

SHERIFFDOM OF SOUTH STRATHCLYDE, DUMFRIES AND GALLOWAY AT AYR

DETERMINATION

by

SHERIFF NORMAN McFADYEN, Sheriff of South Strathclyde, Dumfries and Galloway

in Inquiry into the circumstances of the deaths of

**BRIAN FRENCH, date of birth 21 June 1958 and
COLIN WILLIAM FERGUSON, date of birth 27 November 1969**

under the Fatal Accidents and Sudden Deaths Inquiry (Scotland) Act 1976

For the Crown: Mr S Toal, Procurator Fiscal Depute
For Mrs Lorna French: Mr G Whyte, Solicitor
For Mr Alan Shannon: Mr D White, Solicitor
For Castlebridge Plant Ltd and Scottish Coal Company Ltd: Mr H Neilson, Solicitor
For the Health and Safety Executive: Mr J Herd, Solicitor
For Terex Ltd: Mr G Graham and Ms D Fusi, Solicitors

Ayr 24 June, 2011

My determination is:-

(1) In terms of section 6(1)(a) of the Fatal Accidents and Sudden Deaths Inquiry (Scotland) Act 1976 (the 1976 Act), Brian French, born 21 June 1968, who normally resided at 19 Polmeur Road, Kirkconnel, and Colin William Ferguson, born 27 November 1969, who normally resided at 49 Coylebank, Prestwick died at the Pennyvenie Opencast Coal Mine Site near Dalmellington on 26 February 2007 at around 1300 hours while working in the course of their employment respectively as a foreman fitter and fitter with Castlebridge Plant Limited.

(2) In terms of section 6(1)(b) of the 1976 Act the cause of death of Brian French was 1a) Multiple injuries due to 1b) Accident at work; and in respect of Colin William Ferguson the cause of death was 1a) Asphyxia due to 1b) Crush Injury to chest due to 1c) Accident at work.

(3) In terms of section 6(1)(b) of the 1976 Act the cause or causes of the accident resulting in the deaths was the absence of an effective system of segregation between large and small vehicles, whereby a Terex TR 100 dump truck, driven by Alan Shannon, turned sharply to the right on moving off from a stationary position and

collided with and crushed a Land Rover, driven by Colin Ferguson and occupied by him and Brian French, which was sitting stationary to the front offside of the dump truck in an area which would have afforded no or limited visibility to Alan Shannon, killing both of the occupants of the Land Rover.

(4) In terms of section 6(1)(c) of the 1976 Act reasonable precautions whereby the deaths and the accident resulting in the deaths might have been avoided would be:

- (a) If the deceased had obtained access to a radio and used it to request the leading driver, the supervisor or the excavator operator to alert others to their entry to the dig area;
- (b) If the dump truck driver, Alan Shannon, had been alerted to the presence of the Land Rover in close proximity by means such as direct communication with Mr Shannon by another operator;
- (c) If Alan Shannon had paid more attention and in particular had not been reading a newspaper in the cab of his vehicle;
- (d) If Alan Shannon had reversed or stopped when faced with an obstruction large enough to offer resistance to a 100 tonne truck that had 2 metre diameter wheels;
- (e) If Scottish Coal had ensured that dump truck drivers drove forward before turning right wherever possible;
- (f) If Scottish Coal had ensured that dump truck drivers reversed or stopped when faced with an obstruction large enough to offer resistance;
- (g) If Scottish Coal had ensured that light vehicles did not travel along blind areas on the offside of dump trucks without advance communication with the dump truck operator;
- (h) If there had been universal radios on site and there had been clear rules and protocols requiring the use of such radios for communication in relation to interaction of vehicles;
- (i) If there had been improved conspicuity of light vehicles, in particular by the attachment of buggy whips to all Land Rovers;
- (j) If there had been installation of front off side cameras and monitors on dump trucks;
- (k) If an effective system for the segregation of large dump trucks and smaller vehicles such as Land Rovers had been implemented and managed;

(5) In terms of Section 6(1)(d) of the 1976 Act defects in any system of working which contributed to the deaths or accident were:

- (a) The absence of an adequate system of communication on site, including a universal radio policy and clear rules and protocols requiring the use of such radios for communication in relation to interaction of vehicles;
- (b) Lack of aids to conspicuity of Land Rovers, including buggy whips with flashing beacons and prominent body paint;
- (c) The absence of an effective system of segregation of large and small vehicles in the dig area;
- (e) The absence of an adequate system of traffic management;
- (f) The practice of small vehicles routinely entering the operational or "live" dig area when dump trucks were moving, including at the time of the accident and the absence of an effective system for dealing with breakdown and unplanned maintenance situations;
- (g) The system whereby dump trucks were entitled to operate off more than one excavator, creating uncertainty for dump truck and light vehicle drivers;

(h) The failure of the system of training to document the knowledge and competences which those who were training dump truck drivers should ensure were covered in training and to ensure that the trainers and those who assessed the competence of drivers covered knowledge of blind spots and of the circumstances in which sharp right hand turns should be executed.

(6) In terms of Section 6(1)(e) of the 1976 Act other factors which are relevant to the circumstances of the deaths are:

(a) Greater emphasis could have been given to alerting drivers to the consequences of reading newspapers in their cabs;

(b) Scottish Coal failed properly to learn from the lessons of a non-fatal accident in 2005 and address the systemic problems that it should have identified;

(c) Universal introduction of site operators' radios in vehicles across both Scottish Coal's various sites and in the remainder of the Scottish opencast industry has improved communication and safety in the movement and interaction of large and small vehicles on site. Evidence has indicated that effective off side front cameras and radios can be installed at relatively low cost;

(d) Without being obliged to do by the Health and Safety Executive, Scottish Coal, after suitable consultation with employees and researching of the market introduced and led the industry in introducing offside CCTV cameras in large dump trucks. They also swiftly introduced an effective and workable system for physically ensuring the segregation of large and small vehicles in or around live dig areas;

(e) The front off side cameras have substantially improved the driver's visibility by eliminating or reducing the off side blind spot. This has improved safe use of the dump trucks not only in the dig area but also in other parts of the site where the driver will routinely require to drive into or through his blind spot;

(f) Scottish Coal and other operators collaborate systematically with the Health and Safety Executive on safety advisory bodies such as the Quarries National Joint Advisory Committee (QNJAC). Scottish Coal also takes a leading role in the Confederation of UK Coal Producers (COALPRO) which likewise through the vehicle of its safety committee regularly looks at safety issues arising in the industry. The existence of these organisations and participation in their deliberations is to be commended;

(g) Scottish Coal takes a leading role in the promoting of health and safety within the industry;

(h) Consideration should given to those involved in providing training in Scottish Coal and across the industry providing that training against a more detailed checklist of competencies than exists at present and the competence assessment scheme should be updated to reflect that initial and further assessment should be carried out by properly trained trainers or assessors;

(i) Given the advances in technology Health and Safety Executive Inspectors should as a matter of course make enquiry about radio usage and traffic management as part of their inspections;

(j) The Health and Safety Executive should consider systematically disseminating the advisability of practices identified by their inspectors which ought, in the interest of safety, to be introduced;

(k) The Health and Safety Executive should consider, in consultation with the industry, a speedier, more efficient mechanism for the dissemination of good and important best practice identified by inspectors;

(l) Although segregation as now successfully organised at Pennyvenie will not always be possible due to the changing geography in quarries and opencast sites, the Health and Safety Executive should constantly press home the message that it is for the duty holder to ensure proper job site organisation and systems to deal with the dangers posed by large machinery;

(m) Awareness should be raised more generally within the opencast coal mining industry of the availability, benefits and utility of off side front cameras and two way radios, such as by placing information on the Health and Safety Executive's website which can be accessed by the industry, by raising these matters with any working groups concerned with update of the guidance attached to the relevant Approved Code of Practice (ACOP) and by advising organisations concerned with safety within the industry such as the Quarries National Joint Advisory Committee (QNJAC) and the coal producers organisation, the Confederation of UK Coal Producers (COLAPRO). But it must be recognised that the primary control measure is an effective system of segregation of large and small vehicles in quarries;

(n) Consideration should be given to updating the Quarries Regulations Approved Code of Practice (ACOP) to make crystal clear the dangers of blind spots in dump trucks and that segregation is the key to addressing such dangers; in particular, reference should be included to the duty holder considering the use of technology such as radios to aid in achieving segregation and effective traffic management;

(o) The Health and Safety Executive should work with the Quarries Joint National Advisory Committee (QNJAC) to raise these issues ahead of any proposed update to the Code of Practice;

(p) It is incumbent upon manufacturers and users of dump trucks to regularly monitor and ensure the introduction of suitable and sufficient controls so as to keep up with technology in a manner that maintains or indeed improves safety;

(q) Consideration should be given to the development of international standards or at least standard industry practice on the use of offside cameras in dump trucks which will promote the safe use of such cameras to improve visibility for operators.

(r) The Health and Safety Executive should consider whether to call on police for assistance, e.g. from crash investigators in relation to measurements and plans etc of accident scenes;

(7) Although it is outside the scope of Section 6(1) of the 1976 Act, I recommend that:

Consideration should be given to the inclusion in the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR) of dangerous occurrences, where there is no actual injury but there is a high risk of serious injury or fatality.

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1 Procedure

1.1 The Inquiry commenced on 17 May 2010 and evidence was presented on 33 days between then and 24 January 2011. Parties were requested to submit outline draft written submissions on a timetable which would allow adjustment of submissions ahead of an oral hearing on submissions. In the event, for extraneous reasons, that goal was not fully achieved, but nonetheless helpful outline submissions by all parties were available to the Court by the time of the relatively brief closing submissions which were heard on 14 and 15 March 2011. The evidence was transcribed and, where I refer to the transcript, I do so by day and page number, including only days when evidence was heard.

1.2 24 witnesses were called by the Crown and two witnesses were called by the solicitor for Mrs Lorna French. They are listed in Annex A. In addition, the sworn statement of Dr Edwin Robert Nairn, Consultant Pathologist was introduced with agreement of the parties under Rule 10 of the Fatal Accidents and Sudden Deaths Inquiry Procedure (Scotland) Rules 1977; and statements of two witnesses, David Arthur Oglesby and James Goudie Willison, who were unfit to attend court, but had been interviewed under Section 20 of the Health and Safety at Work etc Act 1974 were, without objection, incorporated in the evidence of the interviewing Inspector, Crown witness Norman Buchanan.

1.3 The parties entered into a joint minute which agreed that various documents were true copies of originals, mainly of or relating to the Scottish Coal Company Limited and Castlebridge Plant Limited, but also of relevant police, Strathclyde Fire and Rescue and sudden death records and Health and Safety Executive records. The joint minute also agreed that blood samples taken from the deceased Brian French and Colin William Ferguson following death were analysed for alcohol with a negative result and agreed various photographs and that Crown Productions 61 to 63 were accident reconstruction plans prepared on behalf of Scottish Coal Company Limited on the basis of measurements taken by witness Derek Kyle, who was site engineer at Pennyvenie, on 26 February 2007. The joint minute further agreed that Crown Production 38 was a true copy of an indictment in respect of which Scottish Coal Company Limited pleaded guilty to charge 3 on 18 August 2008 and were fined £400,000 on 26 August 2008. Charge 3 is reproduced as Annex B.

2 The deceased Brian French and Colin William Ferguson

2.1 The witnesses called by the solicitor for Mrs L French were Mr Hugh Kirkwood and Mrs Vanessa Taylor. The main purpose in calling them was to provide more personal information than would be elicited from work place witnesses in relation to both men. Mrs Taylor is the daughter of Mr French and she movingly described her father and his personality and his relationship with his family, including with her brother who worked with him and always looked up to his father.

2.2 Mr Kirkwood was a lifelong friend of Mr Ferguson who came in due course to work with him. He too was able to describe Mr Ferguson's personality and his relationship with his family and loved ones. Mr Kirkwood did work with Mr Ferguson at Pennyvenie and I will refer later to his evidence about Pennyvenie.

2.3 More generally, witnesses who worked with both men described them as careful colleagues who would not take unnecessary risks at their work. Mr French had been employed by SCC since 2001 and had worked at a number of sites, although he had only fairly recently transferred to Pennyvenie, where he was a foreman fitter. He also had significant previous experience in the industry, having previously worked for Miller Mining. Mr French was Mr Ferguson's line manager. Although he appears to have previous Scottish Coal experience, his training record shows that Mr Ferguson had started at Pennyvenie in 2001 and thereafter worked at other Scottish Coal sites. He took redundancy for a period and had returned to work at Pennyvenie, as a fitter, some months before the accident. Both men were experienced and familiar with the working processes and systems of Scottish Coal.

