

## MINUTES

### Roads Australia Sustainability/Capacity Workshop

3 April 2014

Location: Roads & Maritime Services, Level 9, 101 Miller Street

NORTH SYDNEY

---

### Introduction

John Pitt, Roads Australia's Sustainability Policy Chapter Chair, summarised the challenges for different sectors of the supply chain when it comes to delivering value for money.

Concepts discussed included gold-plating, placing the right amount of capital into the right project, procurement tensions and industry's ability to respond to and find value for money propositions.

John highlighted value for money as a key initiative on the Roads Australia 2014 policy program. This workshop is one of a number of Roads Australia events being held as part of a series with a focus on value for money.

John noted the workshop today has a strong focus on case studies to learn about value for money from real examples and will include a dialogue session.

### Welcome and Summary

*Geoff Fogarty, Director Infrastructure Development Division, Roads & Maritime Services*

Geoff Fogarty, Director Infrastructure Development Division at Roads & Maritime Services (RMS) noted the fantastic turn out to the workshop and described RMS's role as supporting Roads Australia and assisting the discussion about value for money.

Geoff noted that currently there are many opportunities for the public to discuss value for money. Geoff cited the Productivity Commission inquiry as a great way to put forward a raft of ideas to government that provide better value when delivering infrastructure.

Geoff discussed the competing themes of taking a concept through to a detailed stage to reduce waste and effort when taking a design concept forward, and where a strong focus on outcomes specifications can enable industry to find value. Geoff acknowledged there is no one right answer to this complex issue.

Geoff highlighted that more sustainable infrastructure is a key priority for RMS and discussed the work currently being undertaken by RMS to update the 2010 Sustainability Strategy.

The updated strategy will align with new organisational responsibilities and structure, Government Resource Efficiency Policy and Transport for NSW Sustainability Policy Framework.

The strategy will focus on construction, maintenance and corporate activities, and emphasise value for money, balancing whole of life, government priorities, road safety, materiality and the delivery of on-ground outcomes. Sustainability will be completely integrated into RMS operations to provide balanced decision making.

After summarising the extensive network and infrastructure assets currently under management by RMS, Geoff discussed the cost of congestion and the growth in interstate and intrastate freight movements as key strategic considerations for RMS.

Geoff detailed the key features of the \$5.1 billion NSW roads and maritime budget for 2013-2014 to build and maintain critical infrastructure.

Geoff summarised the feedback received at a recent RMS workshop with industry where constructors and road designers were invited to discuss their views on sustainability and the barriers to its implementation.

Geoff shared RMS's response to the feedback provided by industry at the workshop.

Concepts discussed included capturing learnings at project completion stage (and throughout the life cycle), sharing these learnings with industry, considering sustainability initiatives (though must be materially-significant and demonstrate whole of life benefits and value for money), ECI processes, early tender involvement opportunities and innovative technology assessment process update.

As custodians to get best value for money for the network, Geoff looks forward to the opportunity to discuss and develop ideas to achieve value for money with industry further.

### **Value for money: delivering sustainability through project development**

*Michael Crowley, Principal Manager Environmental Policy, Planning and Assessment, Roads & Maritime Services*

Michael surveyed participants in the room and noted the flow through of industry participants discussing sustainability in the context of value for money at industry forums.

Michael discussed how sustainability and value for money interplay. Michael described the various opportunities to deliver value for money at different stages of the strategic program/framework and how that influences opportunities to create value for money throughout the infrastructure life cycle.

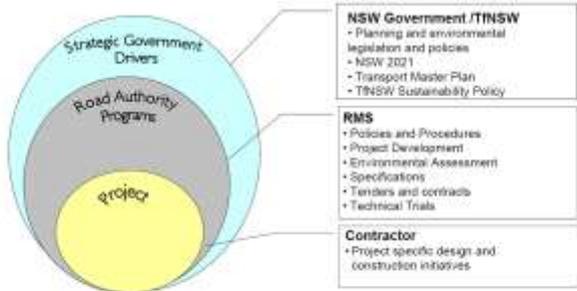
Michael acknowledged elements of sustainability and value for money do conflict, but many are complementary.

Michael suggests sustainability must foster a culture of decision making made daily, where there is least use of resources at least cost.

Where sustainability is perceived as not adding value is where too much is invested in the decision making process and where market failures exist (e.g. cost of externalities). The concept of valuing fauna close to extinction was discussed as a complex element.

Michael described the different levels of influence where legislation, policies, strategic plans, delivery procedures and the specification of products offer the best opportunities for design and innovation to improve value for money outcomes.

**Levels of influence/opportunities**



Michael described the following 4 major policy frameworks as the key drivers of sustainability for RMS. RMS look at what is feasible and reasonable in any given context.

**Strategic Government Drivers**

NSW Government policies that set the environmental and sustainability agenda



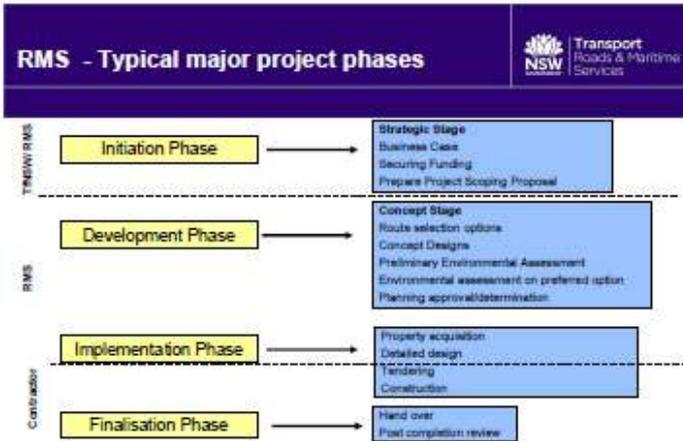
Michael offered examples of value for money at a program level. For example, investigations into new LED lighting technology suggested reduced energy use, reduced maintenance and reduced cost where sustainability outcomes were viable.

Michael highlighted the value for money issues uncovered by LED lighting trials as meeting main road lighting standards, not compromising road safety, reduced maintenance and reduced energy.

Recycled materials were reviewed to evaluate replacement or reduction in the use of certain road base substances to facilitate greater recycling of materials.

Michael reinforced that the roads sector is achieving good levels when recycling its materials.

Michael detailed areas of opportunity to achieve better value for money outcomes during each major project phase, such as early project development and through route selection.



Michael suggests as an industry we need to recognise where a standard approach to achieving value for money is appropriate and where a more detailed approach is required.

Michael reinforced that there are a range of opportunities at different stages of projects to influence good tangible value for money outcomes. Feedback on project development phase, what’s working and what’s not working will help drive continuous improvement.

Questions from participants included how whole of life cost is calculated, discussed opportunities to achieve value for money, alliancing contract delivery style and greenhouse gas assessments (EIS process).

### Pacific Highway – delivering value for money

*Bob Higgins, General Manager, Pacific Highway*

Bob Higgins, General Manager, Pacific Highway summarised 7 case studies from Pacific Highway projects (listed below) and highlighted value for money for transport solutions as creating public value.

#### Case Studies

- 1 – The Sapphire to Woolgoolga Story
- 2 – The St Helena Tunnel Story
- 3 – The Ballina Bypass Story
- 4 – The Macleay River Crossing Story
- 5 – The Nambucca Heads Interchange Story
- 6 – A Changing Design Standards Story
- 7 – A Fauna Crossing Story

© 2014 Roads & Maritime Services

**Case Study No. 1: Sapphire to Woolgoolga**

Bob described the project as an existing two-lane highway, near to capacity with a variety of roads users and tensions as to where the highway should go.

