Appendix F – Twin Crossing Operational Strategy

APPENDIX F

Appendix F details the alignment options determined in the Stage 1 STAG Appraisal and contains tables that provide several possible operational arrangements for each option.

Four alignment options were carried forward from Stage 1 STAG appraisal:

F1 Alignment Option - Tunnel C:

Proposed tunnel C alignment option crosses the Firth of Forth approximately 1400 metres west of the existing Forth Road Bridge. The preferred alignment would link the A823 Junction at St Margaret's Stone to a new junction with the M9 through a tunnel from a point close to Pattiesmuir, under Limekilns reaching the south shore at approximately Abercorn.

The tunnel would then rise to form a portal between Duntaruie and Carmelhill. The alignment of the road as it enters the tunnel is northeast to southwest before it turns bearing north-south. The road emerges from the tunnel in a north to south alignment to the north of the existing M9. This proposal would involve approximately eight and half kilometres of twin-bore tunnel.

F2 Alignment Option - Tunnel D:

Proposed tunnel D alignment option crosses the Firth of Forth approximately 250 metres west of the existing Forth Road Bridge. The tunnel descends underground to the north of the crossing at a point approximately 400 metres north of the Firth of Forth.

The new crossing merges with the existing infrastructure at the A985 / A921 / M90 junction 1 and Junction 1a of the M9. The alignment of the road as it enters the tunnel is in a north to south direction. The tunnel continues in this direction and emerges at a portal between Dundas Mains and Junction 1a of the M9. A tunnel on this alignment would be approximately seven kilometres in length.

F3 Alignment Option - Tunnel E:

Proposed tunnel E alignment option crosses the Firth of Forth approximately 500 metres east of the existing Forth Road Bridge. The tunnel descends underground 300 metres north of the Forth at Hillend. The crossing merges with the existing infrastructure at junction 2 of the M9.

The alignment of the road as it enters the tunnel is northwest to Southeast but bears quickly towards a north to south alignment to cross the Forth before turning again towards a northeast to southwest alignment where the route emerges from the tunnel to the east of the A8000. The crossing merges with the A8000 and the A8000 / M9 link road and at a new junction on the A90. The length of the tunnel for this alignment would be approximately nine kilometres.

F4 Alignment Option - Bridge D:

Proposed bridge D alignment option crosses the Forth approximately 200 metres west of the existing Forth Road Bridge. The bridge links with the A90 at its existing junction with the B980 and B981 approximately 300 metres north of the Firth of Forth. The bridge follows a north to south alignment with the southern end directly to the west of the existing Queensferry settlement.

A newly constructed junction with the A904 and new link road to the M9 will allow merging with the existing infrastructure.

