

RISK ASSESSMENT WORK GROUP 23 September 2003 Proposal and Cost Estimate to Achieve Work Programme

The ACDS Working Group on Pipelines meeting on 9 July 2003 enables UKOPA to be involved with "fitness for purpose" assessment of HSE models for detailed pipeline risk assessment tools through membership of the P5 group as part of the Fundamental Review of Land Use Planning. HSE are no longer participating in joint developments identified and being progressed as part of the Working Party (Risk Assessment), so this proposal puts forward a programme for completing and publishing enhanced methodologies for pipeline risk assessment. For more details on the work packages see attached note dated June 2003.

1 Failure Rate Contribution from Ground Movement.

Current situation

British Geological Survey have completed this work for Transco

Further work / Deliverable

Mark up areas on maps

Produce and publish paper on results

Cost / timescale

~ £3k to produce paper - end December 2003 – who?

2 Third Party Damage Predictive Model.

Current situation

Advantica have a proposal to develop Limit State Function for £40k

Further work / Deliverable

Advantica to develop LSF

Produce and publish paper on results

Develop into a computer-based model for predicting pipeline failure rates

Cost / timescale

£40k for initial Advantica work - by end December 2003

~ £20k for further work to develop computer model by March 2004?

3 Mitigation – Risk Reduction Factors for Physical Protection of Pipelines.

Current Situation

Transco report available on 3rd party damage for slabbing and marker tape

HSE CRR / W S Atkins report on 3rd party damage gives sufficient data for Fault Tree Analysis

Further work / Deliverable

ABB (Rod McConnell) to complete Fault Tree Analysis

Produce and publish paper on results and risk reduction factors for marker tape and slabbing

Cost / timescale

£3k for ABB work - publish paper by end November 2003

4 Ethylene Pipelines – Revision of LUPZs.

Current Situation

HSE have sent electronic output from their modelling of TPEP Feb 2003

ABB Risk assessment of TPEP in progress for Huntsman using replicate HSE models using

UKOPA failure rate data

Further work / Deliverable

1 ABB - further work on review of applicability of UKOPA data to ethylene pipelines following on from Jane Haswell's work

2 ABB (Rod McConnell) to produce generalised risk assessment for UK ethylene pipelines
Produce and publish paper on results and proposed LUP zones for UK ethylene pipelines

Cost / timescale

£8k for ABB work - publish papers by end November 2003

5 Spiked Crude & NGLs – Revision of LUPZs .

Current Situation

BP currently considering how to progress this (Neil Macnaughton)

ABB able to provide Risk Assessment review and consultancy if required, similar to Gasoline pipelines (see below)

Further work / Deliverable

ABB (Rod McConnell) to assist in review of previous risk assessments for spiked crude - eventual aim to produce and publish paper on results and proposed LUP zones for UK ethylene pipelines - timescale to be devised

Cost / timescale

~ £5k for ABB work - publish paper

6 Gasoline Pipeline Risk Assessment.

Current Situation

Peter Davis progressing review of previous risk assessments and methodologies with Rod McConnell in preparing the arguments ready for November meeting with HSE

Further work / Deliverable

ABB (Rod McConnell) to produce review of previous risk assessments for gasoline to provide balance view of risk assessment approach which is reasonable for gasoline pipelines in the UK

Cost / timescale

ABB work cost not yet defined - assume £5k

7 Involvement with P5 Committee

This will require significant research and preparation time to enable in-depth understanding and discussion of HSE's modelling techniques so as to put strong arguments to this group

Estimate 5 meetings + preparation time = 15 days = £9000 (2003 and 2004)

Total Costs

1	Ground Movement work	3,000
2	Predictive Modelling	
	Limit State Function	40,000
	Computer model	20,000
3	Mitigation Fault Tree analysis	3,000
4	Ethylene LUP Zones	
	Review failure rate data	5,000
	Generalised risk assessment	3,000
5	Spiked crude risk assessment	
	Joint work with BP	5,000
6	Gasoline Risk assessment	5,000
7	P5 Committee	9,000
	Total Estimate	93,000
	Contingency	7,000
	Total	~ £100,000

MAJOR HAZARDS SUB-COMMITTEE
Working Group on Pipelines – Working Party (Risk Assessment)
Proposals for Future Work Programme

June 2003

This note discusses the outstanding work programme being progressed by the Working Party (Risk Assessment) and proposes a possible work process and timetable for completing it. There are 6 outstanding issues which need to be resolved. They are listed below with a brief explanation. The proposed work programme, deliverables and timescale for each are attached.

