Criteria Legend
Significant comparative advantage over other options
Some comparative advantage over other options
Comparable to other options / neutral
Some comparative disadvantage over other options
Significant comparative disadvantage over other options

Integration													Physical Activity	
Works Description	Summary of requirements	Option Number	Adaptability in the future		Transport Integration		Land use integration		Geographical Integration		Government policy Integration		Walking / cycling opportunities	
			Qualitative appraisal of capacity of options to cater for future projects or aspirations	Rationale	Qualitative appraisal of the options and their impact on integration with other transport modes	Rationale	Qualitative appraisal of the options and their impact on integration with land use policies	Rationale	Qualitative appraisal of the options and their impact on integration with geographical policies	Rationale	Qualitative appraisal of the options and their impact on integration with geographical and government policies	Rationale	Qualitative appraisal of the options and their impact to enable walking and cycling opportunities in a safer environment for the communities along the route	Rationale
			Ability to continue to function successfully despite future changes in circumstances		Scope for and ease of interchange between modes New interchange nodes and facilities Reduce waking and wait times associated with interchanges Integration with the cycle networks Modal shifts figures during construction and operations Changes to journey times to transport nodes Impact on the operation of the other transport services both during construction and in operation stage		Consistency with land use strategies, regional and local plans		Potential to impact on external links during construction Potential to impact on external links during operations Consideration for any community severance impacts		Integration with national and international plans and policies		To enable walking and cycling opportunities in a safer environment in the communities along the route To create a healthy environment conducive to active travel Connectivity to adjoining cycling and pedestrian facilities Enhanced connectivity between key attractions/trip generators related to active modes Diversions, duration and impact on journey times and potential to create a negative modal shift (e.g. people opt to drive instead of walk or cycle)	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1		All options are comparable - options of substation locations do not impact the adaptability in the future in this area		All options are comparable - options of substation locations do not impact transport integration in this area.		Option 1 is zoned Open Space. A substation is acceptable.		All of the options are infrastructural buildings adjoining a railway line and are considered neutral.		All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.		All options are comparable - options of substation locations do not impact the walking and cycling opportunities in this area.
		4		All options are comparable - options of substation locations do not impact the adaptability in the future in this area		All options are comparable - options of substation locations do not impact transport integration in this area.		Option 4 is zoned High Amenity. This option is less preferable.		All of the options are infrastructural buildings adjoining a railway line and are considered neutral.		All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.		All options are comparable - options of substation locations do not impact the walking and cycling opportunities in this area.

Balbriggan Substation Optioneering MCA Matrix

Comparison Criteria Legend	
Significant comparative advantage over other options	
Some comparative advantage over other options	
Comparable to other options / neutral	
Some comparative disadvantage over other options	
Significant comparative disadvantage over other options	

				Economy							
Works Description	Summary of requirements	Option Number	cost - TO BE HIDDEN FOR ISSUE	Capital Expenditure (CAPEX): Construction, land acquisition, temporary works		OPEX:operational costs (IÉ or other entities), Technology advancements and future proofing / obsolescence		Train Operations Functionality/Economic Benefit		Traffic functionality and associated economic activities and opportunities	
				Qualitative appraisal of potential infrastructure costs of proposed options	Rationale	Qualitative appraisal of potential ongoing infrastructure maintenance costs of proposed options	Rationale	Qualitative appraisal of potential ongoing operational costs of proposed options	Rationale	Qualitative appraisal of potential wider benefits of proposed options	Rationale
				Estimate high level cost of construction of option Extent and type of 3rd party lands required permanently Extent and type of 3rd party land required temporarily for temporary works during construction		To offer good value for money. Cost to maintain the infrastructure over the whole life. Effects of infrastructure maintenance to services. Provision of ways of undertaking routine inspections and maintenance activities while minimising the effect on service to customers.		Potential improvement or deterioration of the operation conditions of the line (reduction or increase of the risk of interruption of service) Rolling stock & staff utilisation		Potential benefit to vehicular traffic flows in the vicinity of the works during construction and associated economic activities and opportunities in the vicinity Consideration of duration of traffic disruption and length of diversions To minimise the impacts on traffic and transportation during the construction and operational stages	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1	€ 9,607,135	All options are comparable - no major construction works required outside of the standard substation buildings		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits	
		2	€ 9,620,736	All options are comparable - no major construction works required outside of the standard substation buildings		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits	
		3	€ 10,571,212	All options are comparable - no major construction works required outside of the standard substation buildings		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits	

Comparison Criteria Legend
Significant comparative advantage over other options
Some comparative advantage over other options
Comparable to other options / neutral
Some comparative disadvantage over other options
Significant comparative disadvantage over other options

Safety							
Works Description	Summary of requirements	Option Number	cost - TO BE HIDDEN FOR ISSUE	Employer's Safety		Public safety	
				Qualitative appraisal on the safety impacts on IE or railway staff	Rationale	Qualitative appraisal on the safety impacts on the public (road/rail/cycle/pedestrian)	Rationale
				To reduce safety risks associated with construction maintenance and operations. To reduce the potential for incidents or near-misses for IE/construction staff.		To reduce safety risks associated with passengers at platforms, public adjacent to the railway and road, pedestrian and cycle users at level crossings. To reduce the potential for accidents for members of the public/passengers on railway infrastructure. To reduce the potential for conflict between rail and road users.	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1	€ 9,607,135		All options are comparable, with no differences between the options with regards to employer's safety		Integration with the public
		2	€ 9,620,736		All options are comparable, with no differences between the options with regards to employer's safety		Integration with the public
		3	€ 10,571,212		All options are comparable, with no differences between the options with regards to employer's safety		All options are comparable, with no differences between the options with regards to public safety

Comparison Criteria Legend	
Significant comparative advantage over other options	
Some comparative advantage over other options	
Comparable to other options / neutral	
Some comparative disadvantage over other options	
Significant comparative disadvantage over other options	