Figure F.1: Twin Crossings (One-Way)
New Bridge with Existing Bridge

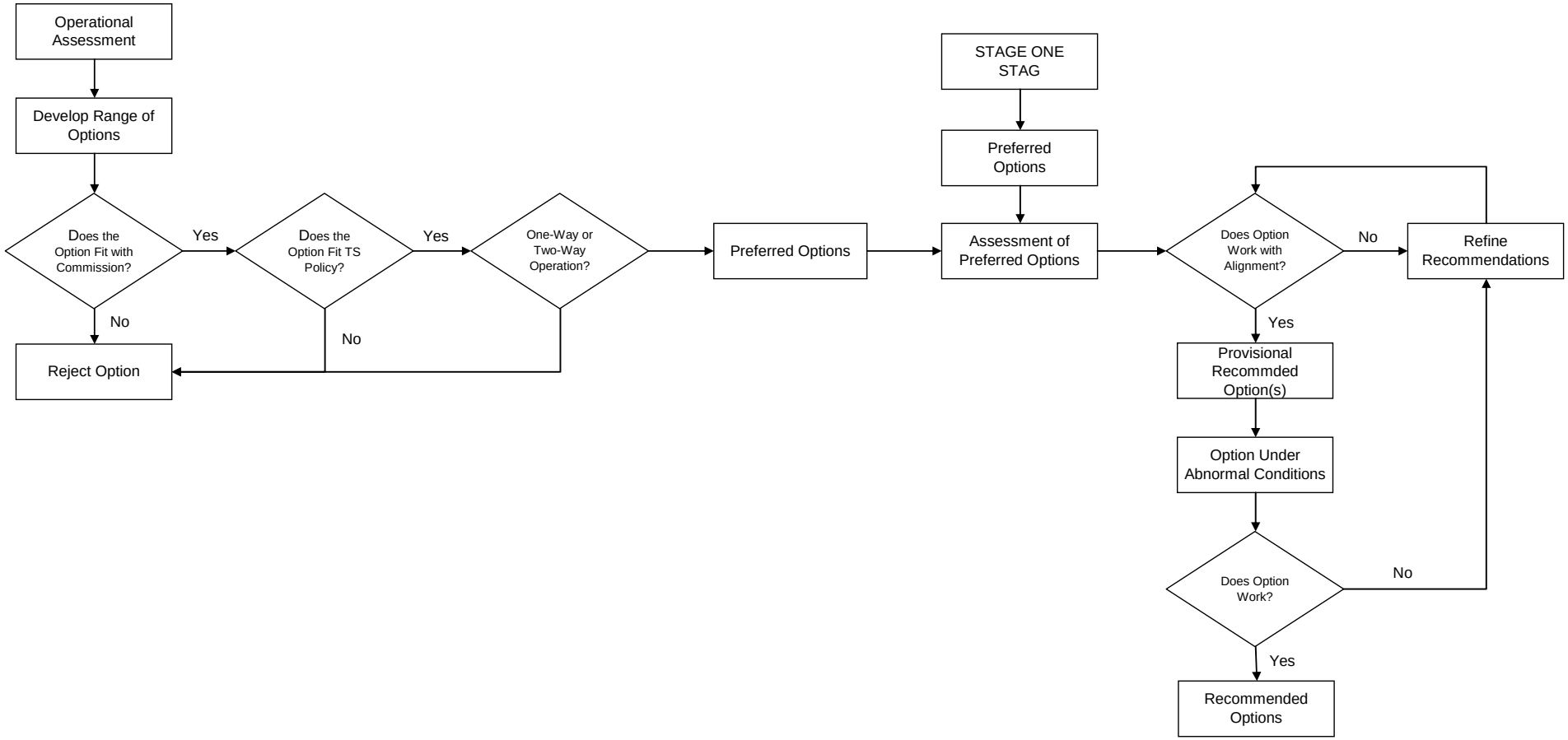

Table F.1: Twin Crossings (One-Way)
New Bridge with Existing Bridge

Options	New Bridge Crossing				Existing Crossing				Description
	Lane One	Lane Two	Lane Three	Lane Four	Lane Five	Lane Six	Lane Seven	Lane Eight	
Option 2.1(A)	Bus	Any	Any	Any	Any	Any	Any	Bus	Three lanes for any vehicles plus bus lane.
Option 2.1(B)	Bus + HOV	Any	Any	Any	Any	Any	Any	Bus + HOV	Three lanes for any vehicles plus bus and HOV lane.
Option 2.1(C)	Bus	HOV	Any	Any	Any	Any	HOV	Bus	Two lanes for any vehicles plus a bus lane and HOV lane.
Option 2.1(D)	Bus + HOV	Any	Any	Non-HGVs	Non-HGVs	Any	Any	Bus + HOV	Two lanes for any vehicles plus Non-HGV lane and Bus & HOV lane.
Option 2.1(E)	Bus	HOV	Any	Non-HGVs	Non-HGVs	Any	HOV	Bus	One lane for any vehicles, Non-HGV lane, Bus lane and HOV lane.
Option 2.1(F)	Bus + HOV	Any	Non-HGVs	Non-HGVs	Non-HGVs	Non-HGVs	Any	Bus + HOV	One lane for any vehicles plus two Non-HGV lanes and a Bus & HOV lane.
Option 2.1(G)	Bus	Green	Any	Any	Any	Any	Green	Bus	Two lane for any vehicles plus a Green lane and Bus lane.
Option 2.1(H)	Bus +HOV	Green	Any	Any	Any	Any	Green	Bus +HOV	Two lane for any vehicles plus a Green lane and Bus & HOV lane.
Option 2.1(I)	Bus	HOV	Green	Any	Any	Green	HOV	Bus	One lane for any vehicles plus a Green lane, a Bus lane and HOV lane.

Notes:

1. LRT has only been considered valuable for the new bridge crossing – if crossings operate in one-way the LRT option would be difficult to accommodate and as such has not been considered under this operational arrangement;
2. “Green” refers to low emissions vehicles;

Table F.2: Twin Crossings (One-Way)
New Tunnel with Existing Bridge

Options	New Tunnel Crossing				Existing Crossing				Description
	Lane One	Lane Two	Lane Three	Lane Four	Lane Five	Lane Six	Lane Seven	Lane Eight	
Option 2.2(A)	Bus	Any	Any	Any	Any	Any	Any	Bus	Three lanes for any vehicles plus bus lane.
Option 2.2(B)	Bus + HOV	Any	Any	Any	Any	Any	Any	Bus + HOV	Three lanes for any vehicles plus bus and HOV lane.
Option 2.2(C)	Bus	HOV	Any	Any	Any	Any	HOV	Bus	Two lanes for any vehicles plus a bus lane and HOV lane.
Option 2.2(D)	Bus + HOV	Non-HGVs	Any	Any	Any	Any	Non-HGVs	Bus + HOV	Two lanes for any vehicles plus Non-HGV lane and Bus & HOV lane.
Option 2.2(E)	Bus	HOV	Non-HGVs	Any	Any	Non-HGVs	HOV	Bus	One lane for any vehicles, Non-HGV lane, Bus lane and HOV lane.
Option 2.2(F)	Bus + HOV	Non-HGVs	Non-HGVs	Any	Any	Non-HGVs	Non-HGVs	Bus + HOV	One lane for any vehicles plus two Non-HGV lanes and a Bus & HOV lane.
Option 2.1(G)	Bus	Green	Any	Any	Any	Any	Green	Bus	Two lane for any vehicles plus a Green lane and Bus lane.
Option 2.1(H)	Bus +HOV	Green	Any	Any	Any	Any	Green	Bus +HOV	Two lane for any vehicles plus a Green lane and Bus & HOV lane.
Option 2.1(I)	Bus	HOV	Green	Any	Any	Green	HOV	Bus	One lane for any vehicles plus a Green lane, a Bus lane and HOV lane.

Notes:

1. LRT can't be combine with road based traffic in a tunnel and as such has not been considered under this operational arrangement;
2. "Green" refers to low emissions vehicles;

Table F.3: Twin Crossing (Two-Ways)
New Bridge with Existing Bridge

Options	New Bridge Crossing				Existing Crossing				Description
	Lane One	Lane Two	Lane Three	Lane Four	Lane Five	Lane Six	Lane Seven	Lane Eight	
Option 2.3(A)	Any	Any	Any	Any	Bus	Any	Any	Bus	Three lanes for any vehicles plus Bus lane over the existing bridge
Option 2.3(B)	Any	Any	Any	Any	Bus + HOV	Any	Any	Bus + HOV	Three lanes for any vehicles plus a combine Bus & HOV lane.
Option 2.3(C)	Any	Any	Any	Any	Bus	HOV	HOV	Bus	Two lanes for any vehicles with a Bus lane plus separate HOV lane
Option 2.3(D)	Any	Any	Any	Any	Bus + HOV	Non-HGVs	Non-HGVs	Bus + HOV	Two lanes for any vehicles plus a combine Bus & HOV lane and one non-HGV lane
Option 2.3(E)	Bus	Any	Any	Bus	HOV	Non-HGVs	Non-HGVs	HOV	One lane for any vehicles plus Bus lane on new crossing with HOV and Non-HGVs lanes on existing.
Option 2.3(F)	Bus + HOV	Any	Any	Bus +HOV	Non-HGVs	Non-HGVs	Non-HGVs	Non-HGVs	One lane for any vehicles plus a Bus & HOV lane on new crossing with all Non-HGVs on existing crossing.
Option 2.3(G)	Any	Tidal (AM)	Any	Any	Any	Any	Any	Bus	Bus lane over the existing bridge with one tidal lane on new crossing – four lanes for any vehicles.
Option 2.3(H)	Any	Tidal (AM)	Any	Any	Bus + HOV	Any	Any	Bus + HOV	Combine Bus & HOV lane over existing with one tidal lane on new crossing - four lanes for any vehicles.
Option 2.3(I)	Any	Tidal (AM)	Any	Any	Bus	HOV	HOV	Bus	Bus lane plus separate HOV lane, with one tidal lane on new crossing – three lanes for any vehicles.
Option 2.3(J)	Any	Tidal (AM)	Any	Any	Bus + HOV	Non-HGVs	Non-HGVs	Bus + HOV	Combine Bus & HOV lane; one lane non-HGVs; with one tidal lane on new crossing.
Option 2.3(K)	Any	Any	Any	Any	Tidal Any	Tidal Any	Tidal Any	Bus	Existing crossing tidal – bus lane plus five lanes for any vehicles (am).
Option 2.3(L)	Any	An	Any	Any	Tidal Any	Tidal Any	Tidal Any	Bus + HOV	Existing crossing tidal – combine bus & HOV lane plus five lanes for any vehicles (am).