A steering panel was created and included a mix of stakeholders was set up a preferred route. The value assessment process was a key element of evaluating to route selection.

Public value was assessed based on individual silos where different criteria receive a ranking.

**Case Study No. 1: Sapphire to Woolgoolga - Process**

- Steering panel (DoP, RTA & Council \*)
  - \* Council 'pulled out' halfway through
- Preferred route decision based on:
  - technical studies
  - value management study
  - community views (many feedback loops)
- Value for money assessment process:

Value	for	Money																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
<table border="1"> <thead> <tr> <th>Value</th> <th>for</th> <th>Money</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>7</td> <td>8</td> <td>9</td> </tr> <tr> <td>10</td> <td>11</td> <td>12</td> </tr> <tr> <td>13</td> <td>14</td> <td>15</td> </tr> <tr> <td>16</td> <td>17</td> <td>18</td> </tr> <tr> <td>19</td> <td>20</td> <td>21</td> </tr> <tr> <td>22</td> <td>23</td> <td>24</td> </tr> <tr> <td>25</td> <td>26</td> <td>27</td> </tr> <tr> <td>28</td> <td>29</td> <td>30</td> </tr> <tr> <td>31</td> <td>32</td> <td>33</td> </tr> <tr> <td>34</td> <td>35</td> <td>36</td> </tr> <tr> <td>37</td> <td>38</td> <td>39</td> </tr> <tr> <td>40</td> <td>41</td> <td>42</td> </tr> <tr> <td>43</td> <td>44</td> <td>45</td> </tr> <tr> <td>46</td> <td>47</td> <td>48</td> </tr> <tr> <td>49</td> <td>50</td> <td>51</td> </tr> <tr> <td>52</td> <td>53</td> <td>54</td> </tr> <tr> <td>55</td> <td>56</td> <td>57</td> </tr> <tr> <td>58</td> <td>59</td> <td>60</td> </tr> <tr> <td>61</td> <td>62</td> <td>63</td> </tr> <tr> <td>64</td> <td>65</td> <td>66</td> </tr> <tr> <td>67</td> <td>68</td> <td>69</td> </tr> <tr> <td>70</td> <td>71</td> <td>72</td> </tr> <tr> <td>73</td> <td>74</td> <td>75</td> </tr> <tr> <td>76</td> <td>77</td> <td>78</td> </tr> <tr> <td>79</td> <td>80</td> <td>81</td> </tr> <tr> <td>82</td> <td>83</td> <td>84</td> </tr> <tr> <td>85</td> <td>86</td> <td>87</td> </tr> <tr> <td>88</td> <td>89</td> <td>90</td> </tr> <tr> <td>91</td> <td>92</td> <td>93</td> </tr> <tr> <td>94</td> <td>95</td> <td>96</td> </tr> <tr> <td>97</td> <td>98</td> <td>99</td> </tr> <tr> <td>100</td> <td>101</td> <td>102</td> </tr> <tr> <td>103</td> <td>104</td> <td>105</td> </tr> <tr> <td>106</td> <td>107</td> <td>108</td> </tr> <tr> <td>109</td> <td>110</td> <td>111</td> </tr> <tr> <td>112</td> <td>113</td> <td>114</td> </tr> <tr> <td>115</td> <td>116</td> <td>117</td> </tr> <tr> <td>118</td> <td>119</td> <td>120</td> </tr> <tr> <td>121</td> <td>122</td> <td>123</td> </tr> <tr> <td>124</td> <td>125</td> <td>126</td> </tr> <tr> <td>127</td> <td>128</td> <td>129</td> </tr> <tr> <td>130</td> <td>131</td> <td>132</td> </tr> <tr> <td>133</td> <td>134</td> <td>135</td> </tr> <tr> <td>136</td> <td>137</td> <td>138</td> </tr> <tr> <td>139</td> <td>140</td> <td>141</td> </tr> <tr> <td>142</td> <td>143</td> <td>144</td> </tr> <tr> <td>145</td> <td>146</td> <td>147</td> </tr> <tr> <td>148</td> <td>149</td> <td>150</td> </tr> <tr> <td>151</td> <td>152</td> <td>153</td> </tr> <tr> <td>154</td> <td>155</td> <td>156</td> </tr> <tr> <td>157</td> <td>158</td> <td>159</td> </tr> <tr> <td>160</td> <td>161</td> <td>162</td> </tr> <tr> <td>163</td> <td>164</td> <td>165</td> </tr> <tr> <td>166</td> <td>167</td> <td>168</td> </tr> <tr> <td>169</td> <td>170</td> <td>171</td> </tr> <tr> <td>172</td> <td>173</td> <td>174</td> </tr> <tr> <td>175</td> <td>176</td> <td>177</td> </tr> <tr> <td>178</td> <td>179</td> <td>180</td> </tr> <tr> <td>181</td> <td>182</td> <td>183</td> </tr> <tr> <td>184</td> <td>185</td> <td>186</td> </tr> <tr> <td>187</td> <td>188</td> <td>189</td> </tr> <tr> <td>190</td> <td>191</td> <td>192</td> </tr> <tr> <td>193</td> <td>194</td> <td>195</td> </tr> <tr> <td>196</td> <td>197</td> <td>198</td> </tr> <tr> <td>199</td> <td>200</td> <td>201</td> </tr> <tr> <td>202</td> <td>203</td> <td>204</td> </tr> <tr> <td>205</td> <td>206</td> <td>207</td> </tr> <tr> <td>208</td> <td>209</td> <td>210</td> </tr> <tr> <td>211</td> <td>212</td> <td>213</td> </tr> <tr> <td>214</td> <td>215</td> <td>216</td> </tr> <tr> <td>217</td> <td>218</td> <td>219</td> </tr> <tr> <td>220</td> <td>221</td> <td>222</td> </tr> <tr> <td>223</td> <td>224</td> <td>225</td> </tr> <tr> <td>226</td> <td>227</td> <td>228</td> </tr> <tr> <td>229</td> <td>230</td> <td>231</td> </tr> <tr> <td>232</td> <td>233</td> <td>234</td> </tr> <tr> <td>235</td> <td>236</td> <td>237</td> </tr> <tr> <td>238</td> <td>239</td> <td>240</td> </tr> <tr> <td>241</td> <td>242</td> <td>243</td> </tr> <tr> <td>244</td> <td>245</td> <td>246</td> </tr> <tr> <td>247</td> <td>248</td> <td>249</td> </tr> <tr> <td>250</td> <td>251</td> <td>252</td> </tr> <tr> <td>253</td> <td>254</td> <td>255</td> </tr> <tr> <td>256</td> <td>257</td> <td>258</td> </tr> <tr> <td>259</td> <td>260</td> <td>261</td> </tr> <tr> <td>262</td> <td>263</td> <td>264</td> </tr> <tr> <td>265</td> <td>266</td> <td>267</td> </tr> <tr> <td>268</td> <td>269</td> <td>270</td> </tr> <tr> <td>271</td> <td>272</td> <td>273</td> </tr> <tr> <td>274</td> <td>275</td> <td>276</td> </tr> <tr> <td>277</td> <td>278</td> <td>279</td> </tr> <tr> <td>280</td> <td>281</td> <td>282</td> </tr> <tr> <td>283</td> <td>284</td> <td>285</td> </tr> <tr> <td>286</td> <td>287</td> <td>288</td> </tr> <tr> <td>289</td> <td>290</td> <td>291</td> </tr> <tr> <td>292</td> <td>293</td> <td>294</td> </tr> <tr> <td>295</td> <td>296</td> <td>297</td> </tr> <tr> <td>298</td> <td>299</td> <td>300</td> </tr> <tr> <td>301</td> <td>302</td> <td>303</td> </tr> <tr> <td>304</td> <td>305</td> <td>306</td> </tr> <tr> <td>307</td> <td>308</td> <td>309</td> </tr> <tr> <td>310</td> <td>311</td> <td>312</td> </tr> <tr> <td>313</td> <td>314</td> <td>315</td> </tr> <tr> <td>316</td> <td>317</td> <td>318</td> </tr> <tr> <td>319</td> <td>320</td> <td>321</td> </tr> <tr> <td>322</td> <td>323</td> <td>324</td> </tr> <tr> <td>325</td> <td>326</td> <td>327</td> </tr> <tr> <td>328</td> <td>329</td> <td>330</td> </tr> <tr> <td>331</td> <td>332</td> <td>333</td> </tr> <tr> <td>334</td> <td>335</td> <td>336</td> </tr> <tr> <td>337</td> <td>338</td> <td>339</td> </tr> <tr> <td>340</td> <td>341</td> <td>342</td> </tr> <tr> <td>343</td> <td>344</td> <td>345</td> </tr> <tr> <td>346</td> <td>347</td> <td>348</td> </tr> <tr> <td>349</td> <td>350</td> <td>351</td> </tr> <tr> <td>352</td> <td>353</td> <td>354</td> </tr> <tr> <td>355</td> <td>356</td> <td>357</td> </tr> <tr> <td>358</td> <td>359</td> <td>360</td> </tr> <tr> <td>361</td> <td>362</td> <td>363</td> </tr> <tr> <td>364</td> <td>365</td> <td>366</td> </tr> <tr> <td>367</td> <td>368</td> <td>369</td> </tr> <tr> <td>370</td> <td>371</td> <td>372</td> </tr> <tr> <td>373</td> <td>374</td> <td>375</td> </tr> <tr> <td>376</td> <td>377</td> <td>378</td> </tr> <tr> <td>379</td> <td>380</td> <td>381</td> </tr> <tr> <td>382</td> <td>383</td> <td>384</td> </tr> <tr> <td>385</td> <td>386</td> <td>387</td> </tr> <tr> <td>388</td> <td>389</td> <td>390</td> </tr> <tr> <td>391</td> <td>392</td> <td>393</td> </tr> <tr> <td>394</td> <td>395</td> <td>396</td> </tr> <tr> <td>397</td> <td>398</td> <td>399</td> </tr> <tr> <td>400</td> <td>401</td> <td>402</td> </tr> <tr> <td>403</td> <td>404</td> <td>405</td> </tr> <tr> <td>406</td> <td>407</td> <td>408</td> </tr> <tr> <td>409</td> <td>410</td> <td>411</td> </tr> <tr> <td>412</td> <td>413</td> <td>414</td> </tr> <tr> <td>415</td> <td>416</td> <td>417</td> </tr> <tr> <td>418</td> <td>419</td> <td>420</td> </tr> <tr> <td>421</td> <td>422</td> <td>423</td> </tr> <tr> <td>424</td> <td>425</td> <td>426</td> </tr> <tr> <td>427</td> <td>428</td> <td>429</td> </tr> <tr> <td>430</td> <td>431</td> <td>432</td> </tr> <tr> <td>433</td> <td>434</td> <td>435</td> </tr> <tr> <td>436</td> <td>437</td> <td>438</td> </tr> <tr> <td>439</td> <td>440</td> <td>441</td> </tr> <tr> <td>442</td> <td>443</td> <td>444</td> </tr> <tr> <td>445</td> <td>446</td> <td>447</td> </tr> <tr> <td>448</td> <td>449</td> <td>450</td> </tr> <tr> <td>451</td> <td>452</td> <td>453</td> </tr> <tr> <td>454</td> <td>455</td> <td>456</td> </tr> <tr> <td>457</td> <td>458</td> <td>459</td> </tr> <tr> <td>460</td> <td>461</td> <td>462</td> </tr> <tr> <td>463</td> <td>464</td> <td>465</td> </tr> <tr> <td>466</td> <td>467</td> <td>468</td> </tr> <tr> <td>469</td> <td>470</td> <td>471</td> </tr> <tr> <td>472</td> <td>473</td> <td>474</td> </tr> <tr> <td>475</td> <td>476</td> <td>477</td> </tr> <tr> <td>478</td> <td>479</td> <td>480</td> </tr> <tr> <td>481</td> <td>482</td> <td>483</td> </tr> <tr> <td>484</td> <td>485</td> <td>486</td> </tr> <tr> <td>487</td> <td>488</td> <td>489</td> </tr> <tr> <td>490</td> <td>491</td> <td>492</td> </tr> <tr> <td>493</td> <td>494</td> <td>495</td> </tr> <tr> <td>496</td> <td>497</td> <td>498</td> </tr> <tr> <td>499</td> <td>500</td> <td>501</td> </tr> <tr> <td>502</td> <td>503</td> <td>504</td> </tr> <tr> <td>505</td> <td>506</td> <td>507</td> </tr> <tr> <td>508</td> <td>509</td> <td>510</td> </tr> <tr> <td>511</td> <td>512</td> <td>513</td> </tr> <tr> <td>514</td> <td>515</td> <td>516</td> </tr> <tr> <td>517</td> <td>518</td> <td>519</td> </tr> <tr> <td>520</td> <td>521</td> <td>522</td> </tr> <tr> <td>523</td> <td>524</td> <td>525</td> </tr> <tr> <td>526</td> <td>527</td> <td>528</td> </tr> <tr> <td>529</td> <td>530</td> <td>531</td> </tr> <tr> <td>532</td> <td>533</td> <td>534</td> </tr> <tr> <td>535</td> <td>536</td> <td>537</td> </tr> <tr> <td>538</td> <td>539</td> <td>540</td> </tr> <tr> <td>541</td> <td>542</td> <td>543</td> </tr> <tr> <td>544</td> <td>545</td> <td>546</td> </tr> <tr> <td>547</td> <td>548</td> <td>549</td> </tr> <tr> <td>550</td> <td>551</td> <td>552</td> </tr> <tr> <td>553</td> <td>554</td> <td>555</td> </tr> <tr> <td>556</td> <td>557</td> <td>558</td> </tr> <tr> <td>559</td> <td>560</td> <td>561</td> </tr> <tr> <td>562</td> <td>563</td> <td>564</td> </tr> <tr> <td>565</td> <td>566</td> <td>567</td> </tr> <tr> <td>568</td> <td>569</td> <td>570</td> </tr> <tr> <td>571</td> <td>572</td> <td>573</td> </tr> <tr> <td>574</td> <td>575</td> <td>576</td> </tr> <tr> <td>577</td> <td>578</td> <td>579</td> </tr> <tr> <td>580</td> <td>581</td> <td>582</td> </tr> <tr> <td>583</td> <td>584</td> <td>585</td> </tr> <tr> <td>586</td> <td>587</td> <td>588</td> </tr> <tr> <td>589</td> <td>590</td> <td>591</td> </tr> <tr> <td>592</td> <td>593</td> <td>594</td> </tr> <tr> <td>595</td> <td>596</td> <td>597</td> </tr> <tr> <td>598</td> <td>599</td> <td>600</td> </tr> <tr> <td>601</td> <td>602</td> <td>603</td> </tr> <tr> <td>604</td> <td>605</td> <td>606</td> </tr> <tr> <td>607</td> <td>608</td> <td>609</td> </tr> <tr> <td>610</td> <td>611</td> <td>612</td> </tr> <tr> <td>613</td> <td>614</td> <td>615</td> </tr> <tr> <td>616</td> <td>617</td> <td>618</td> </tr> <tr> <td>619</td> <td>620</td> <td>621</td> </tr> <tr> <td>622</td> <td>623</td> <td>624</td> </tr> <tr> <td>625</td> <td>626</td> <td>627</td> </tr> <tr> <td>628</td> <td>629</td> <td>630</td> </tr> <tr> <td>631</td> <td>