Environment																			
Works Description	Summary of requirements	Option Number	cost - TO BE HIDDEN FOR ISSUE	Landscape and Visual Qualitative		Biodiversity		Noise and Vibration		Water resources		Archaeology, Architectural and Cultural Heritage		Geology & Soils		Agricultural and non-agricultural		Air Quality & Climate Change	
				Appraisal of landscape and visual impacts of options based on the sensitive viewpoints	Rationale	Qualitative appraisal on the impact on biodiversity	Rationale	Qualitative appraisal of the potential noise and vibration impact	Rationale	Qualitative appraisal on the potential impacts to surface ground or coastal waters	Rationale	Qualitative appraisal of the potential impacts of proposed options on potential sub-surface archaeology and impact on foundations and above ground elements of architectural heritage	Rationale	Qualitative appraisal of the potential of the proposed options on waste and material resources including the reuse of site won materials.	Rationale	Qualitative appraisal of impacts on valued resources either from a human or natural origin with value arising from economic or cultural reasons. These assets can be existing utilities or non-renewable resources	Rationale	Qualitative appraisal of air quality and climate impacts both on the operational and construction phases	Rationale
				<ul style="list-style-type: none"> To avoid / minimise impact on designated amenities, landscapes, protected trees or views. To avoid / minimise visual impact on properties & amenities. To avoid / minimise removal of trees / hedgerows. To avoid / minimise impact from light pollution. To provide opportunities to enhance the local amenity and green infrastructure. 		<ul style="list-style-type: none"> To ensure that the solution provided minimises the effects on biodiversity of the area and/or provides opportunities to enhance it. 		<ul style="list-style-type: none"> To provide a solution which ensures minimum levels of noise and vibration 		<ul style="list-style-type: none"> To minimise the impact or provide opportunities to enhance the quality of surface waters and associated floodplains, ground waters and coastal waters. 		<ul style="list-style-type: none"> To minimise the impact on cultural heritage such as on below ground archaeological remains, historic buildings (individual and areas), and historic landscapes and parks. 		<ul style="list-style-type: none"> To provide a solution which minimises total capital carbon. To minimise waste. 		<ul style="list-style-type: none"> To provide a solution which minimises total capital carbon. 		<ul style="list-style-type: none"> To provide a solution which comprises a reduction in greenhouse gas emissions. To ensure that the chosen solution preserves or enhances the local air quality 	
Electrification of Northern Line Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1	€ 9,607,135	Site is partly overlooked from residential development at Cardy Rock and is sited at off the beach access lane. Some screening could be provided.		Some Comparative advantage to other options due to construction and operation related impacts. Scrub/hedgerow removal required for TSS location and access roads. potential disturbance/displacement impacts on birds, bats, mammals. TSS location adjacent to bridge with high potential for roosting bats. Additional lighting required for TSS has potential for disturbance impacts on bats, wintering birds (if using agricultural lands for foraging), and other mammals. Agricultural field may be used by over wintering bird species and/or ground nesting bird species, potential disturbance/displacement impacts during construction and operation due to increased human presence, lighting, noise. However location of TSS looks potentially disturbed already, therefore impact may be limited.		Closest to residential receptors		All options comparable		This option is located in Bremore townland where there are the recorded monuments such as Bremore Castle, church and graveyard and the National Monument of Bremore Megalithic Tombs (DU002-001001-005). As such this option is considered to have the potential to reveal sub-surface archaeological features and preconstruction investigation will be required to be carried out. The proposed site is a greenfield site with no known architectural heritage features. There is a potential visual impact on UB661 located to the SE. It is anticipated that the magnitude of impact on the setting of the bridge would be low. No other buildings or features of architectural heritage interest were identified which could be impacted by a proposed substation at this location.		There is potential for loss of topsoil/growing soil since proposed location is in agricultural land. The location for the proposed works will require the construction of an access road thereby generating earthworks.		Located on agricultural land with a short access road		No operational air quality or climate impacts. Similar distance to sensitive receptors for potential dust impacts during construction. No real differentiator.	
		2	€ 9,620,736	Site located within open space, adjoining / impacting on footpaths and along the beach access lane. Site is in close proximity to Bremore Castle.		Some Comparative advantage to other options due to construction and operation related impacts. hedgerow removal required for TSS location and access roads (less so than Option 3). potential disturbance/displacement impacts on birds, bats, mammals. TSS location adjacent to bridge with high potential for roosting bats. Additional lighting required for TSS has potential for disturbance impacts on bats, wintering birds (if using amenity grasslands for foraging). Amenity grassland may be used and an inland feeding site for over wintering bird species (green) potential disturbance/displacement impacts during construction and operation due to increased human presence, lighting, noise. However location of TSS looks potentially disturbed already as a public path and residential area is nearby, therefore impact may be limited.		Further from residential receptors than Option 1 but closer than Option 3		All options comparable		This option is located in Bremore townland where there are the recorded monuments such as Bremore Castle, church and graveyard and the National Monument of Bremore Megalithic Tombs (DU002-001001-005). As such this option is considered to have the potential to reveal sub-surface archaeological features and preconstruction investigation will be required to be carried out. Option 2 may have a visual impact on impact on the setting of St. Molaga's Church and graveyard (FCC RPS 0013) and Bremore Castle (FCC RPS 0014). While these features are approximately 150m away from the proposed substation, due to the open nature of the coastal setting, the magnitude of impact on the setting of the historic structures is anticipated to be Medium. Due to the number of sites which would be impacted by a sub-station at this location, it is anticipated that the proposed sub-station at Location 2 would have a Negative, moderate impact on the architectural heritage value of the site.		The location for the proposed works will require the construction of an access road thereby generating earthworks.		Not located on agricultural land		No operational air quality or climate impacts. Similar distance to sensitive receptors for potential dust impacts during construction. No real differentiator.	
		3	€ 10,571,212	Site is remote and not openly visible. Appropriate screening can be provided. Long section of access road required.		Some comparative disadvantage other options due to construction related impacts. Hedgerow removal (c. 370m) will be required for access road, unable to determine if good quality hedgerow/well established but would likely have a range of bird species nesting/foraging in this hedgerow, also suitable yellowhammer habitat (red-listed species). Also disturbance impacts on bats, small mammals and invertebrates, possibly some hedgerow/scrub removal required for TSS location. Agricultural field may be used by over wintering bird species and/or ground nesting bird species, potential disturbance/displacement impacts during construction and operation due to increased human presence, lighting, noise.		Furthest from any residential receptors		All options comparable		This option is located in Bremore townland where there are recorded monuments such as Bremore Castle, church and graveyard, and the National Monument of Bremore Megalithic Tombs (DU002-001001-005). As such this option is considered to have the potential to reveal sub-surface archaeological features and preconstruction investigation will be required to be carried out. This option incorporates a long access route through a greenfield environment which adds to the potential to reveal below-ground remains. The proposed site is a greenfield site. For option 3, no buildings or features of architectural heritage interest were identified which could be impacted by a proposed substation at this location.		There is potential for loss of topsoil/growing soil since proposed location is in agricultural land. The location for the proposed works will require the construction of longer access road thereby generating more earthworks.		Located on agricultural land with a long access road		No operational air quality or climate impacts. Similar distance to sensitive receptors for potential dust impacts during construction. No real differentiator.	

Comparison Criteria Legend
Significant comparative advantage over other options
Some comparative advantage over other options
Comparable to other options / neutral
Some comparative disadvantage over other options
Significant comparative disadvantage over other options

				Accessibility & Social Inclusion			
Works Description	Summary of requirements	Option Number	cost - TO BE HIDDEN FOR ISSUE	Accessibility		Social Inclusion	
				Qualitative appraisal of capacity of options to facilitate the movement of people (either within, on to or across the rail system)	Rationale	Qualitative appraisal of capacity of options to provide ease of access for the mobility and visually impaired	Rationale
				Capacity of options to facilitate the movement of people (either within, on to or across the rail system) Impact on the wellbeing of the passenger and public. Positive impact on passenger and public experience. Improve accessibility to key facilities, such as employment, education, transport and healthcare to satisfy transport demand for all trip types.		Positive impact towards vulnerable groups Improvement of accessibility to public transport facilities, in particular from deprived geographic areas.	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1	€ 9,607,135		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.
		2	€ 9,620,736		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.
		3	€ 10,571,212		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.

Comparison Criteria Legend	
Significant comparative advantage over other options	
Some comparative advantage over other options	
Comparable to other options / neutral	
Some comparative disadvantage over other options	
Significant comparative disadvantage over other options	

				Integration								Physical Activity			
Works Description	Summary of requirements	Option Number	cost - TO BE HIDDEN FOR ISSUE	Adaptability in the future		Transport Integration		Land use integration		Geographical Integration		Government policy Integration		Walking / cycling opportunities	
				Qualitative appraisal of capacity of options to cater for future projects or aspirations	Rationale	Qualitative appraisal of the options and their impact on integration with other transport modes	Rationale	Qualitative appraisal of the options and their impact on integration with land use policies	Rationale	Qualitative appraisal of the options and their impact on integration with geographical polices	Rationale	Qualitative appraisal of the options and their impact on integration with geographical and government polices	Rationale	Qualitative appraisal of the options and their impact to enable walking and cycling opportunities in a safer environment for the communities along the route	Rationale
				Ability to continue to function successfully despite future changes in circumstances		Scope for and ease of interchange between modes New interchange nodes and facilities Reduce waking and wait times associated with interchanges Integration with the cycle networks Modal shifts figures during construction and operations Changes to journey times to transport nodes Impact on the operation of the other transport services both during construction and in operation stage		Consistency with land use strategies, regional and local plans		Potential to impact on external links during construction Potential to impact on external links during operations Consideration for any community severance impacts		Integration with national and international plans and policies		To enable walking and cycling opportunities in a safer environment in the communities along the route To create a healthy environment conducive to active travel Connectivity to adjoining cycling and pedestrian facilities Enhanced connectivity between key attractions/trip generators related to active modes Diversion, duration and impact on journey times and potential to create a negative modal shift (e.g. people opt to drive instead of walk or cycle)	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1	€ 9,607,135	All options are comparable - options of substation locations do not impact the adaptability in the future in this area	All options are comparable - options of substation locations do not impact transport integration in this area.	Option 1 is zoned Open Space. A utility installation is considered open for consideration. However, the area is included in a Part XI approval for a recreational park, it is considered less likely in planning terms.	All of the options are infrastructural buildings adjoining a railway line and are considered neutral.	All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.	All options are comparable - options of substation locations do not impact the walking and cycling opportunities in this area.						
		2	€ 9,620,736	All options are comparable - options of substation locations do not impact the adaptability in the future in this area	All options are comparable - options of substation locations do not impact transport integration in this area.	Option 2 is zoned Open Space. A utility installation is considered open for consideration. However, the area is included in a Part XI approval for a recreational park, it is considered less likely in planning terms.	All of the options are infrastructural buildings adjoining a railway line and are considered neutral.	All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.	All options are comparable - options of substation locations do not impact the walking and cycling opportunities in this area.						
		3	€ 10,571,212	All options are comparable - options of substation locations do not impact the adaptability in the future in this area	All options are comparable - options of substation locations do not impact transport integration in this area.	Options 3 is zoned High Amenity. A utility installation is open for consideration.	All of the options are infrastructural buildings adjoining a railway line and are considered neutral.	All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.	All options are comparable - options of substation locations do not impact the walking and cycling opportunities in this area.						