Options	New Bridge Crossing				Existing Crossing				Description
	Lane One	Lane Two	Lane Three	Lane Four	Lane Five	Lane Six	Lane Seven	Lane Eight	
Option 2.3(M)	Any	Any	Any	Any	Tidal Any	Tidal Any	HOV	Bus	Existing crossing tidal – separate bus & HOV lanes plus four lanes for any vehicles.
Option 2.3(N)	Any	Any	Any	Any	Tidal Non-HGVs	Tidal Non-HGVs	HOV	Bus	Existing crossing tidal – separate bus and HOV lanes, two non-HGVs lanes and two lanes for ant vehicles.
Option 2.3(O)	Bus	Any	Any	Bus	Any	Any	Any	Any	Bus lane over new crossing – three lanes for any.
Option 2.3(P)	Bus +HOV	Any	Any	Bus +HOV	Any	Any	Any	Any	Bus & HOV lane over new crossing – three lanes for any vehicles.
Option 2.3(Q)	Bus	HOV	HOV	Bus	Any	Any	Any	Any	Bus and separate HOV lane over new crossing – two lanes for any vehicles.
Option 2.3(R)	Bus +HOV	Non-HGVs	Non-HGVs	Bus + HOV	Any	Any	Any	Any	Bus & HOV lane over new crossing with Non-HGV lane – two lanes for any vehicles.
Option 2.3(S)	Bus +HOV	Any	Any	Bus +HOV	Bus +HOV	Any	Any	Bus +HOV	One lane for any vehicles plus one lane for Bus & HOV on both crossings.
Option 2.3(T)	Any	Any	Any	Any +HS	Bus	Any	Any	Bus	Bus lane over the bridge – three lanes for any vehicles – plus hard shoulder running S/B (am).
Option 2.3(U)	Any	Any	Any	Any +HS	Bus + HOV	Any	Any	Bus + HOV	Combine Bus & HOV lane – three lanes for any vehicles – plus hard shoulder running S/B (am).
Option 2.3(V)	Any	Any	Any	Any +HS	Bus	HOV	HOV	Bus	Bus lane plus separate HOV lane – two lanes for any vehicles – plus hard shoulder running S/B (am).
Option 2.3(W)	Any	Any	Any	Any +HS	Bus + HOV	Non-HGVs	Non-HGVs	Bus + HOV	Bus & HOV lane; one non-HGV lane – two lanes for any vehicles – plus hard shoulder running S/B (am).
Option 2.3(X)	Bus	Any	Any	Bus +HS	HOV	Non-HGVs	Non-HGVs	HOV	Bus lane plus hard shoulder running on new crossing – HOV and Non-HGVs lanes on existing.
Option 2.3(Y)	Bus + HOV	Any	Any	Bus HOV +HS	Non-HGVs	Non-HGVs	Non-HGVs	Non-HGVs	Non-HGVs lanes on existing crossing – Bus & HOV lane on new crossing with hard shoulder running.

	New Bridge Crossing				Existing Crossing				
Options	**Lane One**	**Lane Two**	**Lane Three**	**Lane Four**	**Lane Five**	**Lane Six**	**Lane Seven**	**Lane Eight**	**Description**
Option 2.3(Z)	HOV	Any	Any	HOV	Bus	Non-HGV	Non-HGV	Bus	Bus and Non-HGV lanes on existing with HOV and any lanes on new crossing.
Option 2.3(AA)	Bus +HOV	Any	Any	Bus +HOV	Bus +HOV	Non-HGV	Non-HGV	Bus +HOV	Bus and Non-HGV lanes on existing with Bus & HOV and any lanes on new crossing.
Option 2.3(BB)	Any	Tidal HOV (AM)	Any	Any	Any	Any	Any	Bus	Tidal HOV lane on new crossing. Bus lane on existing bridge.
Option 2.3(CC)	Any	Tidal HOV (AM)	Any	Any	Bus + HOV	Any	Any	Bus +HOV	Tidal HOV lane on new crossing. Bus & HOV lane on existing bridge.
Option 2.3(DD)	Any	Tidal HOV (AM)	Any	Any	Bus	HOV	HOV	Bus	Tidal HOV lane on new crossing. Bus lane and HOV lane on existing bridge.
Option 2.3(EE)	Any	Tidal HOV (AM)	Any	Any	Bus	Non-HGVs	Non-HGVs	Bus	Tidal HOV lane on new crossing. Bus lane and Non-HGV lane on existing.
Option 2.3(FF)	Any	Any	Any	Any	Bus	HOV + HGV	HOV +HGV	Bus	Bus Lane with HOV & HGV lane on existing. Two lanes for any vehicles on new crossing,
Option 2.3(UU)	Any	Any	Any	Any	Bus	HOV +Green	HOV +Green	Bus	Bus Lane with HOV & Green lane on existing bridge. Two lanes for any on new crossing.
Option 2.3(VV)	Any	Any	Any	Any	Bus + HOV	HOV +Green	HOV +Green	Bus + HOV	Bus & HOV lane plus HOV & Green lane on exiting. Two lanes for any on new crossing.
Option 2.3(WW)	Any	Any	Any	Any	Bus +HOV	Green	Green	Bus +HOV	Bus & HOV lane plus Green lane on existing. Two lanes for any vehicle on new crossing.

