TECHNOLOGICAL IMPLEMENTATION PLAN

A Framework for the further development, dissemination and use of
the results of EC RTD Projects (including also thematic networks and concerted actions)

Contract No: SMT4-CT98-2215(DG12-RSMT)

The Determination of Hydrocarbons in Water
HYDROCARBEX

DATA SHEETS

- Preliminary version at mid-term (optional, programme per programme)

X **Final version before final term (contractual obligation)**

Table of Contents

Part 1: Overview and Description of the project and the exploitable results

EC PROGRAMME:	**Standard, Measurement and Testing**
PROJECT TITLE & ACRONYM:	**The Determination of Hydrocarbons in Water: Hydrocarbex**
CONTRACT NUMBER :	**SMT4-CT98-2215 (DG12 – RSMT)**
PROJECT WEB SITE (if any) :	
PARTNERS NAMES :	**Dublin City University, School of Physical Sciences,** Ireland **National Microelectronics Research Centre, UCC,** Ireland **Le Verre Floure,** France **Capital Controls Ltd,** UK **Hyperion Ltd,** Ireland

1.1 Executive Summary

a) Original research objectives :

In 1997 the European Commission proposed a Directive to establish a framework for Community action in the field of water policy (OJ C 184, P20). The Directive, known as the Water Framework Directive, was adopted in September 2000 (2000/60/EC). The aim of the Water Framework Directive was to bring all Community legislation on water into a single system so that water management and water policy could be developed in a more coherent way. The 1997 Directive recommended that the Commission should identify a number of 'priority hazardous substances' which should be included in the Directive. On the 16th January 2001 a proposal (COM 2001/17/) was prepared to amend the Water Framework Directive to include a list of these 'priority hazardous substances'. The list has 11 substances including PAH (Polycyclic Aromatic Hydrocarbons). Hydrocarbon compounds can be a major pollution problem in drinking water. The list is prioritized on the basis of risk PAH's are also listed under the ' List of Chemical for Priority Action' under the OSPAR Convention for the Protection for the Marine Environment. The Environmental Protection Agency states that 33% of all water pollution is due to hydrocarbons. Their presence in water can create a hazard to public health and the environment. The majority of hydrocarbon pollution incidents are usually due to deliberate dumping of chemicals, accidental spills involving the release of petroleum products such as diesel fuel and gasoline, leaking oil tanks and the release from used fuel. Hydrocarbons also enter surface water from industrial discharges and from accidental spillages. In the case of heavier accidents, hydrocarbons may even enter the groundwater and as a result propose a threat to drinking water.

The monitoring of hydrocarbons in water is defined in the ISO Standard 9377-4 (ISO/TC 147/SC 2/WG 15 N62.) This defines the methods use based on solvent extraction and gas chromatography. The monitoring equipment used by water authorities, oil drilling platforms and industries discharging waste water into rivers is based on this technology. The main disadvantage of this technology are its cost (each unit cost over 19,000 €). The solvents used in the IR extraction method have been shown to be hazardous to the environment and will have to be removed from future use due to EU legislation. Laboratory analysis by its nature is time consuming, expensive and the inherent time delay means that environmental damage is not being monitored as effectively as possible. However, today they are used by the industries as they are listed as the Best Available Technology (BAT) and Best Environmental Practice (BET).Alternatives such as UV fluorescence systems are calibrated for a specific mix of hydrocarbons and the sensors are prone to degradation. Problems arise if more than one type of oil exists, or if there are contaminants from turbidity. (Oil in Water Workshop, 1999).

The aim of this project was to develop a low cost sensor (estimated 6500€ to 13,000€), which can be used as an on-line sensor, with a high sensitivity (to 10 ppb) and a quick recovery time (less than 3 minutes). This meets the requirements specified by the Oil in Water Workshop (Annex 1): 'the need for an unmanned sensor that can work in hostile environments for long periods, the need for a wide dynamic range and the ability to handle all types of samples, including contamination from chemicals and debris'. This argument is also supported in the Frost and Sullivan market study (European Water Pollution Instruments Market, Report 3785-15, January 2000) where they state: ' Customers are increasingly demanding instrumentation that can operate accurately and reliably without manned intervention, and that can demonstrate that the measurement made is valid'.

Applications for the sensor:

Runoff concentrations of petroleum hydrocarbons from automotive-intensive land uses typically range from 1.0 to 10.0 milligrams per litre (1 to 10ppm). The recommended maximum concentration of petroleum hydrocarbons for fisheries protection is 0.1 milligrams per litre (0.1ppm). The EC Directives which state the maximum admissible concentrations of hydrocarbons in drinking, bathing and surface waters are outlined in section 4 of this Technology Implementation Plan. The strictest regulations are for drinking water where the maximum admissible concentration of dissolved or emulsified hydrocarbons is 10 µg/l (10ppb)and the maximum admissible concentration of polycyclic aromatic hydrocarbons is 0.2 µg/l (0.2ppb). These are the levels at which the hydrocarbon sensor will have to operate at if it is to be used for the drinking water market.

b) Expected deliverables :

Main technical deliverable:
The expected deliverable was a new standard on-line measurement system based on infrared attenuated total reflection (ATR) using a polymer-coated sapphire rod for direct quantification of the total hydrocarbon index in water employing the C-H stretching vibration (2940cm^{-1}). The sensor specifications were: a total hydrocarbon index detection limit of 10ppb, a sensor recovery time of three minutes, sensor stability within two minutes with a reproducibility of 5% and a polymer coating lifetime of 800 uses for each coating. The prototype sensor was to be evaluated via laboratory and industrial field trials and at the end of the project the instrument would be brought to a prototype, pre-competitive stage.The sensor can be used for the analysis of the in-take at water treatment plants and treated effluent from the microelectronics industry.

Other deliverables from the project included:

- The sensor is a new product which Capital Controls Ltd. plans to launch on the market within 24 months. A patent search was completed and a patent application is planned over the next six months.
- A new industrial process was developed by the French partner i.e. a new process for the coating of sapphire fibers with polymer. This process will be used to improve an existing production line for fibre optic cables.
- Data was used to generate characteristics curves for the sensors. These curves will be used by the instrument designer as calibration curves of the sensors.
- An R&D Strategy was planned to identifying further research in the area of sensor development for the detection of a wider range of hydrocarbons. The R&D priorities have been identified
- The results will be input to the ISO Working Group (ISO/TC 147/WG 2 Water Quality – On-line Sensors/Analysing Equipment for Water Specifications and Performance tests) through Dublin City University.
- The results will be promoted to the water industry and to relevant National and EU policy officials through the Sensor in Water Industry Group (SWIG www.swig.org.uk) Two of the partners are members of this group.

c) Project's actual outcome *(in terms of technical achievements or if appropriate task per task)*

Main Deliverable:
The main deliverable was an on-line measurement system based on infrared attenuated total reflection (ATR) using a polymer-coated sapphire rod for direct quantification of the total hydrocarbon index in water employing the C-H stretching vibration (2940cm^{-1}). A total hydrocarbon index detection limit of 10ppm was achieved, a sensor recovery time of ten minutes, sensor stability at steady state within twenty minutes and stable hydrocarbon index values after 10 minutes with a reproducibility of 5% and a polymer coating lifetime of 800 uses for each coating. The prototype sensor was evaluated via laboratory and industrial field trials and the instrument was brought to a prototype, pre-competitive stage. The lowest LOD at present for the laboratory prototype, at DCU, is 5ppb Undecane with a PDMS sensing layer. The sensitivity for the smaller hydrocarbons is in the low ppm range. The prototype system has achieved similar sensitivities. The sensor can be used for the analysis of the in-take at water treatment plants and treated effluent from the microelectronics industry. The prototype has been assessed at two test sites.