1 Failure Rate Contribution from Ground Movement.

Due to one historical incident in the UK, the failure rate contribution from Ground Movement to the Land Use Planning Zones (LUPZ) is disproportionately high for a significant number of pipelines, particularly natural gas pipeline in Suburban areas, which have had their LUPZs increased as a result of the HSE reassessment in 2002. Transco have embarked on a project with the British Geological Survey to identify parts of the country where there is a risk of ground movement. When this work is completed, it should enable more realistic LUPZs to be set for most of Transco's transmission pipelines.

2 Third Party Damage Predictive Model.

There is a significant divergence in the Third Party Damage Predictive Models used by HSE and Transco. This results in differences of up to 100 and in a few cases of 1000 in the LUPZs calculated by HSE and Transco, because the highest contribution to risk is from Third Party damage to the pipelines. Advances in fracture mechanics over the past 25 years enables a much better way of modelling gouges and micro-cracks which result from Third Party Damage. Advantica have put forward a proposal for progressing the modelling techniques so as to reflect the best attributes of the HSE and Transco models.

3 Mitigation – Risk Reduction Factors for Physical Protection of Pipelines.

One recognised way to reduce the risk of Third Party Damage (including the UK Code for Gas Transmission Pipelines) is to install reinforced concrete slabbing and marker tape over a pipeline to warn unauthorised excavator drivers that a pipeline exists below the slabs. An initial review of mitigation methods was issued by WP(RA) in February 2003. Transco have kindly contributed (on a confidential basis) their 1995 report on a research project into digging up marked and unmarked pipelines which involved 53 tests at two test sites. Slabbing is a relatively cost-efficient way of risk reduction compared with, say, re-laying the pipeline. An informed view on the degree of risk reduction, which can be allowed for slabbing is therefore required by HSE and Operators for re-assessment of LUPZs.

4 Ethylene Pipelines – Revision of LUPZs.

After natural gas, ethylene is the next largest MAHP pipeline network in the UK. WP(RA) has started the reassessment and were close to defining new LUPZs based on the HSE's MISHAP consequence modelling, and using UKOPA's failure rate data. This will significantly reduce Land Use Planning issues which arise in the vicinity of these pipelines.