3 Background

3.1 General

3.1.1 The deaths of Brian French and Colin William Ferguson occurred when they were working at the Pennyvenie Opencast Coal Mine Site at Pennyvenie, Ayrshire on 26 February 2007, when the Land Rover which they were operating in the course of their employment was crushed by an unloaded 68 Tonne (100 Tonne payload) Terex TR 100 dump truck which was being driven by Alan Shannon. Colin William Ferguson was driving the Land Rover and Brian French was in the passenger seat next to him. Messrs French and Ferguson were both employed by Castlebridge Plant Limited and Alan Shannon was employed by Scottish Coal Company Limited. Both companies are wholly owned subsidiaries of Scottish Resources Group Limited. Scottish Coal Company Limited generally operates opencast coal mines and employs those operating operational plant, whereas Castlebridge Plant Limited generally provides maintenance and repair services. All employees are subject to the same general site rules and subject to the overall management of the site manager, who is employed by Scottish Coal Company Limited. When there are talks for all employees (known as toolbox talks), Castlebridge Plant employees also attend these talks, although sometimes they are held at different times, for convenience.

3.1.2 Witnesses tended to speak of Scottish Coal as the generic description of the business, in particular at Pennyvenie and unless the context otherwise particularly requires, I will use the name Scottish Coal or SCC in the same way.

3.1.3 Scottish Coal Company Limited is the largest operator of opencast mines in the United Kingdom and operates some of the largest opencast mines in Europe.

3.2 Regulatory framework

3.2.1 Opencast mining is regulated by the Quarries Regulations 1999 (SI 1999 No. 2024) (the Quarries Regulations) made under the Health and Safety at Work etc. Act 1974 (the 1974 Act) and the Approved Code of Practice on *Health and safety at quarries*, second edition (the ACOP), approved by the Health and Safety Commission (now the Health and Safety Executive) on 10 August 1999. An opencast mine is a quarry within the meaning of the Quarries Regulations. A quarry is

“an excavation or system of excavations made for the purpose of, or in connection with, the extraction of minerals (whether in their natural state or in solution or suspension) or products of minerals, being neither a mine nor merely a well or borehole or a well and borehole combined” (Regulation 3).

3.2.2 A “mine”, for the purposes of the Quarries Regulations is a mine within the meaning of the Mines and Quarries Act 1954 or, in common parlance, a deep mine (Section 180(1)).

3.2.3 The ACOP was approved and issued under Section 16 of the 1974 Act, which provides for practical guidance with respect to the requirements of any provision of Sections 2 to 7 of the 1974 Act or of relevant health and safety regulations, including the Quarries Regulations.

3.2.4 While, in terms of Section 17 of the 1974 Act a failure on the part of any person to observe any provision of an ACOP shall not of itself render him liable to any civil or criminal proceedings, where in any criminal proceedings a party is alleged to have committed an offence by reason of a contravention of any requirement or prohibition imposed by or under a provision for which there was an ACOP at the time of the alleged contravention, any provision of the code of practice which appears to the court to be relevant to the requirement or prohibition alleged to have been contravened is admissible in evidence in the proceedings; and if it is proved that there was at any material time a failure to observe any provision of the code which appears to the court to be relevant to any matter which it is necessary for the prosecution to prove in order to establish a contravention of that requirement or prohibition, that matter shall be taken as proved unless the court is satisfied that the requirement or prohibition was in respect of that matter complied with otherwise than by way of observance of that provision of the code.

3.2.5 Accordingly, in practice the ACOP supplements the Quarries Regulations and the 1974 Act as regards opencast mines.

3.2.6 Section 2 of the 1974 Act provides as to general duties of employers to their employees:

“(1) It shall be the duty of every employer to ensure, so far as is reasonably practicable, the health, safety and welfare at work of all his employees.

(2) Without prejudice to the generality of an employer's duty under the preceding subsection, the matters to which that duty extends include in particular—

(a) the provision and maintenance of plant and systems of work that are, so far as is reasonably practicable, safe and without risks to health;

(b) arrangements for ensuring, so far as is reasonably practicable, safety and absence of risks to health in connection with the use, handling, storage and transport of articles and substances;

(c) the provision of such information, instruction, training and supervision as is necessary to ensure, so far as is reasonably practicable, the health and safety at work of his employees;

(d) so far as is reasonably practicable as regards any place of work under the employer's control, the maintenance of it in a condition that is safe and without

risks to health and the provision and maintenance of means of access to and egress from it that are safe and without such risks;

(e) the provision and maintenance of a working environment for his employees that is, so far as is reasonably practicable, safe, without risks to health, and adequate as regards facilities and arrangements for their welfare at work.

(3) Except in such cases as may be prescribed, it shall be the duty of every employer to prepare and as often as may be appropriate revise a written statement of his general policy with respect to the health and safety at work of his employees and the organisation and arrangements for the time being in force for carrying out that policy, and to bring the statement and any revision of it to the notice of all of his employees.

(4) Regulations made by the Secretary of State may provide for the appointment in prescribed cases by recognised trade unions (within the meaning of the regulations) of safety representatives from amongst the employees, and those representatives shall represent the employees in consultations with the employers under subsection (6) below and shall have such other functions as may be prescribed.

(5)

(6) It shall be the duty of every employer to consult any such representatives with a view to the making and maintenance of arrangements which will enable him and his employees to co-operate effectively in promoting and developing measures to ensure the health and safety at work of the employees, and in checking the effectiveness of such measures.

(7) In such cases as may be prescribed it shall be the duty of every employer, if requested to do so by the safety representatives mentioned in subsection (4) above, to establish, in accordance with regulations made by the Secretary of State, a safety committee having the function of keeping under review the measures taken to ensure the health and safety at work of his employees and such other functions as may be prescribed.”

3.2.7 Section 21 empowers an inspector who is of the opinion that a person is contravening or had contravened one or more of the relevant statutory provisions in certain circumstances to serve an improvement notice stating that he is of that opinion, specifying the relevant statutory provision, giving reasons and requiring remedy of the contravention or relevant matters within a specified period.

3.2.8 Section 22(1) empowers an inspector, who is of the opinion that activities to which the relevant statutory provisions apply involve or will involve a risk of serious personal injury, to serve a prohibition notice specifying the relevant statutory provision, giving reasons and directing that the activities to which the notice relates shall not be carried on by or under the control of the person on whom the notice is served unless the matters specified in the notice and any associated contraventions of provisions so specified have been remedied.

3.2.9 Sections 23 and 24 are supplemental; Section 23 is not applicable to the present case, but Section 24 provides for a right of appeal to an Employment Tribunal.

3.2.10 The Quarries Regulations impose a number of duties on operators, including the preparation of a health and safety document which demonstrates that

the risks to which persons at work at the quarry are exposed have been assessed in accordance with regulation 3 of the Management of Health and Safety at Work Regulations 1999 and that adequate measures, including measures concerning the design, use and maintenance of the quarry and of its plant, will be taken to safeguard the health and safety of persons at the quarry, and in the area immediately surrounding the quarry who are directly affected by the activities of the quarry, includes a statement of how these measures will be co-ordinated and gives details of the management structure and sets out the authority and duties of each person in the management structure (Regulation 7(1) (a) to (d)).

3.2.11 It also requires operators to record rules required by specific regulations, including Regulation 10(1)(a) (the health and safety of persons at the quarry, and in the area immediately surrounding the quarry who are directly affected by the activities of the quarry and the safe use of equipment) (Regulation 7(1)(e)(i)) and

- “(ii) the arrangements for the review of safety measures in accordance with regulation 11,
 - (iii) details of the inspection, maintenance and testing schemes prepared in accordance with regulation 12,
 - (iv) the rules controlling risks from vehicles required by regulation 14,
 - (v) details of the permit to work system required by regulation 18,
 - (vi) the shotfiring rules required by regulation 25(2),
 - (vii) the excavations and tips rules required by regulation 31,
 - (viii) the conclusions of any appraisal or assessment of an excavation or tip undertaken in accordance with regulation 32, and
 - (ix) the arrangements for health surveillance required by regulation 43.”
- (Regulation 7(1)(ii) to (ix))

3.2.12 There are other requirements relating to explosions and toxic gases which are not relevant to the circumstances of this accident.

3.2.13 The operator requires to ensure that the health and safety document is kept up to date; and made available to each employer of persons at work at the quarry and to all persons at work at the quarry, that the measures identified in the health and safety document are taken; and that any plans included in that document are followed (Regulation 7(3) and (4)). Each person in the management structure requires to carry out the duties assigned to him in the health and safety document so as to protect the health and safety of persons at work at the quarry (Regulation 7(5)).

3.2.14 Regulation 8 requires, inter alia, that

- “the management structure shall be established to provide in particular that all persons working at the quarry come under the authority of a competent person in the management structure who shall have a duty to exercise such supervision of those persons as is appropriate to ensure the health and safety of those persons and of all others who may be affected by their activities” (Regulation 8(2)).

3.2.15 Regulation 9 requires that no person undertakes any work at the quarry unless

- “(a) that person is either competent to do that work or he does so under the instruction and supervision of some other person who is competent to give instruction in and to supervise the doing of that work for the purpose of training him; and
- (b) a sufficient number of persons with the requisite competence to perform the tasks assigned to them are present.”

3.2.16 Regulation 10(1) requires operators to ensure that rules are in place at the quarry with a view to securing the health and safety of persons at the quarry, and in the area immediately surrounding the quarry who are directly affected by the activities, ensure that copies of all current instructions, rules and schemes required to be made under the Regulations are kept at the quarry and are given to any person at work at the quarry upon whom they impose duties; and comprehensible to all persons at work at the quarry to whom they apply and take all reasonable measures to ensure that each person at work at the quarry understands any rules required to be made under the Regulations which are relevant to that person.

3.2.17 Regulation 10(2) requires the operator shall ensure, so far as is reasonably practicable, that any instructions, rules and schemes required to be made under the Regulations are followed, or as the case may be, complied with, by persons at work at the quarry.

3.2.18 Regulation 11 requires operators to ensure that the measures taken to protect the health and safety of those persons at the quarry, and in the area immediately surrounding the quarry who are directly affected by the activities are reviewed on a regular basis to ensure compliance with the relevant statutory provisions, and whenever the circumstances require it, including where there has been a significant change in the way that the quarry operates; and the regularity with which such reviews are to take place is specified in the health and safety document.

3.2.19 Under Regulation 12 operators require to prepare and keep up to date a suitable written scheme for the systematic inspection, maintenance and, where appropriate, testing of all parts of the quarry, all buildings (whether temporary or permanent) at the quarry, and any plant at the quarry, with a view to securing the health and safety of persons at the quarry, and in the area immediately surrounding the quarry who are directly affected by the activities and keep suitable records of inspections, defects and steps to remedy them.

3.2.20 Regulation 14 provides that

“The operator shall make suitable and sufficient rules (known in these Regulations as the “vehicles rules”) which shall lay down in writing measures designed to control the risks to persons at the quarry arising from the use of vehicles at the quarry.”

4 Pennyvenie Opencast Mine

4.1 *General description*

4.1.1 Pennyvenie is one of a number of opencast mines operated by Scottish Coal Company Limited in Scotland. Opencast mining is a vehicle based activity. In the nature of opencast mining the extent and configuration of the areas worked on will vary constantly. Seams of coal are exposed by blasting and digging. Excavators (sometimes described as diggers, shovels, navvies or just as machines) remove overburden or muck, which can be rock, topsoil or boulder clay, to allow access to the coal seam itself and deposit that into dump trucks, which remove it to a tip area. There are different processes for extracting the actual coal, but these are not relevant to this Inquiry.

4.1.2 Depending on the size and shape of an opencast site there may be different numbers of excavators operating at any one time; and they may be a greater or lesser distance from each other. Typically an excavator will be serviced by a number of dump trucks which will operate a cycle of approaching the excavator, manoeuvring into position to receive a load, and taking the load to the tip before returning to the excavator.

4.1.3 An excavator may sit on an excavated raised area, or bench, above the level of the dump trucks. Such an excavator is known as a back actor. There is a different type of operation where the excavator sits and excavates at the same level as the dump trucks and that excavator is known as a face shovel. The relevant operation in this case was that of a back actor sitting on a bench.

4.1.4 Pennyvenie was at the time of the accident a 24 hour operation during weekdays and there were two 12 hour shifts. Most employees operating heavy plant worked on a pattern of alternate day and night shifts. Nominal working hours were 39 hours per week, but employees signed Working Time Directive waivers and were paid overtime for the balance worked over 39 hours. Overtime was also sometimes available on a Saturday. Plant and vehicles were, of course, shared between shifts, but plant operators tended to operate off the same piece of plant – thus a dump truck driver would habitually work on the same truck, except when it was under repair or being serviced.