Table F.4: Twin Crossings (Two-Ways)
New Tunnel with Existing Bridge

Options	New Tunnel Crossing				Existing Crossing				Description
	Lane One	Lane Two	Lane Three	Lane Four	Lane Five	Lane Six	Lane Seven	Lane Eight	
Option 2.4(A)	Any	Any	Any	Any	Bus	Any	Any	Bus	Three lanes for any vehicles plus Bus lane over the existing bridge
Option 2.4(B)	Any	Any	Any	Any	Bus + HOV	Any	Any	Bus + HOV	Three lanes for any vehicles plus a combine Bus & HOV lane.
Option 2.4(C)	Any	Any	Any	Any	Bus	HOV	HOV	Bus	Two lanes for any vehicles with a Bus lane plus separate HOV lane
Option 2.4(D)	Any	Any	Any	Any	Bus + HOV	Non-HGVs	Non-HGVs	Bus + HOV	Two lanes for any vehicles plus a combine Bus & HOV lane and one non-HGV lane
Option 2.4(E)	Bus	Any	Any	Bus	HOV	Non-HGVs	Non-HGVs	HOV	One lane for any vehicles plus Bus lane on new crossing with HOV and Non-HGVs lanes on existing.
Option 2.4(F)	Bus + HOV	Any	Any	Bus +HOV	Non-HGVs	Non-HGVs	Non-HGVs	Non-HGVs	One lane for any vehicles plus a Bus & HOV lane on new crossing with all Non-HGVs on existing crossing.
Option 2.4(G)	Any	Tidal (AM)	Any	Any	Any	Any	Any	Bus	Bus lane over the existing bridge with one tidal lane on new crossing – four lanes for any vehicles.
Option 2.4(H)	Any	Tidal (AM)	Any	Any	Bus + HOV	Any	Any	Bus + HOV	Combine Bus & HOV lane over existing with one tidal lane on new crossing - four lanes for any vehicles.
Option 2.4(I)	Any	Tidal (AM)	Any	Any	Bus	HOV	HOV	Bus	Bus lane plus separate HOV lane, with one tidal lane on new crossing – three lanes for any vehicles.
Option 2.4(J)	Any	Tidal (AM)	Any	Any	Bus + HOV	Non-HGVs	Non-HGVs	Bus + HOV	Combine Bus & HOV lane; one lane non-HGVs; with one tidal lane on new crossing.
Option 2.4(K)	Any	Any	Any	Any	Tidal Any	Tidal Any	Tidal Any	Bus	Existing crossing tidal – bus lane plus five lanes for any vehicles (am).
Option 2.4(L)	Any	An	Any	Any	Tidal Any	Tidal Any	Tidal Any	Bus + HOV	Existing crossing tidal – combine bus & HOV lane plus five lanes for any vehicles (am).

Options	New Tunnel Crossing				Existing Crossing				Description
	Lane One	Lane Two	Lane Three	Lane Four	Lane Five	Lane Six	Lane Seven	Lane Eight	
Option 2.4(M)	Any	Any	Any	Any	Tidal Any	Tidal Any	HOV	Bus	Existing crossing tidal – separate bus & HOV lanes plus four lanes for any vehicles.
Option 2.4(N)	Any	Any	Any	Any	Tidal Non-HGVs	Tidal Non-HGVs	HOV	Bus	Existing crossing tidal – separate bus and HOV lanes, two non-HGVs lanes and two lanes for ant vehicles.
Option 2.4(O)	Bus	Any	Any	Bus	Any	Any	Any	Any	Bus lane over new crossing – three lanes for any.
Option 2.4(P)	Bus +HOV	Any	Any	Bus +HOV	Any	Any	Any	Any	Bus & HOV lane over new crossing – three lanes for any vehicles.
Option 2.4(Q)	Bus	HOV	HOV	Bus	Any	Any	Any	Any	Bus and separate HOV lane over new crossing – two lanes for any vehicles.
Option 2.4(R)	Bus +HOV	Non-HGVs	Non-HGVs	Bus + HOV	Any	Any	Any	Any	Bus & HOV lane over new crossing with Non-HGV lane – two lanes for any vehicles.
Option 2.4 (S)	Bus +HOV	Any	Any	Bus +HOV	Bus +HOV	Any	Any	Bus +HOV	One lane for any vehicle plus Bus & HOV lane on both crossings.
Option 2.4(T)	Any	Any	Any	Any +HS	Bus	Any	Any	Bus	Bus lane over the bridge – three lanes for any vehicles – plus hard shoulder running S/B (am).
Option 2.4(U)	Any	Any	Any	Any +HS	Bus + HOV	Any	Any	Bus + HOV	Combine Bus & HOV lane – three lanes for any vehicles – plus hard shoulder running S/B (am).
Option 2.4(V)	Any	Any	Any	Any +HS	Bus	HOV	HOV	Bus	Bus lane plus separate HOV lane – two lanes for any vehicles – plus hard shoulder running S/B (am).
Option 2.4(W)	Any	Any	Any	Any +HS	Bus + HOV	Non-HGVs	Non-HGVs	Bus + HOV	Bus & HOV lane; one non-HGV lane – two lanes for any vehicles – plus hard shoulder running S/B (am).
Option 2.4(X)	Bus	Any	Any	Bus +HS	HOV	Non-HGVs	Non-HGVs	HOV	Bus lane plus hard shoulder running on new crossing – HOV and Non-HGVs lanes on existing.
Option 2.4(Y)	Bus + HOV	Any	Any	Bus HOV +HS	Non-HGVs	Non-HGVs	Non-HGVs	Non-HGVs	Non-HGVs lanes on existing crossing – Bus & HOV lane on new crossing with hard shoulder running.
Option 2.4(Z)	HOV	Any	Any	HOV	Bus	Non-HGV	Non-HGV	Bus	Bus and Non-HGV lanes on existing with HOV and any lanes on new crossing.

Options	New Tunnel Crossing				Existing Crossing				Description
	Lane One	Lane Two	Lane Three	Lane Four	Lane Five	Lane Six	Lane Seven	Lane Eight	
Option 2.4(AA)	Bus +HOV	Any	Any	Bus +HOV	Bus +HOV	Non-HGV	Non-HGV	Bus +HOV	Bus and Non-HGV lanes on existing with Bus & HOV and any lanes on new crossing.
Option 2.3(BB)	Any	Tidal HOV (AM)	Any	Any	Any	Any	Any	Bus	Tidal HOV lane on new crossing. Bus lane on existing bridge.
Option 2.3(CC)	Any	Tidal HOV (AM)	Any	Any	Bus + HOV	Any	Any	Bus +HOV	Tidal HOV lane on new crossing. Bus & HOV lane on existing bridge.
Option 2.3(DD)	Any	Tidal HOV (AM)	Any	Any	Bus	HOV	HOV	Bus	Tidal HOV lane on new crossing. Bus lane and HOV lane on existing bridge.
Option 2.3(EE)	Any	Tidal HOV (AM)	Any	Any	Bus	Non-HGVs	Non-HGVs	Bus	Tidal HOV lane on new crossing. Bus lane and Non-HGV lane on existing.
Option 2.3(FF)	Any	Any	Any	Any	Bus	HOV + HGV	HOV +HGV	Bus	Bus Lane with HOV & HGV lane on existing. Two lanes for any vehicles on new crossing,
Option 2.3(GG)	Any	Any	Any	Any	Bus	HOV +Green	HOV +Green	Bus	Bus Lane with HOV & Green lane on existing bridge. Two lanes for any on new crossing.
Option 2.3(HH)	Any	Any	Any	Any	Bus + HOV	HOV +Green	HOV +Green	Bus + HOV	Bus & HOV lane plus HOV & Green lane on exiting. Two lanes for any on new crossing.
Option 2.3(II)	Any	Any	Any	Any	Bus +HOV	Green	Green	Bus +HOV	Bus & HOV lane plus Green lane on existing. Two lanes for any vehicle on new crossing.