632</td> <td>633</td> </tr> <tr> <td>634</td> <td>635</td> <td>636</td> </tr> <tr> <td>637</td> <td>638</td> <td>639</td> </tr> <tr> <td>640</td> <td>641</td> <td>642</td> </tr> <tr> <td>643</td> <td>644</td> <td>645</td> </tr> <tr> <td>646</td> <td>647</td> <td>648</td> </tr> <tr> <td>649</td> <td>650</td> <td>651</td> </tr> <tr> <td>652</td> <td>653</td> <td>654</td> </tr> <tr> <td>655</td> <td>656</td> <td>657</td> </tr> <tr> <td>658</td> <td>659</td> <td>660</td> </tr> <tr> <td>661</td> <td>662</td> <td>663</td> </tr> <tr> <td>664</td> <td>665</td> <td>666</td> </tr> <tr> <td>667</td> <td>668</td> <td>669</td> </tr> <tr> <td>670</td> <td>671</td> <td>672</td> </tr> <tr> <td>673</td> <td>674</td> <td>675</td> </tr> <tr> <td>676</td> <td>677</td> <td>678</td> </tr> <tr> <td>679</td> <td>680</td> <td>681</td> </tr> <tr> <td>682</td> <td>683</td> <td>684</td> </tr> <tr> <td>685</td> <td>686</td> <td>687</td> </tr> <tr> <td>688</td> <td>689</td> <td>690</td> </tr> <tr> <td>691</td> <td>692</td> <td>693</td> </tr> <tr> <td>694</td> <td>695</td> <td>696</td> </tr> <tr> <td>697</td> <td>698</td> <td>699</td> </tr> <tr> <td>700</td> <td>701</td> <td>702</td> </tr> <tr> <td>703</td> <td>704</td> <td>705</td> </tr> <tr> <td>706</td> <td>707</td> <td>708</td> </tr> <tr> <td>709</td> <td>710</td> <td>711</td> </tr> <tr> <td>712</td> <td>713</td> <td>714</td> </tr> <tr> <td>715</td> <td>716</td> <td>717</td> </tr> <tr> <td>718</td> <td>719</td> <td>720</td> </tr> <tr> <td>721</td> <td>722</td> <td>723</td> </tr> <tr> <td>724</td> <td>725</td> <td>726</td> </tr> <tr> <td>727</td> <td>728</td> <td>729</td> </tr> <tr> <td>730</td> <td>731</td> <td>732</td> </tr> <tr> <td>733</td> <td>734</td> <td>735</td> </tr> <tr> <td>736</td> <td>737</td> <td>738</td> </tr> <tr> <td>739</td> <td>740</td> <td>741</td> </tr> <tr> <td>742</td> <td>743</td> <td>744</td> </tr> <tr> <td>745</td> <td>746</td> <td>747</td> </tr> <tr> <td>748</td> <td>749</td> <td>750</td> </tr> <tr> <td>751</td> <td>752</td> <td>753</td> </tr> <tr> <td>754</td> <td>755</td> <td>756</td> </tr> <tr> <td>757</td> <td>758</td> <td>759</td> </tr> <tr> <td>760</td> <td>761</td> <td>762</td> </tr> <tr> <td>763</td> <td>764</td> <td>765</td> </tr> <tr> <td>766</td> <td>767</td> <td>768</td> </tr> <tr> <td>769</td> <td>770</td> <td>771</td> </tr> <tr> <td>772</td> <td>773</td> <td>774</td> </tr> <tr> <td>775</td> <td>776</td> <td>777</td> </tr> <tr> <td>778</td> <td>779</td> <td>780</td> </tr> <tr> <td>781</td> <td>782</td> <td>783</td> </tr> <tr> <td>784</td> <td>785</td> <td>786</td> </tr> <tr> <td>787</td> <td>788</td> <td>789</td> </tr> <tr> <td>790</td> <td>791</td> <td>792</td> </tr> <tr> <td>793</td> <td>794</td> <td>795</td> </tr> <tr> <td>796</td> <td>797</td> <td>798</td> </tr> <tr> <td>799</td> <td>800</td> <td>801</td> </tr> <tr> <td>802</td> <td>803</td> <td>804</td> </tr> <tr> <td>805</td> <td>806</td> <td>807</td> </tr> <tr> <td>808</td> <td>809</td> <td>810</td> </tr> <tr> <td>811</td> <td>812</td> <td>813</td> </tr> <tr> <td>814</td> <td>815</td> <td>816</td> </tr> <tr> <td>817</td> <td>818</td> <td>819</td> </tr> <tr> <td>820</td> <td>821</td> <td>822</td> </tr> <tr> <td>823</td> <td>824</td> <td>825</td> </tr> <tr> <td>826</td> <td>827</td> <td>828</td> </tr> <tr> <td>829</td> <td>830</td> <td>831</td> </tr> <tr> <td>832</td> <td>833</td> <td>834</td> </tr> <tr> <td>835</td> <td>836</td> <td>837</td> </tr> <tr> <td>838</td> <td>839</td> <td>840</td> </tr> <tr> <td>841</td> <td>842</td> <td>843</td> </tr> <tr> <td>844</td> <td>845</td> <td>846</td> </tr> <tr> <td>847</td> <td>848</td> <td>849</td> </tr> <tr> <td>850</td> <td>851</td> <td>852</td> </tr> <tr> <td>853</td> <td>854</td> <td>855</td> </tr> <tr> <td>856</td> <td>857</td> <td>858</td> </tr> <tr> <td>859</td> <td>860</td> <td>861</td> </tr> <tr> <td>862</td> <td>863</td> <td>864</td> </tr> <tr> <td>865</td> <td>866</td> <td>867</td> </tr> <tr> <td>868</td> <td>869</td> <td>870</td> </tr> <tr> <td>871</td> <td>872</td> <td>873</td> </tr> <tr> <td>874</td> <td>875</td> <td>876</td> </tr> <tr> <td>877</td> <td>878</td> <td>879</td> </tr> <tr> <td>880</td> <td>881</td> <td>882</td> </tr> <tr> <td>883</td> <td>884</td> <td>885</td> </tr> <tr> <td>886</td> <td>887</td> <td>888</td> </tr> <tr> <td>889</td> <td>890</td> <td>891</td> </tr> <tr> <td>892</td> <td>893</td> <td>894</td> </tr> <tr> <td>895</td> <td>896</td> <td>897</td> </tr> <tr> <td>898</td> <td>899</td> <td>900</td> </tr> <tr> <td>901</td> <td>902</td> <td>903</td> </tr> <tr> <td>904</td> <td>905</td> <td>906</td> </tr> <tr> <td>907</td> <td>908</td> <td>909</td> </tr> <tr> <td>910</td> <td>911</td> <td>912</td> </tr> <tr> <td>913</td> <td>914</td> <td>915</td> </tr> <tr> <td>916</td> <td>917</td> <td>918</td> </tr> <tr> <td>919</td> <td>920</td> <td>921</td> </tr> <tr> <td>922</td> <td>923</td> <td>924</td> </tr> <tr> <td>925</td> <td>926</td> <td>927</td> </tr> <tr> <td>928</td> <td>929</td> <td>930</td> </tr> <tr> <td>931</td> <td>932</td> <td>933</td> </tr> <tr> <td>934</td> <td>935</td> <td>936</td> </tr> <tr> <td>937</td> <td>938</td> <td>939</td> </tr> <tr> <td>940</td> <td>941</td> <td>942</td> </tr> <tr> <td>943</td> <td>944</td> <td>945</td> </tr> <tr> <td>946</td> <td>947</td> <td>948</td> </tr> <tr> <td>949</td> <td>950</td> <td>951</td> </tr> <tr> <td>952</td> <td>953</td> <td>954</td> </tr> <tr> <td>955</td> <td>956</td> <td>957</td> </tr> <tr> <td>958</td> <td>959</td> <td>960</td> </tr> <tr> <td>961</td> <td>962</td> <td>963</td> </tr> <tr> <td>964</td> <td>965</td> <td>966</td> </tr> <tr> <td>967</td> <td>968</td> <td>969</td> </tr> <tr> <td>970</td> <td>971</td> <td>972</td> </tr> <tr> <td>973</td> <td>974</td> <td>975</td> </tr> <tr> <td>976</td> <td>977</td> <td>978</td> </tr> <tr> <td>979</td> <td>980</td> <td>981</td> </tr> <tr> <td>982</td> <td>983</td> <td>984</td> </tr> <tr> <td>985</td> <td>986</td> <td>987</td> </tr> <tr> <td>988</td> <td>989</td> <td>990</td> </tr> <tr> <td>991</td> <td>992</td> <td>993</td> </tr> <tr> <td>994</td> <td>995</td> <td>996</td> </tr> <tr> <td>997</td> <td>998</td> <td>999</td> </tr> <tr> <td>1000</td> <td>1001</td> <td>1002</td> </tr> </tbody> </table>	Value	for	Money	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001	1002
Value	for	Money																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
1	2	3																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
4	5	6																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
7	8	9																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
10	11	12																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
13	14	15																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
16	17	18																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
19	20	21																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
22	23	24																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
25	26	27																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
28	29	30																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
31	32	33																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
34	35	36																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
37	38	39																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
40	41	42																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
43	44	45																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
46	47	48																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
49	50	51																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
52	53	54																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
55	56	57																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
58	59	60																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
61	62	63																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
64	65	66																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
67	68	69																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
70	71	72																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
73	74	75																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
76	77	78																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
79	80	81																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
82	83	84																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
85	86	87																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
88	89	90																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
91	92	93																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
94	95	96																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
97	98	99																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
100	101	102																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
103	104	105																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
106	107	108																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
109	110	111																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
112	113	114																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
115	116	117																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
118	119	120																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
121	122	123																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
124	125	126																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
127	128	129																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
130	131	132																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
133	134	135																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
136	137	138																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
139	140	141																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
142	143	144																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
145	146	147																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
148	149	150																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
151	152	153																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
154	155	156																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
157	158	159																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
160	161	162																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
163	164	165																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
166	167	168																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
169	170	171																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
172	173	174																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
175	176	177																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
178	179	180																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