Other deliverables: Actual outcome

- A patent search has been completed.
- A new industrial process was developed by the French partner i.e. a new process for the coating of sapphire fibers with polymer.
- Data was generated on the characteristics curves for the sensors. These curves have been used by the instrument designer for the calibration of the sensors.
- An R&D Strategy was planned to identifying further research in the area of sensor development for the detection of a wider range of hydrocarbons. The R&D priorities have been identified
- The results have been input to the ISO Working Group (ISO/TC 147/WG 2 Water Quality – On-line Sensors/Analysing Equipment for Water Specifications and Performance tests) through Dublin City University.
- The results have been promoted to the water industry and to relevant National and EU policy officials through the Sensor in Water Industry Group (SWIG www.swig.org.uk) Two of the partners are members of this group.

c) Broad dissemination and use intentions for the expected outputs

The main dissemination and exploitation routes can be summarized as follows:

- Commercialization will be done through the commercial partner (Capital Control Ltd)
- The coating process will be implemented by Le Verre Flouree. Further dissemination of the coating process and will be done through relevant training courses and industrial conferences. Later these processes will be documented as guidelines or handbooks for the industry.
- The results will be input to standards bodies and policy through individual partners involvement in these groups. (ISO Technical Committee 147)
- The scientific developments will be integrated into the Physics courses at DCU and into post graduate activities at the newly National Center for Sensors Research in DCU.

TARGET APPLICATIONS:

Sensor Range (approx.)	Application	Industry
1-10ppb	Drinking Water	Water
1-50ppm	River Intake Protection	Water
1-20ppm	Monitoring HC concentrations in storm water runoff	Wastewater
10-50ppm	Wastewater treatment (oil/water separation)	Wastewater
10-100ppb	Fisheries protection	Fisheries
1-50ppm	Testing bilge and ballast discharge	Marine Transportation
10-100ppm	Monitoring HC concentrations in produced water	Petroleum
0-10ppm	Monitoring HC concentrations in cooling water	Power
Up to 100ppm	Monitoring HC concentrations in accidental spills	Regulatory
Up to 100ppm	Oil storage tanks (Airports/Railways/Petrol Stations)	Transport
0.5-10ppm	Urban Runoff (roads, car parks etc)	Transport
<100ppm	Testing water samples for oil contamination	Laboratories
5-100ppm	Monitoring waste water discharge	Industry
<5ppm	Micro-electronics Industry	Semiconductor

TARGET MARKETS:

The sensor will be used to supplement (or complement) the following technologies used to measure hydrocarbons in water. The list shows the technology, number of existing monitors on the market and number of manufacturers of these systems (Source: National Engineering Laboratory database)

Technology used	Number of systems	Number of Manufacturers
Light Scattering/Turbidity	30	20
Ultraviolet Flourescence	9	8
Solvent extraction and IR absorbtion	3	3
Ultraviolet absorption	3	3
Direction IR absorption	1	1
Combination of IR and UV absorption	1	1

Further Research and Development

The partners are considering further R&D in this area, in particular:
(These priorities were identified in the European Water Pollution Monitoring Instruments Market)
(Frost and Sullivan Report 3785-15, January 2000)

- The application of the technology to monitor other inorganic compounds in water
- Development of customised solutions
- Integrating software into the sensor i.e more intelligence as the point of monitoring
- Development of multi parameter sensors

1.2 Overview of all the main project results

No.	Self-descriptive title of the result	Category *	Partner(s) owning the result(s) (referring in particular to specific patents, copyrights, etc.) & involved in their further use
1	Technical Prototype of Sensor to Detect Hydrocarbons in Water	A	DCU, Capital Controls,
2	New process: sapphire-coated fibers and dedicated IR coupling optics.	A	DCU, Le Verre Fluore
3.	Calibration data for the sensors	B	All
4.	Education and Training material on the design/development of IR sensors	B	DCU, Capital Controls Ltd
5.	Data as input to water sensor standard ISO WG5 TC 146	B	DCU
6.	Dissemination through Sensors in Water Industry Group (SWIG)	A	DCU, Capital Controls

* A: results usable outside the consortium / B: results usable within the consortium / C: non usable results

1.3 Quantified Data on the dissemination and use of the project results

Items about the dissemination and use of the project results (consolidated numbers)	Currently achieved quantity	Estimated future*
# of product innovations (commercial)	**1** (Laboratory Models available)	**3**
# of process innovations (commercial)	**2** (Laboratory version developed)	**2**
# of new services (commercial) # of new services (public)	**1** (Detection of hydrocarbons) **1** (Advice on hydrocarbon detection.)	**1** **1**
# of new methods (academic)	**2** (Coating of sapphire +Polishing of IR Lenses)	**2**
# of scientific breakthrough	**1** (Development of IR Sensor technology to detect hydrocarbons)	**1**
# of technical standards to which this project has contributed	**1** (Sensors in Water Standard (CEN))	**1**
# of EU regulations/directives to which this project has contributed	**1** (Water Index Group)	**1**
# of international regulations to which this project has contributed	.....	.....
# of PhDs generated by the project	**1**.....	.....
# of grantees/trainees **	.....	.....

*# = number of ... / * "Future" means expectations within the next 3 years following the end of the project*

** Including transnational exchange of personnel

Exploitation of Result No. 1

1.4 Description of Result No 1

No. & TITLE OF RESULT *(as in section 1.2)*

1	Sensor to detect Hydrocarbons in Water

SUMMARY

The sensor specifications are as follows:

- The sensor will utilise the C-H stretching wavelength (2900/3100cm^{-1})
- The sensor should provide a total hydrocarbons in water index sensitive to 10µg/L (10ppb)
- The recovery time between uses should be less than three minutes
- Sensing stability should be within two minutes and achieve a reproducibility of 5%
- The polymer chosen should have a lifetime of 800 uses for each coating

The material used to coat the sapphire fibre must be able to withstand the environment that it will be subjected to and perform the function that is required. The environment that the probe-head will be exposed to will be water. The material must then be non-soluble in an aqueous environment and be hydrophobic to reduce the interference around the region of interest (2940/3030cm^{-1}). Coating materials will perform the function of enhancing the sensitivity of the probe by preferentially absorbing the analyte chemicals, which are hydrocarbons.

Other generic specifications for the prototype include:

- The sensing probe should be easily replaced when used.
- The design should allow variations in the sensing probe to enable sensing of alternative chemicals using various polymers.
- The probe electronics should be compatible with the generic systems of Capital Controls Ltd.
- The interface and control of the sensor should be software controlled.
- Diagnostics to be logged and allow the possibility of alarm relay operation.

A patent search was undertaken and no relevant patent was found.

Please categorise the result using codes from Annex 1

Subject descriptor codes	670	331	

CURRENT STAGE OF DEVELOPMENT

Please tick one category only ✓

Scientific and/or Technical knowledge (Basic research)	☐
Guidelines, methodologies, technical drawings	☐
Software code	☐
Experimental development stage (laboratory prototype)	**X**
Prototype/demonstrator available for testing	☐
Results of demonstration trials available	☐
Other (please specify.):	☐

DOCUMENTATION AND INFORMATION ON THE RESULT.

List main information and documentation, stating whether public or confidential.