Table F.5: Replacement Crossing
New Bridge – D2M

Options	Replacement Crossing – Bridge D2M						Description
	H/S	Lane One	Lane Two	Lane Three	Lane Four	H/S	
Option 2.5(A)		Any	Any	Any	Any		Two lanes for any vehicles.
Option 2.5(B)		Bus	Any	Any	Bus		One lane for any vehicles and one Bus lane.
Option 2.5(C)		Bus +HOV	Any	Any	Bus +HOV		One lane for any vehicles and one Bus & HOV lane.
Option 2.5(D)	Any (pm)	Any	Any	Any	Any	Any (am)	Two lanes for any vehicles plus hard shoulder running.
Option 2.5(E)	Bus (am)	Any	Any	Any	Any	Bus (am)	Two lanes for any vehicles plus hard shoulder running for a Bus lane.
Option 2.5(F)	Bus +HOV	Any	Any	Any	Any	Bus + HOV	Two lanes for any vehicles plus hard shoulder running for a Bus & HOV lane.

Table F.6: Replacement Crossing
New Tunnel – D2M

Options	Replacement Crossing – Tunnel D2M						Description
	H/S	Lane One	Lane Two	Lane Three	Lane Four	H/S	
Option 2.6(A)		Any	Any	Any	Any		Two lanes for any vehicles.
Option 2.6(B)		Bus	Any	Any	Bus		One lane for any vehicles and one Bus lane.
Option 2.6(C)		Bus +HOV	Any	Any	Bus +HOV		One lane for any vehicles and one Bus & HOV lane.
Option 2.6(D)	Any (pm)	Any	Any	Any	Any	Any (am)	Two lanes for any vehicles plus hard shoulder running.
Option 2.6(E)	Bus (am)	Any	Any	Any	Any	Bus (am)	Two lanes for any vehicles plus hard shoulder running for a Bus lane.
Option 2.6(F)	Bus +HOV	Any	Any	Any	Any	Bus + HOV	Two lanes for any vehicles plus hard shoulder running for a Bus & HOV lane.

Table F.7: Replacement Crossing New Bridge – D3M

Options	Replacement Bridge D3M								Description
	H/S	Lane One	Lane Two	Lane Three	Lane Four	Lane Five	Lane Six	H/S	
Option 2.7(A)		Any	Any	Any	Any	Any	Any		Three lanes for any traffic.
Option 2.7(B)		Bus	Any	Any	Any	Any	Bus		Two lanes for any traffic plus Bus lane.
Option 2.7(C)		Bus +HOV	Any	Any	Any	Any	Bus +HOV		Two lanes for any traffic plus Bus & HOV lane.
Option 2.7(D)		Any	Any	Tidal Any	Any	Any	Any		One tidal lane – four lanes for any traffic.
Option 2.7(E)		Bus	Any	Tidal Any	Any	Any	Bus		One tidal lane – three lanes for any traffic.
Option 2.7(F)		Bus +HOV	Any	Tidal Any	Any	+HOV	Bus		One tidal lane – separate Bus and HOV lanes – two lanes for any traffic.
Option 2.7(G)	Any (pm)	Any	Any	Any	Any	Any	Any	Any (am)	Hard Shoulder running – four lanes for any vehicles.
Option 2.7(H)	Bus (pm)	Any	Any	Any	Any	Any	Any	Bus (am)	Hard shoulder running for Bus lane (am) – three lanes for any vehicles.
Option 2.7(I)	Bus +HOV	Any	Any	Any	Any	Any	Any	Bus +HOV	Hard Shoulder running for Bus & HOV lane – three lanes for any vehicles.
Option 2.7(J)	HOV (pm)	Bus	Any	Any	Any	Any	Bus	HOV (am)	Hard shoulder running for HOV plus Bus lane and two lanes for any vehicles.
Option 2.7(K)	Any (pm)	Any	Any	Tidal Any	Any	Any	Any	Any (am)	Tidal lane for any vehicles – four lanes for any vehicles.
Option 2.7(L)	Bus (pm)	Any	Any	Tidal Any	Any	Any	Any	Bus (am)	Tidal lane for any vehicles – three lanes for any vehicles.

Options	Replacement Bridge D3M								Description
	H/S	Lane One	Lane Two	Lane Three	Lane Four	Lane Five	Lane Six	H/S	
Option 2.7(M)	Bus +HOV	Any	Any	Any	Any	Any	Any	Bus +HOV	Tidal lane for any vehicle – four lanes for any vehicles.
Option 2.7(N)	HOV (pm)	Bus	Any	Any	Any	Any	Bus	HOV (am)	Tidal lane for any vehicle – three lanes for any vehicles.
Option 2.7(O)		LRT	Any	Any	Any	Any	LRT		LRT on outside lane – two lanes for any vehicles.
Option 2.7(P)		LRT	Bus	Any	Any	Bus	LRT		LRT on outside lane with a Bus lane – One lane for any vehicles.
Option 2.7(Q)		LRT	Bus +HOV	Any	Any	Bus +HOV	LRT		LRT on outside lane with a Bus & HOV lane – One lane for any vehicles.
Option 2.7(R)	LRT	Any	Any	Any	Any	Any	Any	LRT	LRT running on the Hard Shoulder.
Option 2.7(S)	LRT	Bus	Any	Any	Any	Any	Bus	LRT	LRT running on the Hard Shoulder.
Option 2.7(T)	LRT	Bus +HOV	Any	Any	Any	Any	Bus +HOV	LRT	LRT running on the Hard Shoulder.
Option 2.7(U)		Any	Any	LRT	LRT	Any	Any		LRT running on the central lane – two lanes for any vehicles.
Option 2.7(V)		Bus	Any	LRT	LRT	Any	Bus		LRT running on the central lane plus a Bus lane – one lane for any vehicles.

