Hand-Arm Vibration Syndrome (HAVS) deep dive
2016/17

Safety, Technical and Engineering

Health & Safety
Finance

Engineering
Business Management

Environment & Sustainable Development
Risk, Analysis & Assurance
Introduction and background
Background and Context

- Hand-Arm Vibration Syndrome (HAVS) is a condition caused by repeated, regular exposure to vibration from hand-held tools.
- Using these tools can cause significant ill health if not monitored correctly. Medical complications can include painful and disabling disorders with nerves, blood vessels, muscles and joints of the hand, wrist and arm.
- The effects can be permanent and make everyday life and work difficult.
- HAVS is preventable, but once damage is done it is a permanent condition.
- Health surveillance is vital to detect and respond to early signs and symptoms of HAVS.
Background and Context

- 7.(5) of The Control of Vibration at Work Regulations 2005 states that where an individual is diagnosed with HAVS, that the employer is to ensure that they are informed of findings from the diagnosis, review the workplace risk assessment and control measures.

- As such, Network Rail’s standard on health surveillance (NR/L2/OHS/00113) states that a level 1 investigation is required to be carried out for every new and worsening diagnosis of HAVS.

- Line managers are also required to complete a health management action plan (HMAP) to assist them in managing the individual’s health in the workplace.
Purpose of Deep Dive

- Network Rail agreed an ambitious 10 year strategy for employee health and wellbeing in September 2013
- By 2024, we aim to achieve the following in employee health and wellbeing:
  - There will be no incidences of newly diagnosed or worsening occupational health conditions due to Network Rail working practises
- The completion of this deep dive is anticipated to support identifying common root causes into HAVS diagnoses for 2016/17, to review the delivery of part of the above strategy and where possible, further reduce the risk of exposure to vibration, for Network Rail employees and those working on our infrastructure.
Methodology
Data gathering approach

- All completed Level 1 investigations for 2016/17 were requested from the Routes. Those submitted were reviewed and information collated from them.
- However, the data from these were of a poor quality and root causes for diagnoses were not included in the investigation reports.
- Data on completed investigations is included in the next few slides.
- Management information was also collated from OH Assist, Network Rail’s approved occupational health provider and Torrent Trackside, Network Rail’s tool maintainer.
- The data within refers to all diagnosed HAVS cases for 2016/17.
Investigation findings
Investigations completed

Investigations Completed by Route

Level 1 investigations are required for all new and worsening diagnoses of HAVS. Those individuals with stable and pre-NR diagnoses, have been identified as “not requiring” an investigation.
Investigations completed – National

- Yes: 22%
- No: 50%
- Not required: 28%
Investigations completed
Investigation findings

- Whilst the quality of the completed level 1 investigations was of a poor quality, some investigations cited that the root cause of diagnosis was “Inadequate controls to mitigate and prevent exposure to vibration”, and no further information was provided.

- Further to this, the activity that led to ill health often linked the use of vibrating tools to the diagnosis, without looking at the ten incident factors within investigations. For example, names of tools that individuals used were listed, however length of use, whether exposure action values (EAV) or exposure limit values (ELV) were breached on a regular basis, control measures and other factors were not explored within the investigation.

- Links between tools not presented for maintenance and number of diagnoses in Delivery Units were explored, but none were found.
HAVS diagnosis by Type and Route

Total number of HAVS Cases by Route

<table>
<thead>
<tr>
<th>Route</th>
<th>Number of HAVS cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anglia</td>
<td>5</td>
</tr>
<tr>
<td>LNE&amp;EM</td>
<td>50</td>
</tr>
<tr>
<td>LNW</td>
<td>20</td>
</tr>
<tr>
<td>Scotland</td>
<td>10</td>
</tr>
<tr>
<td>SouthEast</td>
<td>5</td>
</tr>
<tr>
<td>Wales</td>
<td>5</td>
</tr>
<tr>
<td>Western</td>
<td>5</td>
</tr>
</tbody>
</table>

