

# 7

## Water

### 7.1

#### *Introduction and Methodology*

The existing water environment has been characterised using published information obtained from the Environment Agency, reference to previously published documents and turbidity monitoring undertaken in May/June 2005.

Information on bathing water quality was obtained from the Environment Agency's Bathing Waters Directive database, which holds data on monitoring samples.

Sediment transport modelling was undertaken in June 2005 to assess the environmental impact of the discharge of drilling lubricants such as bentonite from the directional drilling and the sediment released from the jetting of the trench for the pipeline installation (Appendix A). Southern Water's 125m grid Solent and the Isle of Wight (IOW) MIKE21 tidal hydrodynamic model was used in conjunction with the MIKE21 Particle Tracking Model. This model has been calibrated and extensively verified and applied in other sediment transport impact assessment studies.

### 7.2

#### *Baseline Conditions*

#### 7.2.1

##### *Surface Water*

There are a number of surface water features both within and in close proximity to the study area. These include:

- The Solent – The tidal channel provides a link between the mainland at Lepe and Gurnard on the Isle of Wight. It has an average width of 4.5km and is narrowest at its western entrance. The Solent is strongly asymmetrical in cross-section ([www.scopac.org.uk](http://www.scopac.org.uk)).
- Gurnard Luck Stream - Gurnard Luck stream flows in a northerly direction from Parkhurst Forest to the south of the working area on the Isle of Wight, into the sea.
- Tributaries of the Gurnard Luck – small tributaries link to the Gurnard Luck stream.
- Dark Water – The Dark Water flows in a southerly direction to the west of the working area at Lepe and Lepe Road and discharges into the Solent at Lepe Country Park.

## 7.2.2

*Water Resources and Supply*

The need for the scheme in relation to water resources is outlined in section 3.1 'Need and Alternatives'.

Public water supply on the Isle of Wight currently utilises three principal supplies of water; the Carisbrooke WSW abstracting from the chalk aquifer, Sandown WSW abstracting from the River Yar and the existing Cross-Solent transfer to the Isle of Wight from Hampshire. The reliance on these three sources, which account for approximately 74% of average daily supply is shown in Table 7.1.

**Table 7.1** *Treated water 2004/2005*

<b>Name of Source</b>	<b>Water Supplied (Ml/d)</b>
Ashey	0
Bowcombe	1.54
Brighstone	0
Broadfields	0
Calbourne	0.80
<b>Carsibrooke</b>	<b>7.77</b>
Chillerton	0.69
Freshwater	0
Knighton	3.42
Luccombe	0
Niton	0.16
<b>Sandown</b>	<b>8.33</b>
Shalcombe	0.30
Shanklin	0
St Lawrence	0.35
Ventnor	1.47
<b>Cross-Solent transfer</b>	<b>9.13</b>
<b>TOTAL</b>	<b>33.96</b>

A shortfall in water supply from the mainland places heavy reliance on the other sources, particularly Carisbrooke WSW where higher abstraction depletes aquifer storage necessary to meet summer peak demands.

Groundwater levels on the Isle of Wight are critical in locations subject to land slippage.

Water resources in Hampshire are largely dependent on groundwater stored in the chalk aquifer of the Hampshire Downs (Environment Agency 2003b). This groundwater is replenished by winter rainfall which infiltrates the thin soil and percolates down to the water table. It then drains out of the aquifer to provide reliable flows in chalk rivers such as the Test, Itchen and Meon, or abstracted.

The major water supply in the south Hampshire area is provided by Testwood WSW (from the River Test) and Otterbourne WSW (abstraction from the aquifer and from the River Itchen).

### 7.2.3

#### *Flood Risk*

The study area and its hinterland at Lepe lie within an area considered by the Environment Agency to be at a low risk of flooding by the sea. However, the proposed working areas do not lie within a flood-risk area.

At Gurnard, the study area lies within an area considered to be at a low (area surrounding Gurnard Luck stream) to moderate (frontage) risk of flooding. Gurnard Luck Bridge is prone to flooding with the main cause being run-off into the stream. Sluice gates under the Luck Bridge drain the water but this is only possible on each side of the high tide when the sluice gates are open. However, the proposed working areas do not lie within a flood-risk area.

### 7.2.4

#### *Marine Water Quality*

##### Turbidity/Suspended Solids

Emu Ltd carried out background measurements of turbidity levels in the region of potential drilling lubricant discharge locations on both sides of the Solent in May and June 2005. The data gained assists sediment dispersion modelling to determine the impacts of the drilling lubricant discharge and jetting for pipe embedment on the internationally designated conservation sites and shellfisheries (section 9 'Fisheries'). The surveys were undertaken over three days in May and June 2005 (one occasion on a Spring tide, on two occasions on an intermediate tide and one occasion on a Neap tide). Monitoring sites were selected to represent the areas approximately 250m either side of the proposed break out points, between 650m and 750m offshore of the mainland and the Isle of Wight.

The results of the turbidity survey, which are presented as suspended solids (mg/l) (and are derived from the conversion of turbidity (NTU) measurements to suspended solids) are provided in Appendix A.