Option 2.7(W)		Bus +HOV	Any	LRT	LRT	Any	Bus +HOV		LRT running on the central lane plus a Bus & HOV lane – one lane for any vehicles.
Option 2.7(X)	Any	Any	Any	LRT	LRT	Any	Any	Any	LRT running on the central lane – three lanes for any vehicles.
Option 2.7(Y)	Bus	Any	Any	LRT	LRT	Any	Any	Bus	LRT running on the central lane plus Bus lane – two lanes for any vehicles.
Option 2.7(Z)	Bus +HOV	Any	Any	LRT	LRT	Any	Any	Bus +HOV	LRT running on the central lane plus Bus & HOV lane – two lanes for any vehicles.

Table F.8: Replacement Crossing
New Bridge – D4M

Options	Replacement Bridge D4M									Description
	H/S	Lane One	Lane Two	Lane Three	Lane Four	Lane Five	Lane Four	Lane Five	Lane Six	H/S	
Option 2.8(A)		Any	Any	Any	Any	Any	Any	Any	Any		Four lanes for any vehicles.
Option 2.8(B)		Bus	Any	Any	Any	Any	Any	Any	Bus		Three lanes for any vehicles plus a Bus lane.
Option 2.8(C)		Bus +HOV	Any	Any	Any	Any	Any	Any	Bus +HOV		Three lanes for any vehicles plus a Bus & HOV lane.
Option 2.8(D)		Bus	+HOV	Any	Any	Any	Any	+HOV	Bus		Two lanes for any vehicles plus separate Bus and HOV lanes.

Option 2.8(E)	Bus (pm)	Any	Any	Any	Any	Any	Any	Any	Any	Bus (am)	Four lanes for any vehicles plus Bus lane on hard shoulder running.
Option 2.8(F)	Bus +HOV	Any	Any	Any	Any	Any	Any	Any	Any	Bus +HOV	Four lanes for any vehicles plus Bus & HOV lane on hard shoulder running.
Option 2.8(G)	HOV (pm)	Bus	Any	Any	Any	Any	Any	Any	Bus	HOV (am)	Three lanes for any vehicles plus a Bus lane with HOV on hard shoulder running.
Option 2.8(H)		LRT	Any	Any	Any	Any	Any	Any	LRT		LRT on outside lane with three lanes for any vehicles.
Option 2.8(I)		LRT	Bus	Any	Any	Any	Any	Bus	LRT		LRT on outside lane plus a Bus lane and two lanes for any vehicles.
Option 2.8(J)		LRT	Bus +HOV	Any	Any	Any	Any	Bus +HOV	LRT		LRT on outside lane plus a Bus & HOV lane and two lanes for any vehicles.
Option 2.8(K)	LRT	Any	Any	Any	Any	Any	Any	Any	Any	LRT	LRT running on Hard Shoulder with four lanes for any vehicles.

Table F.9 – Options Going Forward
Twin Crossing

Options	New Bridge / Tunnel Crossing (D2M)				Existing Crossing				Description
	Lane One	Lane Two	Lane Three	Lane Four	Lane Five	Lane Six	Lane Seven	Lane Eight	
Option 2.3(C) Option 2.4(C)	Any	Any	Any	Any	HOV	Bus	Bus	HOV	Two lanes for any vehicles with a Bus lane plus separate HOV lane
Option 2.3(E) Option 2.4(E)	Bus	Any	Any	Bus	HOV	Non-HGVs	Non-HGVs	HOV	One lane for any vehicles plus Bus lane on new crossing with HOV and Non-HGVs lanes on existing.
Option 2.3(S) Option 2.4(S)	Bus +HOV	Any	Any	Bus +HOV	Bus +HOV	Any	Any	Bus +HOV	Bus & HOV lane and any on existing – match operations on new crossing.
Option 2.3(Z)	HOV	Any	Any	HOV	Bus	Non-HGV	Non-HGV	Bus	Bus and Non-HGV lanes on existing with HOV

Option 2.4(Z)									and any lanes on new crossing.
Option 2.3(AA) Option 2.4(AA)	Bus +HOV	Any	Any	Bus +HOV	Bus +HOV	Non-HGV	Non-HGV	Bus +HOV	Bus and Non-HGV lanes on existing with Bus & HOV and any lanes on new crossing.

Table F.10 – Additional Bridge Options
D2M plus LRT

Options	New Bridge Crossing D2M Plus LRT						Existing Bridge				Description
	Lane One	Lane Two	Lane Three	Lane Four	Lane Five	Lane Six	Lane Seven	Lane Eight	Lane Nine	Lane Ten	
Option 2.3(C)	Any	Any	LRT	LRT	Any	Any	Bus	HOV	HOV	Bus	Two lanes for any vehicles with a Bus lane plus separate HOV lane plus LRT
Option 2.3(E)	Bus	Any	LRT	LRT	Any	Bus	HOV	Non-HGVs	Non-HGVs	HOV	One lane for any vehicles plus Bus lane on new crossing with HOV and Non-HGVs lanes on existing plus LRT
Option 2.3(S)	Bus +HOV	Any	LRT	LRT	Any	Bus +HOV	Bus +HOV	Any	Any	Bus +HOV	Bus & HOV lane and any on existing – match operations on new crossing plus LRT
Option 2.3(Z)	HOV	Any	LRT	LRT	Any	HOV	Bus	Non-HGV	Non-HGV	Bus	Bus and Non-HGV lanes on existing with HOV and any lanes on new crossing plus LRT
Option 2.3(AA)	Bus +HOV	Any	LRT	LRT	Any	Bus +HOV	Bus	Non-HGV	Non-HGV	Bus	Bus and Non-HGV lanes on existing with Bus & HOV and any lanes on new crossing plus LRT