5 Spiked Crude & NGLs – Revision of LUPZs .

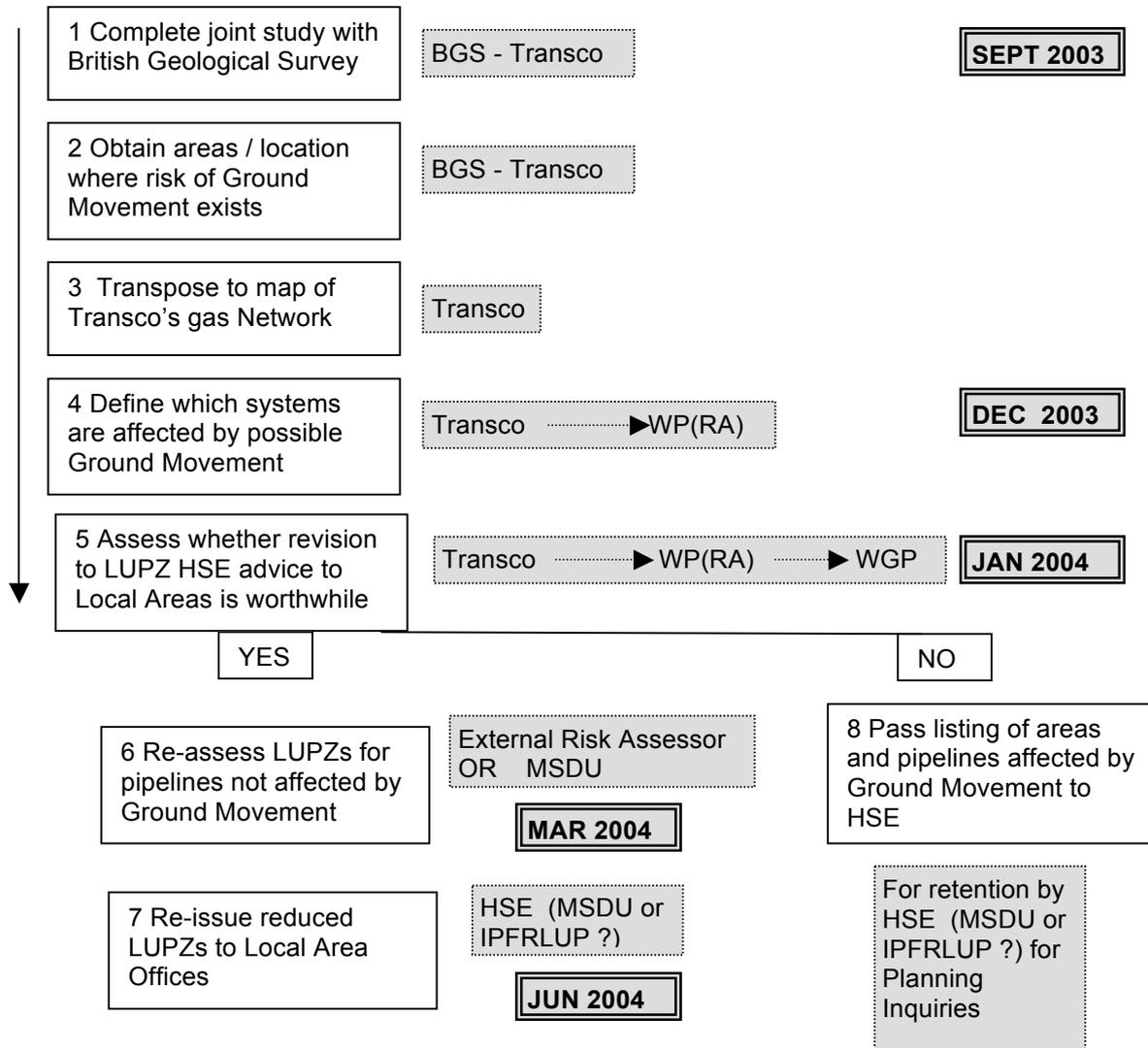
After ethylene the next most significant MAHP pipeline network which causes Land Use Planning issues in Scotland is the Spiked Crude network. These pipelines need to be reassessed using HSE's MISHAP consequence modelling and the UKOPA failure rate data, to obtain new LUPZs.

6 Gasoline Pipeline Risk Assessment.

Ongoing discussion of whether Gasoline should be incorporated as a dangerous substance into the Pipeline Safety Regulations 1996 continues, but development of a risk assessment methodology needs to be addressed if LUPZs are to be defined for these pipelines.

1 Failure Rate Contribution from Ground Movement.

Work programme, responsibilities, benefits, deliverables, timescale (target dates)



Benefits:

- New LUPZs should result in reduced number of planning disputes, fewer public inquiries, less re-work of individual cases via MSDU
- Recognition of risk-based application of failure rate data, support from UK gas pipeline operator

Deliverables

- Database containing location of areas of increased risk of ground movement which could affect cross-country pipelines

