The purpose of this exhibition is to present an update of recent progress on the Stage 2 route options appraisal for the Stromeferry bypass. Information displayed is draft at this stage and will be updated in light of comments received today.

The first set of boards (2 - 5) provides some background information on the scheme, the process and stages of assessment, and outlines the route options that emerged from the Stage 1 work.

The second set of boards (6 - 11) displays the identified key environmental, engineering, traffic and economic constraints, and solutions developed.

The third set of boards (12 - 13) provides a brief summary of the emerging results of the appraisal, scoring the route options against considered criteria.

The next set of boards (14 - 17) shows more details of the identified best route options for each of the three corridors (North Shore, Online and Southern) emerging from preliminary appraisal.

The final set of boards (18 - 21) provides further information and preliminary appraisal results, including indicative costings and potential phasing. Details of the next steps for the project are also provided.

We welcome your feedback on the current route options and invite you to fill in a comments sheet, provided at the end of the exhibition.

Further information is available at: http://www.highland.gov.uk/yourenvironment/roadsandtransport/roads/stromeferry.html
**Background**

The existing Stromeferry Bypass is an approximately 12km long section of public road alongside the southern shore of Loch Carron. Since opening in 1970, a 4.5km section between Ardnarff and Cuddies’ Point has been subject to a number of landslide and rock fall events causing temporary closures, requiring a 130 mile diversion.

During the 1990s, several feasibility studies were undertaken to identify potential solutions, however, no final decision was reached. In response to a more recent rock fall event which closed the road for several months, a further options appraisal was commissioned. The initial stage of this appraisal included public and statutory consultation and input from technical experts to identify a number of options for further study.

A Stage 2 route options appraisal of the nine route options, emerging from the Stage 1 appraisal in May 2013, is currently underway in order to identify one preferred option.

**Need for Scheme**

- Landslides and rock falls causing hazards to road users and road closures
- Existing sub-standard road geometry
- Transport reliability and dependability
- Economic impact
Scheme Objectives

- Safeguard and enhance access to the natural and built environment during construction, maintenance and operation of the scheme
- Minimise all risks during design, construction, operation and maintenance
- Ensure deliverability of scheme and ‘Value for Money’
- Deliver a safe and reliable, two lane carriageway
- Ensure no increase in risk to and liability of the railway, maintaining access over the life of the scheme
- Keep the A890 and peripheral road network open during construction
- Maintain and improve social cohesion for the local population, making use of leisure, health and educational facilities and by improving accessibility for emergency services
- Maintain and improve choice of transport mode and integration of public transport links
- Take account of relevant local, regional and national planning policies during the design stage
- Maximise / improve network efficiency, sustainable connectivity and social cohesion in terms of journey times and journey reliability in the Wester Ross area
- Deliver a scheme that assists local businesses to maximise opportunities for sustainable development and economic growth
Consultation
Consultation and active engagement with Stakeholders has featured throughout the project and continues to inform the options assessment. As part of Stage 1 and Stage 2 a number of workshops with Regulatory and Economic Stakeholders and the local community have been undertaken.

Future Works
Further discussions with Key Stakeholders, including the local community, will be held at Stage 3 of the process and will include a public exhibition.

Regulatory Stakeholders
The Highland Council
Transport Scotland
Highlands & Island Enterprise
Network Rail
First Scotrail
Scottish Natural Heritage
Scottish Environment Protection Agency
Historic Scotland
Marine Scotland

Economic Stakeholders
The Highland Council
Highlands & Island Enterprise
Kirkton Woodland and Heritage Group
Lochcarron Community Council
Stromeferry and Achmore Community Council
Plockton Community Council
Applecross Community Council
Lochcarron and District Business Association
Area Highland Councillors
Forestry Commission

Local Community and General Public

Draft Reporting
Final Reporting
Emerging Route Options from Stage 1

- N9 - North Shore Option: Lochcarron Bypass
- N6 - North Shore Alternative: Through Lochcarron
- Online options: O2 - Viaduct, O3 - Tunnel, O4 - Do Minimum, O5 - Shared Road and Rail, O7 - Avalanche Shelter
- Potential Local Improvement: S4 - Southern Option: Gleann Udalain
- S1 & S3 - Southern Alternative Links
Stromeferry Bypass

Key Environmental Constraints

**European designations**
- Special Areas of Conservation
- A number of European Protected Species, including: Otter, Wild Cat, Cetaceans, and Bat species