Documentation type	**Details (Title, ref. number, general description, language)**	**Status: *PU*=Public *CO*=Confidential**
Final Scientific Report	Published on 30th June 2001	PU
Mid-term Report	Published November 1999	PU
Report (Month 6)	Report on the sensor definition and specifications	PU
Report (Month 24)	Report on the performance of the sensor in laboratory trials	PU
Report (Month 29)	Report on the performance of the sensor in industrial field trials	PU

INTELLECTUAL PROPERTY RIGHTS

Indicate all generated knowledge and possible pre-existing know-how (background or sideground) being exploited

Type of IPR	**Tick a box and give the corresponding details (reference numbers, etc.) if appropriate.**		**Knowledge *(K)*/ Pre-existing know-how *(P)***
	Current	**Foresee**	
Patent applied for	• **No**	**X**	
Patent search carried out	• **No**	•	
Patent granted	• **No**	•	
Registered design	• **No**	•	
Trademark applications	• **No**	•	
Copyrights	• **No**	•	
Secret know-how	• **No**	•	
other – please specify :	• **No**	•	

1.5 Quantified data about Result No 1

Items (about the results)	Actual current quantity [a]	Estimated (or future) quantity [b]
Time to application / market (in months from the end of the research project)		**36 months**
Number of (public or private) entities potentially involved in the implementation of the result :		……**3**…….
of which : number of SMEs :		……**2**……..
of which : number of entities in third countries (outside EU) :		……**0**……..
Targeted user audience: # of reachable people	……..	**566 authorities**
# of S&T publications (referenced publications only)	……..	**5**
# of publications addressing general public (e.g. CD-ROMs, WEB sites)	……..	**2**
# of publications addressing decision takers / public authorities / etc…	……..	**4**
Visibility for the general public	**YES**	

[a] *Actual current quantity = the number of items already achieved to date.*

[b] *Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve within the next 3 years.*

Exploitation of Result No. 2

1.4 Description of Result No 2

No. & TITLE OF RESULT *(as in section 1.2)*

2	**New process: sapphire -coated fibers and dedicated IR coupling optics.**

SUMMARY

PDMS was deemed to be the most suitable of the polymers due to its ease of use, inertness in response to chemical attack, the ability to enhance the target analytes and its transmission window in the wavelegth range of interest.

The optimum process parameters identified are:

1. Pre-cure at 120^{o}C for 10mins to evaporate all remaining solvent
2. Cure at 230^{o}C for 2 hours
3. Allow to cool and stabilise for approximately 2 hours

The ability to coat the fibre evenly and completely in the sensing region is critical to the performance of a sensor.

Please categorise the result using codes from Annex 1

Subject descriptor codes	670	331	

CURRENT STAGE OF DEVELOPMENT

Please tick one category only ✓

Scientific and/or Technical knowledge (Basic research)	☐
Guidelines, methodologies, technical drawings	☐
Software code	☐
Experimental development stage (laboratory prototype)	
Prototype/demonstrator available for testing	**X**
Results of demonstration trials available	☐
Other (please specify.):	☐

DOCUMENTATION AND INFORMATION ON THE RESULT.

List main information and documentation, stating whether public or confidential.

Documentation type	**Details (Title, ref. number, general description, language)**	**Status: *PU*=Public *CO*=Confidential**
Contractual Report	First Annual Report 1/6/1998 to 30/11/1998	PU
Contractual Document	Final Report 30th June 2001	PU

INTELLECTUAL PROPERTY RIGHTS

Indicate all generated knowledge and possible pre-existing know-how (background or sideground) being exploited

Type of IPR	**Tick a box and give the corresponding details (reference numbers , etc.) if appropriate.**		**Knowledge *(K)*/ Pre-existing know-how *(P)***
	Current	**Foresee**	
Patent applied for	• **No**	•	
Patent search carried out	• **No**	•	
Patent granted	• **No**	•	
Registered design	• **No**	•	
Trademark applications	• **No**	•	
Copyrights	• **No**	•	
Secret know-how	• **No**	•	
other – please specify :	• **No**	•	

1.5 Quantified data about Result No 2

Items (about the results)	**Actual current quantity [a]**	**Estimated (or future) quantity [b]**
Time to application / market (in months from the end of the research project)		**12**
Number of (public or private) entities potentially involved in the implementation of the result :		……**1**…….
of which : number of SMEs :		……**1**……..
of which : number of entities in third countries (outside EU) :		……0……..
Targeted user audience: # of reachable people	……..	**0**
# of S&T publications (referenced publications only)	……..	**2**
# of publications addressing general public (e.g. CD-ROMs, WEB sites)	……..	**0**
# of publications addressing decision takers / public authorities / etc…	……..	**0**
Visibility for the general public	**No**	

[a] *Actual current quantity = the number of items already achieved to date.*

[b] *Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve within the next 3 years.*

Exploitation of Result No. 3

1.4 Description of Result No 3

No. & TITLE OF RESULT *(as in section 1.2)*

3	Calibration Data for the sensors

SUMMARY

The sensor that was developed in this project is the physical device, which will be installed in rivers, water reservoirs and in discharge pipes from factories.

To the sensor developer and the sensor vendor the more important issue is the calibration curve. This is used to calibrate the sensor, to test its performance and to provide the warrantees demanded by the customer. The calibration curve will also be used to identify the limitations of the sensor. The calibration data takes into account the range of temperature applications, the drift of the sensor and the test kits that will be needed to recalibrate the instrument.

The calibration curve will not be a product but will be the criteria on which the applications of the sensor will be selected.

Please categorise the result using codes from Annex 1

Subject descriptor codes	670	331	

CURRENT STAGE OF DEVELOPMENT

Please tick one category only ✓

Scientific and/or Technical knowledge (Basic research) Guidelines, methodologies, technical drawings	☐ **X**
Software code	☐
Experimental development stage (laboratory prototype)	☐
Prototype/demonstrator available for testing Results of demonstration trials available	☐ ☐
Other (please specify.):	☐

DOCUMENTATION AND INFORMATION ON THE RESULT.

List main information and documentation, stating whether public or confidential.

Documentation type	**Details (Title, ref. number, general description, language)**	**Status: *PU*=Public *CO*=Confidential**
Final Report	Final project report 31st May 2001	PU

INTELLECTUAL PROPERTY RIGHTS

Indicate all generated knowledge and possible pre-existing know-how (background or sideground) being exploited

Type of IPR	**Tick a box and give the corresponding details (reference numbers, etc.) if appropriate.**		**Knowledge *(K)*/ Pre-existing know-how *(P)***
	Current	**Foresee**	
Patent applied for	• **Not relevant**	•	
Patent search carried out	• **Not relevant**	•	
Patent granted	• **Not relevant**	•	
Registered design	• **Not relevant**	•	
Trademark applications	• **Not relevant**	•	
Copyrights	• **YES**	•	
Secret know-how	• **No**	•	
other – please specify :	• **No**	•	

1.5 Quantified data about Result No 4

Items (about the results)	Actual current quantity [a]	Estimated (or future) quantity [b]
Time to application / market (in months from the end of the research project)		**36**
Number of (public or private) entities potentially involved in the implementation of the result :		**3**
of which : number of SMEs :		**2**
of which : number of entities in third countries (outside EU) :		**0**
Targeted user audience: # of reachable people	……..	**0**
# of S&T publications (referenced publications only)	……..	**0**
# of publications addressing general public (e.g. CD-ROMs, WEB sites)	……..	**0**
# of publications addressing decision takers / public authorities / etc…	……..	**2**
Visibility for the general public	**No**	

[a] *Actual current quantity = the number of items already achieved to date.*
[b] *Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve within the next 3 years.*

Exploitation of Result No. 4

1.4 Description of Result No 4

No. & TITLE OF RESULT *(as in section 1.2)*

4	Educational and Training Material

SUMMARY

In this project two of the partners used the reports as educational and training material.

Dublin City University (DCU)

DCU has recently created the National Centre for Sensor Research (NCSR). One of the courses offered by the lecturers from this research centre is a course on infrared sensors. The reports generated in this project and the experiments and test rigs prepared for the project will be used as lecture material and laboratory experiments in the Sensor Research Centre.

Capital Controls Ltd will use the reports as a basis for training material for the staff who are responsible for the design and manufacture of the hydrocarbex sensors. These training courses will also incorporate the slides and multimedia material generated as part of the contractors meeting.