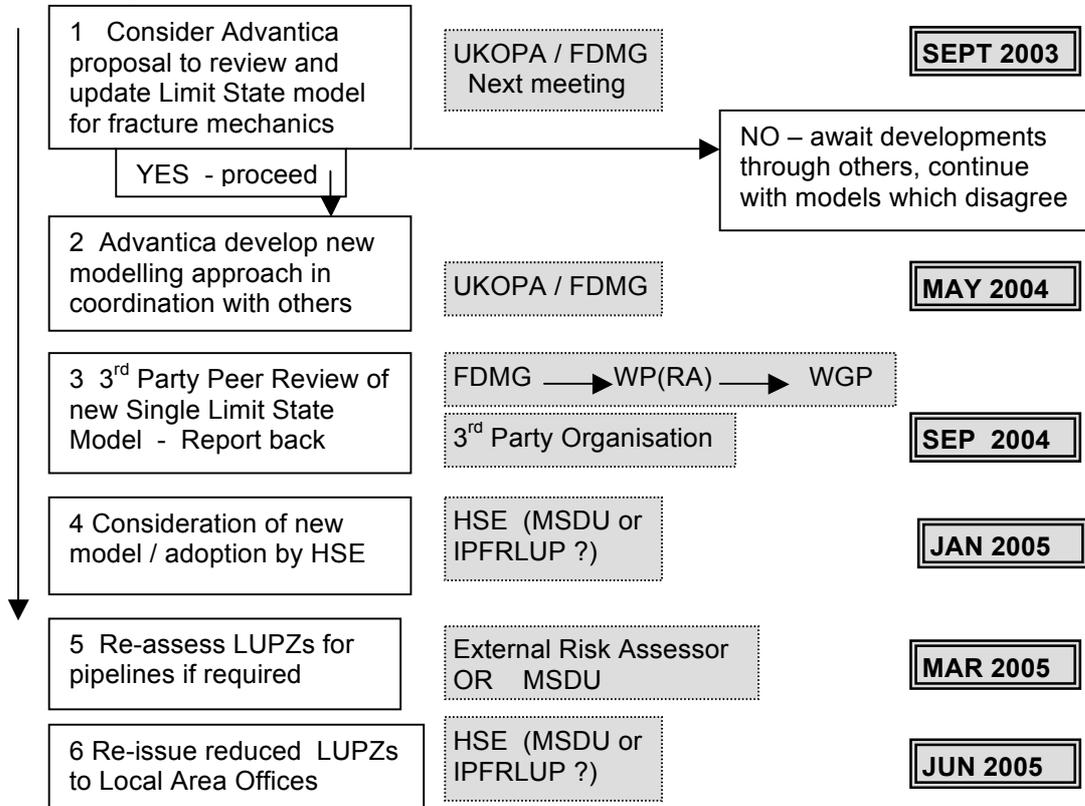
Resource Requirements

No	Task	Resource estimate / suggested source	Funding
1-4	Joint project Transco and BGS to define affected systems	BGS time + 2 man-weeks - sourced from Transco	Transco
5	Decision on whether LUPZ revision is worthwhile	WP(RA) / WGP meeting time + view from HSE (either attendance at meeting or consideration of case)	Members + 1 day HSE time
6- 7	Re-assess LUPZs – re-issue to Local Area offices	Depends on access to HSE MSDU models – through 3 rd party (HSL, Atkins?)	HSE if done in-house Funding of external

	Estimate 5 man-days	work to be agreed
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2 Third Party Damage Predictive Model

Work programme, responsibilities, benefits, deliverables, timescale (target dates)



Note:- HSE are a full and participating member of the UKOPA Fault Database Management Group (FDMG) having helped fund the development of the UKOPA Fault Database.

Benefits:

- Provides one technical solution by Industry and HSE to this problem rather than two.
- Possibly results in new LUPZs, reduced number of planning disputes, public inquiries, re-work of individual cases via MSDU

Deliverables

- Updated single Limit State Model based on significant developments in fracture mechanics over the past 25 years and verified against work carried out by British Gas on 130 tests
- Peer review by independent 3rd party organisation