**National designations**
- National Nature Reserve
- National Scenic Area
- Scheduled Monuments and Listed Buildings, including: Strome Castle and Lochcarron Old Parish Church
- Sites of Special Scientific Interest

**Other designations or key constraints**
- Ancient Woodland Inventory Sites
- Marine Consultation Area
- Search Areas for Wild Land
- Special Landscape Areas
- Views Over Open Water
- Diverse ground conditions and hydrology
**Key Engineering Constraints**

### Alignments
- Topography
- Railway
- Level Crossings
- Existing settlements, properties and frontage activity
- Geometry of existing roads
- Existing structures
- Existing land use and ownership

### Strome Narrows Crossing
- Tidal range and currents
- Topography and make-up of seabed
- Length of structure required
- Navigational clearance requirements

### Structures
- Requirements for major bridge or tunnel at the Narrows
- Retaining existing structures, if possible
- Existing avalanche shelter
- On-line viaduct/shelter/tunnel

### Buildability
- Restricted road corridors
- Ground conditions
- Construction risks
- Unstable rock faces
- Potential requirement for road and rail closures
- Securing suitable scheme funding
Stromeferry Bypass

Preferred North Shore Crossing Options

**Bridge Crossing**

Five potential options for crossing the Strome Narrows, including a barrage, have been considered. The drawing to the right shows two indicative alignments that have emerged from the initial engineering assessment.

The options include a range of lengths and heights of bridge crossings, two of which are shown below. The high level bridge would have the highest structure and longest span of the options, while the low level bridge would have multiple and shorter spans. The engineering assessment has identified the low level bridge as the most feasible option.

**Proposed High Level Bridge**

**Proposed Low Level Bridge**

**Tunnel**

In addition to the identified bridge crossing options, a tunnel crossing under the Narrows has also been considered. The below drawings show a typical tunnel profile and a potential tunnel alignment.

The tunnel is likely to better satisfy environmental criteria but would be more costly and carry greater risks than a bridge crossing.

**Typical Tunnel Profile**

**Preferred Tunnel Alignment Option**
Considered Online Options

A number of different solutions have been considered for the online options to bypass the most problematic online section, between Cuddies Point and Ardnarff.

Potential options include:

- a Railway Viaduct along the edge of the loch, enabling a wider road corridor;
- a Developed Avalanche Shelter, providing an elevated carriageway above the existing railway;
- an Extended Avalanche Shelter;
- Tunnel options; and
- a Shared Road and Rail option.
A high level traffic and economic assessment is underway for each of the identified 9 routes. This has involved a review of historical and collected data, including:

- Journey times
- Accident rates
- Traffic, volumes and mix
- Turning movements
- Roadside interviews
- Origin & Destination assessments
- Public Transport review

A cost benefit appraisal is currently being completed using an assessment of scheme benefits against up to date total scheme costs. A review of the Economic Activity and Location Impacts is also being completed and includes a detailed Business Survey. The assessment has also taken account of traffic that is likely to be generated should the Kishorn development go into full production.

**Typical Traffic Flows**

Two way traffic on A890, showing seasonal variation

**Comparison of average vehicle flows on A890 and northern sections of the A9 and A82**

- A9 summer flow: 1.9x winter flow
- A82 summer flow: 2.0x winter flow
- A890 summer flow: 2.8x winter flow

**Frequency of Business Travel using Local Road Network**

**Responses on Likely Business Impact of A890 Improvements**
The Strome Narrows is considered to have a significant tidal resource and as such Renewable Energy was investigated as a means to offset some of the construction costs. The following three tidal technologies have been considered in some detail as part of the Stage 2 study:

- **Tidal Barrage**, a dam across the Narrows, catching the tides and there after working like a hydro scheme.
- **Tidal Stream Device**, stand alone turbines fixed to the sea bed.
- **Tidal Bridge**, an array of smaller turbines across the Narrows, fixed to a bridge structure.

In conclusion, a tidal bridge is the preferred option. However as the technology is not well developed it is suggested further work on renewable energy as a mechanism for off-setting construction cost is deferred and revisited closer to the construction start date when technologies, revenue generation, incentives and funding models will be more mature.