4.1.5 Other than at the start and end of shifts, when drivers required to be transported to the truck park (for the dump truck vehicles) or to the excavators (which remain at their working station), there would be no regularly scheduled movement of smaller vehicles in the dig areas, but it would be necessary for smaller vehicles – almost invariably Land Rovers – to enter dig areas for supervision, maintenance and repair purposes.

4.1.6 Management and fitters used Land Rovers on site and they were also used to convey excavator operators to their machines, which were not moved between shifts.

4.1.7 Other site plant which is relevant to the inquiry includes bulldozers (or dozers), bowzers, a grader and a manrider. The grader is a vehicle which grades, or flattens the haul roads on the site. Haul roads are the routes by which heavy plant moves between the dig areas and tipping areas. They are normally the width of three dump trucks (i.e. 15 metres in total), but they are unmetalled rough roads which are levelled so far as possible by vehicles known as graders. Graders move across the road as they progress and other vehicles require to accommodate themselves to their operation. Bowzers are water bowzers or fuel bowzers. The former are used to control dust, which can be a problem on an opencast site, but the consequence of their spraying the ground to suppress dust can be unexpectedly wet and slippery conditions on a dry sunny day. Fuel bowzers supply fuel to plant.

4.1.8 A manrider is a lorry with seats on the back which is used to transport dump truck drivers to the truck park, where their vehicles are parked up at the start and end of shifts.

4.1.9 At the time of the accident there were six excavators, being serviced by 23 dump trucks, with a further two dump trucks available as spares.

4.2 Management

4.2.1 Pennyvenie had a site manager, under whom was a deputy site manager and a general foreman, beneath whom was a shift supervisor and then a leading driver. The leading driver did not have line management responsibility, but was a dump truck driver on whom particular work organisation duties fell. There were two supervisors and leading drivers – one for day and one for night shift – but only one general foreman. There were other specialist supervisors with whom the Inquiry is not directly concerned and there were other specialist staff, including site engineers, who were concerned with surveying the site rather than maintenance of plant.

4.2.2 Castlebridge Plant Limited had a separate management structure, overseen by a Plant Engineer, with two plant foremen (for the different shifts) and chargehand fitters as well as fitters and fitters' mates. Although they had their own management structure, they reported to the site manager.

4.2.3 At the time of the accident the site manager was David Paterson who had been site manager there since 2004, but had about 20 years experience as site manager at different sites and with different operators. His deputy was Lyle Ramsay, who was not a witness at the Inquiry. The general foreman was Brian Robertson, who had held that position since around 2002 and also had extensive opencast experience, having previously been a site manager. The shift supervisor was Alexander McCulloch who had been a supervisor since 2004. He too had extensive opencast experience.

4.2.4 The leading driver on the day shift was Robert (Ronnie) Stewart, who had over 30 years experience in opencast mines and was responsible for organising the work of his fellow dump truck drivers, by allocating them to excavators at the start of the shift, in consultation with the supervisor and reallocating them as necessary during a shift.

4.2.5 There was some suggestion in evidence that there were two leading drivers on the day shift, but the preponderance of evidence was that there was only one such driver on a shift at that time.

5 The Accident

5.1 *General background to the accident*

5.1.1 Communication on the site was by a variety of means. Surprisingly, not all plant or vehicles were equipped with radios (fixed or handheld) and communication with or between plant and vehicles without radio had to be by a mixture of word of mouth – communicated by literally shouting cab to cab – eye to eye contact and hand signals, many of them improvised. Communication of this kind with, by or between men who were in very large vehicles and operating on rough and sometimes sloping or ramped ground was not always straightforward.

5.1.2 The site operated on rule of the road principles – i.e. traffic should drive on the left hand side where possible. However, most items of large plant, including dump trucks and excavators were and are invariably left hand drive vehicles, designed for an international market.

5.1.3 All vehicles have blind spots, i.e. areas outside the vehicle into which, even with secondary visual aids, routinely mirrors and, in particular in the case of dump trucks a rear view camera, it is not possible to see from the driver's normal driving position. In some cases these areas can be covered by moving the body and head – as is typically and safely done by motorists checking their near or off side before coming out from a parking position or changing lane in traffic.

5.1.4 The problem of off side blind spots is exacerbated in the case of dump trucks by the left hand position of the driver in a 5 metres wide vehicle which is sitting high off the ground. In the case of some large dump trucks in particular there will be blind spots which will not be visible directly or with visual aids, unless the driver gets out of the cab and goes over to the other side and looks down, or even gets down out of the vehicle. The Terex TR 100, as its visual aids were configured on the day of the accident, is such a vehicle.

5.2 *The day of the Accident*

5.2.1 The accident occurred at around 1pm, around the middle of the day shift. On the day of the accident the weather appears to have been fine. The accident occurred in an area of the dig where there was one excavator, an RH 120E machine, which was operated by Duncan McDougall, an experienced operator who also had experience on other plant, including dump trucks. Mr McDougall's machine was a back actor excavator, operating from a bench. To the north or north west of Mr McDougall's machine and in a lower area no more than about 50 to 100 metres away was a face shovel being operated by John Dunlop, who was not a witness at the Inquiry. Mr McDougall had a fixed unit radio in his cab, as had all excavators.

5.2.2 Brian French, the foreman fitter spoke to Brian Robertson, the general foreman at about 11am on the hardstand at the main workshop and said he needed to

park both the RH 120E excavators at some point to check the jib, because cracks had appeared on one of the other machines on another site. The jib is where the main rams connect on the machine and where the hydraulic pressure is put on for the excavator to dig and it could cause significant damage if it broke.

5.2.3 The two machines were about 200-300 yards apart. Mr French intended to deal with one of the excavators on the meal break (which Mr Robertson thought had started) and would need to stop the other one while it was working. Mr Robertson usually spoke to the fitters in their site office in the morning to look at the defect sheet and he thought he had done that earlier. At that time there was no mention of missing radios. Mr Robertson approved this work but he did not enquire how the area around the excavator was going to be cleared.

5.2.4 In the past he had cleared areas if he was up on the site, or the supervisor could clear the area and he considered that Brian French was capable of clearing the area, because he thought that he had radio contact. He did not appreciate that Mr French did not have a site radio. He told Mr French that Sandy McCulloch, the supervisor, would be up at the dig area if he himself was not back up there.

5.2.5 Mr Robertson thought that Mr French would probably contact the excavator driver by radio and tell him he needed access. He thought (erroneously) that he probably spoke to Mr McCulloch, the supervisor, or the leading driver. It was effectively left to Mr French how he wanted the area cleared. It was his responsibility to ensure that the area was cleared, but there was no definitive procedure to achieve that.

5.2.6 It is fair to say that Mr Robertson had no idea how Mr French might have gone about ensuring the area was cleared for him to approach the excavator.

5.2.7 In the event, Mr French did not contact the supervisor or the leading driver before he and Mr Ferguson, who was driving, entered the area of Mr McDougall's excavator.

5.2.8 At the time of the accident, the relevant personnel in the vicinity of Mr McDougall's excavator had taken their first of two meal breaks.

5.2.9 None of the dump trucks operating in his vicinity at the immediate time of the accident had radios, nor did the fitters, the deceased Colin Ferguson and Brian French. Mr McDougall's excavator, in common with all excavators, had a fitted site radio.

5.2.10 Mr McDougall was located at the eastern end of what might be described as a horseshoe or U-shaped area, if the U is rotated 90° to the left, where the open mouth of the U was to the west and the bottom of the U to the east. At its widest the area was about 50 metres. The immediate area was about 80-100 metres in length. It was bounded to the north by a berm, or ledge which would have been built up by bulldozers to prevent heavy plant from going over the edge of that digging area, to the east by the bench on which the RH 120E excavator was operating and to the south by a high wall.

5.2.11 It is convenient to consider what happened from the viewpoint of Messrs Murray, Cullen and McDougall before considering the evidence of Mr Shannon, not the least because Mr Shannon claims to have very little recollection of key parts of the incident.

5.3 *Eye witness account of Peter Murray*

5.3.1 Peter Murray has 14 years experience as a dump truck driver and was operating a Caterpillar 777 truck – which, like the Terex TR 100, is a 100 Tonne payload truck. He and two or three other dump truck drivers, including Kevin Cullen, had been instructed by the leading driver to work off Mr McDougall's excavator.

5.3.2 Some time around 1pm, Mr Murray returned from the tip and approached Mr McDougall's excavator, driving in to the north, left hand, side of the U shaped digging area. There was another truck being loaded, so Mr Murray remained on the north side until the other truck was loaded. He then drove round the U shape and positioned himself on the south side, now facing west, ready to reverse in to the excavator and be loaded. He did not reverse, because Mr McDougall put the excavator bucket on the ground – indicating that he was not excavating. Mr Murray observed him walking round to the back, concluding that he was checking for a breakdown (Mr McDougall did not mention getting out of the excavator and was not aware of any fault, so he may simply have been relieving himself).

5.3.3 Mr Murray then observed Alan Shannon driving his Terex dump truck TR 100 number 4262 which drove in the same way and stopped, on the north side, facing the excavator, about 30-40 metres apart from Mr Murray and about 2-3 metres from the berm on Mr Shannon's left – in much the same position that Mr Murray had occupied when he first drove into Mr McDougall's dig area. Mr Shannon had not been working off Mr McDougall's excavator that morning and Mr Murray thought it odd for him to appear there for the first time that morning.

5.3.4 Mr McDougall had still not got back in his cab when Kevin Cullen appeared in his identical TR 100 and stopped behind Mr Shannon. Mr Murray estimated that he was about 30 metres from the excavator, Mr Shannon was 30-35 metres from the excavator and Mr Cullen was about 5-10 metres behind Mr Shannon.

5.3.5 Mr Murray saw Mr McDougall get back in his cab and thought that he saw him go on the radio (again, Mr McDougall did not mention that and it does not appear relevant to the accident). A couple of minutes later Mr Murray saw a Land Rover approach the dig, with orange flashing lights on the roof (as were displayed by all Land Rovers operating on site).

5.3.6 The Land Rover drove down the middle of the dig area, an equal distance between Mr Murray and the other trucks. There was no room for the Land Rover to pass on the nearside of Mr Cullen and Mr Shannon, which would have allowed it more easily to be seen by them, because of their left hand driving position.

5.3.7 Mr Murray saw the Land Rover drive past him, about 2 to 3 metres out. The driver - Colin Ferguson - looked up and made eye contact with Mr Murray as he passed, probably just before he got to front of his dump truck.

5.3.8 The excavator started to raise his bucket; Mr Murray assumed he was working again and therefore started to reverse. He realised quickly that he should not have done that, because he could not see where the Land Rover had gone in his blind spot. He thought he had reversed about a metre when he stopped again; he also stopped because he saw that Mr McDougall had dropped the bucket again.

5.3.9 The Land Rover reversed back to about 5 metres in front of Mr Murray's truck, on the same line of travel. Mr Murray was first aware of that when it had passed him. Mr Ferguson signalled Mr Murray to move on, with a pointing gesture. Mr Ferguson may have been aware of and been responding to his reversing, because that would have activated his reversing alarm.

5.3.10 Mr Murray moved off behind Messrs Shannon and Cullen and to the right, towards John Dunlop's excavator and he saw the Land Rover drive forward again. When he lost sight it would have been 10 metres from Mr Shannon's vehicle. The final position of the Land Rover would have been in the Terex's blind spot. As he was leaving Mr McDougall's dig to head towards Mr Dunlop's excavator, he looked across and saw Mr Shannon acting normally, but reading a newspaper.

5.3.11 From viewing a reconstruction video, Mr Murray agreed that Mr Shannon must have applied full lock, which he agreed in cross-examination should be avoided by a careful and competent driver, but in Mr Murray's view Mr Shannon did not do anything that he and other drivers had not done, although the common sense route was to follow as near as possible the curve of the edges of the dig area, which was to some extent marked on the ground, cut up by tyre tracks; that was safer and more practical and was the route they drove in all day. As he put it, "Why should I turn into a blind spot" (Day 3, page 60).

5.4 *Eye witness account of Kevin Cullen*

5.4.1 Mr Cullen's evidence was that he followed Mr Shannon into the dig and stopped about 1 ½ truck lengths behind Mr Shannon. Like Mr Murray, he observed that Mr Shannon had not been working at that machine earlier, although that was not uncommon.

5.4.2 There was nothing unusual about Mr Shannon's position, which was maybe 6 truck lengths from the digger and was further back than Mr Murray.

5.4.3 He sat waiting for maybe 5-10 minutes, which was not unusual. He noticed the Land Rover approaching in his offside mirror and rear view camera, near the entry point of the digging area – maybe 200 yards away. It came in the same route that he had taken. He did not watch it all the way in, but it would have passed along his offside blind spot. He saw the orange beacons on the roof of the Land Rover and saw it pass his truck and go past Mr Shannon's truck, three to four Land Rover widths away on the offside.