Suspended sediments were monitored at four sites and a summary of the results are shown in Tables 7.2.

**Table 7.2** *Summary statistics for suspended sediment measurements for the survey period*

	445550E 097637N			446003E 097794N			446566E 095706N			446958E 095994N			TOTAL MEAN (mg/l)
	1B	1M	1S	2B	2M	2S	3B	3M	3S	4B	4M	4S	
<b>Mean</b>	9.1	5.7	5.0	5.8	3.6	2.9	9.1	7.1	6.3	10. 8	8.8	7.4	6.8
<b>Min</b>	0.0	0.0	0.3	0.0	0.0	0.0	0.2	0.0	0.0	0.3	0.3	0.0	0.1
<b>Max</b>	45. 0	19. 3	29. 4	14. 6	11. 8	11. 2	23. 6	16. 4	17. 7	28. 8	23. 0	16. 3	21.4
<b>SD</b>	9.2	4.9	5.3	4.4	3.0	2.5	6.0	4.8	4.3	6.9	5.9	5.2	5.2
<b>95%ile</b>	24. 6	14. 3	11. 9	11. 9	9.3	7.8	17. 1	14. 2	13. 1	21. 2	17. 4	16. 0	14.9
<b>99%ile</b>	36. 4	17. 3	24. 3	14. 1	11. 0	9.7	22. 7	16. 0	16. 1	26. 2	20. 7	16. 3	19.2

NOTE: B (1m above bottom), M (Mid-depth) and S (0.5m below surface)

#### Bathing Water Quality

The EU Bathing Water Directive (76/160/EEC) was agreed on 8 December 1975 and imposes statutory objectives on bathing waters. Its two main objectives are:

- to improve or maintain the quality of bathing water for reasons of amenity; and
- to protect public health.

The Environment Agency carries out monitoring and reports to Defra, which assesses compliance on a calendar year basis. The bathing season in England and Wales runs from 15 May to 30 September and sampling commences two weeks before the start of the season. Twenty samples are taken at regular intervals throughout the season at each site and these are analysed for total and faecal coliform bacteria. All samples are taken at predetermined points off the beach of the identified bathing water where the daily average density of bathers is at its highest.

The mandatory coliform standards given in the Directive that are used to assess compliance are that 95% of samples meet the following:

- a limit of 10,000 total coliforms per 100ml.
- no more than 2,000 faecal coliforms per 100ml.

Samples taken in 2004 at the closest sampling points to the study area (Lepe and Gurnard) achieved an 'excellent' rating for all parameters tested for ([www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)).

#### 7.2.5

##### *Urban Wastewater Treatment*

The Environment Agency's Urban Waste Water Treatment Directive database contains details of designated Sensitive Areas located within England and Wales, in order to protect the environment from the adverse effects of wastewater discharges. It also holds summary data concerning the treatment requirements at qualifying discharges upstream of these designations which make a contribution to the undesirable disturbance caused by nutrient enrichment.

The Solent within the study area is classified as a 'sensitive area' for urban wastewater treatment under the Urban Wastewater Treatment Directive.

#### 7.2.6

##### *Catchment Abstraction Management Strategy (CAMS)*

The study area lies within the Isle of Wight CAMS (Environment Agency 2004) and New Forest CAMS (which was due to be started in April 2005). The former strategy has been developed to manage water resources at a local level and will need to be considered by Southern Water during the planning of water resources and management of water supply and demand.

### 7.3

#### ***Impact Assessment and Mitigation***

#### 7.3.1

##### *Construction Impacts: New Forest*

I.1. No water bodies lie adjacent to the proposed drill rig site at Lepe and therefore **no significant impacts** on water bodies are envisaged during the construction works. However, all storage areas for fuel, oil, chemicals and other potentially contaminating liquids will be appropriately sited and bunded in accordance with Environment Agency requirements.

### 7.3.2

#### *Construction Impacts: Isle of Wight*

- I.2. **No significant impacts** on water in the tributary of Gurnard Luck are envisaged during the construction works as the tributary lies at a minimum distance of 20m from the drill rig site. Also the water used for cleaning the pipes will be pre-treated to an acceptable standard agreed with the Environment Agency prior to the discharge into the local watercourse. However, all storage areas for fuel, oil, chemicals and other potentially contaminating liquids will be appropriately sited and bunded in accordance with Environment Agency requirements.

### 7.3.3

#### *Construction Impacts: Marine Areas*

- I.3. There is the potential for impacts on bathing water quality during the construction phase resulting from sedimentation and accidental spillages of fuels, oil, or other construction materials into the water column of the Solent during the directional drilling of the pipeline.

The nature and severity of adverse impacts associated with accidental spillages is difficult to assess. Any pollution or deterioration in water quality is likely to have an associated impact upon wildlife (e.g. smothering of habitats), landscape (e.g. presence of unsightly substances such as oil slicks) and the local community (e.g. presence of potentially hazardous substances).