### Summary of Potential Output and Costs

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Tidal Barrage</th>
<th>Tidal Stream Devices</th>
<th>Tidal Bridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Cost (£m)</td>
<td>113</td>
<td>13.8</td>
<td>29.9</td>
</tr>
<tr>
<td>Yearly Generation (MWh)</td>
<td>35,474</td>
<td>245</td>
<td>6,100</td>
</tr>
<tr>
<td>Net Annual Revenue (£k)</td>
<td>3,908: yr 1-50</td>
<td>65</td>
<td>1,628</td>
</tr>
<tr>
<td></td>
<td>822: yr 50-120</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating and Management Cost (£k/per annum)</td>
<td>987</td>
<td>30</td>
<td>15</td>
</tr>
<tr>
<td>Payback Period (Years)</td>
<td>30</td>
<td>20</td>
<td>19</td>
</tr>
<tr>
<td>Operating Life (Years)</td>
<td>120</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Breakeven Price (£MWh)</td>
<td>56</td>
<td>2,490</td>
<td>247</td>
</tr>
</tbody>
</table>

### Evaluation of Technologies

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Tidal Barrage</th>
<th>Tidal Stream Devices</th>
<th>Tidal Bridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Risk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction Risk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology Maturity Risk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planning Risk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generation Output Cost</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Considered feasible**
- **Considered unfeasible**
Stromeferry Bypass

Selected Route Options from Stage 1

- N9 - North Shore Option: Lochcarron Bypass
- N6 - North Shore Alternative: Through Lochcarron
- O2 - Railway Viaduct
- O3 - Tunnel
- O4 - Do Minimum
- O5 - Shared Road and Rail
- O7 - Avalanche Shelter
- S4 - Southern Option: Gleann Udalain
- S1 & S3 - Southern Alternative Links

Approximate Scale

0 1km 2km 3km

Loch Carron
Stromemore
Stromeferry
Achmore
Attadale
S3 Link
S1 Link
S4
Ardaneaskan
N9
N6
A890
A896
Strathcarron
Lochcarron
<table>
<thead>
<tr>
<th>Scheme Objectives</th>
<th>Environment</th>
<th>Safety</th>
<th>Economy</th>
<th>Integration</th>
<th>Accessibility/ Social Inclusion</th>
<th>Cost to Government</th>
<th>Risk and Uncertainty</th>
<th>Best Route Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good linkage, but online through Lochcarron</td>
<td>Deliver on scheme objectives</td>
<td>Some buildability and environmental issues, limited road closures</td>
<td>Some buildability issues, road/ rail closures required</td>
<td>Does not satisfy objectives</td>
<td>Issues with safety and not delivering required road standard</td>
<td>Significant buildability issues for road and railway, closures inevitable</td>
<td>Environmental intrusion and lengthened journey, but safe and deliverable</td>
<td>Significant Benefit</td>
</tr>
<tr>
<td>Potential marine, ecology, landscape and visual, cultural heritage, air quality and noise impacts</td>
<td>Potential marine environment, ecology and landscape and visual impacts</td>
<td>Considerable waste material, but reduced hydrology, ecology and landscape and visual impacts</td>
<td>No change</td>
<td>Reduced impacts on landscape and visual</td>
<td>Potential Landscape and visual impacts</td>
<td>Potential landscape, ecology, peat and hydrology impacts</td>
<td>Potential Marine, Ecology, Landscape and Visual Impacts</td>
<td>Minor Benefit</td>
</tr>
<tr>
<td>Increased traffic flow through Lochcarron village and conflicts due to frontage activity</td>
<td>Safe and secure route</td>
<td>Railway realigned on viaduct and road on existing embankment, protected by rock trap measures</td>
<td>Existing route made safe but tunnels not as safe as other structures</td>
<td>Potential for further rockfalls</td>
<td>Road/ rail conflicts</td>
<td>Existing route made safe</td>
<td>Safe route but more remote</td>
<td>Negligible Effect on key characteristics, features or elements</td>
</tr>
<tr>
<td>Benefit to cost ratio: 0.73</td>
<td>Benefit to cost ratio: 0.71</td>
<td>Benefit to cost ratio: 0.63</td>
<td>Benefit to cost ratio: 0.43</td>
<td>Benefit to cost ratio: n/a</td>
<td>Benefit to cost ratio: 1.1</td>
<td>Benefit to cost ratio: 0.66</td>
<td>Benefit to cost ratio: 0.76</td>
<td>Minor Adverse</td>
</tr>
<tr>
<td>Opens up north/ south corridor and enhanced linkage to Kishorn</td>
<td>Opens up north/ south corridor and enhanced linkage to Kishorn</td>
<td>Safeguards existing connections</td>
<td>Safeguards existing connections, but potential for delays associated with road closures</td>
<td>Requires traffic control which results in potential delays</td>
<td>Safeguards existing connections</td>
<td>Longer route, but of high quality</td>
<td>Route lengthened for strategic and local traffic</td>
<td>Minor Benefit</td>
</tr>
<tr>
<td>Traffic through Lochcarron, but disbenefits Strathcarron area</td>
<td>Benefits Lochcarron, but disbenefits Strathcarron area</td>
<td>Improved existing route</td>
<td>Improved existing route</td>
<td>Reluctance to use route due to threat of road closures</td>
<td>Improved existing route</td>
<td>Improved existing route</td>
<td>Route lengthened for strategic and local traffic</td>
<td>Negligible Effect on key characteristics, features or elements</td>
</tr>
<tr>
<td>£97 Million</td>
<td>£100 Million</td>
<td>£115 Million</td>
<td>£171 Million</td>
<td>£43 Million</td>
<td>£61 Million</td>
<td>£110 Million</td>
<td>£88 Million</td>
<td>Significant Adverse</td>
</tr>
<tr>
<td>Ground conditions for bridge and marine environment</td>
<td>Ground conditions for bridge and marine environment and Lochcarron bypass</td>
<td>Ground conditions for structure, marine environment and working from barges</td>
<td>Rock quality for tunnel portals, buildability: portals adits, compound, spoil</td>
<td>Potential further rockfall events can be managed</td>
<td>Road/ rail conflicts, not acceptable to Network Rail</td>
<td>Significant buildability issues and potential closures</td>
<td>Peat identified but otherwise little engineering/ construction risk</td>
<td>Minor Adverse</td>
</tr>
<tr>
<td>Best north shore route option</td>
<td>Best online route option</td>
<td>Best south route option</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Significant Adverse</td>
</tr>
</tbody>
</table>
Stromeferry Bypass