5.4.4 He knew it was a fitters' Land Rover. It was going in a straight line towards the digger, along the middle of the dig area. He did not see any signals or gestures. The Land Rover went a couple of Land Rover lengths in front of Mr Shannon's truck, three to four Land Rover widths out, although it could have been closer, but not much and not as close as two widths. It would have passed along Mr Shannon's blind spot. It apparently stopped because the digger was starting to load the bucket and put it in the air, in preparation to load Mr Murray's truck. He assumed that either Mr McDougall had not seen them or there was radio communication from him that he was going to load one more truck.

5.4.5 He saw Mr Murray start to reverse, but not far. The Land Rover reversed back as well, as soon as Mr Murray started reversing, about a Land Rover length, not any closer to the offside of Mr Shannon and still parallel to him. Mr Shannon would probably not have been able to see it, although he would just be guessing, because it would be in the blind spot area. He was not sure whether the Land Rover came as far back as the front wheels of Mr Shannon's truck.

5.4.6 He did not see the Land Rover do anything other than reverse back and was not aware of any gestures, although he considered that the occupants would have to have got out of the vehicle to gesture to him.

5.4.7 After the Land Rover reversed back Mr McDougall tipped his load out on the ground; Mr Cullen took it he had seen the Land Rover, but that indicated to him that Mr McDougall may not have been aware of it before that point. Mr Murray then left the dig area. Mr Cullen assumed that the fitters were going to be working on the excavator.

5.4.8 Mr Cullen then saw Mr Shannon move forward, in a right turn, accelerating in a normal manner. It would have been open to Mr Shannon to drive round in a gentle arc (as had Mr Murray). Mr Cullen realised that Mr Shannon was not aware that the Land Rover was there and he started to panic, moved slightly to the right and sounded his horn. The Land Rover did not move and he saw Mr Shannon's truck strike the Land Rover. This may have taken 8-10 seconds.

5.4.9 The Terex seemed to come to a stop as if Mr Shannon was aware he had hit something. He stopped for a few seconds and, after about five seconds, his wheels started spinning for about 10 or 15 seconds and his truck then tried to mount the top of the Land Rover. Mr Cullen was making a right turn and blasting his horn and when got to the side he flashed his lights as well; he also thought he had raised his hands. Then Mr Shannon made visual contact with him and stopped immediately. The overall time from the initial collision until he established contact with Mr Shannon was about a minute. Mr Shannon had his arms raised, saying "I didn't see them, I didn't see them". (Day 4, page 121).

5.4.10 If the Land Rover had gone as far forward as to go past Mr Murray, into Mr Murray's blind spot, Mr Cullen would have expected it to be visible to Mr Shannon from straight ahead.

5.5 *Eye witness account of Duncan McDougall*

5.5.1 Mr McDougall was swinging round the bucket on his excavator to get it in position to load Mr Murray's truck when he first saw the Land Rover on the right hand side. He was not at that point aware of other trucks in the dig. Mr Murray was waiting to reverse back – about two or three truck lengths out.

5.5.2 The Land Rover was close as 15 to 20 feet, or maybe two Land Rover lengths, when Mr McDougall was first aware of it. Colin Ferguson signalled to him by a hand signal to come down off the bench. In order to do that he first had to make a ramp, using his excavator, and he started to do so. He saw Mr Ferguson start to reverse back out.

5.5.3 He heard Mr Cullen's horn going and saw Mr Shannon's truck mounting the Land Rover, which had already been struck. He saw the truck hit the Land Rover, rocking back, hitting it again and he blew his horn and placed both hands in the air to try to get Mr Shannon to stop. He saw Mr Shannon raise his hands in a gesture as if to ask what was the problem. He was not sure whether the eye contact and gesture was directed to him or Mr Cullen.

5.5.4 Mr McDougall had not been aware of Mr Shannon's or Mr Cullen's trucks until he turned when he heard Mr Cullen's horn. He had been looking down at his excavator tracks to sort the ramp out to get down off the bench.

5.6 *Eye witness account of Alan Shannon*

5.6.1 Alan Shannon had just completed his probationary period as a novice dump truck driver. On the day of the accident he was told to work from any of four excavators in the advanced dig, i.e. the less deep (and therefore less difficult) part of the dig.

5.6.2 He had a newspaper with him. It was his normal practice to take newspapers to work, to read at breaks. He normally kept his newspaper in his bag, where he also had his food, when he was at work. On the day of the accident he went into the cabin to have tea at the first break and took his bag with him. When he got back he put his bag on the passenger seat and he put the newspaper on the passenger seat underneath the bag. He started his truck; the other trucks were moving out and he had to move out. He did not have any time to put the paper in his bag because "Time is money" (Day 8, page 9). That was a phrase the site manager used (pages 16-17). He did not read the newspaper while he was in the dig area that day.

5.6.3 He approached Mr McDougall's excavator from the left hand side and parked in a safe position there. He saw that Mr Murray was waiting to reverse in to the excavator. Mr Shannon stopped fairly close to the berm on the left-hand side – maybe a couple of metres from it.

5.6.4 He intended to wait for Peter Murray to be loaded and then manoeuvre round and reverse to get in to the excavator to be loaded. He was not intending to drive round the U shape, but to drive immediately to his right. He was vigilant as to

the entrance to the dig, the route other vehicles would be coming in and he was checking mirrors and visual aids. He was not reading a newspaper.

5.6.5 He was aware of Kevin Cullen coming into the dig, although at that point he did not realise that it was Kevin Cullen. Mr Cullen was there by the time he noticed him in his rear-view monitor. He did not think that Mr Cullen came in immediately after him. Mr Cullen stopped directly behind him, but he could not say how far behind him; they were facing a wall and the excavator would have been to his right.

5.6.6 He saw that Mr McDougall was sweeping, going from side to side, using his bucket and he was clearing a path. The excavator was facing away from Mr Shannon when he arrived, his boom was on Mr Shannon's right side and the cab was at the other side of the boom. The area which he was sweeping was to Mr Shannon's right.

5.6.7 If Mr McDougall was clearing a path, that meant he was about to move, but it might be to a position elsewhere on the bench. When Mr Murray moved away, Mr McDougall started to sweep a ramp to come down off his bench.

5.6.8 Mr Murray was a bit closer than Mr Shannon to Mr McDougall's excavator, maybe 1 ½ to 2 truck lengths and was in position where he could reverse in to the excavator, but Mr Shannon did not see Mr Murray reverse back when he was sitting there. He thought Mr McDougall was sweeping a path before Mr Murray left.

5.6.9 He was not aware of seeing anything which caused Mr Murray to leave. He was unloaded when he left, which was unusual. He was not aware of Mr McDougall dropping his bucket at any stage when Mr Murray was there. When he saw Mr McDougall starting to prepare to make a ramp for the excavator to come down he thought there was a problem with Mr McDougall's machine and he made the decision to leave the dig, to go and find another machine.

5.6.10 He was sure he checked his mirrors. He turned the steering to the right, but could not be sure how far to the right, although it was possible that he did – and indeed he thought that he did – apply full right hand lock before he moved. He checked his mirrors, released the parking brake, checked the mirrors again and proceeded to move off. It had not crossed his mind at any point prior to this that there may be Land Rovers in the area.

5.6.11 He proceeded very slowly and took the quickest route to leave the dig. He had barely moved before he knew something was wrong and he was still in first gear. He had possibly driven a couple of feet. All he could remember as to what alerted him to something being wrong was hearing the sound of horns.

5.6.12 He remembered looking to the right and seeing Mr Cullen and he could remember him pointing down. He then he put the parking brake on the truck, got out the cab and looked down to the right and saw the Land Rover.

5.6.13 He did not remember feeling the impact at all and had no recollection of having to accelerate so that his wheels were spinning. He had no recollection of

going forward, striking the Land Rover, almost rocking back slightly, and accelerating further and moving his vehicle onto the Land Rover. He had no recollection of feeling resistance from the Land Rover.

5.6.14 He did not remember hearing any noise of the impact; he was not wearing earplugs and the (music) radio in his cab was not loud. He had no recollection of wheels spinning.

5.6.15 It did not cross his mind to get out of his seat and go and check the blind spot. He had not seen other drivers do that in dig areas before moving off and it was not something he was trained to do. He accepted that it was possible with hindsight that it was a bad idea to turn into the blind spot without ensuring there was anything in it, but at the time, as far as he was aware, there was nothing there.

5.6.16 It did not cross his mind when he saw the excavator was going to come down that he should sit where he was and wait for instructions. He was not aware of other drivers doing that as a normal practice; he understood that he was to use his own initiative. He was told in training that unless truck drivers were told to wait, they had to go and find another machine. He always did that until the leading driver told him to stand.

5.7 *The immediate aftermath*

5.7.1 Mr McDougall immediately radioed for assistance, using the open channel site radio system. He initially tried to raise the supervisor, then the general foreman and when he then called to the base, the general foreman, Brian Robertson responded. He was at the coal distribution point, about two and a half miles away, but immediately made his way to the accident scene. The supervisor, Alexander McCulloch was also well outside the general dig area, dealing with the grader, which was broken down at the tip, about half a mile from the scene of the accident. He heard a message about the accident and made his way there with first aiders.

5.7.2 Mr Cullen attempted, with assistance from others who arrived on the scene, to get the driver's and back doors of the Land Rover open, but they were jammed. While he could not get to the men, there was no sign of life. When Mr Robertson arrived he was able to get to Mr Ferguson's body and found no pulse; he could not get to Mr French, although he understood that one of the first aiders had been able to detect a pulse from him. There was some confusion in the immediate aftermath as to what could be done and how it could be organised, although the emergency services were speedily contacted and both the general foreman and supervisor made their way to the scene as quickly as possible. Some thought was given to attempting to pull the Terex TR 100 dump truck off the Land Rover, but Mr Robertson concluded that nothing could be done.

5.7.3 Mr Murray realised from the reaction of Mr Dunlop, the excavator driver whose machine he had moved to, that something was amiss and headed back towards Mr McDougall's dig area. Mr Shannon was quickly removed from the immediate area and placed in Mr Murray's cab. He was crying and asked if he would lose his job.

5.7.4 Witnesses varied in their recollection of time spans, but it seems likely that little time was lost in the relevant people getting to the scene and making a realistic assessment of the position. An ambulance technician was only about half a mile from the site entrance when he got a call to attend the site at 13.39, arriving at the site at 13.45 and at the scene of the accident at 13.53. He was able to access both bodies; there was no pulse or sign of life and the injuries to both men appeared to be incompatible with life. The air ambulance arrived minutes later and a paramedic confirmed these findings.

5.7.5 In the meantime Mr Shannon was removed by the leading driver, Robert Stewart, to the medical or first aid room near the site office. Again, he asked if he would lose his job. His father and partner came for him and he was taken home. Before that he said that he needed to get his bag from the dump truck, but he was not allowed to do that.

5.7.6 The site manager, David Paterson, visited him that evening and he was suspended pending investigation.

5.7.7 Strathclyde Fire and Rescue personnel attended at the scene initially at 13.50 and co-ordinated efforts with the police to remove the dump truck and extricate the bodies. An attempt was made to lift the dump truck clear with a crane, but that was not successful and eventually it was pulled clear using chains attached to another dump truck and fire and rescue personnel used hydraulic cutting gear to remove the roof and dashboard of the Land Rover so that the bodies could be extricated. John Alexander, Group Commander, gave evidence that it was extremely unlikely that the men could have been extricated without specialist cutting equipment and knowledge.

5.7.8 Drs Edwin Nairn and Iain Graham, both Consultant Pathologists, undertook post mortem dissections on the bodies of Colin Ferguson and Brian French. They determined that the cause of death in the case of Mr Ferguson was:

1a) Asphyxia; 1b) Crush injury to chest due to 1c) Accident at work

In the case of Mr French, they determined that the cause of death was:

1a) Multiple injuries due to 1b) Accident at work.

5.7.9 In the case of Mr Ferguson, Dr Nairn expressed the opinion that for him to have had any chance of surviving the accident he would have been required to have been extricated from the Land Rover and provided with acute medical treatment by way of ventilation and support within three or four minutes of the accident occurring. It was quite clear on the evidence that there were no practicable means whereby extrication or such immediate medical treatment could have been feasible. I thus conclude that the accident was not survivable in Mr Ferguson's case.

5.7.10 In the case of Mr French the crushing injuries were even more significant and Dr Nairn concluded that he would have been unable to survive this accident and would have died almost instantly upon the Land Rover being crushed.