HAVS Diagnosis by Condition

<table>
<thead>
<tr>
<th>Condition</th>
<th>Number of HAVS cases</th>
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</thead>
<tbody>
<tr>
<td>New</td>
<td>80</td>
</tr>
<tr>
<td>Pre-NR</td>
<td>10</td>
</tr>
<tr>
<td>Stable</td>
<td>40</td>
</tr>
<tr>
<td>Worsening</td>
<td>10</td>
</tr>
</tbody>
</table>
HAVS diagnosis by Type and Route

Anglia Route

LNE&EM Route

LNW Route

Scotland Route

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HAVS diagnosis by Type and Route

South East Route

<table>
<thead>
<tr>
<th>Condition</th>
<th>Number of HAVS cases</th>
</tr>
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<tbody>
<tr>
<td>New</td>
<td>3</td>
</tr>
<tr>
<td>Pre-NR</td>
<td>1</td>
</tr>
<tr>
<td>Stable</td>
<td>2</td>
</tr>
<tr>
<td>Worsening</td>
<td>0</td>
</tr>
</tbody>
</table>

Wales Route

<table>
<thead>
<tr>
<th>Condition</th>
<th>Number of HAVS cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>New</td>
<td>6</td>
</tr>
<tr>
<td>Pre-NR</td>
<td>3</td>
</tr>
<tr>
<td>Stable</td>
<td>2</td>
</tr>
<tr>
<td>Worsening</td>
<td>0</td>
</tr>
</tbody>
</table>

Western Route

<table>
<thead>
<tr>
<th>Condition</th>
<th>Number of HAVS cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>New</td>
<td>5</td>
</tr>
<tr>
<td>Pre-NR</td>
<td>2</td>
</tr>
<tr>
<td>Stable</td>
<td>3</td>
</tr>
<tr>
<td>Worsening</td>
<td>0</td>
</tr>
</tbody>
</table>

Please note that there were no diagnoses in Wessex Route for 2016/17.
Staging by classification

Staging by classification - National

<table>
<thead>
<tr>
<th>Stage</th>
<th>New</th>
<th>Pre-NR</th>
<th>Stable</th>
<th>Worsening</th>
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<tbody>
<tr>
<td>Stage 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage 2 early</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage 2 late</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Stage 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Staging by classification by Route

- Network Operations
- Anglia
- LNE&EM
- LNW
- Scotland
- South East
- Wales
- Western

- Stage 1
- Stage 2 early
- Stage 2 late
- Stage 3
- Stage 4
Fitness Outcomes per classification - National

- **Fit to work**: 57 (Stage 1)
- **Fit with restrictions**: 17 (Stage 1), 2 (Stage 2 early), 1 (Stage 2 late), 0 (Stage 3)
- **Unfit permanently**: 11 (Stage 2 early), 3 (Stage 2 late), 3 (Stage 3)
- **Unfit temporarily**: 12 (Stage 1), 13 (Stage 1), 2 (Stage 2 early), 4 (Stage 2 late)
Fitness Outcomes

Fitness Outcomes per classification by Route

* Excludes Wessex Route

<table>
<thead>
<tr>
<th>Route</th>
<th>Fit to work</th>
<th>Fit with restrictions</th>
<th>Unfit permanently</th>
<th>Unfit temporarily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anglia</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>LNE&amp;EM</td>
<td>30</td>
<td>5</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>LNW</td>
<td>17</td>
<td>1</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>Scotland</td>
<td>8</td>
<td>2</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>South East</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>1</td>
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<tr>
<td>Wales</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>1</td>
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<tr>
<td>Western</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Number of Classifications

Safety, Technical and Engineering

Health & Safety  Engineering
Finance  Business Management

Environment & Sustainable Development  Risk, Analysis & Assurance

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Compliance Rates

Tier 3 Compliance Rates by Route

- Anglia: 60%
- LNE&EM: 68%
- LNW: 65%
- Scotland: 85%
- South East: 34%
- Wales: 34%
- Western: 73%