Please categorise the result using codes from Annex 1

Subject descriptor codes	670	331	

CURRENT STAGE OF DEVELOPMENT

Please tick one category only ✓

Scientific and/or Technical knowledge (Basic research)	☐
Guidelines, methodologies, technical drawings	**X**
Software code	☐
Experimental development stage (laboratory prototype)	☐
Prototype/demonstrator available for testing	☐
Results of demonstration trials available	☐
Other (please specify.):	☐

DOCUMENTATION AND INFORMATION ON THE RESULT.

List main information and documentation, stating whether public or confidential.

Documentation type	**Details (Title, ref. number, general description, language)**	**Status: *PU*=Public *CO*=Confidential**
Final Report	Final report 30th June 2001	PU
Lecture Material	Course on Infrared sensor	CO
Training Material	Training course on the manufacture of the hydrocarbex sensor	CO

INTELLECTUAL PROPERTY RIGHTS

Indicate all generated knowledge and possible pre-existing know-how (background or sideground) being exploited

Type of IPR	**Tick a box and give the corresponding details (reference numbers, etc.) if appropriate.**		**Knowledge *(K)*/ Pre-existing know-how *(P)***
	Current	**Foresee**	
Patent applied for	• **Not Relevant**	•	
Patent search carried out	• **Not Relevant**	•	
Patent granted	• **Not Relevant**	•	
Registered design	• **Not Relevant**	•	
Trademark applications	• **Not Relevant**	•	
Copyrights	• **Yes**	•	Knowledge
Secret know-how	• **No**	•	
other – please specify :	• **No**	•	

1.5 Quantified data about Result No 4

Items (about the results)	Actual current quantity [a]	Estimated (or future) quantity [b]
Time to application / market (in months from the end of the research project)		**3**
Number of (public or private) entities potentially involved in the implementation of the result :		……**1**…….
of which : number of SMEs :		……**1**……..
of which : number of entities in third countries (outside EU) :		……**0**……..
Targeted user audience: # of reachable people	……..	**50 per year**
# of S&T publications (referenced publications only)	……..	**5**
# of publications addressing general public (e.g. CD-ROMs, WEB sites)	……..	**0**
# of publications addressing decision takers / public authorities / etc…	……..	**0**
Visibility for the general public	**No**	

[a] *Actual current quantity = the number of items already achieved to date.*
[b] *Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve within the next 3 years.*

Exploitation of Result No. 5

1.4 Description of Result No 5

No. & TITLE OF RESULT *(as in section 1.2)*

5	**Input to ISO Standard ISO TC 146**

SUMMARY

Prof. Brian McCraith is a member of the ISO Technical Committee ISO/TC147/WG2. This standard covers sensor in water.

The data will also be provided to the ISO/TC/147/WG15 which specifies the methods which are used to measure the hydrocarbon oil index. (http://www.oslo.sintef.no/chem/6640/thmldo/llgcfi.htm)

The following CEN Standards were also identified (www.cenorm.be)

Technical Committee 164 Water Supply

Technical Committee 230 Water Analysis

Please categorise the result using codes from Annex 1

Subject descriptor codes	670	331	

CURRENT STAGE OF DEVELOPMENT

Please tick one category only ✓

Scientific and/or Technical knowledge (Basic research)	☐
Guidelines, methodologies, technical drawings	☐
Software code	☐
Experimental development stage (laboratory prototype)	☐ ✓
Prototype/demonstrator available for testing	☐
Results of demonstration trials available	☐
Other (please specify.):	☐

DOCUMENTATION AND INFORMATION ON THE RESULT.

List main information and documentation, stating whether public or confidential.

Documentation type	**Details (Title, ref. number, general description, language)**	**Status: *PU*=Public *CO*=Confidential**
Contractual Report	First Annual Report 1/6/1998 to 30/11/1998	PU

INTELLECTUAL PROPERTY RIGHTS

Indicate all generated knowledge and possible pre-existing know-how (background or sideground) being exploited

Type of IPR	**Tick a box and give the corresponding details (reference numbers, etc.) if appropriate.**		**Knowledge *(K)*/ Pre-existing know-how *(P)***
	Current	**Foresee**	
Patent applied for	• **Not Relevant**	•	
Patent search carried out	• **Not Relevant**	•	
Patent granted	• **Not Relevant**	•	
Registered design	• **Not Relevant**	•	
Trademark applications	• **Not Relevant**	•	
Copyrights	• **Not Relevant**	•	
Secret know-how	• **Not Relevant**	•	
other – please specify :	• **Not Relevant**	•	

1.5 Quantified data about Result No 5

Items (about the results)	Actual current quantity [a]	Estimated (or future) quantity [b]
Time to application / market (in months from the end of the research project)		**0**
Number of (public or private) entities potentially involved in the implementation of the result :		……**0**…….
of which : number of SMEs :		……**0**……..
of which : number of entities in third countries (outside EU) :		……**0**……..
Targeted user audience: # of reachable people	……..	**25 policy makers**
# of S&T publications (referenced publications only)	……..	**2**
# of publications addressing general public (e.g. CD-ROMs, WEB sites)	……..	**2**
# of publications addressing decision takers / public authorities / etc…	……..	**10**
Visibility for the general public	**Yes**	

[a] *Actual current quantity = the number of items already achieved to date.*
[b] *Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve within the next 3 years.*

Exploitation of Result No. 6

1.4 Description of Result No 6

No. & TITLE OF RESULT *(as in section 1.2)*

6	Data for the Sensors in Water Industry Group

SUMMARY *(200 words maximum)*

The Sensors in Water Industry Group (SWIG www.swig.org.uk) was established by producers and users of water sensors to keep its members up to date with developments in technologies, legislation and standards. Two of the partners (DCU and Capital Controls Ltd.) are members of SWIG.

SWIG concentrates on activities which disseminate information on sensor developments and which foster collaboration. SWIG offers a cost effective way of maintaining an up to date knowledge of, and dissemination of, information on individual new technologies and/or sensor applications. SWIG workshops also consider the affect of existing and forecast regulations and legislation on the design and use of environmental and process measurements.

Aims and Objectives

- Provide a forum for manufacturers, end users and researchers in the sensor community for the testing of new ideas, the exchange of views and networking.
- Provide workshops that concentrate on practical applications and current challenges.
- Encourage collaboration for all parties interested in research, development and use of sensors for water quality and quantity measurements.
- Promote the concept of whole life costing and cost/benefit analysis for process measurement.
- Represent the waste treatment and water quality sensor community to the National Governments , European institutions and other interested bodies.

Please categorise the result using codes from Annex 1

Subject descriptor codes	670	331	

CURRENT STAGE OF DEVELOPMENT

Please tick one category only ✓

Scientific and/or Technical knowledge (Basic research)	☐
Guidelines, methodologies, technical drawings	**X**
Software code	☐
Experimental development stage (laboratory prototype)	☐
Prototype/demonstrator available for testing	☐
Results of demonstration trials available	☐
Other (please specify.):	☐

DOCUMENTATION AND INFORMATION ON THE RESULT.

List main information and documentation, stating whether public or confidential.