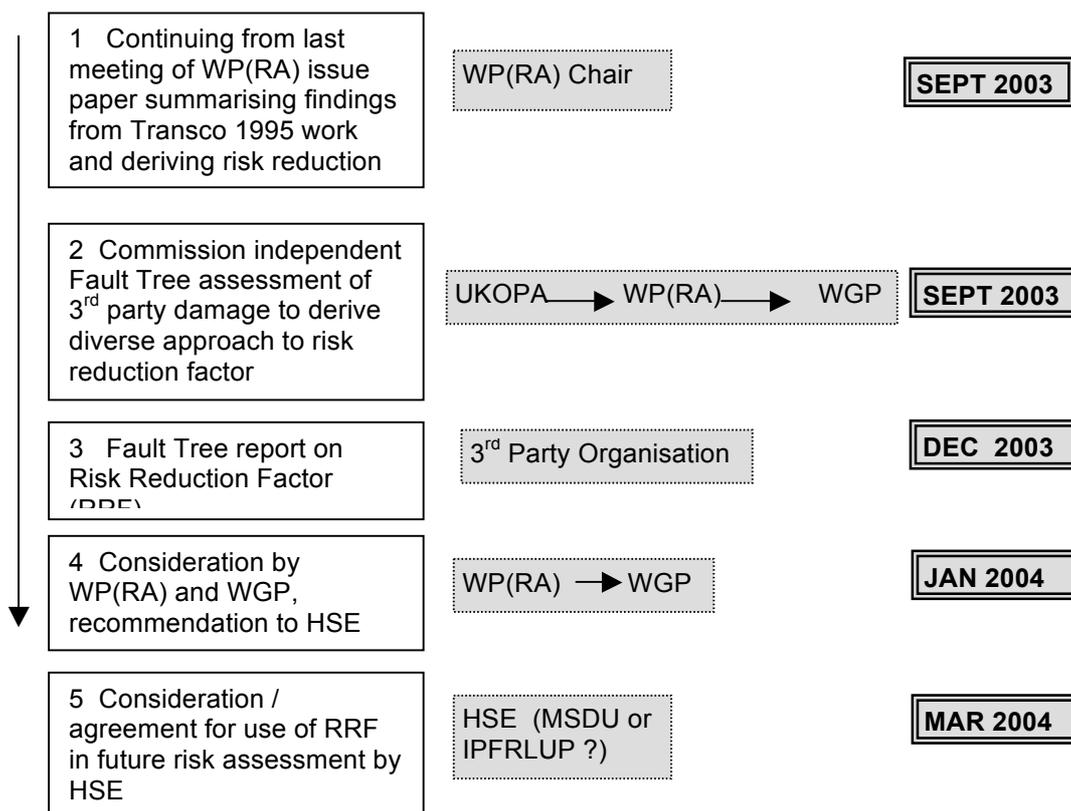
Resource Requirements

No	Task	Resource estimate / suggested source	Funding
2	Advantica develop new modelling approach	Advantica have proposed a 2-phase project – Phase 1 £40,000 to develop a limit state model based on micro-crack approach, fitting to 132 data points and sensitivity checks –Phase 2 costs have yet to be established but could be over £200k to carry out required validation /physical test work (UKOPA would also look for other international partners to share the cost of this work).	FDMG group (including HSE)
3	Peer review of Advantica Limit State Model	2-3 man-weeks, say £6,000	External funding to be agreed

4	Consideration of new model / adoption by HSE	View from HSE (either attendance at meeting or consideration of case)	5 days HSE time?
5- 6	Re-assess LUPZs – re-issue to Local Area offices	Depends on access to HSE MSDU models – through 3 rd party (HSL, Atkins?) Estimate 5 man-days	HSE if done in-house External funding to be agreed

3 Mitigation – Risk Reduction Factors for Physical Protection of Pipelines.

Work programme, responsibilities, benefits, deliverables, timescale (target dates)



Note: the last WP(RA) meeting tentatively agreed that a RRF of 10 was reasonable for well-designed slabbing with marker tape.

Benefits:

- Large financial savings will result from adoption of a realistic RRF for proper slabbing – the cost of slabbing is less than one tenth the cost of re-laying a pipeline.
- Marginal cases of high risk can be effectively reduced by mitigation such as slabbing so decreasing LUPZs.