Routes

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Health & Safety Engineering Environment & Sustainable Development
Finance Business Management Risk, Analysis & Assurance

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20-Dec-17 / 20
HAVS Diagnosis by Work Area

Total Number of Cases

- Distribution & Plant
- Infrastructure Maintenance Engineer
- Leading Trackman
- Lubrication
- Mobile Flash Butt Welding
- Off Track
- Off Track Inspection
- Off Track Maintenance
- On Track Plant Specialist
- Overhead Line Equipment
- Principal Signalling Support Technician
- Rail Testing & Lubrication
- Signalling
- Signalling Maintenance
- Track
- Track Inspection
- Track Maintenance
- Track Quality Supervisor
- Trackman
- Welding
- Welding & Grinding
- Works Delivery Off Track
- Works Delivery Overhead Line Equipment
- Works Delivery Signalling
- Works Delivery Track
- Not Known
HAVS Diagnosis by Job Title

Total Number of Cases

- Artisan (B&C)
- Infrastructure Maintenance Engineer
- Leading Trackman
- Not Known
- On Track Plant Specialist
- Operative
- Principal Signalling Support Technician
- Section Manager
- Section Supervisor
- Team Leader
- Technician
- Track Quality Supervisor
- Trackman
- Working Supervisor

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HAVS Diagnosis by Age Range

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Number of Employees</th>
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<tr>
<td>20-29</td>
<td>2</td>
</tr>
<tr>
<td>30-39</td>
<td>14</td>
</tr>
<tr>
<td>40-49</td>
<td>36</td>
</tr>
<tr>
<td>50-59</td>
<td>62</td>
</tr>
<tr>
<td>60-64</td>
<td>18</td>
</tr>
<tr>
<td>65+</td>
<td>3</td>
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<table>
<thead>
<tr>
<th>Age Range</th>
<th>Percentage of Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-29</td>
<td>1%</td>
</tr>
<tr>
<td>30-39</td>
<td>10%</td>
</tr>
<tr>
<td>40-49</td>
<td>27%</td>
</tr>
<tr>
<td>50-59</td>
<td>46%</td>
</tr>
<tr>
<td>60-64</td>
<td>13%</td>
</tr>
<tr>
<td>65+</td>
<td>2%</td>
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Length of service

Length of Service

Number of Years in Service

<table>
<thead>
<tr>
<th>Number of Years in Service</th>
<th>Number of Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>6</td>
</tr>
<tr>
<td>11-20</td>
<td>8</td>
</tr>
<tr>
<td>21-30</td>
<td>1</td>
</tr>
<tr>
<td>31-40</td>
<td>7</td>
</tr>
<tr>
<td>40+</td>
<td>1</td>
</tr>
<tr>
<td>Unknown</td>
<td>6</td>
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</table>
Organisation findings

- LNE&EM and LNW Route presented the highest number of new HAVS diagnoses for the year, at 32 and 20 respectively. This is the majority of the 75 reported cases for the year.
- Most new HAVS cases were classified as stage 1 or stage 2 early (65 of total cases).
- Four worsening cases were classed as stage 3, indicating that there was further harm to health to individuals who were previously diagnosed. These individuals would have more than likely been advised to stop using vibrating tools, which would have meant a potential redeployment into another role. This could have been prevented if HMAPs had been utilised at initial diagnosis.
- At 85%, Scotland presented the highest compliance for the Tier 3 face-to-face assessments for the year, with 8 new and 2 worsening diagnoses.
- Those involved in track maintenance activities presented the higher number of diagnoses, with 31 diagnosed cases.
- Almost three quarters of all diagnosed cases were in the 40 to 59 age bracket, which can align to years of vibration exposure prior to diagnosis.
Delivery unit Findings
Total number of HAVS Cases