5.7.11 When Mr Paterson, who had been away from the site, arrived back at the site he went to Mr Shannon's truck and saw that there was a newspaper on the passenger seat. When Mr Shannon was shown, in evidence, a photograph of the inside of the cab of his truck taken after the accident, he confirmed that the bag was on the floor and the newspaper was on the seat. He said that the bag must have fallen off the seat, but he conceded that it was possible that the newspaper was lying in that position on the seat when he left the cab, with the bag on the floor.

6 The investigation

6.1 Strathclyde Police took charge of the accident scene and arranged for photographs of the immediate area and around the vehicles to be taken, and later for views to be taken from within the cab of the dump truck that had been driven by Alan Shannon. The main part of the formal investigation was undertaken by the Health and Safety Executive (HSE). At the relevant time, opencast coal mines were the responsibility of the Mines Inspectorate of the Health and Safety Executive which was based at Sheffield and did not have inspectors permanently located in Scotland. That Inspectorate was not able to undertake the investigation because of pressure of work and Norman (Norrie) Buchanan, HM Inspector with the Quarries Inspectorate, who is based in Scotland, was asked to undertake the investigation. The Quarries Inspectorate had previously had responsibility for inspection of opencast coal mines, which were indeed returned to that Inspectorate some time after this accident, but had not had any such responsibility for about five years at the time of the accident. Mr Buchanan had direct experience as a manager in both deep and opencast coal mining and was able to bring that experience to bear.

6.2 Mr Buchanan attended at the scene of the accident that evening, viewed the scene of the accident and spoke to the site manager, David Paterson. He asked Mr Paterson if there were radios and he seemed quite sure that Messrs French and Ferguson and Paterson had all been supplied with radios. He said all the dump trucks had radios on them. Mr Buchanan spoke to Mr Shannon who was in the office when he got back and he said he did not have a radio but he had asked for a radio three or four weeks previously from a site supervisor, who refused him a radio because he felt it would distract him. He later learned from Messrs Cullen and Murray's statements that they did not have radios. He thought that Mr Paterson had meant that all the vehicles involved in the accident had radios.

6.3 When Mr Buchanan returned to the office with Mr Paterson immediately after visiting the accident scene, he asked for a list of the number of radios on site to be available first thing the following morning. A radio list was provided the following day and it identified 9 out of 23 dump trucks – including 5 out of 8 Terex TR 100 trucks - as having no radio, but in each case it noted that a radio was required. He was concerned because of his experience and his knowledge of the operation on that site with heavy plant and the risk of collision, with the poor visual field for truck operators. Not being able to communicate verbally was a high risk that could be averted or reduced with the use of two way radios. Without it operators were half blind and deaf and dumb.

6.4 It is not HSE policy to take formal statements immediately after a fatal accident and Mr Buchanan returned for the formal investigation on the following day

with a colleague, Dr Harris Cooper and took statements from witnesses. Further technical investigations were carried out by Mr Jeremy Ferreira, M Erg S, a qualified ergonomist with the Health and Safety Laboratory (HSL), itself part of the HSE and Mr Colin Martin, a specialist mechanical inspector with the HSE who submitted the main HSE report.

6.5 The executive summary and recommendations from Mr Ferreira's report are reproduced in Annex G and the conclusions from Mr Martin's report are reproduced in Annex H.

6.6 Pending these detailed technical investigations, Mr Buchanan concluded that there were issues at the site that justified and required the issue of immediate prohibition notices under Sections 22 to 24 of the 1974 Act and these were served on the company on 27 February 2007.

6.7 They were concerned with

(1) The use of dump trucks in their excavation and hauling activities on their site without operational 2-way radio or equivalent, involving a risk of serious injury that without radios or equivalent the truck driver was isolated and could not effectively communicate with others in the vicinity and of contravention of Sections 2(1) and 3(1) of the 1974 Act because "you have not so far as reasonably practicable ensured the safety of your employees and others at work by providing a suitable system of communication to ensure safe vehicle movement"; and

(2) the entry of non-production type vehicles namely vehicles other than dump trucks into the dig area while excavation operations were active which involved a risk of collision between vehicles and of contravention of Sections 2(1) and 3(1) of the 1974 Act because "you have not so far as reasonably practicable ensured the safety of your employees and others at work by providing and operating a safe system of work to control vehicle movements in the workplace".

6.8 The effect of these notices, which were not appealed, was that there could be no work on the site until they were complied with.

6.9 Separately, Scottish Coal Company Limited investigated the accident, although properly letting the HSE investigation proceed first. The author of the Scottish Coal report was Mr Ian Munro, the company's environment safety manager. The conclusions and recommendations from his report are reproduced in Annex I.

6.10 There was one respect in which Scottish Coal were able to proceed themselves and that was in respect of surveying the area of the accident. Their site engineer (who is responsible for surveying the site rather than for mechanical engineering) took accurate measurements of the topography of the area around where Mr McDougall's excavator had been located, the final position of the dump truck driven by Alan Shannon and the point of impact with the Land Rover. Unfortunately these were the only points surveyed. In the case of the other vehicles which had been

in the dig area it was impossible to identify their precise positions, because all had moved since the accident.

6.11 In a previous accident, in 2005, to which I will refer later, which involved a Caterpillar dump truck and a Land Rover, it had been possible for the site engineer to take further measurements, including of skid marks and produce a plan which helped determine more of the mechanism of that accident. In the present accident, the photographs taken by the police show that there was some indication of skid or gouge movements in the ground, but these were not surveyed. Moreover, although the point of impact of the Land Rover was surveyed, its precise position in the dig area and in relation to the dump truck was not surveyed and there is therefore no accurate information available in particular as to the angle of the Land Rover in its resting position in relation to the dump truck and the general layout of the immediate dig area.

6.12 Subsequent efforts to reconstruct the positions of vehicles (other than Mr Shannon's final position) were hampered by the lack of such data and had to rely to a great extent on the recollection and estimation of witnesses. For practical purposes, almost all of the eye witness evidence as to the positioning and movement of vehicles at critical times has to be treated with care and the evidence of various reconstructions has to have a significant health warning.

6.13 Nonetheless, useful reconstructions were carried out by Scottish Coal (who invited the HSE to participate, although they declined) and subsequently by the HSE. The former included video recording of different aspects of the reconstruction; the latter included video recording and photographs. And, at the request of the Crown, SCC prepared, on the basis of the available evidence, three large charts which attempted to show Mr McDougall's dig area immediately before the Land Rover appeared, after it had appeared but shortly prior to the accident and immediately after the accident.

6.14 The principal authors of the investigation reports by the Health and Safety Laboratory (Mr Ferreira), the HSE (Mr Martin) and Scottish Coal (Mr Munro) gave evidence and their reports have undoubtedly informed the Inquiry.

7 The short term aftermath

7.1 Alan Shannon

7.1.1 As already indicated, Mr Shannon was immediately suspended. Mr Hugh Phillips, the driver who had instructed Mr Shannon visited him twice in the days after the accident. When he visited Mr Shannon the first time after the accident he was too distraught to talk about anything but he maybe said "I wisnae reading a newspaper" (Day 24, page 2). He did remember him saying something like "I wisnae reading a newspaper" apparently on the second time he visited (Day 24, page 6).

7.1.2 Mr Paterson remained suspended on basic pay until a meeting to which the site manager, David Paterson, invited him on 25 April 2007, when he was dismissed. The reason which he was given was a perceived lack of confidence, although there was and remains some ambiguity about whether the confidence was

his confidence or that of his employer, or both. He was told that consideration had been given to relocating him to other sites, but for a variety of reasons it was not possible to offer him employment there. But on the issue of blame for the accident it was noted in the formal record of the meeting that Mr Paterson “stated that this was not the case as we had no worries about his ability” (Production 1 for Alan Shannon).

7.1.3 It was clear, however, that one factor which was taken into account was a posting by Mr Shannon on his “Bebo” social networking page in the weeks after the accident. The page included a picture of a TR 100 truck, which he posted after the accident and remarks concerning his situation, including “I’m just taking each day as it comes. I’m on suspension the noo and still getting paid, yippee” and “So unlike you, I’ll be up sometime tomorrow, ha ha, but other than that daein’ fine, going back to the pub and the football tomorrow, so another late night beckons and so does another sair heid” (Day 9, pages 121-2).

7.1.4 He attributed this bizarre material to the fact he had hit a downward spiral and turned to drink, quickly after the accident. He did not have a previous drinking problem, but his drinking was getting out of control in the months following the accident.

7.1.5 Whatever the background, this material quickly became known at the site and a degree of ill feeling towards him built up in consequence of that. While I only heard evidence from several workers at the site, there does not seem to have been any widespread ill-feeling against him generated by his involvement in the accident itself.

7.2 *The site*

7.2.1 There was no work at the Pennyvenie site for two weeks after the accident, for a variety of reasons, including respect for the dead men and the need for the company to introduce technical and working systems which met the requirements of the prohibition notices.

7.2.2 When work resumed all site vehicles and plant were equipped with fitted or hand held radios and an addendum was issued to the Site Manager’s Vehicle Rules which in particular prohibited the entry of non-production type vehicles to the loading zone of an excavator while excavation operations were active, required contact with a supervisor when entry to the loading zone by a vehicle other than a dump truck was necessary and required the supervisor to ensure that dump trucks and other vehicles were withdrawn to a place of safety before giving permission for the driver of the non-production type vehicle to enter the excavator loading zone. The full text of the addendum is reproduced as Annex D.

7.2.3 In the longer term, a sophisticated traffic management system was introduced and modifications were made to Land Rovers and dump trucks to improve visibility and visual aids and I will return to these matters.

8 *The 2005 accident*

8.1 Fatal accident inquiries are inevitably an exercise in hindsight and it is often necessary to bear that in mind in examining the behaviour of individuals and

systems of working, but in this case there was a previous accident which had a number of features in common with this accident. The company's approach to training and organisation of work was to some extent coloured by that experience; and its response to that accident is relevant to what happened on 26 February 2007.

8.2 On 23 March 2005, at the changeover from night to day shift Alexander McCulloch, the supervisor, drove a Land Rover into a position towards the front and about 6 metres to the driver's offside of a Caterpillar 785 dump truck (a very large 150 tonne payload truck) while he was speaking on the radio to the operator of an excavator that the driver of the dump truck was intending to approach. Mr McCulloch did not communicate, by radio or otherwise, with the driver of the dump truck, who did not see him and that driver started to manoeuvre into position to reverse to the excavator by turning to the right, whereupon his truck crushed the Land Rover. Mr McCulloch heard the revving of the dump truck and tried to engage gear to escape, but stalled, although miraculously, as the dump truck started to crush the Land Rover, he was able to force the by now jammed driver's door open and escape before he too was crushed.

8.3 Mr McCulloch was disciplined and given a final written warning for entering the loading/manoeuvring zone of the dump truck without ensuring that all operators were aware of his presence or machines were immobilized. The truck driver was given a verbal warning for failing to check properly before he moved off. Although it seemed clear that the Land Rover was in an offside blind spot, it was apparently a blind spot caused by the cab strut of that particular truck, into which the truck driver could have been seen, if he had moved his head.

8.4 Mr McCulloch was a witness at the Inquiry and was at pains to accept personal responsibility for the 2005 accident.

8.5 SCC reported the circumstances of the accident to the HSE, although they were under no obligation to do so, since it was not a reportable incident under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR), because it did not involve death or major injury and, although it was plainly a near miss for death, it was not in the categories of near miss which are reportable to the HSE. Nonetheless, a responsible employer is expected to report significant accidents.

8.6 SCC's response was to issue immediate guidance to all employees by means of a Safety Alert issued with pay packets and exhibited on notice boards, run a poster campaign with illustrations of the accident, hold toolbox talks (talks to employees on safety issues) for all employees and retrain all light vehicle drivers in all round visibility appreciation and hazards of large vehicles, to which I will return. The text of the Safety Alert is reproduced as Annex E.

9 Visibility from dump trucks

The problem of blind spots of visibility from dump trucks has already been mentioned. It was recognised by SCC and their policy was to carry out a full all round visibility assessment on new plant arriving on their sites.

9.1 Regulations and standards

9.1.1 There is no requirement that dump trucks afford full visibility to their drivers. Indeed, there is no detailed standard laid down, whether for manufacturers or users, for visibility for trucks of the size typically operated in opencast mines.

9.1.2 Trucks had to comply with the Supply of Machinery (Safety) Regulations 1992 (revoked and replaced at the end of 2009 by the Supply of Machinery (Safety) Regulations 2008), which prohibited supply of machinery which did not satisfy the relevant essential health and safety requirements. Essential health and safety requirements were set out in Annex I of the Machinery Directive (Council Directive 89/392/EEC on the approximation of the laws of the Member States relating to machinery and, from 1 May 2005, Directive 98/37/EC of the European Parliament and of the Council on the approximation of the laws of the Member States relating to machinery) which was also contained in Schedule 3 to the 1992 Regulations.