Deliverables

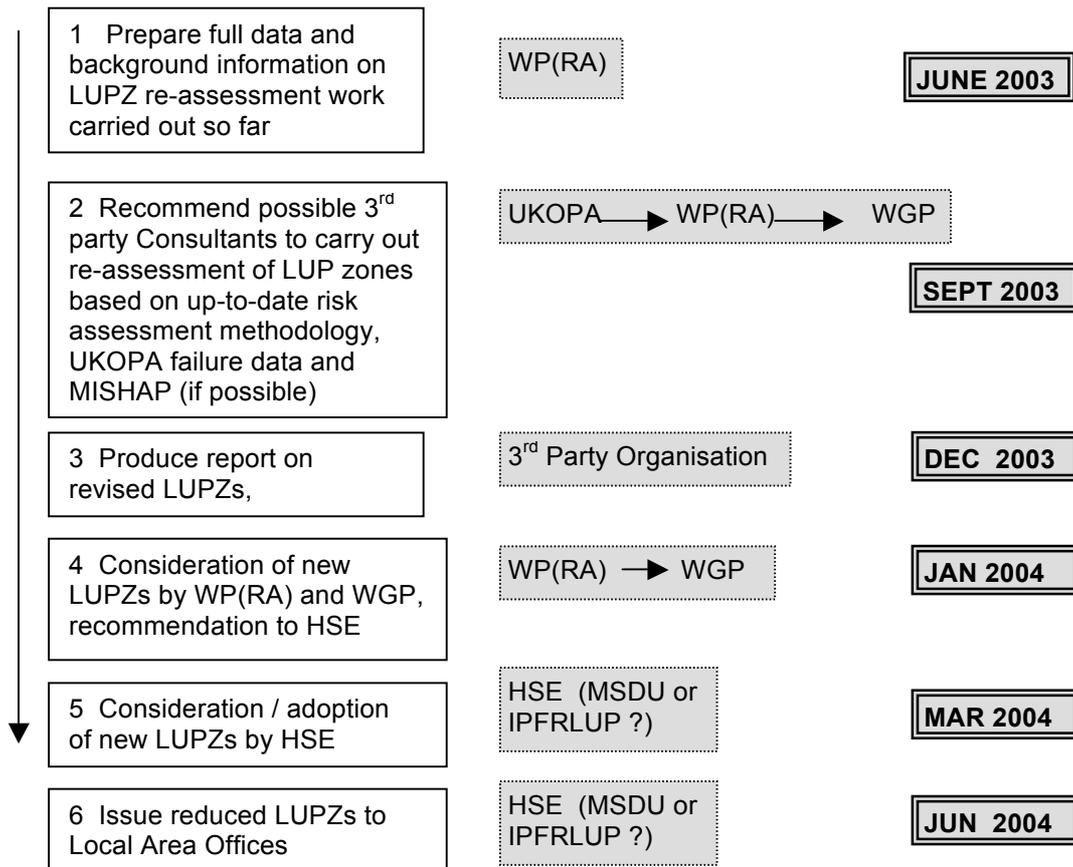
- Authoritative and properly researched approach to cost-effective risk reduction, and developed from two independent start-points – a practical set of tests, and an analytical fault tree top-down approach.

Resource Requirements

No	Task	Resource estimate / suggested source	Funding
2	Independent Fault Tree assessment of third party damage to derive diverse approach to risk reduction factor	Estimate 2-3 man-weeks of time to produce authoritative fault tree – say £5,000 - £7,000.	External funding to be agreed
5	Consideration by HSE	2-3 man-days of HSE time?	HSE

4 Ethylene Pipelines – Revision of LUPZs.

Work programme, responsibilities, benefits, deliverables, timescale (target dates)



Note: the last WP(RA) meeting tentatively agreed that UKOPA failure rate data applied to ethylene pipelines, so combined with reduced LUPZs using MISHAP rather than PRAM, there is likely to be a significant reduction in ethylene LUPZs.

Benefits:

- New LUPZs should result in reduced number of planning disputes, fewer public inquiries, less re-work of individual cases via MSDU
- Recognition of risk-based application of failure rate data, support from UK ethylene pipeline operators

Deliverables

- Authoritative, independent set of reports (some already completed) covering various aspects of ethylene pipeline risk assessment, allowing more realistic LUPZs to be set for ethylene pipelines