Table F.11 – Recommended Operational Arrangement D2M plus LRT

Alignment Option: Tunnel C		
Operational Option	**Description of Operations**	**Comments**
2.3 (C) 2.4 (C)	New Crossing: Any / Any – Existing Crossing: Bus / HOV	• Maximise the benefit to public transport heading into / from within the A720 area. No bus priority provide on the new crossing; • Largest possible benefit for HOV traffic heading into / from within the A720 area and using existing bridge, no advantage to HOV on new bridge; • Operational arrangement causes disadvantage to local traffic on both sides of the crossing. HGVs and Single Occupancy Vehicles will have to travel north or south from locality to access the crossing, likely to increase travel time and distance and could incur rat running; and • Removal of HGV from existing may pro-long design life of bridge.
2.3 (E) 2.4 (E)	New Crossing: Bus / Any – Existing Crossing: HOV / Non-HGV	• Advantage to bus priority on the new crossing will not yield significant benefits to public transport as large; • Major benefit for HOV traffic heading to the area within the A720, no provision on new bridge for HOV vehicles; • Disadvantage for local HGV / Single Occupancy traffic on both sides, require to travel north / south from locality to access crossing, likely to increase both travel time and distance and could incur rat running; • Option only allows for one lane for HGVs, reducing the HGV capacity from existing situation; and • Removal of HGV from existing may pro-long design life of bridge.
2.3 (S) 2.4 (S)	New Crossing: Bus + HOV / Any – Existing Crossing: Bus + HOV / Any	• Major benefit for public transport as majority is heading to / from within the A720 area, however unlikely to be as large a benefit from the lane across the new crossing; • Major benefit to HOV traffic as majority heading to / from destination within the A720 , however, unlikely to be major benefit from the lane across the new crossing; • HGV capacity remains the same as current provision; • Non removal of HGV over existing crossing

		therefore no saving on design life of bridge

Alignment Option: Tunnel C		
Operational Option	**Description of Operations**	**Comments**
2.3 (Z) 2.4 (Z)	New Crossing: Any / HOV – Existing Crossing: Bus / Non-HGV	• Major benefit to public transport as majority heading to/from destination within the A720 area; • HOV unlikely to produce a major benefit on new crossing; • Largest disadvantage for local HGV / Single Occupancy traffic on both sides, require to travel north / south from locality to access crossing, likely to increase both travel time an distance and could incur rat running; • Only one lane for HGVs reduces HGV capacity from existing situation; • Removal of HGV from existing may pro-long design life of bridge.
2.3 (AA) 2.4 (AA)	New Crossing: Bus + HOV / Any Existing Crossing: Bus + HOV / Non-HGV	• Major benefit to public transport as majority heading to / from destination within the A720 area, however unlikely to be large benefit for PT on new bridge; • Major benefit to HOV on both crossings, although HOV lane across new crossing unlikely to cause large benefit; • Largest disadvantage for local HGV / Single Occupancy traffic on both sides, require to travel north/south from locality to access crossing, likely to increase both travel time and distance and could incur rat running, • Only one lane for HGVs reduces HGV capacity from existing situation; • Removal of HGV from existing may pro-long design life of bridge.

Alignment Option: Tunnel D		
Operational Option	**Description of Operations**	**Comments**
2.3 (C) 2.4 (C)	New Crossing: Any / Any Existing Crossing: Bus / HOV	• Largest possible benefit to public transport as full capacity of bridge for PT and HOV and the majority of traffic heading into / from the area within the A720. No advantage to PT on new bridge; • Largest possible benefit for HOV traffic heading into / from Edinburgh City Centre and using existing bridge, no advantage to HOV on new bridge; • Operational arrangement causes disadvantage to local traffic on both sides of the crossing. HGVs / Single Occupancy will have to travel north / south from locality to access the crossing, likely to increase travel time and distance and could incur rat running; • No restriction of usage on new crossing allows free movement of vehicles between lanes; • Removal of HGV from existing may pro-long design life of bridge.

Alignment Option: Tunnel D		
Operational Option	**Description of Operations**	**Comments**
2.3 (E) 2.4 (E)	New Crossing: Bus / Any – Existing Crossing: HOV / Non-HGV	• Advantage to public transport on new crossing not as large as same provision no existing crossing; • Major benefit for HOV traffic heading into the area within the A720 area, no benefit on new bridge for HOV vehicles; • Disadvantage for local HGV / Single Occupancy traffic on both sides, require to travel north / south from locality to access crossing, likely to increase both travel time and distance and could incur rat running; • Only one lane for HGVs reduces HGV capacity from existing situation; • Removal of HGV from existing may pro-long

		design life of bridge.
2.3 (S) 2.4 (S)	New Crossing: Bus + HOV / Any Existing Crossing: Bus + HOV / Any	• Major benefit to public transport as majority heading to / from destination within the A720, however unlikely to be as large a benefit from the lane across the new crossing; • Major benefit to HOV traffic as majority heading to / from Edinburgh City centre, however, unlikely to be major benefit from the lane across the new crossing; • HGV / Any vehicles provision same as current provision; • Single Occupancy – greatest benefit, choice of crossing and best access to from the area within the A720. • Non removal of HGV over existing crossing therefore no saving on design life of bridge
2.3 (Z) 2.4 (Z)	New Crossing: Any / HOV Existing Crossing: Bus / Non-HGV	• Major benefit to public transport as majority heading to/from the area within the A720, also benefit on new bridge but not as large. • HOV unlikely to produce a major benefit on new crossing • Disadvantage for local HGV / Single Occupancy traffic on both sides, require to travel north / south from locality to access crossing, likely to increase both travel time an distance and could incur rat running; • Only one lane for HGVs reduces HGV capacity from existing situation; • Removal of HGV from existing may pro-long design life of bridge.
2.3 (AA) 2.4 (AA)	New Crossing: Bus + HOV / Any – Existing Crossing: Bus + HOV / Non-HGV	• Major benefit to public transport as majority heading to / from destination within the A720 boundary, however unlikely to be large benefit for PT on new bridge; • Major benefit to HOV on both crossings, although HOV lane across new crossing unlikely to cause large benefit; • Disadvantage for local HGV / Single Occupancy traffic on both sides, require to travel north/south from locality to access crossing, likely to increase both travel time and distance and could incur rat running, only one lane for HGVs reduces HGV capacity from existing situation;

		• Removal of HGV from existing may pro-long design life of bridge.