181	182	183																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
184	185	186																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
187	188	189																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
190	191	192																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
193	194	195																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
196	197	198																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
199	200	201																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
202	203	204																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
205	206	207																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
208	209	210																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
211	212	213																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
214	215	216																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
217	218	219																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
220	221	222																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
223	224	225																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
226	227	228																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
229	230	231																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
232	233	234																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
235	236	237																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
238	239	240																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
241	242	243																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
244	245	246																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
247	248	249																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
250	251	252																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
253	254	255																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
256	257	258																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
259	260	261																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
262	263	264																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
265	266	267																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
268	269	270																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
271	272	273																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
274	275	276																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
277	278	279																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
280	281	282																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
283	284	285																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
286	287	288																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
289	290	291																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
292	293	294																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
295	296	297																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
298	299	300																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
301	302	303																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
304	305	306																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
307	308	309																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
310	311	312																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
313	314	315																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
316	317	318																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
319	320	321																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
322	323	324																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
325	326	327																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
328	329	330																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
331	332	333																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
334	335	336																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
337	338	339																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
340	341	342																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
343	344	345																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
346	347	348																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
349	350	351																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
352	353	354																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
355	356	357																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
358	359	360																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
361	362	363																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
364	365	366																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
367	368	369																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
370	371	372																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
373	374	375																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
376	377	378																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
379	380	381																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
382	383	384																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
385	386	387																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
388	389	390																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
391	392	393																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
394	395	396																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
397	398	399																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
400	401	402																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
403	404	405																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
406	407	408																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
409	410	411																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
412	413	414																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
415	416	417																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
418	419	420																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
421	422	423																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
424	425	426																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
427	428	429																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
430	431	432																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
433	434	435																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
436	437	438																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
439	440	441																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
442	443	444																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
445	446	447																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
448	449	450																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
451	452	453																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
454	455	456																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
457	458	459																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
460	461	462																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
463	464	465																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
466	467	468																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
469	470	471																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
472	473	474																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
475	476	477																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
478	479	480																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
481	482	483																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
484	485	486																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
487	488	489																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
490	491	492																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
493	494	495																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
496	497	498																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
499	500	501																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
502	503	504																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
505	506	507																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
508	509	510																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
511	512	513																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
514	515	516																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
517	518	519																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
520	521	522																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
523	524	525																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
526	527	528																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
529	530	531																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
532	533	534																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
535	536	537																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
538	539	540																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
541	542	543																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
544	545	546																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
547	548	549																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
550	551	552																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
553	554	555																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
556	557	558																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
559	560	561																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
562	563	564																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
565	566	567																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
568	569	570																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
571	572	573																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
574	575	576																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
577	578	579																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
580	581	582																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
583	584	585																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
586	587	588																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
589	590	591																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