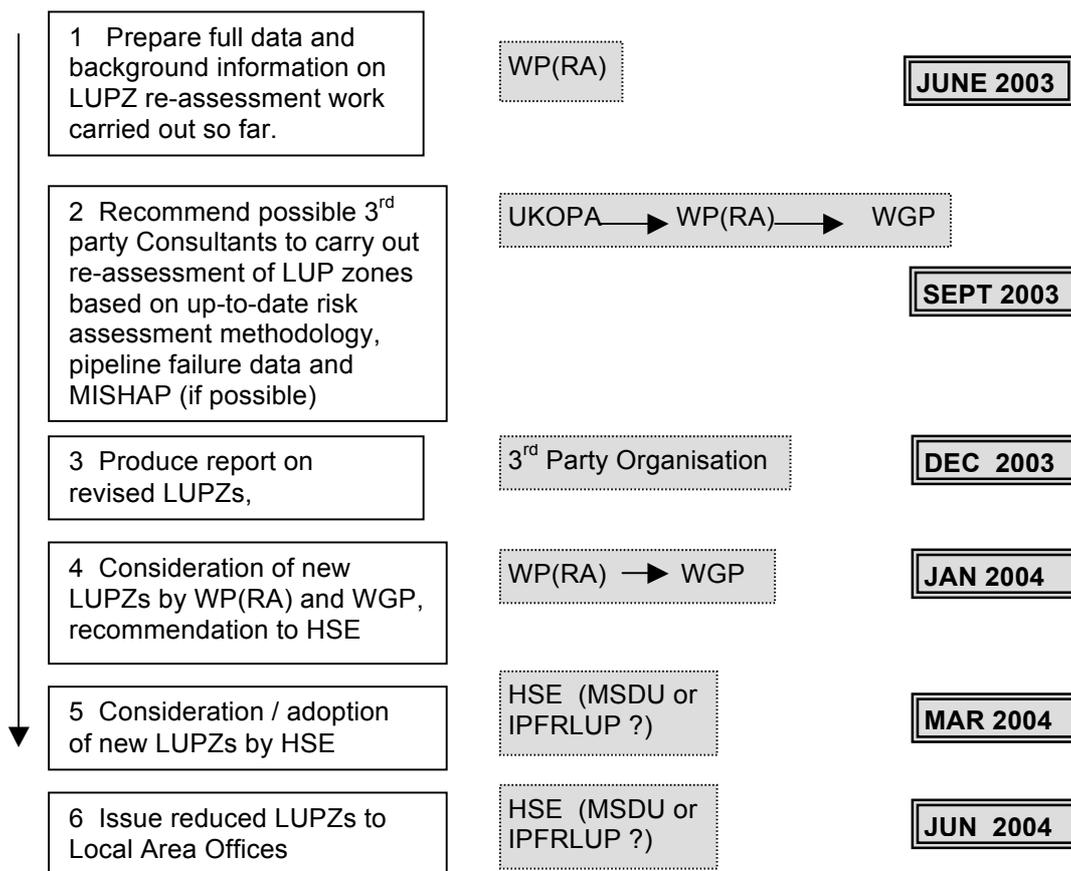
Resource Requirements

No	Task	Resource estimate / suggested source	Funding
2	Independent re-assessment of LUP zones for ethylene pipelines building on extensive	Estimate 3-4 man-weeks of time to produce authoritative risk assessment – say £7,000 - £10,000.	External funding to be agreed

	work completed to date		
5-6	Consideration by HSE	3-5 man-days of HSE time?	HSE

5 Spiked Crude & NGL Pipelines – Revision of LUPZs.

Work programme, responsibilities, benefits, deliverables, timescale (target dates)



Note: the WP(RA) has not yet started considering Spiked Crude. Therefore the amount of work is likely to be greater than for ethylene, in considering the appropriate failure rate data to use (is UKOPA data from the Fault Database the correct data to use?) and the right consequence models.