Documentation type	**Details (Title, ref. number, general description, language)**	**Status: *PU*=Public *CO*=Confidential**

INTELLECTUAL PROPERTY RIGHTS

Indicate all generated knowledge and possible pre-existing know-how (background or sideground) being exploited

Type of IPR	**Tick a box and give the corresponding details (reference numbers, etc.) if appropriate.**		**Knowledge *(K)*/ Pre-existing know-how *(P)***
	Current	**Foresee**	
Patent applied for	• **Not Relevant**	•	
Patent search carried out	• **Not Relevant**	•	
Patent granted	• **Not Relevant**	•	
Registered design	• **Not Relevant**	•	
Trademark applications	• **Not Relevant**	•	
Copyrights	• **Not Relevant**	•	
Secret know-how	• **Not Relevant**	•	
other – please specify :	• **Not Relevant**	•	

1.5 Quantified data about Result No 6

Items (about the results)	**Actual current quantity [a]**	**Estimated (or future) quantity [b]**
Time to application / market (in months from the end of the research project)		**48**
Number of (public or private) entities potentially involved in the implementation of the result :		……**0**…….
of which : number of SMEs :		……**0**……..
of which : number of entities in third countries (outside EU) :		……**0**……..
Targeted user audience: # of reachable people	……..	**28 (Technical Committee)**
# of S&T publications (referenced publications only)	……..	**2**
# of publications addressing general public (e.g. CD-ROMs, WEB sites)	……..	**1**
# of publications addressing decision takers / public authorities / etc…	……..	**5**
Visibility for the general public	**Yes**	

[a] *Actual current quantity = the number of items already achieved to date.*
[b] *Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve within the next 3 years.*

Signature of Part 1 (by Co-ordinator)

I, **project co-ordinator**, confirm the publishable information contained in this part 1 (sections 1.1 to 1.5) of the Technological Implementation Plan.

Signature: **Name: Prof. Brian McCraith**

Date: 31st May 2001 **Organization: Dublin City University, Ireland**

Part 2 Description of the intentions by each partner

This part 2 must be completed by each partner who is essential for the dissemination and use (i.e. result owners and/or major project contributors and/or major dissemination and use contributors). Each will detail its own use and dissemination intentions concerning the result(s) they are involved with. This description must be made result by result.

These different parts may be transmitted to the Commission either assembled at the consortium level, or individually by each partner to safeguard confidential matters if necessary (through any appropriate media). Obviously, when all partners are implementing a single dissemination and use scheme all together, a single part 2 is needed.

PARTS 2 WILL ALWAYS BE KEPT CONFIDENTIAL BY THE COMMISSION

Exploitation Plans of Dublin City University

2.1 : Description of the use and the dissemination of result(s), (DCU)

MANDATORY INFORMATION :

CONTRACT NUMBER :	**SMT4-CT98-2215 (DG12 – RSMT)**
PARTNER's NAME :	**Dublin City University, School of Physical Sciences,** Ireland
PARTNER's WEB SITE (if any) :	

CONTACT PERSON (S):

Name	Brian McCraith
Position/Title	Professor, Centre Director
Department	Sensors Research Centre
Address	Dublin City University
Telephone	+ 353 1 700 5299
Fax	+ 353 1 700 5384
E-mail	mccraithb@dcu.ie

No, TITLE *(as in section 1.2)* **AND BRIEF DESCRIPTION OF MAIN RESULT(S)**

1	Sensor to detect hydrocarbons in water
4	Education material. The reports will be used in course material for post graduate courses on infra red sensors
5	Input to ISO Standard TC 147

MARKET APPLICATION SECTORS

Please describe the possible sectors for application using the NACE classification in Annex 2.

Market application sectors	671	331		

FOR EACH MAIN RESULT, TIMETABLE OF THE USE AND DISSEMINATION ACTIVITIES WITHIN THE NEXT 3 YEARS AFTER THE END OF THE PROJECT

Mention the use and dissemination related activities, the main associated partners, the related milestones and give an indicative timescale

Activity	Brief description of the activity, including main milestones and deliverables (and how it relates to data in sections 1.5 and 2.2).	Timescale (months)
Further Research and Development	Dublin City University will continue to develop evanescent sensor head configuration for a range of other sensors. DCU will also development other prototype instrument based on the infrared technologies. The partners for this R&D will be Capital Controls Ltd, Le Verre Floure and NMRC. Proposals will be submitted to the Irish Science Foundation Initiative (www.sfi.ie)	**12**
Input to EU Water Policy	Prof. Brian McCraith is a member of the Sensors in Water Group (SWIG). The aim of this group is to provide information on water sensors to the water industry, national officials and EU officials working on the Water Framework Directive. Prof. McCraith will use the data generated in this project as input to this group.	**12**
Input to ISO Water Sensor Standards	Prof. Brian McCraith is a member of the ISO TC 147 WG2. Technical Committee on Sensors for Water. The aim of this Technical Committee is to develop an international harmonized standard. Prof. McCraith will provide 'factual data' to the Technical Committee from this project.	**14**

FORESEEN COLLABORATIONS WITH OTHER ENTITIES

Please tick appropriate boxes (✓) corresponding to your most probable follow-up.

R&D	Further research or development	X	**FIN**	Financial support	☐
LIC	Licence agreement	☐	**VC**	Venture capital/spin-off funding	☐
MAN	Manufacturing agreement	☐	**PPP**	Private-public partnership	☐
MKT	Marketing	☐	**INFO**	Information exchange, training	☐
JV	Joint venture	☐	**CONS**	Available for consultancy	☐
			Other	(please specify)	☐

2.2 : Quantified data for each partner's main result (DCU)

Items	**Currently achieved quantity** [a]	**Estimated future quantity** [b]
Economic impacts (in EURO)	.....0.....	500,000euros
# of licenses issued (within EU) # of licenses issued (outside EU)	.....0..... .....0.....	....
Total value of licenses (in EURO)	.....0.....	.....
# of entrepreneurial actions (start-up company, joint ventures…)	.....0.....	.....1.....
# of direct jobs created [c] # of direct jobs safeguarded [c]	.....0..... .....0.....	....
# of direct jobs lost	.....0.....	.....

[a] *The added value or the number of items already achieved to date.*
[b] *Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve in the future (i.e. expectations within the next 3 years following the end of the project).*
[c] *"Direct jobs" means jobs within the partner involved. Research posts are to be excluded from the jobs calculation*
 # = number of ...

I confirm the information contained in part 2 of this Technological Implementation Plan and I certify that these are our exploitation intentions

Signature: **Name: Prof. Brian McCraith**

Date: 31st May 2001 **Dublin City University**

Exploitation Plans of the National Microelectronics Research Centre

2.1 : Description of the use and the dissemination of result(s), (NMRC)

MANDATORY INFORMATION :

CONTRACT NUMBER :	**SMT4-CT98-2215 (DG12 – RSMT)**
PARTNER's NAME :	**National Micro electronics Research Centre, UCC,** Ireland
PARTNER's WEB SITE (if any) :	www.nmrc.ie

CONTACT PERSON (S):

Name	Dr. Pat Kelly
Position/Title	Director
Department	
Address	Lee Maltings, Prospect Row University College, Cork, Ireland
Telephone	+353 21 4 904 377
Fax	+ 353 21 4 270 271
E-mail	Pat.kelly@nmrc.ie

No, TITLE *(as in section 1.2)* **AND BRIEF DESCRIPTION OF MAIN RESULT(S)**

1	Sensor to monitor hydrocarbons in water
3	Calibration data for sensor

MARKET APPLICATION SECTORS

Please describe the possible sectors for application using the NACE classification in Annex 2.

Market application sectors	671	331		

FOR EACH MAIN RESULT, TIMETABLE OF THE USE AND DISSEMINATION ACTIVITIES WITHIN THE NEXT 3 YEARS AFTER THE END OF THE PROJECT

Mention the use and dissemination related activities, the main associated partners, the related milestones and give an indicative timescale

Activity	**Brief description of the activity, including main milestones and deliverables (and how it relates to data in sections 1.5 and 2.2).**	**Timescale (months)**
Further Research and Development	The NMRC will continue research on infrared sensors as part of its overall research programme. NMRC will work with DCU, Capital Controls, and Le Verre Floure to develop further sensors based on the technologies developed in this project.	**12**

FORESEEN COLLABORATIONS WITH OTHER ENTITIES

Please tick appropriate boxes (✓) corresponding to your most probable follow-up.