Anglia Route

Ipswich  | Romford  | Tottenham

Delivery Units

Number of HAVS cases

LNE&EM Route

Bedford  | Bletchley  | Derby  | Doncaster  | Hitchin  | Newcastle Delivery Units  | Leeds  | Sheffield  | York

Number of HAVS cases

Safety, Technical and Engineering

Health & Safety  Engineering  Environment & Sustainable Development

Finance  Business Management  Risk, Analysis & Assurance
Total number of HAVS Cases

LNW Route

Scotland Route

<table>
<thead>
<tr>
<th>Delivery Units</th>
<th>Number of HAVS cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birmingham</td>
<td>16</td>
</tr>
<tr>
<td>Bletchley</td>
<td>3</td>
</tr>
<tr>
<td>Lancs &amp; Cumbria</td>
<td>2</td>
</tr>
<tr>
<td>Liverpool</td>
<td>1</td>
</tr>
<tr>
<td>Stafford</td>
<td>1</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Delivery Units</th>
<th>Number of HAVS cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edinburgh</td>
<td>8</td>
</tr>
<tr>
<td>Glasgow</td>
<td>2</td>
</tr>
<tr>
<td>Motherwell</td>
<td>9</td>
</tr>
</tbody>
</table>
Total number of HAVS Cases

South East Route

<table>
<thead>
<tr>
<th>Delivery Units</th>
<th>Number of HAVS cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ashford</td>
<td>2</td>
</tr>
<tr>
<td>Croydon</td>
<td>1</td>
</tr>
<tr>
<td>Orpington</td>
<td>0</td>
</tr>
</tbody>
</table>

Wales Route

<table>
<thead>
<tr>
<th>Delivery Units</th>
<th>Number of HAVS cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiff</td>
<td>9</td>
</tr>
<tr>
<td>Shrewsbury</td>
<td>1</td>
</tr>
</tbody>
</table>
Total number of HAVS Cases

Please note that there were no diagnoses in Wessex Route for 2016/17.
Delivery unit findings

- In each Route, a delivery unit (DU) was able to be identified that had the highest number of diagnosed HAVS cases
- These were:
  - Anglia – Romford
  - LNE&EM – Derby
  - LNW – Birmingham
  - Scotland – Motherwell
  - South East – Ashford
  - Wales – Cardiff
  - Western – Bristol
- However, it should be noted that if 100% compliance rates had been achieved, that the above would be a fairer reflection of which DUs had the highest number of diagnosed cases.
Tool Maintenance Findings
PPM non-presentation of equipment

Anglia Route

LNE&EM Route

Ipswich  Romford  Tottenham

Bedford  Derby  Doncaster  Hitchin  Leeds  Newcastle  Sheffield  York  LNE WD  LNE&EM
PPM non-presentation of equipment

LNW Route

Scotland Route

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PPM non-presentation of equipment

South East Route

<table>
<thead>
<tr>
<th>Location</th>
<th>Number of not presented</th>
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</thead>
<tbody>
<tr>
<td>Ashford</td>
<td>30</td>
</tr>
<tr>
<td>London Bridge</td>
<td>10</td>
</tr>
<tr>
<td>Orpington</td>
<td>5</td>
</tr>
<tr>
<td>Brighton</td>
<td>20</td>
</tr>
<tr>
<td>Croydon</td>
<td>40</td>
</tr>
<tr>
<td>South East Capex</td>
<td>35</td>
</tr>
</tbody>
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Wales Route

<table>
<thead>
<tr>
<th>Location</th>
<th>Number of not presented</th>
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<tr>
<td>Cardiff</td>
<td>4.5</td>
</tr>
<tr>
<td>Shrewsbury</td>
<td>4</td>
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Delivery Units
PPM non-presentation of equipment

Wessex Route

- Clapham
- Eastleigh
- Woking
- Wessex Capex

Delivery Units

Number of not presented

Western Route

- Bristol
- Reading
- Swindon
- Plymouth

Delivery Units

Number of not presented
PPM expired by Route

**Graph:**

- **Y-axis:** Number of Expired Records
- **X-axis:** Routes

- **Routes:** Anglia, LNE&EM, LNW, National..., Scotland, South East, Training, Wales, Wessex, Western

- **Comparison:**
  - South East has the highest number of expired records.
  - Other routes have fewer expired records, with Wales and Western having the least.