Gormanston Substation Optioneering MCA Matrix

Comparison Criteria Legend	
Significant comparative advantage over other options	
Some comparative advantage over other options	
Comparable to other options / neutral	
Some comparative disadvantage over other options	
Significant comparative disadvantage over other options	

Economy										
Works Description	Summary of requirements	Option Number	Capital Expenditure (CAPEX): Construction, land acquisition, temporary works		OPEX:operational costs (IÉ or other entities), Technology advancements and future proofing / obsolescence		Train Operations Functionality/Economic Benefit		Traffic functionality and associated economic activities and opportunities	
			Qualitative appraisal of potential infrastructure costs of proposed options	Rationale	Qualitative appraisal of potential ongoing infrastructure maintenance costs of proposed options	Rationale	Qualitative appraisal of potential ongoing operational costs of proposed options	Rationale	Qualitative appraisal of potential wider benefits of proposed options	Rationale
			Estimate high level cost of construction of option Extent and type of 3rd party lands required permanently Extent and type of 3rd party land required temporarily for temporary works during construction		To offer good value for money. Cost to maintain the infrastructure over the whole life. Effects of infrastructure maintenance to services. Provision of ways of undertaking routine inspections and maintenance activities while minimising the effect on service to customers.		Potential improvement or deterioration of the operation conditions of the line (reduction or increase of the risk of interruption of service) Rolling stock & staff utilisation		Potential benefit to vehicular traffic flows in the vicinity of the works during construction and associated economic activities and opportunities in the vicinity Consideration of duration of traffic disruption and length of diversions To minimise the impacts on traffic and transportation during the construction and operational stages	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1		Although Option 1 has a longer access road compared to other options however overall the options are comparable/neutral		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits
		2		Although Option 2 has a longer access road compared to other options however overall the options are comparable/neutral		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits
		3		Overall the options are comparable/neutral		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits
		4		Overall the options are comparable/neutral		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits

Comparison Criteria Legend
Significant comparative advantage over other options
Some comparative advantage over other options
Comparable to other options / neutral
Some comparative disadvantage over other options
Significant comparative disadvantage over other options

Safety						
Works Description	Summary of requirements	Option Number	Employer's Safety		Public safety	
			Qualitative appraisal on the safety impacts on IE or railway staff	Rationale	Qualitative appraisal on the safety impacts on the public (road/rail/cycle/pedestrian)	Rationale
			To reduce safety risks associated with construction maintenance and operations. To reduce the potential for incidents or near-misses for IE/construction staff.		To reduce safety risks associated with passengers at platforms, public adjacent to the railway and road, pedestrian and cycle users at level crossings. To reduce the potential for accidents for members of the public/passengers on railway infrastructure. To reduce the potential for conflict between rail and road users.	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1	Significant comparative advantage over other options	Option 1 is located on the western side of the railway corridor, away from the firing range	Some comparative advantage over other options	All options are comparable, with no differences between the options with regards to public safety
		2	Some comparative disadvantage over other options	Option 2 is located close to the firing range zone of the Defence Forces	Some comparative advantage over other options	All options are comparable, with no differences between the options with regards to public safety
		3	Some comparative disadvantage over other options	Option 3 is located close to the firing range zone of the Defence Forces	Some comparative advantage over other options	All options are comparable, with no differences between the options with regards to public safety
		4	Significant comparative advantage over other options	Option 1 is located on the western side of the railway corridor, away from the firing range	Some comparative advantage over other options	All options are comparable, with no differences between the options with regards to public safety

Comparison Criteria Legend
Significant comparative advantage over other options
Some comparative advantage over other options
Comparable to other options / neutral
Some comparative disadvantage over other options
Significant comparative disadvantage over other options

Environment																		
Works Description	Summary of requirements	Option Number	Landscape and Visual Qualitative		Biodiversity		Noise and Vibration		Water resources		Archaeology, Architectural and Cultural Heritage		Geology & Soils		Agricultural and non-agricultural		Air Quality & Climate Change	
			Appraisal of landscape and visual impacts of options based on the sensitive viewpoints	Rationale	Qualitative appraisal on the impact on biodiversity	Rationale	Qualitative appraisal of the potential noise and vibration impact	Rationale	Qualitative appraisal on the potential impacts to surface ground or coastal waters	Rationale	Qualitative appraisal of the potential impacts of proposed options on potential sub surface archaeology and impact on foundations and above ground elements of architectural heritage	Rationale	Qualitative appraisal of the proposed options on waste and material resources including the reuse of site won materials.	Rationale	Qualitative appraisal of impacts on valued resources either from a human or natural origin with value arising for economic or cultural reasons. These assets can be existing utilities or non-renewable resources.	Rationale	Qualitative appraisal of air quality and climate impacts both on the operational and construction phases	Rationale
			<ul style="list-style-type: none"> To avoid / minimise impact on designated amenities, landscapes, protected trees or views. To avoid / minimise visual impact on properties & amenities. To avoid / minimise removal of trees / hedgerows. To avoid / minimise impact from light pollution. To provide opportunities to enhance the local amenity and green infrastructure. 		<ul style="list-style-type: none"> To ensure that the solution provided minimises the effects on biodiversity of the area and/or provides opportunities to enhance it. 		<ul style="list-style-type: none"> To provide a solution which ensures minimum levels of noise and vibration 		<ul style="list-style-type: none"> To minimise the impact or provide opportunities to enhance the quality of surface waters and associated floodplains, ground waters and coastal waters. 		<ul style="list-style-type: none"> To minimise the impact on cultural heritage such as below ground archaeological remains, historic buildings (individual and areas), and historic landscapes and parks. 		<ul style="list-style-type: none"> To provide a solution which minimises total capital carbon. To minimise waste. 		<ul style="list-style-type: none"> To provide a solution which minimises total capital carbon. 		<ul style="list-style-type: none"> To provide a solution which comprises a reduction in greenhouse gas emissions. To ensure that the chosen solution preserves or enhances the local air quality 	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1	Orange	Site in open and exposed location on land side of railway.	Orange	Some comparative disadvantage over other options due to construction and operational impacts. Potential for indirect impacts on nearby designated sites (River Nanny Estuary and Shore SPA), include potential for water quality impacts or disturbance to birds, also new lighting which could impact on birds. The habitat under the footprint of the TSS and the access road is improved grassland, which is suitable as an inland feeding site for wintering birds (i.e. geese). Increased human presence, lighting, and noise could have significant impacts on qualifying interest species from the nearby SPA. The access road may require scrub/hedgerow removal, with impacts on bats, nesting birds, and other small mammals.	Green	Further from residential receptor than Option 3 or 4 but closer than Option 2	Yellow	All options comparable	Green	There are no recorded monuments at this location for the substation. A recent review of aerial photography identified subsurface archaeological enclosure sites in the agricultural fields to the northwest in Irishtown townland. While there are no known or recorded archaeological constraints at this location, there is the potential to reveal subsurface archaeological features and finds at this greenfield location. The proposed site is a greenfield site with no known architectural heritage features.	Orange	The location for the proposed works will require the construction of longer access road thereby generating more earthworks.	Yellow	Comparable to other options because not located on agricultural land	Yellow	No operational air quality or climate impacts. Similar distance to sensitive receptors for potential dust impacts during construction. No real differentiator.
		2	Orange	Site in open and exposed location on coastal side of railway. Screening would be difficult. Also impact coastal views from trains.	Orange	Some comparative disadvantage over other options due to construction and operational impacts. Potential for indirect impacts on nearby designated sites (River Nanny Estuary and Shore SPA), include potential for water quality impacts or disturbance to birds, also new lighting which could impact on birds. The habitat under the footprint of the TSS and the access road is improved grassland, which is suitable as an inland feeding site for wintering birds (i.e. geese). Increased human presence, lighting, and noise could have significant impacts on qualifying interest species from the nearby SPA. The access road may require scrub/hedgerow removal, with impacts on bats, nesting birds, and other small mammals.	Green	Furthest from residential receptor	Yellow	All options comparable	Green	There are no recorded monuments at this location for the substation. A recent review of aerial photography identified subsurface archaeological enclosure sites in the agricultural fields to the northwest in Irishtown townland. While there are no known or recorded archaeological constraints at this location, there is the potential to reveal subsurface archaeological features and finds at this greenfield location. The proposed site is a greenfield site with no known architectural heritage features.	Orange	The location for the proposed works will require the construction of longer access road thereby generating more earthworks.	Yellow	Comparable to other options because not located on agricultural land	Yellow	No operational air quality or climate impacts. Similar distance to sensitive receptors for potential dust impacts during construction. No real differentiator.
		3	Orange	Site in open and exposed location on coastal side of railway. Screening would be difficult. Also impact coastal views from trains.	Green	Some comparative advantage over other options. Whilst there is still potential for indirect impacts on nearby designated sites (River Nanny Estuary and Shore SPA), the impact would be to a lesser extent in this location, as the access road does not cross the improved grassland field, and the TSS footprint is located in the far corner of the field so disturbance to foraging and/or roosting birds would be minimal and likely not significant. This location is adjacent to a low suitability bridge for roosting bats, however this impact would not be considered to be significant. Likely no hedgerow removal required in this location (or very minor if present).	Orange	Further from residential receptor than Option 4 but closer than Option 1 or 2	Yellow	All options comparable	Orange	There are no recorded monuments at this location for the substation. A recent review of aerial photography identified subsurface archaeological enclosure sites in the agricultural fields to the northwest in Irishtown townland. While there are no known or recorded archaeological constraints at this location, there is the potential to reveal subsurface archaeological features and finds at this greenfield location. Option 3 would impact on the setting of the road bridge (DBB 68) in Irishtown townland. The magnitude of impact is anticipated to be low. Overall, this option would have a Negative, Slight impact on the architectural heritage value of the site.	Green	The location for the proposed works will require the construction of an access road thereby generating earthworks.	Yellow	Comparable to other options because not located on agricultural land	Yellow	No operational air quality or climate impacts. Similar distance to sensitive receptors for potential dust impacts during construction. No real differentiator.
		4	Green	Site has low setting between local road and railway. Well screened in views on approach but visually open locally. Good potential for additional screening.	Green	Some comparative advantage over other options. Whilst there is still potential for indirect impacts on nearby designated sites (River Nanny Estuary and Shore SPA), the impact would be to a lesser extent in this location, as the access road does not cross the improved grassland field, and the TSS footprint is located in the far corner of the field so disturbance to foraging and/or roosting birds would be minimal and likely not significant. This location is adjacent to a low suitability bridge for roosting bats, however this impact would not be considered to be significant. Likely no hedgerow removal required in this location (or very minor if present).	Orange	Close to residential receptor	Yellow	All options comparable	Orange	There are no recorded monuments at this location for the substation. A recent review of aerial photography identified subsurface archaeological enclosure sites in the agricultural fields to the northwest in Irishtown townland. While there are no known or recorded archaeological constraints at this location, there is the potential to reveal subsurface archaeological features and finds at this greenfield location. Option 4 would impact on the setting of the road bridge in Irishtown townland (DBB 68). The magnitude of impact is anticipated to be low. A negative impact is also anticipated on the setting of the farm complexes to the west. The magnitude of impact is anticipated to be low due to the distance between the proposed building and the sites, and existing trees which would provide screening. Overall, this option would have a Negative, Slight impact on the architectural heritage value of the site.	Green	The location for the proposed works will require the construction of an access road thereby generating earthworks.	Yellow	Comparable to other options because not located on agricultural land	Yellow	No operational air quality or climate impacts. Similar distance to sensitive receptors for potential dust impacts during construction. No real differentiator.