9.1.3 The essential health and safety requirements laid down in the Directive were mandatory. “However, taking into account the state of the art, it may not be possible to meet the objectives set by them. In this case, the machinery must as far as possible be designed and constructed with the purpose of approaching those objectives” (Annex I and Schedule 3).

9.1.4 Requirement 3.2.1 deals with driving position and provides:

“.....Visibility from the driving position must be such that the driver can in complete safety for himself and the exposed persons, operate the machinery and its tools in their intended conditions of use. Where necessary, appropriate devices must be provided to remedy hazards due to inadequate direct vision.”

9.1.5 Regulation 12(1) required that dump trucks, as relevant machinery, satisfy the relevant essential health and safety requirements and that the appropriate conformity assessment procedure in respect of the machinery had been carried out by the responsible person in accordance with the procedures in regulation 13, including an EC declaration of conformity in accordance with regulation 22 and the affixing of the CE marking and that the relevant machinery was in fact safe.

9.1.6 In terms of Regulation 12(2) it was the responsibility of the manufacturer of relevant machinery to carry out the necessary research or tests on components, fittings or the completed machine to determine whether by its design or construction the machine was capable of being erected and put into service safely.

9.1.7 In terms of Regulation 13 the responsible person required to draw up a technical file which comprised, inter alia, an overall drawing of the machinery, detailed drawings, accompanied by any calculation notes, test results and such other data as may be required to check the conformity of the machinery with the essential health and safety requirements, a list of the essential health and safety requirements, transposed harmonised standards, standards and other technical specifications, which were used when the machinery was designed and a description of methods adopted to eliminate hazards presented by the machinery. The responsible person may also

include any technical report or certificate obtained from a competent body or laboratory. If he declares conformity with a transposed harmonised standard which provides therefor, he must also include any technical report giving the results of tests carried out at his choice either by himself or by a competent body or laboratory. The HSE are entitled to view the technical file which the manufacturer believes gives him a presumption of conformity.

9.1.8 In terms of Regulation 22, drawing up an EC declaration of conformity was the procedure whereby the responsible person declares in respect of each item of relevant machinery which he supplies in the Community that that particular item of relevant machinery complies with all the essential health and safety requirements applying to it. It will contain a description of the machinery to which the declaration relates including indication of all relevant provisions with which the machinery complies.

9.1.9 The 2008 Regulations implement Directive 2006/42/EC of the European Parliament and of the Council on machinery, but the details of the requirements as regards visibility are unchanged. Generally, the essential health and safety requirements have not been subject to major changes, although several of them have been redrafted and the requirement relating to risk assessment has been made more explicit.

9.1.10 The process was essentially one of self-certification; by applying relevant standards a manufacturer gained a presumption of conformity, but there was no obligation to meet particular standards.

9.1.11 The Provision and Use of Work Equipment Regulations 1998 (known as PUWER) implemented the general non-lifting requirements to the Amending Directive to the Use of Work Equipment Directive (AUWED).

9.1.12 Regulation 28 states:

“Every employer shall ensure that, where self-propelled work equipment may, while in motion, involve risk to the safety of persons –

.....

(e) where the driver’s direct field of vision is inadequate to ensure safety, there are adequate devices for improving his vision so far as is reasonably practicable”.

9.2 *Terex TR 100 dump trucks*

Terex Corporation is an American corporation. Terex TR 100 dump trucks are manufactured at Motherwell by Terex Equipment Ltd, which is part of Terex Construction, which itself is one of the five segments of the global organisation. Terex Construction has about six manufacturing plants in Europe and the plant at Motherwell manufactures trucks. The TR 100 dump truck is primarily used in mining and quarrying applications. Its payload is 100 tonnes and that is the largest size of dump truck that Terex manufactures. I now turn to visibility standards and tests for Terex dump trucks.

9.3 *Manufacture and supply*

9.3.1 Terex Construction regards BSI BS EN 474 (Earth-Moving Machinery - Safety Part 1 - General Requirements) as the most important safety standard for dump trucks. The standard applies to anything classified as earth-moving machinery.

9.3.2 The preferential way for a manufacturer to meet the Supply of Machinery (Safety) Regulations 1992 was to apply relevant standards and in 2005 the particular preferential route would be ISO 5006, an international standard on visibility, which was referred to in the EN 474 Part 1 standard. There are 1991 and 2006 versions of ISO 5006 and, since the truck in question was manufactured in 2005, the version in force was ISO 5006 1991. Applying the standard would give rise to a presumption of conformity; but there was no obligation to do that - a manufacturer could go into production if he considered his equipment met the relevant legislative regulation: it is a self-certification process.

9.3.3 ISO standards are laid down by the International Organization for Standardization and, in its current 2006 version, ISO 5006 relates to heavy machinery of only up to 50 tonnes unladen mass. The version of ISO 5006 in force at the time applied to dump trucks up to 80 tonnes unladen mass and therefore did apply to the truck driven by Mr Shannon, which was of 68 tonnes unladen mass.

9.3.4 While ISO 5006 did not apply after February 2007 in light of the unladen mass of their trucks, Terex would still now apply the standard as the nearest applicable standard for the TR 100.

9.3.5 The visibility test under ISO 5006 1991, in 2005, involved drawing a circle on the ground on a 12 m radius from the driver's position and identifying blind spots on that circle using direct line of site; there was no requirement to see anything inside the circle or beyond it and certain degrees of masking were allowed in the circle.

9.3.6 Terex utilizes an independent organisation, Tiefbau, or TBG, a notifying body which is entitled to give a manufacturer approval that a machine meets the requirements of relevant Directives. They inspect and audit trucks and, in the case of the predecessor of the TR 100 (the K95), their only recommendation was that a mirror be placed above the offside cab access area, in case anyone was approaching the steps on foot or was on the steps to the cab. That was done at the beginning of

1994 and enabled Terex to claim full presumption of conformity with the Directive. The skip of the truck was later modified to increase its capacity from 95 to 100 tonnes, but the cab and visibility were the same.

9.3.7 TR 100 dump trucks were fitted with five mirrors and a rear view camera as standard. Terex put warnings in the operator's manual with regard to visibility and good site practice, in terms of things the driver can be responsible for, such as to make sure the area around the vehicle is clear before moving and to sound the horn twice for forwards, three times for reverse. They are now fitted with eight mirrors.

9.3.8 The 2006 version of ISO 5006 adds a further all round visibility assessment on a 1 m rectangular boundary; a rectangular box is drawn round all the extremities of the vehicle. A line is drawn 1 m out from that and visibility is assessed at 1.5 m height. There can be an unlimited number of maskings or blind spots, but the maximum width is 300 mm, so that wherever a person is stood around the rectangular boundary he can be seen. The test is done with direct vision and using indirect visibility aids. The standards community recognised that the previous test was an unreasonable one for vehicles up to 80 tonnes, because a vehicle that size would be unable to have direct visibility in the requirements, so the new test applies to dump trucks up to 50 tonnes. There is now no standard that goes above 50 tonnes.

9.3.9 ISO 5006 2006 provides

"For machines that are not included in Table 1 [of the Standard] due to their machine mass (large size), the manufacturer should apply the tests and criteria as specified in this International Standard. For those machines that do not meet the criteria for the highest specified category of machine mass in the respective machine family, the manufacturer shall consider appropriate technical measures and shall put an imperative indication (i.e. instructions) in the operator's manual that the customer is required to ensure suitable jobsite organisation with respect of acceptable visibility and operation of the machine"

9.3.10 That was the approach which Terex considered was effectively required by the legislation: to apply the most relevant standard and, if it was not met, provide that information to purchasers. If you could not meet the standard you must use state of the art means and failing that give as much information as you can, but as of 2006, the new truck does meet the requirements of ISO 5006 2006, according to Dale Camsell, the conformance engineering director of Terex Construction, who gave evidence.

9.3.11 Nonetheless, Terex do still go to pains to explain in the operator's manual at great length how to correctly set up mirrors to ensure maximum visibility and they draw out a planned view of the 12 m circle and the 1 m rectangular boundary and label the mirrors and say adjust Mirror A to give you good visibility on the relevant part, to give full visibility on the circle and boundary. When they sell big trucks at the point of delivery a demonstration driver attends the site and gives a familiarisation procedure to nominated representatives of the purchaser.

9.3.12 The front offside quarter blind spot was known to Terex before they supplied the trucks. It did not pass the ISO visibility test because of that, but that was

why they had the notifying body come in to say that the visibility provided with the mirrors they had suggested was adequate to meet the requirements of the Directive.

9.3.13 Mr Camsell agreed that “state of the art” meant the best equipment currently commercially available, on the market. Terex have probably had rear view cameras fitted as standard from around the mid 1990s.

9.4 Use and provision for use at work

9.4.1 To comply with PUWER Regulation 28, SCC applied all round visibility (ARV) procedure to any plant coming in, including hired plant, carrying out a survey to 1 m high at 1 m out from the vehicle (essentially the same survey as applied to manufacturers under ISO 5006 1991) in order to identify blind spots and then tried to cover them with visual aids before surveying again to check they had covered what they needed to for safe operation.

9.4.2 It was industry practice to measure visibility at 1 m height, on the basis of a man crouching at the wheel of a machine ergonomically. Guidance issued by the HSE in February 2007 (Assessing Field of Vision for Operators of Earth Moving Machinery on Construction Sites) encouraged survey at 1.5m height in order to detect the presence of a standing person, of short stature, 1 m out from the perimeter of the machine.

9.5 *Visibility assessment of Terex TR 100 dump trucks at Pennyvenie*

9.5.1 The dump truck involved in the accident was assessed in March/April 2006 and the areas which were visible directly, or through visual aids, were mapped out. These assessments informed the positioning of mirrors, in order to attempt to minimize wholly blind spots. Nonetheless, there was a significant blind spot to the offside and front offside of the vehicle. The assessments were carried out at 1 m height, which was industry standard at the time, but were carried out over an extensive distance and not merely at the 1 m perimeter.

9.5.2 SCC added three mirrors and the full array of mirrors in use at the time of the accident (all external) were

- a convex mirror mounted on the front right corner of the engine casing, providing a view to the immediate front of the vehicle;
- a mirror on the right side railing, providing a view to the access ladder and steps within the front right quarter of the vehicle (the mirror recommended by Tiefbau);
- four external side mirrors, one mounted horizontally and vertically on each side, providing a limited view to the rear sides; and
- a convex mirror mounted on the right side railing, which was mounted further forward than the other side mirrors and provided a view along the right side of the vehicle, which began closer to the front right corner of the vehicle compared with the view provided by the other side mirrors.

9.5.3 The survey carried out by SCC in April 2006 on dump truck 4262 (the truck driven by Mr Shannon) showed that at 1 m height there was reasonable indirect and direct visibility to the front of the vehicle, although there were blind spots to the

nearside, but far more significantly on the offside there were very significant blind spots, to the driver's right, stretching back for the length of the vehicle (except for an area up to 1 m from the offside) and fanning out from there to cover an infinite distance. To the driver's right and forward of his right hand there was a blind spot stretching out for about 5 m in both directions, and there was a narrower, 1 m band stretching out ahead and to the right infinitely.

9.5.4 Following the 2007 accident, SCC carried out a further ARV assessment on dump truck 4259 (Mr Cullen's truck). The ARV assessments for four trucks in 2006 were identical to each other in results and there is no reason to suppose that an assessment of dump truck 4262 (Mr Shannon's truck) would have been significantly different from that carried out on 4259, although the precise positioning of the mirrors by the driver and/or assessor may have altered indirect visibility to some extent.

9.5.5 This assessment differed from the 2006 assessments in one material respect, in that it was carried out at 2 m, or approximate Land Rover height. There were significant but limited blind spots to the front nearside and a broader blind spot to the rear of the nearside, but none were relevant to the accident. To the offside, there was effectively no direct visibility behind the driver, although there was potential visibility by means of mirrors and rear view camera together covering a broad area fanning out from the driver's offside. There were, nonetheless, significant blind spots reaching beyond the rear of the vehicle, from a position about 6 m out from the rear, coming right in to the driver's immediate offside, within which there was no visibility at all.

9.5.6 Front of the driver's position from the immediate offside there was an area of not less than 4 m where there was no visibility at all, and that projected forward for about 7 m, compensated to a limited extent by the front facing mirror, but stretching to the offside of forward for 15 m before beginning to taper. There was a limited window of direct visibility to the offside and slightly to the front of offside fanning out from about 4 m to the offside of the driver's position.