**Legend:**

- PPM Expired by Route

**Conclusion:**

The graph shows a significant disparity in the number of expired records across different routes, with South East leading in expired records.
Tool repairs

Tool Repairs - National

- Robel 62.05 2 Stroke Tamper
- Permaquip Link Rail Trolley
- Maxim Master 35 Impact Wrench
- Cembre NR11-P Impact Wrench
- Partner K1260 14in Rail Saw
- Geismar MP12 Rail Grinder
- 8T Kenhi 805BR Toe Jack
- Permaquip 28957 Ironman
- Permaquip 1/2 Set Stressing Kit
- Cembre SD9P2 Sleeper Drill
- Geismar VPS Vertical Tamper
- Permaquip Type B Rail Trolley

Number of Repairs

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Tool repairs – top 10 per Route

**Tool Repairs - Anglia Route**
- 8T Kenhi 805BR...
- Cembre NR11-P...
- Robel 62.05 2...
- Cembre Rail Drill...
- Permaquip 28957...
- Maxim Master 35...
- Partner K1250...
- Permaquip 1/2 Set...
- Cembre SD9P2...
- Pull Lift 1.5 Tonne...

**Tool Repairs - LNE&EM Route**
- Geismar VPS...
- Maxim Master 35...
- Robel 62.05 2...
- Permaquip Link...
- Cembre SD9P2...
- Partner K1260...
- Permaquip 28957...
- Robel 62.05 2...
- Permaquip 1/2...
- Cembre Rail Drill...

**Tool Repairs - LNW Route**
- Robel 62.05 2...
- Robel 62.06 4...
- Maxim Master 35...
- Maxim Master 35...
- 8T Kenhi 805BR...
- Permaquip Link...
- Partner K1250...
- Cembre NR11-P...
- Geismar MP12...
- Cembre Rail Drill...

**Tool Repairs - Scotland Route**
- Robel 62.05 2...
- Maxim Master 35...
- Geismar MP12...
- Permaquip Link...
- Partner K1260...
- Permaquip Type...
- Cembre NR11-P...
- Cembre SD9P2...
- Permaquip Dual...
- 10T Zwicky Pan...
Tool repairs – top 10 per Route

**Tool Repairs - South East Route**

- Permaquip Link...
- Partner K1260...
- Robel 62.05 2...
- Maxim Master 35...
- Cembre SD9P2...
- 10T Zwicky Pan...
- Geismar VPS...
- Brush Cutter...
- Geismar MP12...
- Cembre LD4-1P...

**Tool Repairs - Wales Route**

- Permaquip Type...
- 15T Simplex...
- Maxim Master 35...
- Partner K1250...
- Geismar MP12...
- Permaquip Link...
- Permaquip Dual...
- Profile Grinder...
- Timberwolf...
- Wacker BH55...

**Tool Repairs - Wessex Route**

- Permaquip Link...
- Permaquip 28957...
- Geismar MP12...
- Partner K1250...
- Robel 62.05 2...
- Maxim Master 35...
- Cembre NR11-P...
- Pull Lift 1.5...
- Permaquip Dual...
- Permaquip Type...