Comparison Criteria Legend
Significant comparative advantage over other options
Some comparative advantage over other options
Comparable to other options / neutral
Some comparative disadvantage over other options
Significant comparative disadvantage over other options

Accessibility & Social Inclusion						
Works Description	Summary of requirements	Option Number	Accessibility		Social Inclusion	
			Qualitative appraisal of capacity of options to facilitate the movement of people (either within, on to or across the rail system)	Rationale	Qualitative appraisal of capacity of options to provide ease of access for the mobility and visually impaired	Rationale
			Capacity of options to facilitate the movement of people (either within, on to or across the rail system). Impact on the wellbeing of the passenger and public. Positive impact on passenger and public experience. Improve accessibility to key facilities, such as employment, education, transport and healthcare to satisfy transport demand for all trip types.		Positive impact towards vulnerable groups. Improvement of accessibility to public transport facilities, in particular from deprived geographic areas.	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.
		2		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.
		3		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.
		4		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.

Comparison Criteria Legend
Significant comparative advantage over other options
Some comparative advantage over other options
Comparable to other options / neutral
Some comparative disadvantage over other options
Significant comparative disadvantage over other options

		Integration										Physical Activity		
Works Description	Summary of requirements	Option Number	Adaptability in the future		Transport Integration		Land use integration		Geographical Integration		Government policy Integration		Walking / cycling opportunities	
			Qualitative appraisal of capacity of options to cater for future projects or aspirations	Rationale	Qualitative appraisal of the options and their impact on integration with other transport modes	Rationale	Qualitative appraisal of the options and their impact on integration with land use policies	Rationale	Qualitative appraisal of the options and their impact on integration with geographical policies	Rationale	Qualitative appraisal of the options and their impact on integration with geographical and government policies	Rationale	Qualitative appraisal of the options and their impact to enable walking and cycling opportunities in a safer environment for the communities along the route	Rationale
			Ability to continue to function successfully despite future changes in circumstances		Scope for and ease of interchange between modes New interchange nodes and facilities Reduce waking and wait times associated with interchanges integration with the cycle networks Modal shifts figures during construction and operations Changes to journey times to transport nodes Impact on the operation of the other transport services both during construction and in operation stage		Consistency with land use strategies, regional and local plans		Potential to impact on external links during construction Potential to impact on external links during operations Consideration for any community severance impacts		Integration with national and international plans and policies		To enable walking and cycling opportunities in a safer environment in the communities along the route To create a healthy environment conducive to active travel Connectivity to adjoining cycling and pedestrian facilities Enhanced connectivity between key attractions/trip generators related to active modes Diversion, duration and impact on journey times and potential to create a negative modal shift (e.g. people opt to drive instead of walk or cycle)	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1	Yellow	All options are comparable - options of substation locations do not impact the adaptability in the future in this area	Yellow	All options are comparable - options of substation locations do not impact transport integration in this area.	Orange	The lands on which the proposed substations are located are not zoned and are considered neutral. This option has impacts on military operations	Yellow	All of the options are infrastructural buildings adjoining a railway line and are considered neutral.	Yellow	All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.	Yellow	All options are comparable - options of substation locations do not impact the walking and cycling opportunities in this area.
		2	Yellow	All options are comparable - options of substation locations do not impact the adaptability in the future in this area	Yellow	All options are comparable - options of substation locations do not impact transport integration in this area.	Orange	The lands on which the proposed substations are located are not zoned and are considered neutral. This option has impacts on military operations	Yellow	All of the options are infrastructural buildings adjoining a railway line and are considered neutral.	Yellow	All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.	Yellow	All options are comparable - options of substation locations do not impact the walking and cycling opportunities in this area.
		3	Yellow	All options are comparable - options of substation locations do not impact the adaptability in the future in this area	Yellow	All options are comparable - options of substation locations do not impact transport integration in this area.	Orange	The lands on which the proposed substations are located are not zoned and are considered neutral. This option has impacts on military operations	Yellow	All of the options are infrastructural buildings adjoining a railway line and are considered neutral.	Yellow	All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.	Yellow	All options are comparable - options of substation locations do not impact the walking and cycling opportunities in this area.
		4	Yellow	All options are comparable - options of substation locations do not impact the adaptability in the future in this area	Yellow	All options are comparable - options of substation locations do not impact transport integration in this area.	Green	The lands on which the proposed substations are located are not zoned. This option has minimal impact on military operations	Yellow	All of the options are infrastructural buildings adjoining a railway line and are considered neutral.	Yellow	All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.	Yellow	All options are comparable - options of substation locations do not impact the walking and cycling opportunities in this area.