9.6 HSE visibility assessment of TR 100 vehicle 4562

9.6.1 As part of the HSE investigation of the accident, visibility tests were carried out by and under the supervision of Mr Jeremy Ferreira, an HSL ergonomist. These were based on the 2006 version of the ISO, but adapted to look only at the front right quarter of the vehicle and measuring visibility at 2 m height, again in order to simulate Land Rover height. The tests were carried out on vehicle 4562, the dump truck involved in the accident.

9.6.2 Using a 2 m pole, there was no direct visibility at a distance of 1 m from the perimeter along the whole of the offside length which was surveyed out to the 1m forward position (8.76 m) and for a length of 4.12 m to the front, from the offside 1 m perimeter position for a length of 4.12 m (allowing direct visibility for 2.31 m out to the nearside 1 m forward position). When the test was repeated with the assistance of mirrors, the area of obscured visibility to the front of the vehicle was eliminated and the area of obscured visibility along the right side was reduced to a length of 3.93 m –

stretching forward from the driver's position and ending 0.43 m from the 1 m forward perimeter line (ie to a position 0.57 m forward of the perimeter of the vehicle).

9.6.3 Mr Ferreira and his team assessed visibility beyond the 1 m perimeter, still using a 2 m pole. To the immediate front of the vehicle, the area of obscured visibility extended 2.2 m beyond the perimeter (i.e. 3.2 m from the front of the vehicle). To the front right quarter of the vehicle, the area of obscured visibility extended to a maximum distance of 7.0 m beyond the side perimeter (i.e. 8.0 m from the side of the vehicle). The major obstructions to visibility were the engine casing, locker, cab platform and the cylinders positioned along the right side railing. The doorframe was also a large obstruction to visibility, but that was not captured by the visibility test, as a reasonable amount of observer head and trunk movement is allowed when establishing direct vision.

9.6.4 Tests were not performed to determine the extent to which vision was obscured beyond the 1 m perimeter with the assistance of mirrors, but Mr Ferreira expected that the convex mirror mounted on the engine casing would slightly reduce the area of obscured visibility to the front of the vehicle, the convex mirror mounted on the right side railing would slightly reduce the of obscured visibility along the right side of the vehicle, and in particular, the area which is near to the 1 m perimeter yet further than 4.4 m from the front perimeter of the vehicle. However, a significant area of obscured visibility to the front right quarter of the vehicle would remain.

9.6.5 His findings seem essentially to have been consistent with those conducting the SCC survey.

9.6.6 Mr Martin of the HSE described the blind spot in the context of the accident. The area beyond the 1 m strip was still largely a blind spot to the driver until he regained partial vision at a distance of over 7 m from the vehicle. A Land Rover parked within approximately 7 m from the front offside would be largely invisible to the driver of the TR 100 dump truck. The driver would have required constantly to view his mirrors and rear view camera in order to note the approach from the rear of the Land Rover and to follow its progress along the offside of his truck. If full concentration was not maintained then clearly a vehicle such as a Land Rover could easily be positioned in a danger area.

10 Training of plant operators

10.1 General

10.1.1 SCC's Plant Operator Competence Scheme provided that, before being deemed suitable to operate any quarry vehicle or item of mobile plant, all operators would be subject to an initial assessment carried out by a nominated competent person who had sufficient knowledge and experience to establish competence levels and determine any future training requirements. Normally the assessor would be the site manager or general foreman. An initial assessment would be undertaken for each category of plant for which the operator was to be authorised to operate. Should this assessment identify any additional training requirements, the operator would be classified as a trainee operator and the recommended training period should be specified.

10.1.2 All employees were given induction training on the first day of their employment. As a minimum requirement, this would include basic site induction covering the relevant site rules and procedures and a COALPRO Induction video. COALPRO is the coal producers' association – the Confederation of UK Coal Producers – and SCC is an active member of the organisation and its safety committee.

10.1.3 Site Managers were also to ensure that new employees receive additional information, instruction and training as appropriate. Details of any additional training given during the post induction period were to be recorded and kept on the employee personal training file.

10.1.4 In practice a significant amount of paperwork was provided to new employees, including three sets of rules, site procedures, a toolbox talk pack and relevant risk assessments. In the course of the office-based part of induction new employees completed a questionnaire which was designed to test their knowledge and understanding of rules and proper practice on health and safety issues.

10.1.5 The site manager was responsible for issuing site driving licences to all operators of quarry vehicles and mobile plant, stating clearly the categories and types of equipment that the operator has been deemed competent to operate.

10.1.6 The scheme provided that, within a period of three months following the initial competence assessment and issue of a site operators authorisation, all plant operators would undertake a further competence assessment by a Plant Instructor who had sufficient experience in the operation of quarry vehicles and mobile plant and had undertaken training to attain sufficient practical and theoretical knowledge by way of the CITB Instructor's Qualification or equivalent (Construction Industry Training Board) to assess operator competence and carry out any necessary training.

10.1.7 All plant operators would be subject to further competence assessments for all categories of plant for which they were authorised to operate at least every three years. These assessments would be valid across all Scottish Coal operational sites should an employee transfer to another site. Competence assessments were to be carried out using the appropriate standard checklist.

10.1.8 The scheme did and does not envisage training or assessment in night-time operation or operating in adverse weather conditions, although, as already pointed out, the use of water bowsers to control dust could lead to wet and slippery conditions in dry weather in any event.

10.1.9 The current Competence Scheme is very similar.

10.1.10 All employees on site were required to attend toolbox talks which should have been held twelve times per year, but were held more irregularly at Pennyvenie, largely because the site manager wanted to conduct them personally. These talks always had a safety focus and were usually delivered at the start or end of the shift in convenient groups (i.e. not all staff at once). The focus could be general interest

safety topics, or could be focused on lessons from an accident. Toolbox talks might also touch on production issues, but this was not their focus.

10.2 *Training of dump truck drivers*

10.2.1 In practice at Pennyvenie, at least in the lead up to the accident, rather than wait for up to three months before bringing in a qualified assessor, the site manager would arrange for one of the then two qualified assessors for the whole company to come in after basic training of new drivers and carry out an assessment or driving test. The pattern of training and induction for a new start was that he would receive general induction from the site manager and/or deputy site manager, which would last about half a shift and would normally include a tour of the site (although the office-based induction may be spread out over days) and the new operator would then be placed with an experienced operator who would show him how the vehicle operated and let him sit in the passenger seat observing operations, before allowing him to take the wheel under the experienced operator's supervision. Once the experienced operator and the general foreman or site manager considered that he was ready for his "driving test" one of the two company assessors would be asked to come in and carry out that test.

10.2.2 The assessment used a fairly detailed competence assessment checklist, which provided as to testing on various skills and knowledge of detailed procedures. The experienced drivers who provided the driving instruction for new operators did not work from a checklist and any knowledge they would have of the competence assessment checklist was at best derived from their own experience of being assessed at an earlier time. Since a number of experienced drivers would have been assessed at a time when there were, to say the least, less prescriptive procedures, that knowledge may not have been significant or up to date.

10.2.3 While the checklist was detailed and included a number of subjects to be assessed under manoeuvring and control of vehicles, it did not specifically prompt the assessor to test the new operator's understanding of blind spots from dump trucks, or on how they should deal with these in their operation of plant.

10.2.4 According to Mr Paterson the all round visibility package was used with new start dump truck drivers. According to Ian Munro, the company's environment safety manager, a member of the management team would have shown a new start dump truck driver the ARV assessment and told him about the Site Manager's Vehicle rules at the induction before he went in the truck. The record of safety training and documentation issued at Mr Shannon's induction is silent on that and he did not remember being told anything about the dangers of blind spots at his induction, although he agreed that he was shown a picture of the 2005 accident – probably the photograph in the Safety Alert – by Mr Paterson, who said he "didn't want this to happen again" (Day 7, pages 132-4).

10.3 *Training of light vehicle drivers*

10.3.1 The induction and training regime in respect of light vehicle drivers – including Land Rover drivers - was similar in many respects to that for dump truck

drivers, but the assessment, certainly as from May 2005, specifically included all round visibility appreciation, requiring the operator to be taken through a visibility package and to demonstrate that he was aware of heavy plant dangers, a safe place to park near heavy plant and his awareness of heavy plant blind spots “and others”.

10.3.2 Mr Alec Ritchie, one of the two company trainer/assessors, personally trained and assessed all light vehicle drivers on all round visibility appreciation, with particular reference to the 2005 accident, but also other similar types of accident referred to in HSE material, using a substantial training pack, which was updated in light of the 2005 accident. This training was also given to new light vehicle drivers. It included illustrations of typical blind areas and distances and prompts for questioning and discussion to develop and test the operator’s understanding.

10.3.3 Mr Ritchie’s approach to this training and assessment – which he delivered to both Mr French and Mr Ferguson – was to take the drivers up to a safe area of the site where they could view operations and have a discussion with them about how to deal with particular situations or manoeuvres (e.g. how they would get into a particular area). In the case of drivers who had limited experience of sitting in a truck, he would put them up in the driver’s seat to see for themselves the limited visibility of light vehicles.

10.3.4 Land Rover drivers should have come away from that training with a good understanding of the blind spots of dump trucks, although whether they would have had an understanding of the blind spots of a Terex TR 100 may be more open to doubt. Mr Paterson thought that the first Terex TR 100s came on site in November 2005, but he was not 100% sure. There would thus have been no TR 100 trucks at Pennyvenie when Mr Ferguson received the training in June 2005, although they would have been on site at Pennyvenie when Mr French was trained in March 2006. But, more to the point, their respective training records show that both men received the relevant training at the Powharnal site and there was no evidence before the Inquiry as to the deployment of dump trucks there at the time.

10.3.5 The blind spots on Caterpillar trucks, which were on site at all times, were more limited than those on TR 100 trucks, although the general issues about awareness of the danger of being close to a dump truck would apply.

10.3.6 The Landrover/Light Vehicle training ARV package includes a specimen ARV survey for a Caterpillar 777D dump truck (i.e. the model being driven by Mr Murray), but it was not clear whether SCC witnesses thought that package or the actual survey for the relevant dump trucks were used.

10.3.7 Supervisors, including Mr French attended a two day EPIC course, Supervising and Safety in Quarries. Mr French attended the course in September 2006. One of the elements of the course was vehicle safety in quarries and it was focused on clearing the area for work by excavators. Those attending the course were required to carry out a practical risk assessment exercise on a scenario involving an RH 120 excavator and four Caterpillar 777D dump trucks and a scheduled repair. They had to describe how to organise traffic management.

11 Reconstruction of the accident

11.1 General

11.1.1 Reconstruction of the accident was difficult, for reasons already discussed. It is unfortunate that the survey carried out by SCC, which provides the only definitive record of vehicle positions and that only of dump truck 4562 and the point of contact with the Land Rover, is thus confined, whereas in the non-fatal 2005 accident it was possible to survey the relative positions of the dump truck and Land Rover and of wheel and skid marks and debris, which allowed a better understanding of the mechanism of contact. In the actual 2007 accident survey (Crown Production 23) it is the point of contact at the resting positions of the vehicles that is shown, rather than the initial point of impact, which could not be determined.

11.1.2 There was evidence from photographs of some movement of the Land Rover and the site engineer, Mr Kyle, who carried out the survey and was responsible for SCC's efforts at reconstruction, saw evidence of a push mark rather than a normal track mark, which he tried to factor into reconstruction by moving the Land Rover back a small bit so he could try and best guess the point of impact. That does not appear to have been factored into the plans which were prepared to assist the Inquiry.

11.1.3 The SCC and HSE reconstructions show visibility, in particular from the cab of the dump truck. In each case the reconstructions did not include Mr Cullen's truck and it was not therefore possible to assess to what extent the rear view from Mr Shannon's truck and thus his opportunity to see the approach of the Land Rover would have been obstructed by that truck.

11.2 SCC reconstruction

11.2.1 In the SCC reconstruction Mr Kyle, who was in the passenger seat of the Land Rover, thought that they marked out the ground with spray lines to try to keep to what they thought was the route of the Land Rover. He was not involved in the preparation of the plans for the Inquiry which showed estimated positions of all the vehicles (Crown Productions 61-63) and he considered that the positioning of the Land Rover to Mr Shannon's truck was a guess. Other technical staff were involved in transposing his survey information onto these plans.

11.2.2 Mr Paterson, who organised that work, thought that in the reconstruction the Land Rover was about 9 m from the truck, before the truck moved, but they had not made allowance for the Land Rover itself being moved by impact from the truck. Having viewed photographs of the accident scene which showed a trough that indicated movement of maybe 1.5 m, he considered that the Land Rover should perhaps have been placed as close as 7.5m from the truck in its stationary position prior to the truck moving.