- M.3. Pollution control measures will be implemented to safeguard aquatic flora and fauna. Good construction management practices will be employed to ensure that there are no significant residual impacts. The storage of fuel, equipment and construction materials will be sited on an impervious base away from water, properly bunded and kept locked when unattended. The relevant codes of practice for construction sites will be implemented, to protect water quality during construction from disturbance of sediment and potential spillage of construction material. This will include adherence to all relevant legislation including the water pollution prevention measures set out in the Environment Agency's Pollution Prevention Guidelines: PPG1 (General Guide to the Prevention of Water Pollution), PPG2 (Above ground oil storage tanks), PPG5 (Works In, Near or Liable to Affect Watercourses) and PPG6 (Working at Construction and Demolition Sites).

Emergency response procedures and equipment, such as oil booms and silt traps, will be kept on-site and all contractor staff will be made aware. Any incident will be reported to the Environment Agency emergency telephone number.

I.4. There are two sources of increased levels of suspended solids in the marine environment:

(i) **Drilling lubricant released from the drill breakouts**  
Drilling lubricants such as bentonite, which is an inert clay is only of concern in relation to suspended and deposited solids. The sediment transport model results show that the depth averaged concentrations of drilling lubricant in the water are predicted to drop well below 0.05mg/l after one week. This is very small in comparison to both mean values and the natural variability in suspended sediment levels (Table 7.2) and will therefore have only a **minor adverse impact** on water quality.

(ii) **Benthic sediment disturbed during embedding (jetting) of the pipeline**  
The sediment transport model results show that depth averaged concentrations of the sand released into the water from the trench mid-section would not exceed 2mg/l in the vicinity of the discharge. The predicted depth averaged sand concentrations are also shown not to exceed 0.5mg/l in the near shore area during the two week simulation period. The simulated sand depth averaged concentrations are shown to fall below 0.5mg/l a few days after the jetting of the trench has ceased. This is very small in comparison to both mean values (which ranged from 2.9mg/l to 10.8mg/l) and the natural variability in suspended sediment levels (which reached a maximum of 29.4mg/l during the monitoring), shown in Table 7.2. Consequently, it is considered that the localised changes in suspended sediment will have only a **minor adverse impact** on water quality.

I.5. Drilling lubricant and benthic sediment released into the water column will settle in the subtidal and intertidal zones.

(i) The deposition depths of drilling lubricant were modelled over a range of discharge scenarios and the cumulative depths are

predicted not to exceed 0.1mm in the study area approximately one week after the release of the drilling lubricant from each release point. As the currents are very strong and the particles are very fine, the drilling lubricant will be rapidly dispersed and will therefore only have a temporary **minor adverse impact**.

- (ii) The cumulative deposition depths of the released sand sediment are predicted not to exceed 0.1mm in the vicinity of the pipeline a few days after the jetting of the pipeline mid-section has ceased. Similarly, the small deposition depths are considered to have only a temporary **minor adverse impact**.

#### 7.3.4

##### *Operational Impacts*

- I.6 The Isle of Wight currently experiences a deficiency in water supply during periods of high demand, and heavy reliance is placed on the Carisbrooke WSW, Sandown WSW and the existing Cross-Solent transfer pipelines (which have reached the end of their design life). The proposed scheme will therefore have a **major beneficial impact** by ensuring that a secure water supply is maintained to customers on the Isle of Wight and by balancing the island's water needs.

The potential to increase the water transfer from the mainland will provide increased flexibility to meet water demand and manage local sources. This will assist aquifer recharge and the maintenance of river levels in the Yar. These are all considered to be **major beneficial impacts** of the scheme.

- I.7. There is the small potential for damage to the pipeline by the accidental lifting of anchors. This could result in the release of treated fresh water into the Solent, and subsequently adversely impact on the international and national conservation sites. It should be noted however, that this risk is much greater with the existing pipeline, which is much more vulnerable as it lies for the most part on the seabed surface. Furthermore, treated fresh water is not expected to have any significant effect on ecology following dilution by sea water. The operational impact of the proposed pipeline on water quality is therefore **negligible**.

- M.7. As part of the detailed design of the scheme, the proposed pipeline will be buried by jetting to a depth of approximately 1.5m and in the shallower

coastal waters, which are most vulnerable to anchor damage, the pipe will be directional drilled beneath the seabed, where it will be completely protected against anchor damage. The flow metering and pressure logging being installed will assist in rapid detection of a failure/leak in the event of damage, to minimise water losses.

### 7.3.5

#### *Further Consents*

Consent will be required from the Environment Agency for the disposal of water into the tributary of Gurnard Luck and under the Land Drainage Act, Water Resources Act and the EC Shellfisheries Directive.

Under the Environment Agency Southern Region Land Drainage and Sea Defence Byelaws, the prior written consent of the Agency is required for any proposed works within 15 metres of a line drawn on the landward side of any sea defence and for any works within 8 metres of the top bank of the Gurnard Luck, designated a 'main river'.

An Environmental Action Plan has been prepared (Halcrow 2005) to ensure that these consents will be obtained prior to the implementation phase of the project.