Bettystown Substation Optioneering MCA Matrix

Comparison Criteria Legend	
Significant comparative advantage over other options	
Some comparative advantage over other options	
Comparable to other options / neutral	
Some comparative disadvantage over other options	
Significant comparative disadvantage over other options	

Economy										
Works Description	Summary of requirements	Option Number	Capital Expenditure (CAPEX): Construction, land acquisition, temporary works		OPEX: operational costs (i€ or other entities), Technology advancements and future proofing / obsolescence		Train Operations Functionality/Economic Benefit		Traffic functionality and associated economic activities and opportunities	
			Qualitative appraisal of potential infrastructure costs of proposed options	Rationale	Qualitative appraisal of potential ongoing infrastructure maintenance costs of proposed options	Rationale	Qualitative appraisal of potential ongoing operational costs of proposed options	Rationale	Qualitative appraisal of potential wider benefits of proposed options	Rationale
			Estimate high level cost of construction of option extent and type of 3rd party lands required permanently and type of 3rd party land required temporarily for temporary works during construction		To offer good value for money. Cost to maintain the infrastructure over the whole life. Effects of infrastructure maintenance to services. Provision of ways of undertaking routine inspections and maintenance activities while minimising the effect on service to customers.		Potential improvement or deterioration of the operation conditions of the line (reduction or increase of the risk of interruption of service) Rolling stock & staff utilisation		Potential benefit to vehicular traffic flows in the vicinity of the works during construction and associated economic activities and opportunities in the vicinity Consideration of duration of traffic disruption and length of diversions To minimise the impacts on traffic and transportation during the construction and operational stages	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1		Located on the eastern side of the railway, a shorter access road is required		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits
		2		Located on the western side of the railway, a longer access road is required		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits
		3		Located on the eastern side of the railway, a shorter access road is required		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits
		4		Located on the western side of the railway, a longer access road is required		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits
		5		Located on the eastern side of the railway, a shorter access road is required		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits		All options are comparable - options of substation locations do not impact the train operations functionality and its economic benefits

Comparison Criteria Legend	
Significant comparative advantage over other options	
Some comparative advantage over other options	
Comparable to other options / neutral	
Some comparative disadvantage over other options	
Significant comparative disadvantage over other options	

Safety						
Works Description	Summary of requirements	Option Number	Employer's Safety		Public safety	
			Qualitative appraisal on the safety impacts on IE or railway staff	Rationale	Qualitative appraisal on the safety impacts on the public (road/rail/cycle/pedestrian)	Rationale
			To reduce safety risks associated with construction maintenance and operations. To reduce the potential for incidents or near-misses for IE/construction staff.		To reduce safety risks associated with passengers at platforms, public adjacent to the railway and road, pedestrian and cycle users at level crossings. To reduce the potential for accidents for members of the public/passengers on railway infrastructure. To reduce the potential for conflict between rail and road users.	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1		All options are comparable, with no differences between the options with regards to employer's safety		All options are comparable, with no differences between the options with regards to public safety
		2		All options are comparable, with no differences between the options with regards to employer's safety		All options are comparable, with no differences between the options with regards to public safety
		3		All options are comparable, with no differences between the options with regards to employer's safety		All options are comparable, with no differences between the options with regards to public safety
		4		All options are comparable, with no differences between the options with regards to employer's safety		All options are comparable, with no differences between the options with regards to public safety
		5		All options are comparable, with no differences between the options with regards to employer's safety		All options are comparable, with no differences between the options with regards to public safety

Comparison Criteria Legend	
Significant comparative advantage over other options	
Some comparative advantage over other options	
Comparable to other options / neutral	
Some comparative disadvantage over other options	
Significant comparative disadvantage over other options	

Environment																		
Works Description	Summary of requirements	Option Number	Landscape and Visual Qualitative		Biodiversity		Noise and Vibration		Water resources		Archaeology, Architectural and Cultural Heritage		Geology & Soils		Agricultural and non-agricultural		Air Quality & Climate Change	
			Appraisal of landscape and visual impacts of options based on the sensitive viewpoints	Rationale	Qualitative appraisal on the impact on biodiversity	Rationale	Qualitative appraisal of the potential noise and vibration impact	Rationale	Qualitative appraisal on the potential impacts to surface ground or coastal waters	Rationale	Qualitative appraisal of the potential impacts of proposed options on potential sub surface archaeology and impact on foundations and above ground elements of architectural heritage	Rationale	Qualitative appraisal of the potential of the proposed options on waste and material resources including the reuse of site won materials.	Rationale	Qualitative appraisal of impacts on valued resources either from a human or natural origin with value arising for economic or cultural reasons. These assets can be existing utilities or non-renewable resources.	Rationale	Qualitative appraisal of air quality and climate impacts both on the operational and construction phases	Rationale
			<ul style="list-style-type: none"> To avoid / minimise impact on designated amenities, landscapes, protected trees or views. To avoid / minimise visual impact on properties & amenities. To avoid / minimise removal of trees / hedgerows. To avoid / minimise impact from light pollution. To provide opportunities to enhance the local amenity and green infrastructure. 		<ul style="list-style-type: none"> To ensure that the solution provided minimises the effects on biodiversity of the area and/or provides opportunities to enhance it. 		<ul style="list-style-type: none"> To provide a solution which ensures minimum levels of noise and vibration 		<ul style="list-style-type: none"> To minimise the impact or provide opportunities to enhance the quality of surface waters and associated floodplains, ground waters and coastal waters. 		<ul style="list-style-type: none"> To minimise the impact on cultural heritage such as on below ground archaeological remains, historic buildings (individual and areas), and historic landscapes and parks. 		<ul style="list-style-type: none"> To provide a solution which minimises total capital carbon. To minimise waste. 		<ul style="list-style-type: none"> To provide a solution which minimises total capital carbon. 		<ul style="list-style-type: none"> To provide a solution which comprises a reduction in greenhouse gas emissions. To ensure that the chosen solution preserves or enhances the local air quality 	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1	Site located in open agricultural landscape.		Some comparative disadvantage over other options. This option requires crossing over the Betaghstown watercourse for the installation of the access road. Potential impacts on surface water quality in immediate environment, and downstream environment (outfall is c. 300m south of SAC). The habitat under the footprint of the TSS and the access road is mainly agricultural grassland, which can be suitable as an inland feeding site for wintering birds. Increased human presence, lighting, and noise could have significant impacts on qualifying interest species from the nearby SPAs. The access road may require small amounts of scrub/hedgerow removal, with potential impacts on bats, nesting birds, and other small mammals.		Closer to residential receptors than Option 2 but further than Options 3, 4, and 5		Construction of access road requires culvert / bridge construction, increasing contamination risks and river works.		There are no recorded monuments at this location for the substation. A recent review of aerial photography identified subsurface archaeological enclosure site (cropmarks) in the agricultural fields in Ministown townland. While there are no known or recorded archaeological constraints at this location, there is the potential to reveal subsurface archaeological features and finds at this agricultural, greenfield location. The proposes site is a greenfield site with no known architectural heritage features.		Possibility of encountering soft deposits due to proximity with river/stream. Potential loss of topsoil/growing soil since in agricultural land. Construction of longer access road will be required, thereby generating earthworks.		Located on agricultural land with a medium sensitivity enterprise - relatively short access road through agricultural land		No operational air quality or climate impacts. Preferred with option 2 as have greatest separation from sensitive receptors for potential dust impacts during construction. No real differentiator.	
		2	Site located in open agricultural landscape.		Some comparative advantage over other options, mainly due to lack of watercourse crossing. The habitat under the footprint of the TSS and the access road is mainly agricultural grassland, which can be suitable as an inland feeding site for wintering birds. Increased human presence, lighting, and noise could have impacts on qualifying interest species from the nearby SPAs. The access road will also require alteration of agricultural grassland, and potentially some hedgerow removal, however this will be minimal and unlikely to be a significant constraint.		Furthest from residential receptors		No river crossing works required.		There are no recorded monuments at this location for the substation. A recent review of aerial photography identified subsurface archaeological enclosure site (cropmarks) in the agricultural fields in Ministown townland. While there are no known or recorded archaeological constraints at this location, there is the potential to reveal subsurface archaeological features and finds at this agricultural, greenfield location. The proposes site is a greenfield site with no known architectural heritage features.		Possibility of encountering soft deposits due to proximity with river/stream. Potential loss of topsoil/growing soil since in agricultural land. Construction of longer access road will be required, thereby generating more earthworks.		Located on agricultural land with a medium sensitivity enterprise - relatively long access road through agricultural land		No operational air quality or climate impacts. Preferred with option 1 as have greatest separation from sensitive receptors for potential dust impacts during construction. No real differentiator.	
		3	Site located on previously disturbed ground, with good potential for screening which integrates with adjoining field boundary.		Some comparative disadvantage over other options. This option is very close to the Betaghstown watercourse. Potential impacts on surface water quality in immediate environment, and downstream environment (outfall is c. 300m south of SAC). The access road and location of TSS may require small amounts of scrub/hedgerow removal, with potential impacts on bats, nesting birds, and other small mammals. Potential disturbance/displacement impacts on any fauna (otter, bat, fish, crayfish) using the watercourse for commuting and/or foraging due to the close proximity of the TSS.		Closer to residential receptors than Options 1, 2, and 4 but further than Option 5		Located adjacent to watercourse increasing contamination risks		There are no recorded monuments at this location for the substation. A recent review of aerial photography identified subsurface archaeological enclosure site (cropmarks) in the agricultural fields in Ministown townland. While there are no known or recorded archaeological constraints at this location, there is the potential to reveal subsurface archaeological features and finds at this scrubland, disturbed location. The proposes site is a greenfield site with no known architectural heritage features.		Possibility of encountering soft deposits due to proximity with river/stream. Construction of longer access road will be required, thereby generating earthworks.		Not located on agricultural land		No operational air quality or climate impacts. Less preferred than options 1 and 2, however good separation from sensitive receptors for potential dust impacts during construction. No real differentiator.	
		4	Site located in corner of agricultural field with potential for screening which integrates with adjoining field boundary.		Some comparative disadvantage over other options. This option crossed the Betaghstown watercourse. Potential impacts on surface water quality in immediate environment, and downstream environment (outfall is c. 300m south of SAC). The access road and location of TSS may require small amounts of scrub/hedgerow removal, with potential impacts on bats, nesting birds, and other small mammals. Potential disturbance/displacement impacts on any fauna (otter, bat, fish, crayfish) using the watercourse for commuting and/or foraging due to the close proximity of the TSS.		Closer to residential receptors than Options 1, 2 and 4 but further than Options 3 and 5		Construction of access road requires culvert / bridge construction, increasing contamination risks and river works. located adjacent to watercourse.		There are no recorded monuments at this location for the substation. A recent review of aerial photography identified subsurface archaeological enclosure site (cropmarks) in the agricultural fields in Ministown townland. While there are no known or recorded archaeological constraints at this location, there is the potential to reveal subsurface archaeological features and finds at this agricultural, greenfield location. The proposes site is a greenfield site with no known architectural heritage features.		Possibility of encountering soft ground due to proximity with river/stream. Potential loss of topsoil/growing soil since in agricultural land. Construction of longer access road will be required, thereby generating more earthworks.		Located on agricultural land with a medium sensitivity enterprise - relatively long access road through agricultural land		No operational air quality or climate impacts. Less preferred than options 1 and 2, however good separation from sensitive receptors for potential dust impacts during construction. No real differentiator.	
		5	Significant impact on existing trees and small woodland area. In close proximity to residential properties.		Some comparative advantage over other options due to lack of watercourse within vicinity of the works. Works will require removal of woodland, hedgerow, and scrub for location of TSS and access road, which may have disturbance and displacement impacts on bats, birds, and mammals. Lighting during operation may also have disturbance/displacement impacts on these species.		Closest to residential receptors		No river crossing works required.		There are no recorded monuments at this location for the substation. A recent review of aerial photography identified subsurface archaeological enclosure site (cropmarks) in the agricultural fields in Ministown townland. While there are no known or recorded archaeological constraints at this location, there is the potential to reveal subsurface archaeological features and finds at this scrubland location. The proposes site is a greenfield site with no known architectural heritage features.		Possibility of encountering soft deposits due to proximity with river/stream. There is potential for excavation of made ground/contaminated land. Construction of access road will be required, thereby generating earthworks.		Not located on agricultural land		No operational air quality or climate impacts. Less preferred than options 1 and 2, however good separation from sensitive receptors for potential dust impacts during construction. No real differentiator.	