Best North Shore Option

Lochcarron Bypass

Single Delivery estimated full scheme cost: £100M
Stromeferry Bypass

Best Online Option

Railway Viaduct

Proposed Railway Viaduct

Existing A road
Existing minor road
Proposed earthwork embankment
Proposed earthwork cutting

Stromeferry
Loch Carron
Strome Wood
Cuddies Point
Maman Hill
Loch Carron Bridge
A896
A890
A896
A890
Strathcarron

New junction to Stromeferry to be retained
New retaining wall and bermed rock cut
Road realigned away from rock face and rock trap provided
Railway realigned onto new viaduct along loch-side
New alignment at Maman Hill providing shallower gradients
New bridge carrying A890 over railway and river
New bypass of Achintee
New river Carron bridge
New junction providing local access

Single Delivery estimated full scheme cost: £115M
Stromeferry Bypass

Best Southern Option

Gleann Udalain

Board No. 16

Single Delivery estimated full scheme cost: £88M

- New junction formed with existing A890
- New bridge carrying A980 over railway and river
- New junction providing local access
- New alignment at Maman Hill providing shallower gradients
- New River Carron bridge
- New bypass of Achintee

- Existing road corridor maintained for railway access only
- Public access ends
- Existing road maintained for railway access only
- New junction to provide local access
- Public access ends
- New bridge carrying A890 over railway and river
- Public access ends

- Existing A road
- Existing minor road
- Proposed earthwork embankment
- Proposed earthwork cutting
The ‘Do-minimum’ Option provides the baseline on which all other route proposals are measured. This retains the existing A890, without any improvements, and as such would involve the following considerations:

- Rock slope management and maintenance to help prevent future uncontrolled rockslope failures;
- Slipway and marshalling improvements for ferry operations during road closures, as and when required;
- Shared use of railway corridor, if lengthy road closures required;
- Contingency planning to coordinate works in the event of a rock fall which closes the road; and
- Reactive repairs to reopen the road in the event of a rock fall.