592	593	594																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
595	596	597																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
598	599	600																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
601	602	603																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
604	605	606																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
607	608	609																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
610	611	612																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
613	614	615																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
616	617	618																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
619	620	621																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
622	623	624																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
625	626	627																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
628	629	630																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
631	632	633																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
634	635	636																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
637	638	639																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
640	641	642																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
643	644	645																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
646	647	648																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
649	650	651																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
652	653	654																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
655	656	657																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
658	659	660																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
661	662	663																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
664	665	666																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
667	668	669																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
670	671	672																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
673	674	675																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
676	677	678																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
679	680	681																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
682	683	684																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
685	686	687																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
688	689	690																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
691	692	693																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
694	695	696																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
697	698	699																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
700	701	702																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
703	704	705																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
706	707	708																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
709	710	711																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
712	713	714																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
715	716	717																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
718	719	720																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
721	722	723																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
724	725	726																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
727	728	729																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
730	731	732																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
733	734	735																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
736	737	738																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
739	740	741																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
742	743	744																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
745	746	747																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
748	749	750																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
751	752	753																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
754	755	756																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
757	758	759																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
760	761	762																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
763	764	765																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
766	767	768																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
769	770	771																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
772	773	774																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
775	776	777																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
778	779	780																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
781	782	783																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
784	785	786																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
787	788	789																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
790	791	792																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
793	794	795																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
796	797	798																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
799	800	801																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
802	803	804																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
805	806	807																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
808	809	810																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
811	812	813																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
814	815	816																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
817	818	819																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
820	821	822																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
823	824	825																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
826	827	828																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
829	830	831																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
832	833	834																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
835	836	837																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
838	839	840																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
841	842	843																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
844	845	846																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
847	848	849																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
850	851	852																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
853	854	855																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
856	857	858																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
859	860	861																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
862	863	864																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
865	866	867																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
868	869	870																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
871	872	873																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
874	875	876																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
877	878	879																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
880	881	882																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
883	884	885																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
886	887	888																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
889	890	891																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
892	893	894																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
895	896	897																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
898	899	900																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
901	902	903																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
904	905	906																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
907	908	909																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
910	911	912																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
913	914	915																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
916	917	918																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
919	920	921																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
922	923	924																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
925	926	927																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
928	929	930																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
931	932	933																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
934	935	936																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
937	938	939																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
940	941	942																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
943	944	945																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
946	947	948																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
949	950	951																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
952	953	954																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
955	956	957																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
958	959	960																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
961	962	963																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
964	965	966																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
967	968	969																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
970	971	972																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
973	974	975																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
976	977	978																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
979	980	981																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
982	983	984																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
985	986	987																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
988	989	990																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
991	992	993																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
994	995	996																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
997	998	999																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
1000	1001	1002																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											