**Tool Repairs - Western Route**

- Robel 62.05 2...
- Permaquip Link...
- Permaquip 1/2...
- Geismar MP12...
- Partner K1260...
- 8T Kenhi 805BR...
- Maxim Master 35...
- Cembre NR11-P...
- Permaquip Dual...
- Cembre SD9P2...
Tools PPM – National

Tools PPM & Statutory Tests - National

In-Service Percentage

PPM & Statutory Test (units)  Average

Periods

P1  P2  P3  P4  P5  P6  P7  P8  P9  P10  P11  P12  P13

94.00%  95.00%  96.00%  97.00%  98.00%  99.00%  100.00%
Tools PPM - Routes

Tools PPM & Statutory Tests by Route & Period

- In-Service Percentage
- Periods
- P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13

- Anglia
- LNE
- LNW
- Scotland
- SouthEast
- Wales
- Wessex
- Western

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Tool maintenance findings

- LNE&EM, LNW and South East Routes had the highest numbers of planned preventative maintenance (PPM) expired records
- The Robel 62.05 2 stroke tamper was the most presented tool for repair (127 total) and featured in the top 10 tools presented for repairs for all Routes, except Wales
- If the two impact wrenches (Maxim Master and Cembre) repairs were totalled, impact wrenches would have been the most presented tool for repair (141 total)
- The in-service percentage dipped below average in P10, which can be anticipated over the Christmas holiday season
- South East and Wessex Routes had the lowest in-service percentage of tools.
Conclusion
What have we learnt?

Some areas to celebrate…

► LNW Route have good processes in place to support with the completion of level 1 investigations
► Basic management information is able to be collated from OH Assist to support with this deep dive
► Torrent Trackside are able to report on different tool metrics each period to the business and are able to consistently report on this.
What have we learnt?

Some areas to address…

► The quality of investigations into HAVS diagnoses needs to be improved, so that root causes are able to be better identified, so that further harm to health is reduced and the risk of exposure is ultimately eliminated

► TU representatives should to be included in the level 1 investigations. Often representatives were not included when investigations were carried out

► Education and information to employees needs to be improved – employees sometimes had signs and symptoms for years prior to these officially being reported to occupational health or their line managers

► Line manager education needs to be improved – they should be fully informed of the risk, as they are responsible for putting action plans in place when someone is diagnosed. Equally, they need to understand what control measures are required to try and prevent a diagnosis

► Engineering solutions on how the risk can be eliminated need to continue to be explored.
Strategic Approach to HAVS

Level 1 investigations to gather suitable intelligence from reportable HAVS cases

Build culture of support, awareness and education

Provide early intervention and support

Health management action plans to support those diagnosed
### Management Actions - National

<table>
<thead>
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<th>Actions</th>
<th>Owner</th>
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<tbody>
<tr>
<td>Review if and how the ten incident factors can be embedded within the level 1 investigation form. This is included in the appendix of the HAVS health surveillance standard and support identifying root cause of the diagnosis.</td>
<td>OH&amp;W team</td>
</tr>
<tr>
<td>To develop a process for how information is collated within investigations, to support improved analysis (by STE and Routes) for future cases</td>
<td>OH&amp;W team</td>
</tr>
<tr>
<td>To liaise with engineering colleagues on the strategy for designing out and ultimately eliminating exposure to vibration</td>
<td>OH&amp;W team</td>
</tr>
</tbody>
</table>
# Management Actions - Routes

<table>
<thead>
<tr>
<th>Actions</th>
<th>Owners</th>
</tr>
</thead>
<tbody>
<tr>
<td>To ensure line managers are supported when conducting a level 1 investigation and that these are conducted in accordance to the standard (NR/L2/OHS/00113)</td>
<td>Routes</td>
</tr>
<tr>
<td>TU representatives to be invited to level 1 investigations</td>
<td>Routes</td>
</tr>
<tr>
<td>To ensure that all individuals exposed to vibration attend a mandatory briefing once a year and understand the importance of reporting signs and symptoms to their line managers</td>
<td>Routes</td>
</tr>
<tr>
<td>To ensure that all line managers understand their duties under the Control of Vibration at Work Regulations 2005</td>
<td>Routes</td>
</tr>
</tbody>
</table>
Safety, Technical and Engineering

Health & Safety
Finance

Engineering
Business Management

Environment & Sustainable Development
Risk, Analysis & Assurance