Comparison Criteria Legend	
Significant comparative advantage over other options	
Some comparative advantage over other options	
Comparable to other options / neutral	
Some comparative disadvantage over other options	
Significant comparative disadvantage over other options	

Accessibility & Social Inclusion						
Works Description	Summary of requirements	Option Number	Accessibility		Social Inclusion	
			Qualitative appraisal of capacity of options to facilitate the movement of people (either within, on to or across the rail system)	Rationale	Qualitative appraisal of capacity of options to provide ease of access for the mobility and visually impaired	Rationale
			Capacity of options to facilitate the movement of people (either within, on to or across the rail system) Impact on the wellbeing of the passenger and public. Positive impact on passenger and public experience. Improve accessibility to key facilities, such as employment, education, transport and healthcare to satisfy transport demand for all trip types.		Positive impact towards vulnerable groups Improvement of accessibility to public transport facilities, in particular from deprived geographic areas.	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.
		2		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.
		3		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.
		4		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.
		5		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.

Comparison Criteria Legend	
Significant comparative advantage over other options	
Some comparative advantage over other options	
Comparable to other options / neutral	
Some comparative disadvantage over other options	
Significant comparative disadvantage over other options	

		Integration										Physical Activity			
Works Description	Summary of requirements	Option Number	Adaptability in the future		Transport Integration		Land use integration		Geographical Integration		Government policy Integration		Walking / cycling opportunities		
			Qualitative appraisal of capacity of options to cater for future projects or aspirations	Rationale	Qualitative appraisal of the options and their impact on integration with other transport modes	Rationale	Qualitative appraisal of the options and their impact on integration with land use policies	Rationale	Qualitative appraisal of the options and their impact on integration with geographical policies	Rationale	Qualitative appraisal of the options and their impact on integration with geographical and government policies	Rationale	Qualitative appraisal of the options and their impact on integration with government policies	Rationale	Qualitative appraisal of the options and their impact on integration with government policies
			Ability to continue to function successfully despite future changes in circumstances		Scope for and ease of interchange between modes New interchange nodes and facilities Reduce waking and wait times associated with interchanges integration with the cycle networks Modal shifts figures during construction and operations Changes to journey times to transport nodes Impact on the operation of the other transport services both during construction and in operation stage		Consistency with land use strategies, regional and local plans		Potential to impact on external links during construction Potential to impact on external links during operations Consideration for any community severance impacts		Integration with national and international plans and policies		To enable walking and cycling opportunities in a safer environment in the communities along the route To create a healthy environment conducive to active travel Connectivity to adjoining cycling and pedestrian facilities Enhanced connectivity between key attractions/trip generators related to active modes Diversions, duration and impact on journey times and potential to create a negative modal shift (e.g. people opt to drive instead of walk or cycle)		
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1		All options are comparable - options of substation locations do not impact the adaptability in the future in this area		All options are comparable - options of substation locations do not impact transport integration in this area.		This option is located in an area zoned as "Rural Area". Utility installations are permitted in principle in this zoning objective.		All of the options are infrastructural buildings adjoining a railway line and are considered neutral.		All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.		All options are comparable - options of substation locations do not impact the walking and cycling opportunities in this area.	
		2		All options are comparable - options of substation locations do not impact the adaptability in the future in this area		All options are comparable - options of substation locations do not impact transport integration in this area.		This option is located in an area zoned as "Rural Area". Utility installations are permitted in principle in this zoning objective.		All of the options are infrastructural buildings adjoining a railway line and are considered neutral.		All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.		All options are comparable - options of substation locations do not impact the walking and cycling opportunities in this area.	
		3		All options are comparable - options of substation locations do not impact the adaptability in the future in this area		All options are comparable - options of substation locations do not impact transport integration in this area.		This option is located in an area zoned as "Rural Area". Utility installations are permitted in principle in this zoning objective.		All of the options are infrastructural buildings adjoining a railway line and are considered neutral.		All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.		All options are comparable - options of substation locations do not impact the walking and cycling opportunities in this area.	
		4		All options are comparable - options of substation locations do not impact the adaptability in the future in this area		All options are comparable - options of substation locations do not impact transport integration in this area.		This option is located in an area zoned as "Rural Area". Utility installations are permitted in principle in this zoning objective.		All of the options are infrastructural buildings adjoining a railway line and are considered neutral.		All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.		All options are comparable - options of substation locations do not impact the walking and cycling opportunities in this area.	
		5		All options are comparable - options of substation locations do not impact the adaptability in the future in this area		All options are comparable - options of substation locations do not impact transport integration in this area.		This option is located in an area zoned as "Rural Area". Utility installations are permitted in principle in this zoning objective.		All of the options are infrastructural buildings adjoining a railway line and are considered neutral.		All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.		All options are comparable - options of substation locations do not impact the walking and cycling opportunities in this area.	