R&D	Further research or development	X	**FIN**	Financial support	☐
LIC	Licence agreement	☐	**VC**	Venture capital/spin-off funding	☐
MAN	Manufacturing agreement	☐	**PPP**	Private-public partnership	☐
MKT	Marketing	☐	**INFO**	Information exchange, training	☐
JV	Joint venture	☐	**CONS**	Available for consultancy	☐
			Other	(please specify)	☐

2.2 : Quantified data for each partner's main result (NMRC)

Items	**Currently achieved quantity** [a]	**Estimated future quantity** [b]
Economic impacts (in EURO)	.....0.....	500000 euros
# of licenses issued (within EU)	.....0.....	.....0.....
# of licenses issued (outside EU)	.....0.....	.....0.....
Total value of licenses (in EURO)	.....0.....	.....0.....
# of entrepreneurial actions (start-up company, joint ventures…)	.....0.....	.....1.....
# of direct jobs created [c]	.....0.....	4
# of direct jobs safeguarded [c]	.....0.....	.....0.....
# of direct jobs lost	.....0.....	.....0.....

[a] *The added value or the number of items already achieved to date.*

[b] *Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve in the future (i.e. expectations within the next 3 years following the end of the project).*

[c] *"Direct jobs" means jobs within the partner involved. Research posts are to be excluded from the jobs calculation*

 # = number of ...

I confirm the information contained in part 2 of this Technological Implementation Plan and I certify that these are our exploitation intentions

Signature: **Name: Dr. Pat Kelly, NMRC**

Date:

Exploitation Plans of Le Verre Floure

2.1 : Description of the use and the dissemination of result(s) (Le Verre Floure)

MANDATORY INFORMATION :

CONTRACT NUMBER :	**SMT4-CT98-2215 (DG12 – RSMT)**
PARTNER's NAME :	**Le Verre Floure,** France
PARTNER's WEB SITE (if any) :	

CONTACT PERSON (S):

Name	Gwenael Maze
Position/Title	President
Department	
Address	Campus Kerlann F-35170 BRUZ Britanny France
Telephone	+ 33 299 05 3130
Fax	+ 33 299 05 3953
E-mail	gwenael.maze@wanadoo.fr

No, TITLE *(as in section 1.2)* **AND BRIEF DESCRIPTION OF MAIN RESULT(S)**

2	**Process for coating sapphire fibres with polymers**

MARKET APPLICATION SECTORS

Please describe the possible sectors for application using the NACE classification in Annex 2.

Market application sectors	671	331		

FOR EACH MAIN RESULT, TIMETABLE OF THE USE AND DISSEMINATION ACTIVITIES WITHIN THE NEXT 3 YEARS AFTER THE END OF THE PROJECT

Mention the use and dissemination related activities, the main associated partners, the related milestones and give an indicative timescale

Activity	**Brief de scription of the activity, including main milestones and deliverables (and how it relates to data in sections 1.5 and 2.2).**	**Timescale (months)**
Installation of techniques in existing processes	Installation of techniques for coating and removal of polymer on sapphire rods.	**12**

FORESEEN COLLABORATIONS WITH OTHER ENTITIES

Please tick appropriate boxes (✓) corresponding to your most probable follow-up.

R&D	Further research or development	☐	**FIN**	Financial support	x
LIC	Licence agreement	☐	**VC**	Venture capital/spin-off funding	☐
MAN	Manufacturing agreement	☐	**PPP**	Private-public partnership	☐
MKT	Marketing	☐	**INFO**	Information exchange, training	☐
JV	Joint venture	☐	**CONS**	Available for consultancy	☐
			Other	(please specify)	☐

2.2 : Quantified data for each partner's main result (Le Verre Floure)

Items	**Currently achieved quantity** [a]	**Estimated future quantity** [b]
Economic impacts (in EURO)	.....0.....	800,000euros...
# of licenses issued (within EU)	.....0.....	.....0.....
# of licenses issued (outside EU)	.....0.....	.....0.....
Total value of licenses (in EURO)	.....0.....	.....0.....
# of entrepreneurial actions (start-up company, joint ventures…)	.....0.....	.....0.....
# of direct jobs created [c]	.....0.....	.....3.....
# of direct jobs safeguarded [c]	.....0.....	.....5.....
# of direct jobs lost	.....0.....	.....0.....

[a] *The added value or the number of items already achieved to date.*

[b] *Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve in the future (i.e. expectations within the next 3 years following the end of the project).*

[c] *"Direct jobs" means jobs within the partner involved. Research posts are to be excluded from the jobs calculation*

 # = number of ...

I confirm the information contained in part 2 of this Technological Implementation Plan and I certify that these are our exploitation intentions

Signature: **Name:** Gwenael Maze, President

Date: 31st May 2001 **Le Verre Floure**

Exploitation Plans of Capitals Controls Ltd.

2.1 : Description of the use and the dissemination of result(s) (Capital Controls Ltd.)

MANDATORY INFORMATION :

CONTRACT NUMBER :	**SMT4-CT98-2215 (DG12 – RSMT)**
PARTNER's NAME :	**Capital Controls Ltd,** UK
PARTNER's WEB SITE (if any) :	

CONTACT PERSON (S):

Name	Dr. Rhys Lewis
Position/Title	Managing Director
Department	
Address	8, Hawksworth, Southmead Industrial Park, Didcot Oxon: OX11 7HR UK
Telephone	+ 44 1235 512 000
Fax	+ 44 1235 512 020
E-mail	jpenn@capitalcontrols.co.uk

No, TITLE *(as in section 1.2)* **AND BRIEF DESCRIPTION OF MAIN RESULT(S)**

1	**Sensor to detect hydrocarbons in water**
3	**Patent on the sensor**
4	**Calibration Curve of the sensor**
6	**Training Material for staff responsible for the design of the manufacturing process for the sensor**

MARKET APPLICATION SECTORS

Please describe the possible sectors for application using the NACE classification in Annex 2.

Market application sectors	671	331		

FOR EACH MAIN RESULT, TIMETABLE OF THE USE AND DISSEMINATION ACTIVITIES WITHIN THE NEXT 3 YEARS AFTER THE END OF THE PROJECT

Mention the use and dissemination related activities, the main associated partners, the related milestones and give an indicative timescale

Activity	**Brief description of the activity, including main milestones and deliverables (and how it relates to data in sections 1.5 and 2.2).**	**Timescale (months)**
Product Development	Fabrication and testing of the instrument, system calibration and optimization. This will be done by Capital Controls Ltd. on its own.	**36**
Product Demonstration	Demonstration of the sensor in a range of location. This will be done by Capital Controls Ltd. on its own.	**40**
Product Launch	Launch of sensors on the market This will be done by Capital Controls Ltd. on its own.	**45**
Further Research and Development	Capital Controls Ltd. Will continue R&D on a range of sensors based on the technologies developed in this project. Proposals will be made to UK R&D programmes and to the EU Framework programmes. This will be done in cooperation with existing partners.	**12**

FORESEEN COLLABORATIONS WITH OTHER ENTITIES

Please tick appropriate boxes (✓) corresponding to your most probable follow-up.

R&D	Further research or development	**X**	**FIN**	Financial support	☐
LIC	Licence agreement	☐	**VC**	Venture capital/spin-off funding	☐
MAN	Manufacturing agreement	☐	**PPP**	Private-public partnership	☐
MKT	Marketing	**X**	**INFO**	Information exchange, training	☐
JV	Joint venture	☐	**CONS**	Available for consultancy	☐
			Other	(please specify)	☐

2.2 : Quantified data for each partner's main result (Capital Controls Ltd.)

Items	**Currently achieved quantity** [a]	**Estimated future quantity** [b]
Economic impacts (in EURO)	.....0.....	2.5 meuros.
# of licenses issued (within EU)	.....0.....	.....0.....
# of licenses issued (outside EU)	.....0.....	.....0.....
Total value of licenses (in EURO)	.....0.....	.....0.....
# of entrepreneurial actions (start-up company, joint ventures…)	.....0.....	.....0.....
# of direct jobs created [c]	.....0.....	.....15.....
# of direct jobs safeguarded [c]	.....0.....	.....10.....
# of direct jobs lost	.....0.....	.....0.....