The outcome was not the perfect answer, but the best balance of key elements was achieved. Human impacts were reduced and staging was achieved to enable affordability.

**Case Study No. 1: Sapphire to Woolgoolga - Outcome**

- Coastal corridor chosen .....'no perfect answer':
  - No perfect answer .....based on balance across the key elements
  - Mitigate human impacts on chosen coastal route
  - Staging:
    - Short term versus long term needs
    - Affordability
- Current status:
  - Sapphire to Woolgoolga: almost finished (14+ year journey)
  - Inner bypass of Coffs Harbour being preserved
  - Planning & design almost complete for Woolgoolga to Halfway Creek

Bob's team applied route selection processes up and down the highway to achieve a robust, well-tested process.

Bob highlighted the need to be transparent and seek options with stakeholders and the community. Test concepts with the community before final decisions are made.

**Case Study No. 1:**  
**Sapphire to Woolgoolga - Learnings**



- Robust decision making process based on:
  - achieving best balance across competing factors
  - 'value for money' diagnostic model
  - successfully applied/ adapted to other highway upgrades + Grafton bridge
  - transparent process
  - sought and explored options
  - tested concepts/ ideas with community & stakeholders before making final decision
- The 'affordability question' needs to be answered
- Robust authorisation process required in a very complex environment

### Case Study No. 2: Sapphire to Woolgoolga

Bob summarised the project as a Class A highway upgrade with a posted speed of 80km, 8% grades (6% is standard, 4.5% is desirable) and slope stability issues.

**Case Study No. 2:**  
**The St Helena Tunnel Story - Background**





- Upgraded highway was to follow existing highway:
  - Class A style highway upgrade
  - posted speed of 80 km
  - 8% grades
  - slope stability issues
- Very strong community division over the initial Bangalow to Ewingsdale route
- Truck noise concerns on St Helena hill
- *Should RTA/ RMS review the alignment ?*

There was very strong community division over the initial earmarked route and truck noise was a concern on St Helena Hill.

The question raised was do RMS continue to seek the earmarked route or look to an alternative option.

In response, Bob's team set about establishing legitimacy for the review, by setting up a viable alternative.

Using the money argument (in 2004 dollars) the new alternative would cost twice as much however, the BCR on the alternative route improved and from a whole of life perspective the better outcome to put a tunnel under than over the top. Improved community acceptance was achieved.

**Case Study No.2:**  
The St Helena Tunnel Story - Process

NSW Transport Roads & Maritime Services

**Step 1:** Establish legitimacy for review (Pacific Noise Task Force outcomes)

**Step 2:** Desk top review to establish a viable alternative under St Helena Hill:

Value	for	Money
Functional		
- meets highway design standards for 110 km/hr		
Natural environment		\$144M versus \$83M (2004 \$'s)
- better visual on St Helena escarpment		
- better connectivity		
Human environment		BCR of 2.0 versus 1.5
- greater amenity impacts on residents		

**Step 3:** Comparative route selection process as part of Tintenbar to Ewingsdale upgrade project

**Step 4:** Obtain approval via Tintenbar to Ewingsdale upgrade approval

Slide Summary 10/18

Improved community acceptance was achieved. The cheaper option is not always the best option.

**Case Study No. 2:**  
The St Helena Tunnel Story - Outcome

NSW Transport Roads & Maritime Services



Tunnel breakthrough, January 2014



Artist's Impression of northern approach to the tunnel

- Higher cost option chosen but better operational/ visual outcome
- Under construction and opens in mid 2016 .....a 19 year journey.
- Higher standard & more consistent link between Ballina and Border.
- Improved community acceptance of the tunnel
- Tintenbar to Ewingsdale is still sensitive... upgrade will leave catchments in better condition

Slide Summary 11/18

Bob said that the community have a good sense of what value for money is, and that we should listen to this instinctive sense. However, note that these views can change over time.

**Case Study No. 2:**  
The St Helena Tunnel Story - Learnings

NSW Transport Roads & Maritime Services

- Had a good baseline to compare to
- A cheaper option is not necessarily the better option but need to demonstrate legitimacy and support for the alternative
- Whole of life considered albeit further work required:
  - Operational costs of tunnel
  - Include full risks for both options
- Need to listen to the community:
  - they have a good idea of 'public value for money'
  - their views can change over time
  - engineering community had views

Slide Summary 12/18

Bob discussed the challenge to create value for money to create a route diversion around a fauna corridor for Koalas would cost an increase in \$60million. The

**Case Study No. 3: The Ballina Bypass Story**

Bob described the project as a big congestion point during peak holiday periods with lots of accidents and incidents on the hill. Many trucks would become bogged in wet weather (flood immunity 1 in 20) and very deep and soft variable soils.

**Case Study No.3: The Ballina Bypass Story - Background**

NSW Transport Roads & Maritime Services

- 12 km bypass of Ballina & Tintenbar Hill
- Major congestion point during peak traffic periods
- Traffic accidents/ incidents on Tintenbar Hill
- Community pressure for an early bypass
- Located In Richmond River flood plain:
  - Flood immunity of 1 in 20 ARI
  - Very deep and variable soft soils (up to 30 metres)
- Delivered In stages:
  - 2005 Early works on critical soft soils
  - 2008 Main works via an alliance
  - Late 2011 Bypass opened to traffic
  - Mid 2012 Completed

The community preferred an early bypass. The local council preferred an inner bypass.

Bob’s team analysed the soft soil capability and set up a set of accountabilities among alliance partners to deliver the project.

A lot of knowledge was shared during the process and many new ideas were discussed.

Funders were convinced to offer seed funding for critical early works.

**Case Study No. 3: The Ballina Bypass Story - Learnings**

NSW Transport Roads & Maritime Services

All milestones met  
 Clear  
 The best result  
 No significant cost overruns

Project  
 Settings  
 Strategic/Local plan  
 Quality/Performance  
 Risk/Control  
 Values/Conditions  
 Design/Integration  
 High quality/High  
 Value

\$  
 Performance  
 Key Decision-Making & Diagnostic Models

- Convinced our funders to allocate & seek funding for early time critical works
- Value testing right through the entire delivery process
- Used a whole-of-life approach
- Engaged the right knowledge:
  - Public sector
  - Private sector
- Applied learnings to future projects & at a much earlier stage in a project’s lifecycle

Value testing was continued right through the project.