Drogheda Substation Optioneering MCA Matrix

Comparison Criteria Legend	
Significant comparative advantage over other options	
Some comparative advantage over other options	
Comparable to other options / neutral	
Some comparative disadvantage over other options	
Significant comparative disadvantage over other options	

		Economy								
Works Description	Summary of requirements	Option Number	Capital Expenditure (CAPEX): Construction, land acquisition, temporary works		OPEX:operational costs (IÉ or other entities), Technology advancements and future proofing / obsolescence		Train Operations Functionality/Economic Benefit		Traffic functionality and associated economic activities and opportunities	
			Qualitative appraisal of potential infrastructure costs of proposed options	Rationale	Qualitative appraisal of potential ongoing infrastructure maintenance costs of proposed options	Rationale	Qualitative appraisal of potential ongoing operational costs of proposed options	Rationale	Qualitative appraisal of potential wider benefits of proposed options	Rationale
			Estimate high level cost of construction of option Extent and type of 3rd party lands required permanently Extent and type of 3rd party land required temporarily for temporary works during construction		To offer good value for money. Cost to maintain the infrastructure over the whole life. Effects of infrastructure maintenance to services. Provision of ways of undertaking routine inspections and maintenance activities while minimising the effect on service to customers.		Potential improvement or deterioration of the operation conditions of the line (reduction or increase of the risk of interruption of service) Rolling stock & staff utilisation		Potential benefit to vehicular traffic flows in the vicinity of the works during construction and associated economic activities and opportunities in the vicinity Consideration of duration of traffic disruption and length of diversions To minimise the impacts on traffic and transportation during the construction and operational stages	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1		Cost of substation and minor civil works		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		The substation location does not impact the train operations functionality and its economic benefits		Impact on existing parking, pedestrians and cyclists at Park and Ride during construction
		3		Cost of substation and the construction works required to raise the substation out of the flood zone		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		Likely impact on the maintenance and operation of the BEMU substation		Impact on existing parking, pedestrians and cyclists at Park and Ride during construction
		6		Cost of substation and minor civil works - mainly the new access road		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		The substation location does not impact the train operations functionality and its economic benefits		No impacts on existing parking, pedestrians and cyclists at Park and Ride during construction
		7		Whilst not costed - it is expected the cost for ESB connection will be significant when compared to the options north of the line.		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		The substation location does not impact the train operations functionality and its economic benefits		No impacts on existing parking, pedestrians and cyclists at Park and Ride during construction
		8		Cost of substation and minor civil works - mainly the new access road		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		The substation location does not impact the train operations functionality and its economic benefits		No impacts on existing parking, pedestrians and cyclists at Park and Ride during construction
		9		Cost of substation and minor civil works - mainly the new access road		Although there are minor differences, in length of access road for example, which could affect maintenance costs, overall the options are comparable/neutral		The substation location does not impact the train operations functionality and its economic benefits		No impacts on existing parking, pedestrians and cyclists at Park and Ride during construction

Comparison Criteria Legend	
Significant comparative advantage over other options	
Some comparative advantage over other options	
Comparable to other options / neutral	
Some comparative disadvantage over other options	
Significant comparative disadvantage over other options	

Safety						
Works Description	Summary of requirements	Option Number	Employer's Safety		Public safety	
			Qualitative appraisal on the safety impacts on IE or railway staff	Rationale	Qualitative appraisal on the safety impacts on the public (road/rail/cycle/pedestrian)	Rationale
			To reduce safety risks associated with construction maintenance and operations. To reduce the potential for incidents or near-misses for IE/construction staff.		To reduce safety risks associated with passengers at platforms, public adjacent to the railway and road, pedestrian and cycle users at level crossings. To reduce the potential for accidents for members of the public/passengers on railway infrastructure. To reduce the potential for conflict between rail and road users.	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1		All options are comparable, with no differences between the options with regards to employer's safety		All options are comparable, with no differences between the options with regards to public safety
		3		All options are comparable, with no differences between the options with regards to employer's safety		All options are comparable, with no differences between the options with regards to public safety
		6		All options are comparable, with no differences between the options with regards to employer's safety		All options are comparable, with no differences between the options with regards to public safety
		7		All options are comparable, with no differences between the options with regards to employer's safety		All options are comparable, with no differences between the options with regards to public safety
		8		All options are comparable, with no differences between the options with regards to employer's safety		All options are comparable, with no differences between the options with regards to public safety
		9		All options are comparable, with no differences between the options with regards to employer's safety		All options are comparable, with no differences between the options with regards to public safety

Comparison Criteria Legend	
Significant comparative advantage over other options	
Some comparative advantage over other options	
Comparable to other options / neutral	
Some comparative disadvantage over other options	
Significant comparative disadvantage over other options	

Environment																		
Works Description	Summary of requirements	Option Number	Landscape and Visual Qualitative		Biodiversity		Noise and Vibration		Water resources		Archaeology, Architectural and Cultural Heritage		Geology & Soils		Agricultural and non-agricultural		Air Quality & Climate Change	
			Appraisal of landscape and visual impacts of options based on the sensitive viewpoints	Rationale	Qualitative appraisal on the impact on biodiversity	Rationale	Qualitative appraisal of the potential noise and vibration impact	Rationale	Qualitative appraisal on the potential impacts to surface ground or coastal waters	Rationale	Qualitative appraisal of the potential impacts of proposed options on potential sub surface archaeology and impact on foundations and above ground elements of architectural heritage	Rationale	Qualitative appraisal of the potential of the proposed options on waste and material resources including the reuse of site won materials.	Rationale	Qualitative appraisal of impacts on valued resources either from a human or natural origin with value arising from economic or cultural reasons. These assets can be existing utilities or non-renewable resources.	Rationale	Qualitative appraisal of air quality and climate impacts both on the operational and construction phases	Rationale
			<ul style="list-style-type: none"> To avoid / minimise impact on designated amenities, landscapes, protected trees or views. To avoid / minimise visual impact on properties & amenities. To avoid / minimise removal of trees / hedgerows. To avoid / minimise impact from light pollution. To provide opportunities to enhance the local amenity and green infrastructure. 		<ul style="list-style-type: none"> To ensure that the solution provided minimises the effects on biodiversity of the area and/or provides opportunities to enhance it. 		<ul style="list-style-type: none"> To provide a solution which ensures minimum levels of noise and vibration 		<ul style="list-style-type: none"> To minimise the impact or provide opportunities to enhance the quality of surface waters and associated floodplains, ground waters and coastal waters. 		<ul style="list-style-type: none"> To minimise the impact on cultural heritage such as on below ground archaeological remains, historic buildings (individual and areas), and historic landscapes and parks. 		<ul style="list-style-type: none"> To provide a solution which minimises total capital carbon. To minimise waste. 		<ul style="list-style-type: none"> To provide a solution which minimises total capital carbon. 		<ul style="list-style-type: none"> To provide a solution which comprises a reduction in greenhouse gas emissions. To ensure that the chosen solution preserves or enhances the local air quality 	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1	Impact on setting of existing railway station, including protected station structures.		Significant comparative advantage in this location. Substation located on hard-standing (carpark). No constraints in this area.		Less impact than Options 7, 9, and 3, but more impact than Options 6 and 8		Located in zone C outside of the 1 in 1000 year flood zone	Potential to reveal below ground remains associated with the development of Drogheda Railway Station. Option 1 is located south of Drogheda Station (LCC RPS DB-055) in an existing car park. No Direct heritage impact anticipated but there is a potential negative visual impact on Drogheda Station Buildings which are protected structures the magnitude of which is low. It is predicted that it will have a slight negative visual impact.		Proposed location is inside IE land. There is potential for excavation of made ground/contaminated land Works will done in a previously developed site/built-up area.	Some comparative advantages because it is not located on agricultural land.	Greater separation from sensitive receptors reducing potential impacts during the construction phase.				
		3	Located in existing carpark. Visual impact on existing residential property and in close proximity to protected viaduct. Some potential for screening.		Some comparative advantage in this area as located on hard-standing. Potential constraints due to proximity to Boyne Viaduct, which has potential for roosting bats. Also closer to the River Boyne but unlikely to be a major constraint as impacts are not predicted on SAC/SPA.		Closest to residential receptors	Located in fluvial flood zone B in the 1 in 1000 year event flood zone and coastal flood zone A in the 1 in 200 year flood zone.	This area has been previously monitored (Licence 11E002) during the construction of the carpark. As this area has been previously resolved archaeologically it is seen to have advantages over other options. Option 3 is located to the west of a Boyne Valley Viaduct (NIAH 13620012, UBB 81b). No Direct heritage impact anticipated but there is a potential negative visual impact on the bridge. It is located below the bridge Overall, this would have a Negative, Slight impact on the architectural heritage value of the site.		Proposed location is inside IE land. There is potential for excavation of made ground/contaminated land. Possibility to encounter soft clay based on existing GI dated 2009. Works will done in a previously developed site/built-up area. IPPC, IPC & IEL (P0368) facility located very near to the north of proposed location.	Some comparative advantages because it is not located on agricultural land.	Located in relative proximity to sensitive receptors - potential air quality impacts during construction phase.					
		6	Impact on existing McBride Pitch and Putt Club / amenity.		Some comparative disadvantage over other options as would require some habitat removal in the pitch and put (low quality but suitable for wintering birds) and hedgerow adjacent to the substation.		Further from residential receptors than Options 1, 3, 7, and 9, but closer than Option 8		Located in zone C outside of the 1 in 1000 year flood zone	Located in a greenfield environment in a pitch and putt course (so some disturbance has taken place within the land). Potential to reveal subsurface archaeology. Option 6 is a greenfield site with no known heritage features. No significant impact is anticipated.		Proposed location is inside IE land. There is potential for loss of topsoil/growing soil.	Some comparative advantages because it is not located on agricultural land.	Greater separation from sensitive receptors reducing potential impacts during the construction phase.				
		7	Impact on existing planting and located in proximity to existing residential developments.		Significant comparative disadvantage over other options due to removal of hedgerow, scrub and potentially trees for location and access road. Impacts likely on birds, bats, mammals, invertebrates. Option also close to bridge with moderate roosting potential for bats.		Closer to residential receptors than most options besides Option 3. Same impact as Option 9		Located in zone C outside of the 1 in 1000 year flood zone	Located in rough and tree planted ground to the south of the old GNR Oldcastle Branch railway line. No recorded monuments are in the locality. Potential to reveal subsurface archaeological features. Under Option 7 there is a potential visual impact on UB880a and UB80b, the historic structures within the Drogheda Station (LCC RPS DB-055) complex and Railway Terrace Architectural Conservation Area, the magnitude of which is low. It is predicted that it will have a slight negative visual impact.		Proposed location is inside IE land. There is potential for loss of topsoil/growing soil.	Some comparative advantages because it is not located on agricultural land.	Located in relative proximity to sensitive receptors - potential air quality impacts during construction phase.				
		8	Located close to, but well screened from existing residential property. Steep access off end of bridge.		Some comparative disadvantage over other options due to habitat removal for location and substation. Hedgerow removal required, as well as some removal of grassland/agricultural land. Potential impacts on birds, bats, mammals.		Furthest from residential receptors		Located in zone C outside of the 1 in 1000 year flood zone	Located in a greenfield environment to the north of Drogheda Station. Potential to reveal subsurface archaeology. Option 8 is a greenfield site located outside of the station complex with no known heritage features. It is to the rear of the station building and will be visually screened or masked by it. No significant impact is anticipated.		Proposed location is outside IE land. There is potential for excavation of made ground/contaminated land There is potential for loss of topsoil/growing soil.	Some comparative disadvantages because it is located on medium sensitivity agricultural land.	Greater separation from sensitive receptors reducing potential impacts during the construction phase.				
		9	Located in proximity to existing residential property. Steep access off end of bridge.		Some comparative advantage over other options due to low quality habitat removal. Unlikely for much (or any) hedgerow removal. Low level impacts predicted.		Closer to residential receptors than most options besides Option 3. Same impact as Option 7		Located in zone C outside of the 1 in 1000 year flood zone	Located to the west of a townland boundary (Bryanstown and Newtown) and in a greenfield environment. Potential to reveal subsurface archaeology. Option 9 is located on a greenfield to the north of UB880a and UB80b. There is a potential negative visual impact but this is negligible as the substation will be screened or masked by mature trees.		Proposed location is outside IE land. There is potential for loss of topsoil/growing soil.	Some comparative disadvantages because it is located on medium sensitivity agricultural land.	Located in relative proximity to sensitive receptors - potential air quality impacts during construction phase.				