[a] *The added value or the number of items already achieved to date.*

[b] *Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve in the future (i.e. expectations within the next 3 years following the end of the project).*

[c] *"Direct jobs" means jobs within the partner involved. Research posts are to be excluded from the jobs calculation*

 # = number of ...

I confirm the information contained in part 2 of this Technological Implementation Plan and I certify that these are our exploitation intentions

Signature: **Name:** Rhys Lewis, Managing Director

Date: 31st May 2001 **Capital Controls, Ltd**

Exploitation Plans of Hyperion Ltd.

2.1 : Description of the use and the dissemination of result(s) (Hyperion Ltd.)

MANDATORY INFORMATION :

CONTRACT NUMBER :	**SMT4-CT98-2215 (DG12 – RSMT)**
PARTNER's NAME :	**Hyperion Ltd,** Ireland
PARTNER's WEB SITE (if any) :	www.hyperion.ie

CONTACT PERSON (S):

Name	Dr. Sean McCarthy
Position/Title	Managing Director
Department	Training
Address	Main Street, Watergrasshill, Co-Cork, Ireland
Telephone	+ 353 21 4 889 461
Fax	+ 353 21 4 889 465
E-mail	Sean.mccarthy@hyperion.ie

No, TITLE *(as in section 1.2)* **AND BRIEF DESCRIPTION OF MAIN RESULT(S)**

None	Hyperion Ltd. Has decided not to exploit any of the results of this project. Following this project Hyperion decided to terminate all R&D activities and concentrate on developing training courses for research managers.

MARKET APPLICATION SECTORS

Please describe the possible sectors for application using the NACE classification in Annex 2.

Market application sectors	N/A			

FOR EACH MAIN RESULT, TIMETABLE OF THE USE AND DISSEMINATION ACTIVITIES WITHIN THE NEXT 3 YEARS AFTER THE END OF THE PROJECT

Mention the use and dissemination related activities, the main associated partners, the related milestones and give an indicative timescale

Activity	**Brief description of the activity, including main milestones and deliverables (and how it relates to data in sections 1.5 and 2.2).**	**Timescale (months)**
None	The most useful results Hyperion obtained from this project was the methodology used to identify the exploitable results from the project.	Not applicable

FORESEEN COLLABORATIONS WITH OTHER ENTITIES

Please tick appropriate boxes (✓) corresponding to your most probable follow-up.

R&D	Further research or development	☐	**FIN**	Financial support	☐
LIC	Licence agreement	☐	**VC**	Venture capital/spin-off funding	☐
MAN	Manufacturing agreement	☐	**PPP**	Private-public partnership	☐
MKT	Marketing	☐	**INFO**	Information exchange, training	**X**
JV	Joint venture	☐	**CONS**	Available for consultancy	☐
			Other	(please specify)	☐

2.2 : Quantified data for each partner's main result (Hyperion Ltd.)

Items	**Currently achieved quantity** [a]	**Estimated future quantity** [b]
Economic impacts (in EURO)	.....0.....	.....0.....
# of licenses issued (within EU)	.....0.....	.....0.....
# of licenses issued (outside EU)	.....0.....	.....0.....
Total value of licenses (in EURO)	.....0.....	.....0.....
# of entrepreneurial actions (start-up company, joint ventures…)	.....0.....	.....0.....
# of direct jobs created [c]	.....0.....	.....0.....
# of direct jobs safeguarded [c]	.....0.....	.....0.....
# of direct jobs lost	.....0.....	.....0.....

[a] *The added value or the number of items already achieved to date.*

[b] *Estimated quantity = estimation of the quantity of the corresponding item or the number of items that you foresee to achieve in the future (i.e. expectations within the next 3 years following the end of the project).*

[c] *"Direct jobs" means jobs within the partner involved. Research posts are to be excluded from the jobs calculation*

 # = number of ...

I confirm the information contained in part 2 of this Technological Implementation Plan and I certify that these are our exploitation intentions

Signature: **Name: Sean McCarthy**

Date: 31st May 2001 **Hyperion Ltd.**

Part 3 Search for Collaboration through Commission services

A separate part 3 might be completed by each partner willing to set up new collaborations, and seeking dissemination support from the CORDIS services.

The part 3 must be consolidated at the consortium level and transmitted to the Commission by the co-ordinator.

COMMENT

This Part 3 is a consolidated document.

PARTS 3 WILL BE DISSEMINATED BY THE COMMISSION

CONTRACT NUMBER :	Contract No: SMT4-CT98-2215(DG12-RSMT)
PARTNER's NAME[1] :	**DCU, NMRC, Capital Controls Ltd, Le Verre Floure**
RESULT N° & TITLE	**Sensor for detecting Hydrocarbons in Water**

COLLABORATIONS SOUGHT

Please tick appropriate boxes (✓) corresponding to your needs.

R&D	Further research or development	**X**	**FIN**	Financial support	**X**
LIC	Licence agreement	☐	**VC**	Venture capital/spin-off funding	☐
MAN	Manufacturing agreement	☐	**PPP**	Private-public partnership	☐
MKT	Marketing agreement/Franchise	☐	**INFO**	Information exchange	☐
JV	Joint venture	☐	**CONS**	Available for consultancy	☐
			Other	(please specify)	☐

POTENTIAL OFFERED FOR FURTHER DISSEMINATION AND USE

Please, clearly describe your input, the value and interest of the applications and the dissemination and use opportunities that you can offer to your potential partner.

The technologies used in the development of the Hydrocarbex sensor can be used to develop a range of sensors to detect inorganic compounds in water.

The partners can offer the technical expertise of infrared sensor, the coating of sapphire fibres with polymers and a detailed understanding on the water sensors market.

The consortium can also offer development facilities and a range of test equipment, test procedures and analysis software to quantify the performance of the sensors.

Sites which were used to test the Hydrocarbex sensor are also available to test further sensors.

PROFILE OF ADDITIONAL PARTNER(S) FOR FURTHER DISSEMINATION AND USE

Please, clearly describe the profile and the expected input from the external partner(s).

External partners are needed who have a clear technology need for a sensor to detect inorganic compounds in water. The demand for the sensor has to be well defined and all other sources of technologies (the market, technology transfer, existing R&D) have to be investigated and proved to have no technical solution to the identified problems.

I confirm the information contained in part 3 of this Technological Implementation Plan and I authorise its dissemination to assist this search for collaboration.

Signature : **Name (Project Co-ordinator): Prof. Brian McCraith**

Date: 31st May 2001 **Organisation: Dublin City University**

[1] The CORDIS database will include all details of the contact person as they are provided in section 2.1

Part 4 Comment on European Interest

All projects are expected to meet European interests. This section should provide an appraisal of your project in terms of European added value and support to the implementation of European Union policies.

4.1 Community added value and contribution to EU policies

4.1.1 European dimension of the problem

(The extent to which the project has contributed to solve problems at European level)

European Legislation on Water (Water Framework Directive) wishes to specify the acceptable levels of hydrocarbons in water. At the same time the CEN standards body wishes to establish standards for the levels of hydrocarbons in water. The legislation and standards cannot be developed until a reliable sensor is available to measure these limits. THE EU LEGISLATION AND STANDARD WILL BE IMPOSSIBLE (OR EXPENSIVE) TO IMPLEMENT WITHOUT THIS SENSOR

4.1.2 Contribution to de veloping S&T co-operation at international level. European added value

(Development of critical mass in human and financial terms; combination of complementary expertise and resources available Europe-wide)

This project has brought together the wide range of technical, industrial and legislation skills which are needed to develop a sensor which can be used to detect hydrocarbons in water. Three of the partners will continue this cooperation to develop a range of sensor (and solutions to water sensing problems) for a range of industrial and public organisations. The partners have also identified a clear strategy for further joint research projects.