Construction was achieved in a shorter time period with great community feedback. Bob discussed the tensions between time, performance and dollars by setting team boundaries.

**Case Study No. 3:**  
The Ballina Bypass Story - Outcome



- For similar cost to base case, delivered:
  - bypass six months earlier
  - reduced overall construction period by 50% to 6-7 year timeframe
- Good community feedback on overall outcomes
- Whole-of-life decision making with accountabilities:
 

0 to 1 years	Alliance
1 to 10 years	Project (RMS)
> 10 years	Assets (RMS)
- Secured funding to complete Pimlico to Tiven final stage:
  - Stage 1.....complete
  - Stage 2.....under construction
  - Stage 3.....part of Woolgoolga to Ballina

**Case Study No. 4: The Macleay River Crossing Story**

Bob summarised the project as a 4.5km river crossing, with 3 bridges with a total of 2.2km opening, 2.3km embankment of deep and variable soft soils.

The community had concerns with building on an embankment on a flood plain.

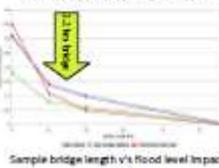
At the time of planning, Bob presented a curve comparing bridge length with level of impact with flood levels. Bob highlighted the decision point. This showed the logic behind the decision to build the river crossing.

**Case Study No.4: The Macleay River Crossing Story – Background**





Macleay R. bridge under construction



Simple bridge length v's Flood level Impact  
(2004)

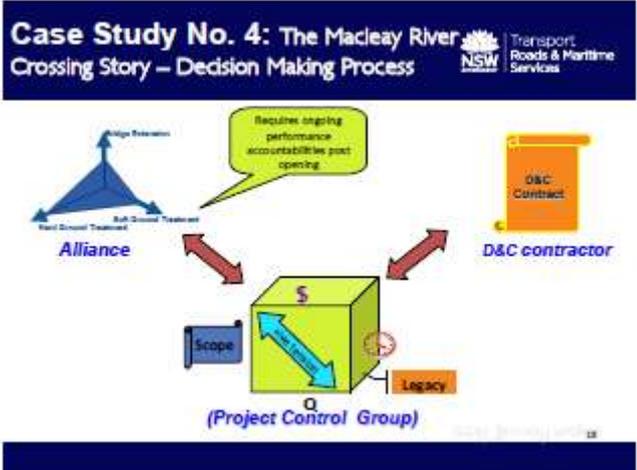
- Preferred highway route to east of Kempsey:
  - 4.5 km crossing of Macleay River & floodplain:
    - 3 bridges / 2.2 km of opening
    - 2.3 km of embankment on deep & variable soft soils
  - ongoing community concerns about building an embankment in the floodplain
- Delivery phase was 'fast tracked':
  - \$618 million from BAF
  - 'start something' by Dec 2009
  - must open by mid 2014
- Chosen delivery model:
 

**Alliance + D&C Contract**



The procurement model chosen was built on a hybrid model and included an alliance partner and a D&C contractor.

The GFC hit and the project needed to be delivered by mid-2014.



The Alliance had preliminary design and road works, and the D&C contractor had the bridge work.

When the Alliance looked at extending the bridge, it was unaffordable. When the D&C contractor came along with the pricing for a bigger bridge – that included hard and soft ground treatments and performance accountabilities, the value began to stack up.

The decision was made on what was best for project. The bigger bridge was best for project.

A project control group was in place who met at intervals where at times there were tensions about price with contingency plans in place. The boundaries were set and the flexibilities between individuals of the delivery team were in place. The legacy of the project control group was how the learnings about the bigger bridge could be applied to future projects.

The outcome was that the project was delivered 1.5 years earlier.

Bob discussed the effectiveness of the hybrid model that created an environment for innovation, the positive tensions with the private sector that led to better outcomes, an effective project control group making fast, big, effective decisions and the receipt of good information to make those decisions from contractors.

**Case Study No. 4: The Macleay River Crossing Story – Outcome**

- Longer waterway opening & higher bridge
- Opened bypass 1.25 years earlier & within budget
- Very satisfied community & removed a perceived risk

Macleay River bridge under construction

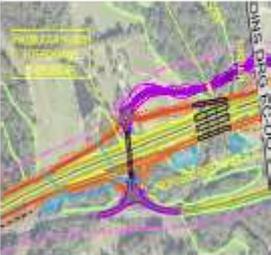
3.2 km bridge

**Case Study No. 5: The Nambucca Heads Interchange Story**

Bob summarised the project as an interchange that was approved and tested, but was changed before tender. A property owner wanted total acquisition.

The project wanted to reduce natural environment, with a rest stop strategy to the west rather than the east and to reduce cost.

**Case Study No. 5: The Nambucca Heads Interchange Story - Background**



Approved interchange shape  
(Werrell Ck to Urunga upgrade)

- Approved interchange shape tested through EIS .
- **Why change the shape?**
  - Property owner on western side wanted a total acquisition
  - To reduce natural environmental impact
  - To better suit overall rest stop strategy
  - To better suit industrial growth area to west of new highway
  - To reduce cost

The interchange moved slightly south. The alternative design was compared against key criteria. A public value proposition was put in place.

The design was tested with the community and the interchange was approved.

**Case Study No.5: The Nambucca Heads Interchange Story - Process & Outcome**



Alternate Design

1. Prepare business case outlining:
  - Alternative design
  - Comparison against key criteria of functionality, human environment, natural environment & co
  - Define public value proposition ?
  - Public exhibition inviting submissions from community and stakeholders
2. Establish public value proposition
3. Test proposition with community & stakeholders for support for change
4. Consider and approve proposal
5. Include in D&C tender documents for Nambucca Heads to Urunga

**Case Study No. 6: A Changing Design Standards Story**

Bob discussed technical standards that create public value.

Bob described the process for building a business case for revising technical standards to improve value for money outcomes.

**Case Study No. 7: A Fauna Crossing Story**

Bob discussed the need to provide early certainty on the type and location of structures.

It enables a contractor to offer a better idea. This type of collaborative approach can achieve better value for money. The table below describes an application of a process that provided better public value and a cost saving of \$2million shared among collaborative stakeholders.

**Case Study No. 7: A Fauna Crossing Story – Process & Outcome**

Connectivity Value	Landholder Impact	EP&A Impact	EP&F Impact	RMS Impact
Low (Medium)	Negative	Positive	Not Applicable	Neutral
Low	Neutral	Positive	Not Applicable	Positive
High	Negative	Positive	Not Applicable	Neutral

- Adopt a collaborative approach between:
  - Contractor (including expert ecologist)
  - RMS
  - Key government agencies
- Develop credible alternative options for fauna crossing
- Assess value / cost from each stakeholder's perspective
- Assess overall public value of proposal
- Alternative proposal adopted has provided better public value:
  - Better overall outcome for fauna
  - Lower cost (approx. \$2 million)

In closing, Bob asks industry to tell him what the public value is for the proposal you are giving him. It may be based on efficiencies. It may be based on public value.

**Learnings for Transport Infrastructure Projects**

- Tell me what the value of your proposition is ?
  - ▲ public
  - An idea = efficiencies ≠ public value
- You will need:
  - to clearly define the issue/ problem to solve
  - preferably have a base case to compare
  - a set criteria to evaluate against
  - a range of diagnostic tools to assist
  - experts from both public and private sector

Bob suggests practitioners really need to define the issue of the problem you are trying to solve. You may need to extract it out, preferably with a base case to compare and a set of criteria. Work with the range of stakeholders to build support to achieve legitimacy (tick off from above) for your project and build a diagnostic capability.