**Slipway Improvements**

**Temporary Shared Use of Railway**

---

**Rock Slope Management**
# Stromeferry Bypass

## Best Options Against Scheme Objectives

**Scheme Objectives**

<table>
<thead>
<tr>
<th>Safeguard and enhance access to the natural and built environment during construction, maintenance and operation of the scheme</th>
<th>North Shore (N9 Lochcarron Bypass)</th>
<th>Online (O2 Railway Viaduct)</th>
<th>Southern (S4 Gleann Udalain)</th>
<th>Baseline (O4 Do-minimum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimise all risks during design, construction, operation and maintenance</td>
<td></td>
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<tr>
<td>Ensure deliverability of scheme and ‘Value for Money’</td>
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<tr>
<td>Deliver a safe and reliable, two lane carriageway</td>
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<td>Ensure no increase in risk to and liability of the railway, maintaining access over the life of the scheme</td>
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<tr>
<td>Keep the A890 and peripheral road network open during construction</td>
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<tr>
<td>Maintain and improve social cohesion for the local population, making use of leisure, health and educational facilities and by improving accessibility for emergency services</td>
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<td>Take account of relevant local, regional and national planning policies during the design stage</td>
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</tr>
<tr>
<td>Maximise / improve network efficiency, sustainable connectivity and social cohesion in terms of journey times and journey reliability in the Wester Ross area</td>
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</tr>
<tr>
<td>Deliver a scheme that assists local businesses to maximise opportunities for sustainable development and economic growth</td>
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</tbody>
</table>

### Evaluation

- **Successfully meets objective**
- **Partially meets objective**
- **Does not meet objective**
The best options have been abstracted from Board No. 13 and are summarised here by means of a simple ‘traffic light’ system.

- The best north shore option is a Lochcarron bypass, crossing Strome Narrows on a low level bridge.
- The best online option is bypassing the rockfall area by means of transferring the railway to a viaduct.
- The best southern option is via Gleann Udalain.

The following provides a brief commentary of the initial findings of the options appraisal:

- North Shore option performs better than Online option;
- Southern option performs better than Online option;
- Online option is not likely to be taken forward;
- North Shore option has slightly more benefits than Southern option;
- Southern option has less adverse impacts than North Shore option; and
- The Southern option and North Shore option are evenly matched however overall the northern option performs marginally better.

We are keen to get your feedback and we invite you to fill in a comments sheet.
Stromeferry Bypass

Phasing and Costs

- A section of the A890, east of Strathcarron Junction, is currently in the Highland Council’s programme of works and funding for the development of the Stromeferry Bypass Project is within the 10-year Strategy.
- The aim of this project is to deliver a full scheme between Strathcarron junction and the A890 south of Achmore.
- Phasing of the scheme has been considered to help meet required affordability criteria for delivery.
- The First phase would involve scheme development to bypass the rockfall area as a minimum.

**Conclusion – considering cost only**

For Phased Delivery, costs for the Online and Southern options are similar (£64M - £65M). The Southern option gives better value for money in cost and benefits.

For Single Delivery or Total Phased Delivery the Southern option, at £94M, gives better value for money in cost and benefits. The North Shore option does not match value for money, but performs better than the Online option.

**Indicative Construction Cost Summary**

<table>
<thead>
<tr>
<th>Delivery</th>
<th>Single Delivery</th>
<th>Phased Delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>North Shore</td>
<td>Online</td>
</tr>
<tr>
<td>Single Delivery (2017)</td>
<td>100</td>
<td>115</td>
</tr>
<tr>
<td>Phase 1 (2017)</td>
<td>97</td>
<td>65</td>
</tr>
<tr>
<td>Phase 2 (2022)</td>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td>Phase 3 (2027)</td>
<td>n/a</td>
<td>41</td>
</tr>
<tr>
<td>Phase 4 (2032)</td>
<td>n/a</td>
<td>41</td>
</tr>
<tr>
<td><strong>Total Scheme Cost</strong></td>
<td>100</td>
<td>115</td>
</tr>
</tbody>
</table>

All above costs are indicative and all values are in £Millions.
What Happens Next?

**Your Comments**
If you have any particular questions please come and talk to the exhibition staff before you leave.

Feel free to take a copy of the exhibition leaflet which provides a summary of the scheme to date. We welcome your feedback and invite you to complete a comment sheet which can be left in the box provided or returned by post. If returning by post please do so no later than 11 April 2014.

**Next Steps**
The Highland Council will consider all the views expressed during this exhibition as they finalise the route option selection.

Further design and environmental work will continue to be undertaken, incorporating your comments, and will feed into the Stage 2 report, leading to the selection of a preferred option. It is anticipated that the Stage 2 report will be delivered in May/June 2014, with The Highland Council selecting their preferred route in August 2014.

**Future Work**

- Successful Funding Application
- Stage 3 design development and detailed assessment of preferred option
- Stakeholder Workshops
- Public Exhibition
- Environmental Statement December 2015
- Road Orders
- Statutory Procedures 2015 - 2016
- Public Inquiry (if necessary)
- Detailed design and preparation of construction information 2016 - 2017
- Construction of preferred option Earliest: Summer 2017 - 2019