4.1.3 Contribution to policy design or implementation

(Contribution to one or more EU policies; RTD connected with standardisation and regulation at Community and/or national levels)

One of the partners (DCU) is a member of the following policy group and standards committee.
Sensor in Water Group: This group contributes to the development of Water policies, in particular, the Water Framework Directive.
The Water Sensors Committee is a Technical Committee of ISO. The committee deals with the standards for all sensors involved in the sensing of water related parameters.

4.2 Contribution to Community social objectives

4.2.1 Improving the quality of life in the Community :

The project contributes to the improvement of the quality of drinking water in the EU by providing low cost sensor to detect hydrocarbons in water. The availability of this sensor will provide water authorities with technologies to monitor and control water quality and it will provide regulatory bodies with sensor to monitor the quality of drinking water.

4.2.2 Provision of appropriate incentives for monitoring and creating jobs in the Community (including use and development of skills) :

The main contribution to jobs will be through the industrial partners who will develop a product based on the results. The industrial partners (Capital Controls Ltd. and Le Floure) expect to generate up to 10 direct permanent jobs from this project.

4.2.3 Supporting sustainable development, preserving and/or enhancing the environment (including use/conservation of resources) :

In recent years the standard procedure for the determination of hydrocarbons in water included extraction using perhalogenated solvents and subsequent IR spectrometry. However, these solvents have been shown to be hazardous to the environment and must be removed from future use due to EU legislation. Also laboratory analysis by its nature is time consuming, expensive and the inherent time delay means that environmental damage is not being properly monitored.

The sensor developed in this project is an electronic device and it will be used to monitor and control and the levels of hydrocarbons in real time. The applications identified in the project can be summarized as follows:

- detection of hydrocarbons in drinking water
- detection of oil leaks from oil platforms
- detection of hydrocarbons in waste streams from industrial processes

EC Directives Relevant to Hydrocarbons

Europe's citizens are increasingly demanding cleaner water for drinking, bathing and as part of their environment and heritage. As a result, water is one of the most comprehensively regulated areas of EU environmental legislation. Current European legislation on water quality includes:

- Directive on urban waste water (91/271/EEC)
- Directive on nitrates (91/676/EEC)
- Directive on dangerous substances to the aquatic environment (76/464/EEC)
- Directive on bathing water (76/160/EEC)
- Directive on drinking water (80/778/EEC)
- Directive on surface water for the abstraction of drinking water (75/440/EEC)
- Directive on measurement and sampling of drinking water (79/869/EEC)
- Directive on ground water (80/68/EEC)
- Directive on fish water (78/659/EEC)
- Directive on shellfish water (79/923/EEC)

Directive on dangerous substances to the aquatic environment (76/464/EEC)
Council Directive of 4 May 1976 on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community (76/464/EEC) describes two groups of substances (List I and List II). ***List I substances*** includes, for example, "persistent mineral oils and hydrocarbons of petroleum origin"

Directive on Surface Water for the Abstraction of Drinking Water (75/440/EEC)
Council Directive of 16 June 1975 concerning the quality required of surface water intended for the abstraction of drinking water in the Member States (75/440/EEC) sets maximum limits and gives guideline limits for a range of contaminants which may be found in surface water.

Directive on drinking water (80/778/EEC)

Council Directive of 15 June 1980 concerning the quality of water intended for human consumption (80/778/EEC) sets maximum limits and gives guideline limits for a range of drinking water contaminants.

Directive on bathing water (76/160/EEC)

Council Directive of 8 December 1975 concerning the quality of bathing water (76/160/EEC) aims to reduce pollution of bathing waters through the establishment of guideline and mandatory limits for contaminant levels.

Annex 1: Sources of Information

European Union Directives

The Water Framework Directive: Establishing a Framework for Community Action in the Field of Water Policy Com (97) 49 Final 26.2.2000

Amended Proposal (to the Water Framework Directive) establishing the list of priority substances in the field of water policy. Com (2001) 17 Final, 16.1.2001

Directive on **dangerous substances to the aquatic environment** (76/464/EEC)
Directive on **Surface Water for the Abstraction of Drinking Water** (75/440/EEC)
Directive on **drinking water** (80/778/EEC)
Directive on **bathing water** (76/160/EEC)
Directive on **urban waste water** (91/271/EEC)
Directive on **nitrates** (91/676/EEC)
Directive on **dangerous substances to the aquatic environment** (76/464/EEC)
Directive on **surface water for the abstraction of drinking water** (75/440/EEC)
Directive on **measurement and sampling of drinking water** (79/869/EEC)
Directive on **ground water** (80/68/EEC)
Directive on **fish water** (78/659/EEC)
Directive on **shellfish water** (79/923/EEC)

European Union R&D Projects and Reports

- **Development of a New Standardised 'Hydrocarbon Index' Method for Oil in Water:** Contract No: SMT4-CT96-2090 Standards, Measurement and Testing Programme of the Fourth Framework Programme. Project Co-ordinator Arne Kvernheim, Sintef, Norway
- **Community Information System for the Control and Reduction of Pollution: Impact Reference System: effects of oil on marine environment; impact of hydrocarbons on fauna and flora.** Published by the European Commission, ,ISBN 9282856674, Luxembourg, 1999
- **European Testing and Assessment of Comparability of Online Sensors/Analysers:** A Lynggaard-Jensen, H. Svankjaer Jacobson. Published by the European Commission, ISBN 9282893480, 2000

Reports on Standards

- **Water Quality-Determination of hydrocarbon oil index** ISO Standard 9377-4: Document ISO/TC 147/SC2/WG 15 N62 (www.oslo.sintef.no/chem/6640/htmldo/llgcfi.htm)
- CEN Technical Committee 230 **Water Analysis** (www.cenorm.be)
- CEN Technical Committee 164 **Water Supply** (www.cenorm.be)
- **Development of a New Standardised 'Hydrocarbon Index' Method for Oil-in-Water Analysis: Freon Replacements and Standards.** A.L. Kvernheim, H.S. Lund, B.E. Berg, Sintef Applied Chemistry, Norway. E. de Pauw, G.Eppe, University of Liege, Belgium. M Chtaib, Luxcontrol Sa. Luxembourg.

Market Information

European Water Pollution Monitoring Instruments Markets: Report 3785-15, Frost and Sullivan, January 2000 (www.frost.com)

Technical Information

In-Situ Continuous Fibre Optic Sensors for Water Pollutants, B. McCraith,, Optics Sensor Laboratory, Published by IOP Publishing Ltd

Pollutants can't hide from Fibre Optic Sensors. K Tatterson , Photonics Spectra, April 1998 (www.photonics.com)

Industry Reports

Proceedings of the Oil in Water Workshop held in National Engineering Laboratories, 22 April 1999

- **Overview of Legislation for Oil-in-Water Discharge and Monitoring.** T Spence. Department of Trade and Industry, Environmental Unit, Aberdeen.
- **Reliable Oil in Water Monitoring: Problems and Solutions**. M Yang and J Peters, National Engineering Laboratory, Scotland
- **The Need for an In-Line Oil-in-Water Monitor.** A.W. Jamieson Shell UK Exploration and Production, Aberdeen
- **The Control of Oil-in-Water Discharges into Rivers.** Graeme Rose MCIWEM
- **The Implications of Legislation on Oil-in-Water Monitoring.** Z. Cuthbertson, Environmental and Resources Technology Ltd.
- **Monitoring Oil in Produced Water Discharged into the Sea: A Review of Current and Emerging Practices.** E. Garland. Elf Exploration-Production, Pau, France.

Annex 2: Final Review Presentation of the TIP

The follow pages contain the PowerPoint slides which were used in the final presentation of the TIP on 18th May 2001.