Alignment Option: Tunnel E		
Operational Option	**Description of Operations**	**Comments**
2.3 (C) 2.4 (C)	New Crossing: Any / Any Existing Crossing: Bus / HOV	• Maximum possible benefit to public transport as full capacity of bridge for PT and HOV, as the majority of traffic heading into / from destination within the A720 . No advantage to PT on new bridge; • HOV largest possible benefit for traffic heading into / from Edinburgh City Centre and using existing bridge, no advantage to HOV on new bridge; • Alignment causes disadvantage to local traffic on both sides of the crossing. HGVs / Single Occupancy traffic will have to travel north / south from locality to access the crossing, likely to increase travel time and distance and could incur rat running; No restriction of usage on new crossing allows free movement of vehicles between lanes; • Removal of HGV from existing may pro-long design life of bridge.
2.3 (E) 2.4 (E)	New Crossing: Bus / Any Existing Crossing: HOV / Non-HGV	• Advantage to public transport on new crossing not as large as same provision no existing crossing; • Major benefit for HOV traffic heading into the area within the A720, no benefit on new bridge for HOV vehicles; • Disadvantage for local HGV / Single Occupancy traffic on both sides, require to travel north / south from locality to access crossing, likely to increase both travel time and distance and could incur rat running; • Only one lane for HGVs reduces HGV capacity from existing situation; • Removal of HGV from existing may pro-long design life of bridge.
2.3 (S) 2.4 (S)	New Crossing: Bus + HOV / Any Existing	• Major benefit to public transport as majority heading to / from destination within the A720, however unlikely to be as large a benefit from the lane across the new crossing;

	Crossing: Bus + HOV / Any	• Major benefit to HOV traffic as majority heading to / from the area within the A720, however, unlikely to be major benefit from the lane across the new crossing; • HGV provision remains at current levels; • Single Occupancy – greatest benefit, choice of crossing and best access to from Edinburgh City Centre. • Non removal of HGV over existing crossing therefore no saving on design life of bridge

Alignment Option: Tunnel E		
Operational Option	**Description of Operations**	**Comments**
2.3 (Z) 2.4 (Z)	New Crossing: Any / HOV Existing Crossing: Bus / Non-HGV	• Major benefit to public transport as majority heading to/from area within the A720, also benefit on new bridge but not as large. • HOV unlikely to produce a major benefit on new crossing • Disadvantage for local HGV / Single Occupancy traffic on both sides, require to travel north / south from locality to access crossing, likely to increase both travel time an distance and could incur rat running; • Only one lane for HGVs reduces HGV capacity from existing situation; • Removal of HGV from existing may pro-long design life of bridge.
2.3 (AA) 2.4 (AA)	New Crossing: Bus + HOV / Any – Existing Crossing: Bus + HOV / Non-HGV –	• Major benefit to public transport as majority heading to / from destination within the A720, however unlikely to be large benefit for PT on new bridge; • Major benefit to HOV on both crossings, although HOV lane across new crossing unlikely to cause large benefit; • Disadvantage for local HGV traffic on both sides, require to travel north/south from locality to access crossing, likely to increase both travel time and distance and could incur rat running; • Only one lane for HGVs reduces HGV capacity from existing situation;

		• Single Occupancy - greatest benefit, choice of crossing and best access to from the area within the A720. • Removal of HGV from existing may pro-long design life of bridge.

Alignment Option: Bridge D		
Operational Option	**Description of Operations**	**Comments**
2.3 (C) 2.4 (C)	New Crossing: Any / Any Existing Crossing: Bus / HOV	• Largest possible benefit to public transport as full capacity of bridge for PT and HOV and the majority of traffic heading into / from destination within the A720. Major advantage on southern side of bridge as northern end very similar. No advantage to PT on new bridge; • HOV largest possible benefit for traffic heading into / from Edinburgh City Centre and using existing bridge, no advantage to HOV on new bridge. Due to alignment advantage of using old bridge only on southern side; • Alignment causes disadvantage (smallest of all options) to local traffic on southern side of the crossing. HGVs / Single Occupancy will have to travel south from locality to access the crossing, likely to increase travel time and distance and could incur rat running; No restriction of usage on new crossing allows free movement of vehicles between lanes; and • Removal of HGV from existing may pro-long design life of bridge.

Alignment Option: Bridge D		
Operational Option	**Description of Operations**	**Comments**
2.3 (E) 2.4 (E)	New Crossing: Bus / Any Existing Crossing: HOV / Non-HGV	• Advantage to public transport on new crossing not as large as same provision no existing crossing; • Major benefit for HOV traffic heading into the area within the A720, no benefit on new bridge for HOV vehicles; • Disadvantage for local HGV / Single Occupancy traffic on both sides, require to travel north / south from locality to access crossing, likely to increase both travel time and distance and could incur rat running; • Only one lane for HGVs reduces HGV capacity from existing situation; • Removal of HGV from existing may pro-long design life of bridge.
2.3 (S) 2.4 (S)	New Crossing: Bus + HOV / Any Existing Crossing: Bus + HOV / Any	• Major benefit to public transport as majority heading to / from destination within the A720, however unlikely to be as large a benefit from the lane across the new crossing; • Major benefit for HOV traffic as majority heading to / from area within the A720, unlikely to be major benefit from the lane across the new crossing although greatest of all alignment options;. • HGV provision remains the same as current provision; • Single Occupancy – greatest benefit, choice of crossing and best access to from area within the A720; and • Non removal of HGV over existing crossing therefore no saving on design life of bridge.
2.3 (Z) 2.4 (Z)	New Crossing: Any / HOV – Existing Crossing: Bus / Non-HGV –	• PT – Major benefit as majority heading to/from destination within the A720 area, also benefit on new bridge but not as large. • HOV – unlikely to produce as large a benefit on new crossing although similarity with alignment of existing bridge means the benefit will be highest of all options; • HGV – disadvantage (smallest of alignment

		options) for local HGV traffic on southern side, require to travel south from locality to access crossing, likely to increase both travel time and distance and could incur rat running, only one lane for HGVs reduces HGV capacity from existing situation; • Single occupancy – advantage as can use both bridges equally, no option to change lanes reduces capacity in comparison to option 2.3 (C) 2.4 (C); and • Removal of HGV from existing may pro-long design life of bridge.

Alignment Option: Bridge D		
Operational Option	**Description of Operations**	**Comments**
2.3 (AA) 2.4 (AA)	New Crossing: Bus + HOV / Any – Existing Crossing: Bus + HOV / Non-HGV –	• Major benefit to public transport as majority heading to / from destination within the A720, however unlikely to be large benefit for PT on new bridge, worst operational option for PT although best of all alignment options; • HOV unlikely to produce as large a benefit on new crossing although similarity with alignment of existing bridge means the benefit will be highest of all options; • Disadvantage (smallest of tunnel alignment options) for local HGV traffic on southern side, require to travel south from locality to access crossing, likely to increase both travel time and distance and could incur rat running, only one lane for HGVs reduces HGV capacity from existing situation; • Single Occupancy - greatest benefit, choice of crossing and best access to from the area within the A720. • Removal of HGV from existing may pro-long design life of bridge.