**Learnings for Transport Infrastructure Projects (cont'd)**

- You need some form of a decision-making framework in the complex environment in which we operate

## Creating and measuring value for money – interactive session

*Scott Olsen, Roads Australia, Capacity Chapter Chair / Dan Reeve, Roads Australia, Capacity Chapter Deputy*

John Pitt introduced Scott Olsen, Capacity Chapter Chair and Dan Reeve, Capacity Chapter Deputy, to facilitate the interactive session.

The objective of the interactive session was to understand how to demonstrate and achieve better value for money outcomes within a transport infrastructure project, and for the life of a transport infrastructure asset.

The purpose of the interactive session was to invite the 72 participants at the Roads Australia Value for Money Workshop to offer their views and experiences in providing value for money when delivering transport infrastructure projects.

At each table, participants were invited to consider the following questions, to list and then share their responses with the wider group:

1. What **key criteria/priorities** should we use to define value for money within a transport infrastructure project?
2. For each criterion, which **attributes** are most important to assess for value for money?
3. Mark each attribute as **objective** (measurable) or **subjective** (qualitative)
4. Discuss how best to **demonstrate** value for money for each attribute (objective/subjective), using examples where possible
5. Identify the key **elements of a decision making framework** that may assist to deliver better value for money outcomes for procurement

A detailed summary of the responses received during the interactive session are available in the accompanying outcomes and analysis report.

## Workshop outcomes/summary

*Jay Stricker, Roads Australia, Sustainability Chapter Deputy*

Jay Stricker, Roads Australia Sustainability Chapter Deputy summarised the key themes discussed, including the need for transparency and a decision making framework that allows for the consideration of criteria. Jay noted the differences in which criteria were labelled subjective and objective and highlighted the range of tools readily available for social analysis and assessment.

Jay offered cross-sectional value by discussing phase 2 of the high speed rail study an referencing chapter 9 for innovative references to developing and explaining social impact in the context of economic benefit, noting that they are similar to a road project.

## Conclusion

Jay invited Geoff Fogarty to close the session. Geoff thanked the RMS Sustainability team and added that the great value of the day was the opportunity to share learnings. Geoff welcomes more opportunities to discuss a range of topics that bring greater benefits to industry and community.

## Participants

Firstname	Surname	Entity	Position
Peter	Achterstraat	Evans & Peck	Principal
Christopher	Allen	Project Support	Managing Director
Axel	Armstrong	Thiess	Senior Project Manager
Joshua	Baker	Lend Lease Engineering - NSW	Project Development
Paul	Biviano	Leighton Contractors	Estimating Manager
Paul	Blackwood	Lend Lease Engineering - NSW	Chief Estimator
Andrew	Boyd	Boral Construction Materials Boral Asphalt (NSW/ACT)	General Manager
Dougall	Broadfoot	Australian Asphalt Pavement Association (AAPA)	NSW Executive Officer
Michael	Caltabiano	Australian Asphalt Pavement Association (AAPA)	Chief Executive Officer
Chris	Cameron	Shell Company of Australia	Key Account Manager
Troy	Compton	Roads & Maritime Services	Principal Project Services Manager
Michael	Crowley	Roads & Maritime Services	Manager   Environmental Policy
Craig	Curnow	Golder Associates	Associate; Principal Geotechnical Engineer
Trevor	Distin	Boral Construction Materials	National Technology Manager Asphalt
Tess	Docherty	Roads & Maritime Services	Environmental Officer
Tracey	Doczy	Thiess	Environment Manager
Peter	Douglas	pitt&sherry	Principal
Greg	Edwards	Thiess	Civil Design Manager
Tracy	Edwards	AECOM	Associate Director
Steve	Edwards	pitt&sherry	Regional Operations Manager NSW
Mark	Elvidge	URS Australia	Principal Civil Engineer
Geoff	Fogarty	Roads & Maritime Services	Director, Infrastructure Development
Judith	Greenwood	EPA	Air Policy
Slobodan	Grojjic	MWH Global	National Business Manager – Transportation Infrastructure Delivery
Chris	Harrison	Roads & Maritime Services	General Manager
Bob	Higgins	Roads & Maritime Services	General Manager - Pacific Highway
Robert	Hunter	SMEC Australia	Design Manager
Antony	Jackson	SMEC Australia	Transport Manager, Sydney
Rick	Jones	McConnell Dowell	Business Development Manager Central Region
Martin	Kanan	Beca	General Manager   Infrastructure
Murray	Kidnie	Austrroads Ltd	Chief Executive
Mike	King	Shell Company of Australia	General Manager - Bitumen & Chemicals
Con	Lambous	Roads & Maritime Services	Senior Environmental Specialist (Sustainability)
Graeme	Laughton	Fulton Hogan	Business Development Manager
Ben	Lister	Shell Company of Australia	Marketing Manager
Sarah	Marshall	Lend Lease	General Manager, Environment and Sustainability

Patrick	McCormack	Thiess Pty	Civil Manager NSW/ACT
Andrew	McGlynn	Lend Lease Engineering - NSW	Bid Manager
Mandi	Mees	Roads Australia	Policy Officer
Michael	Moore	Evans & Peck	Principal
Peter	Murphy	Individual	Consultant
Geoff	Murrant	Thiess	Estimating Manager - Civil, NSW/ACT
John	Nichols	Cement Concrete & Aggregates Australia	Engineer Construction Solutions
Scott	Olsen	Lend Lease Engineering	Executive General Manager NSW
Alex	Paton	Jacobs SKM	Capability Marketing Manager   Infrastructure & Environment
Caroline	Perramant	Bouygues Construction Australia	Business Development Manager
John	Pitt	pitt&sherry	Managing Director
Scott	Powell	Aurecon	Technical Director   Transport Services
Jeff	Price	John Holland	Strategic Development Director
Gary	Pullar	John Holland	Business Development Manager, Civil
Dan	Reeve	SMEC Australia	General Manager   Transport
James	Restuccia	Evans & Peck	Senior Associate
Jerome	Rivory	SNC-Lavalin Australia	Vice President
Tim	Rodham	Jacobs SKM	Senior Project Manager, NSW Infrastructure
Maria Jose	Rodriguez	ACCIONA	Business Development Manager
Richard	Scott	Leighton Contractors	Project Manager Infrastructure Division - Eastern
Cameron	Silverthorne	Lend Lease Engineering - NSW	Pre-Contracts Manager
John	Sindel	Fulton Hogan	Business Development Manager - NSW
Antony	Sprigg	Infrastructure Sustainability Council of Australia (ISCA)	Chief Executive Officer
Bruce	Spry	URS Australia	Principal Civil Engineer
Tony	Stante	Evans & Peck	Executive Consultant
Jay	Stricker	AECOM	Industry Director - Transportation
Giles	Swindley	Fulton Hogan	Pre Contracts Manager
Stephen	Thompson	GHD	Service Group Manager Sustainability & Climate Change
Peter	Tilley	Bouygues Construction	Strategic Projects Manager
Allan	Uhlmann	Queensland Department of Transport and Main Roads	Director (Program Services)
John	Vida	Lend Lease	NSW Engineering Manager
Richard	Vincent	OHL	Business Development Manager - Pacific Region
Rebecca	Walker-Edwards	Lend Lease Engineering - NSW	Environment, Sustainability and QA Manager
Adam	Watts	SMEC Australia	Manager, Major Projects - Transport
Aleksandra	Young	EPA	
Andrea	Zambolt	Parsons Brinckerhoff	Principal Environmental Scientist