Benefits:

- New LUPZs should result in reduced number of planning disputes, fewer public inquiries, less re-work of individual cases via MSDU
- Recognition of risk-based application of failure rate data, support from major UK pipeline operators

Deliverables

- Authoritative, independent set of reports covering various aspects of spiked crude pipeline risk assessment, allowing more realistic LUPZs to be set for spiked crude pipelines

Resource Requirements

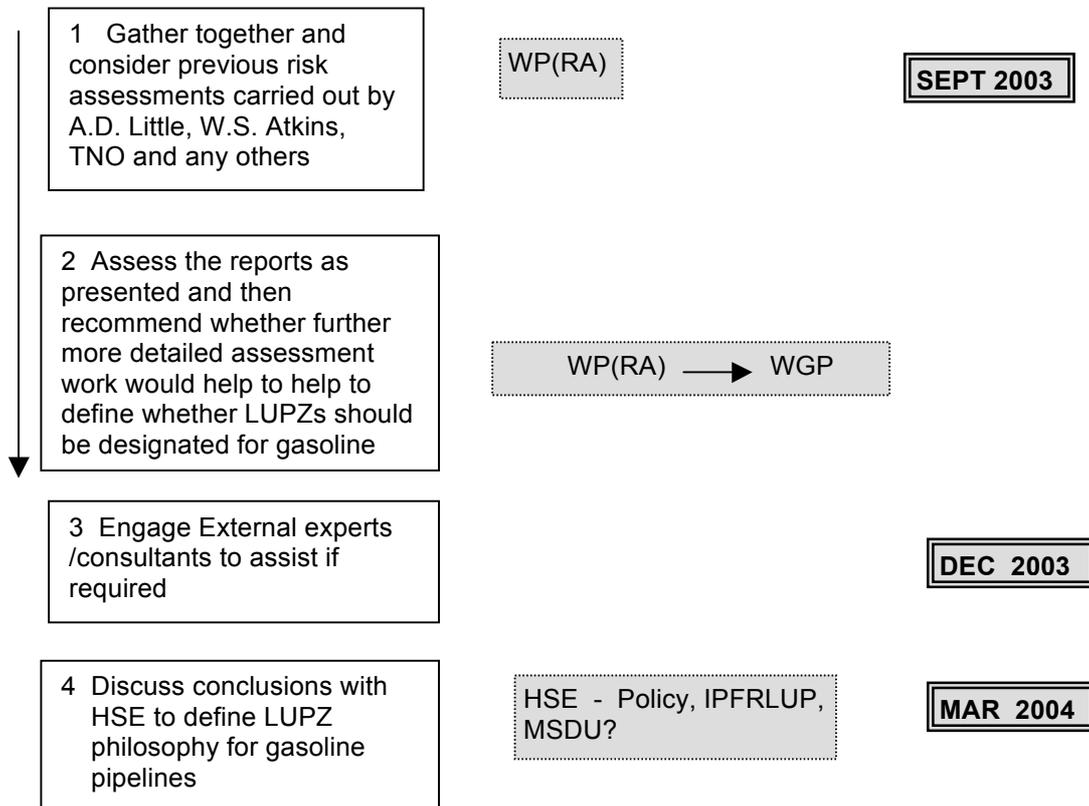
No	Task	Resource estimate / suggested source	Funding
2	Independent re-assessment of LUP zones for spiked crude	Estimate 3-4 man-weeks of time to produce authoritative risk assessment –	External funding to be agreed

	pipelines building on extensive work completed to date	say £7,000 - £10,000.	
5-6	Consideration by HSE	3-5 man-days of HSE time?	HSE

6 Gasoline Pipelines – Risk Assessment Approach for LUPZs.

This work programme pre-supposes that WGP are required to give an authoritative view on gasoline pipeline risk assessment methodology as part of the discussions as to whether gasoline pipelines should have designated LUPZs.

Work programme, responsibilities, benefits, deliverables, timescale (target dates)



Benefits:

- Resolve issue as to
 - a) whether LUPZs can sensibly be applied to gasoline pipelines
 - b) if so, suggest a rational approach to set realistic zones
- Independent expert view from WGP

Deliverables

- Rational risk-based arguments and conclusions
- Authoritative, independent set of report on Gasoline pipeline risk assessment

Resource Requirements

UKOPA/03/0079

No	Task	Resource estimate / suggested source	Funding
1, 2	Assess previous work to see way forward	WP(RA) / WGP meeting time	Members
3	External experts / consultants, if required	To be estimated	Funding of external work to be agreed
4	Discussion of conclusions with HSE	Meeting + preparation time Members + HSE (2-3 days?)	