Comparison Criteria Legend	
Significant comparative advantage over other options	
Some comparative advantage over other options	
Comparable to other options / neutral	
Some comparative disadvantage over other options	
Significant comparative disadvantage over other options	

Accessibility & Social Inclusion						
Works Description	Summary of requirements	Option Number	Accessibility		Social Inclusion	
			Qualitative appraisal of capacity of options to facilitate the movement of people (either within, on to or across the rail system)	Rationale	Qualitative appraisal of capacity of options to provide ease of access for the mobility and visually impaired	Rationale
			Capacity of options to facilitate the movement of people (either within, on to or across the rail system) Impact on the wellbeing of the passenger and public. Positive impact on passenger and public experience. Improve accessibility to key facilities, such as employment, education, transport and healthcare to satisfy transport demand for all trip types.		Positive impact towards vulnerable groups Improvement of accessibility to public transport facilities, in particular from deprived geographic areas.	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.
		3		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.
		6		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.
		7		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.
		8		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.
		9		All options are comparable - options of substation locations do not impact accessibility in this area.		All options are comparable - options of substation locations do not impact social inclusion in this area.

Comparison Criteria Legend	
Significant comparative advantage over other options	
Some comparative advantage over other options	
Comparable to other options / neutral	
Some comparative disadvantage over other options	
Significant comparative disadvantage over other options	

			Integration										Physical Activity	
Works Description	Summary of requirements	Option Number	Adaptability in the future		Transport Integration		Land use integration		Geographical Integration		Government policy Integration		Walking / cycling opportunities	
			Qualitative appraisal of capacity of options to cater for future projects or aspirations	Rationale	Qualitative appraisal of the options and their impact on integration with other transport modes	Rationale	Qualitative appraisal of the options and their impact on integration with land use policies	Rationale	Qualitative appraisal of the options and their impact on integration with geographical policies	Rationale	Qualitative appraisal of the options and their impact on integration with geographical and government policies	Rationale	Qualitative appraisal of the options and their impact to enable walking and cycling opportunities in a safer environment for the communities along the route	Rationale
			Ability to continue to function successfully despite future changes in circumstances		Scope for and ease of interchange between modes New interchange nodes and facilities Reduce waking and wait times associated with interchanges Integration with the cycle networks Modal shifts figures during construction and operations Changes to journey times to transport nodes Impact on the operation of the other transport services both during construction and in operation stage		Consistency with land use strategies, regional and local plans		Potential to impact on external links during construction Potential to impact on external links during operations Consideration for any community severance impacts		Integration with national and international plans and policies		To enable walking and cycling opportunities in a safer environment in the communities along the route To create a healthy environment conducive to active travel Connectivity to adjoining cycling and pedestrian facilities Enhanced connectivity between key attractions/trip generators related to active modes Diversions, duration and impact on journey times and potential to create a negative modal shift (e.g. people opt to drive instead of walk or cycle)	
Electrification of Northern Line: Traction Substation Locations	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	1		All options are comparable - options of substation locations do not impact the adaptability in the future in this area		Impact on existing parking, pedestrians and cyclists at Park and Ride during construction		This Option is zoned J2 - "Transportation Development Hub" in the Louth Development Plan 2021-2027. A substation is acceptable.		All of the options are infrastructural buildings adjoining a railway line and are considered neutral.		All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.		The options are considered to be comparable with each other with regards to physical activity.
		3		All options are comparable - options of substation locations do not impact the adaptability in the future in this area		Impact on existing parking, pedestrians and cyclists at Park and Ride during construction		This Option is zoned J1 - "Transportation Development Hub" in the Louth Development Plan 2021-2027. A substation is acceptable.		All of the options are infrastructural buildings adjoining a railway line and are considered neutral.		All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.		The options are considered to be comparable with each other with regards to physical activity.
		6		All options are comparable - options of substation locations do not impact the adaptability in the future in this area		No impacts on existing parking, pedestrians and cyclists at Park and Ride during construction		This Option is zoned J1 - "Transportation Development Hub" in the Louth Development Plan 2021-2027. A substation is acceptable.		All of the options are infrastructural buildings adjoining a railway line and are considered neutral.		All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.		The options are considered to be comparable with each other with regards to physical activity.
		7		All options are comparable - options of substation locations do not impact the adaptability in the future in this area		No impacts on existing parking, pedestrians and cyclists at Park and Ride during construction		This Option is zoned A1 - "Existing Residential" in the Louth Development Plan 2021-2027. A substation is deemed less desirable than other options that are zoned J1.		All of the options are infrastructural buildings adjoining a railway line and are considered neutral.		All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.		The options are considered to be comparable with each other with regards to physical activity.
		8		All options are comparable - options of substation locations do not impact the adaptability in the future in this area		No impacts on existing parking, pedestrians and cyclists at Park and Ride during construction		This Option is zoned J1 - "Transportation Development Hub" in the Louth Development Plan 2021-2027. A substation is acceptable.		All of the options are infrastructural buildings adjoining a railway line and are considered neutral.		All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.		The options are considered to be comparable with each other with regards to physical activity.
		9		All options are comparable - options of substation locations do not impact the adaptability in the future in this area		No impacts on existing parking, pedestrians and cyclists at Park and Ride during construction		This Option is zoned J1 - "Transportation Development Hub" in the Louth Development Plan 2021-2027. A substation is acceptable.		All of the options are infrastructural buildings adjoining a railway line and are considered neutral.		All international, national, regional and local policies encourage improvements in relation to the efficiency of public transport. All the proposed options will facilitate the achievement of greater efficiency in public transportation long part of the east coast of the country and therefore comply with government policy.		The options are considered to be comparable with each other with regards to physical activity.