11.2.3 The route of the Land Rover in the reconstruction was based on what Kevin Cullen and Peter Murray had said, but Mr Paterson conceded that the route of the Land Rover could have been further south and therefore further away from Mr Shannon's truck. Indeed, the starting position of the dump truck itself was not entirely clear. Although it was plainly placed close to the north side of the dig area,

witness evidence would suggest it was not placed as close to the berm as in the plans (a little over 1 m) and it may have been slightly rotated towards the south, to point more towards Mr McDougall's position.

11.2.4 Mr Martin of the HSE understood Mr Paterson's position to be that the SCC reconstruction was a distance of approximately 7 m out from the side of the body of the Terex TR 100; if the route taken had been any closer than that, working on the same reconstruction, the driver would only have seen it if he had been looking almost constantly in the rear view mirror, rear view camera or examining his offside mirrors as it approached.

11.2.5 It is clear that a significant margin or error needs to be allowed for in positioning both the dump truck and the Land Rover immediately prior to the dump truck moving off and the reconstructions must be regarded with great caution.

11.2.6 Nonetheless, the reconstructions are of value in showing just how little visibility of the Land Rover there was if it passed at a distance which may be a best estimate of the distance from the dump truck – both in terms of what was visible, but also in terms of the short time for which anything was visible - but also in raising the possibility that there may have been even less visibility of the Land Rover as it passed the side of the dump truck.

11.2.7 On the other hand, if the Land Rover had passed as far forward of the dump truck, as Mr Murray suggested, before reversing and had then driven forward again, it is possible that the roof at least had emerged from the blind spot before Mr Shannon moved off. Neither Mr Cullen nor Mr McDougall were aware of the Land Rover moving forward after reversing, but Mr Murray was better placed to see that and there is no reason to doubt his account.

11.2.8 Subject to these health checks, SCC video 2, is a 1 minute 37 second video reconstruction showing the internal view of and from the Terex truck, showing a panorama, with the upper part of the Land Rover initially seen moving at 00.37 seconds in the near side mirrors, going out of sight at 00.42 seconds and then visible through the offside cab window, with the roof only visible for only about two seconds before it goes out of sight, before the top of the roof comes into sight again in the front windscreen and is visible for about eleven seconds, before reversing out of sight. It is not visible in its final position; in this video the Caterpillar truck (representing Mr Murray's truck) then pulls away and the excavator bucket is lowered.

11.2.9 SCC video 3 was an attempt to reconstruct the track of the dump truck as it struck the Land Rover, using a marked out rectangle on the ground to represent the Land Rover. It was of value in demonstrating the likely path of the dump truck applying full right hand lock assuming, of course, the initial positions of both vehicles. The report estimates that the dump truck took 12 seconds to travel 12 metres to the collision point. Of course, the distance travelled before first impact would depend on the actual prior relative positions of the vehicles, which are not established with any certainty.

11.3 HSE reconstruction

11.3.1 The HSE reconstruction was carried out with the assistance of SCC employees.

11.3.2 It is known that in the HSE reconstruction the Land Rover was driven slowly forward along the right hand side of the Terex TR 100 keeping approximately 6 m from the machine. This was repeated three times and the view from the driver position of the Terex was filmed as well as the view in the mirrors and rear view camera. The Land Rover came to rest each time when its rear was about level with the front of the TR 100. This was believed to simulate the approximate position of the Land Rover at the time of the accident.

11.3.3 In this reconstruction the Land Rover did not carry out the manoeuvre of moving to a forward position and then reversing, as described by witnesses, far less moving forward again, as described by Mr Murray.

11.3.4 The Land Rover used in the reconstruction had a roof mounted warning light, whereas that involved in the accident had a light mounted about 400 mm above the roof and towards the rear, which may have afforded slightly better conspicuity.

11.3.5 The HSE videos showed views from the driver's position within the Terex:

- In HSE video 1 the roof and upper part of the Land Rover is visible through the offside window for about six seconds as it passes driving along the offside of the truck.
- In HSE video 2, there is a view of the monitor showing the view from the rearview camera. The view spreads out towards the rear of the shot. The Land Rover is seen driving across from the left of the picture and eventually going out of site on the right of the picture after 22 seconds.
- In HSE video 3, the view through the main offside mirrors is shown. The Land Rover becomes visible in the lower and upper offside mirrors from the same time, but remains visible for about six seconds in the lower mirror and for about twelve seconds in the upper mirror; it goes out of sight in the upper mirror (and is completely out of sight) for about eight seconds and comes into direct vision in the offside window for about five seconds, going out of sight for about three seconds and then the roof re-emerges in the front windscreen

11.3.6 In Mr Ferreira's report (Crown Production 29), Figure 7 photographs 1-6 show the sequence of views from the cab windows taken during the simulations.

- In photograph 1, the front bonnet of the Land Rover is visible in the offside window.
- In photograph 2, the top of the Land Rover and the flashing light are visible in the offside window.
- In photograph 3 most of the roof and some of the side of the vehicle at the rear is visible.
- Photograph 4 is similar to the view in photograph 3, with most of the roof visible.

- In photograph 5 the entire Land Rover appears to have disappeared from direct view.
- In photograph 6 the roof is slightly visible.

11.3.7 In Mr Ferreira's opinion, if the driver was facing to the front, there would not have been much opportunity to see the Land Rover and he would need a reason to direct his view to that area. He would need some indication or warning that it was going to be there and to be looking out in that area.

11.3.8 A conscientious driver robotically scanning across the full mirror array may still have missed such a Land Rover, because it was perhaps entering the field of the mirror and disappearing in under a second. Where it does become visible at some points, that occurs very quickly and it would be conceivable that it could be missed by other drivers as well.

11.3.9 If the Land Rover had moved further ahead and cleared the blind spot, then it would enter the field of view of the operator, but it would have to have gone several metres forward of the vehicle.

11.3.10 The further out it is, the area of masking changes. If it was approaching 5 m in front, direct vision might be possible, but there are other factors which would affect ability to detect it – including conspicuity and the low contrast between Land Rover and Terex, which were both painted a similar white colour.

11.3.11 Mr Ferreira's report says that, with respect to visibility, the most important physical property for conspicuity is the contrast between the object and the background. In the bright conditions at the time of the simulation, the relatively small orange flashing lights on the Land Rover did not appear to add much to the conspicuity of the vehicle.

11.3.12 Mr Ferreira concluded that if the truck driver was reading a newspaper, the chances of him seeing this Land Rover would be almost none, but the chances of seeing it anyway

“would have been very, very slim because of the amount of time that it's actually present in the visual field” (Day 30 page 46-7).

11.3.13 Mr Ferreira considered the visual aids, but found that the image of the Land Rover in the side mirrors was particularly difficult to detect, due to various deficiencies, both with the view to the mirrors as well as the view in the mirrors. The view to the right side mirrors was partially obstructed by some features of the Terex TR 100, in particular the right side railing and at times the frame of the cab door. The handrail bisected all three offside mirrors depending on where the driver's head was when viewing them. It was probably not reasonable to expect a driver to fully check all of those mirrors over a 12 hour shift, but the main limitation was the view that they provided and the view that was offered to the mirrors. In addition, the image of the Land Rover in the side mirrors was only a few square centimetres in area and the driver's position was over 4 m away from the offside mirrors. Although the quality of the image would have been poor, the simulation suggested it was possible that the Land Rover would have entered the view through the rear view camera, side mirror

or right hand side of the cab window as it approached the dig area, although since the HSE did not park another truck behind the test truck, he could not say if it could have obstructed the view in the rear view camera.

“However, humans need a good reason to direct attention to some place or object so that it is seen. It is not reasonable to expect a driver to make checks of the entire visual field and several visual aids on a repetitive and high frequency basis” (Crown Production 29, page 13, para 3.4)

11.3.14 Mr Ferreira explained that this was just something that humans are not well designed to do; it is monotonous, repetitive and boring. They need a good reason to direct attention to certain areas. They have a limited amount of attention that they can focus and are not good at scanning entire environments like that. They tend to direct their attention to specific things.

11.3.15 Mr Murray’s statement had suggested that Mr Shannon was waiting for several minutes. Mr Ferreira observed

“It is especially difficult to direct attention to several different objects or places on a regular and high-frequency basis while waiting for any period of time. A more active means of alerting the operators’ attention to the entry of smaller vehicles in the dig area would be required” (Crown Production 29, page 13 para 3.4).

11.4 *Position of the Land Rover*

11.4.1 Mr Paterson understood that the Land Rover to some extent passed Shannon’s truck then reversed and was firmly in the blind spot and he believed the Land Rover could have been far enough forward at one point where eye contact would have been possible.

11.4.2 But it is clear from the reconstructions and the differing accounts of the eye witnesses that it is not possible to conclude that the Land Rover would have been to any extent visible to Mr Shannon after it passed him.

11.4.3 It is noteworthy that the amount of the Land Rover that was visible in the SCC as opposed to the HSE reconstruction was more limited. There was no accurate information about the closeness of relative positioning in the two reconstructions and it is also possible that there was some variation in the position of the camera – but in any event the differing, but always limited, conspicuity of the Land Rover in these reconstructions perhaps itself underlines how limited the opportunity was for Mr Shannon to see the Land Rover, particularly as it passed on his offside.

12 Segregation of heavy and light vehicles

12.1 General

12.1.1 Segregation is the primary control to avoid accidents between heavy and light vehicles. The hierarchy of controls was described in evidence by Mr Alec Ritchie, company trainer/assessor as avoid, segregate, mitigate or in the HSE's published guidance for Inspectors "Assessing Field of Vision for Operators of Earth Moving Machinery on Construction Sites" (Crown Production 39) avoidance, segregation and system of work. The HSE guidance was of direct application to construction sites, but was relevant to similar operations and plant in opencast mining; indeed it was referred to by Mr Polhill, the senior group safety advisor for Scottish Resources Group Ltd in the context of the HSE advice to move from measuring visibility at 1 m to measuring at 1.5m

12.1.2 In his evidence, Mr Ferreira stated that in the hierarchy of controls, if it was achievable, segregation would probably have the greatest possibility of reducing the level of risk. Once it is in place it becomes almost a passive control, in that it does not require anyone to do anything to get it right: someone has to violate the measures in place for it to fail. Passive controls are more desirable because they essentially work on their own as a control measure – they do not rely on other controls, like mirrors which rely on a person actually looking at the mirror at the right time and taking appropriate action.

12.1.3 Mr Ian Waugh, retired Chief Inspector of Mines, who still undertakes work for the HSE, stated that planning of sites has been recognised as important in the control of vehicle movements since at least 1977. Segregation comes after the standard of the vehicle and the standard of the roads in the hierarchy.

12.1.4 In his evidence Mr Paterson, the site manager stated that the primary control following the 2005 accident was segregation and "ensuring that the light vehicles stayed away from the big vehicles" (Day 20, page 49).

12.1.5 The relevant risk assessment covering transport accidents – contact with moving vehicles or their loads was considered at the Inquiry (Crown Production 26). The first three control measures identified there were

Segregated haul routes – left hand drive rule;
Segregated light and heavy vehicle parking; and
Segregated loading zones and tipping areas.

12.2 Site Manager's Vehicle Rules

12.2.1 The Site Manager's Vehicle Rules are required under Regulation 14 of the Quarries Regulations (the requirement to make suitable and sufficient rules which shall lay down in writing measures designed to control the risks to persons at the quarry arising from the use of vehicles at the quarry). They are essentially the Highway Code of an opencast site. They are issued at induction to all new starts on site and were gone over at least to some extent with inductees during that process.

12.2.2 The relevant edition at the time of the accident was that of July 2006 (Crown Production 19). It ran to 12 pages of fairly close type. The rules are drafted on a generic basis and issued to site managers by the company's safety department. Site managers then have responsibility to adapt them to the particular conditions of their site (for example, if there is a railhead special provisions may be necessary). Relevant extracts of the 2006 edition are reproduced as Annex C.

12.2.3 The 2006 edition of the Rules which was in force at the time was subjected to close scrutiny at the Inquiry.

12.2.4 Rules 7, 8 and, most significantly 11, to a greater or lesser extent emphasise or require segregation. The issue for the Inquiry was more about how these rules were understood in practice, including the question of the degree of segregation which was required.

12.2.5 *The swing radius*

12.2.5.1 Particular areas mentioned in the Rules included the swing radius of an excavator. Rule 7 required that "Vehicles must not enter the swing radius of an excavator without permission of the excavator operator".

12.2.5.2 Although this rule was well enough known, it was not clear that it was always observed. Mr McDougall said that Land Rovers sometimes communicated by driving right up to you and, specifically, stated that supervisors might enter the swing radius, without his permission.

12.2.5.3 While the definition of the swing radius was clear enough, it was also clear that it referred to a limited area in the immediate proximity of an excavator (albeit an area which was itself mobile, as the excavator moved on the bench or floor of the dig in its work).

12.2.6 *The loading zone*

12.2.6.1 Of more difficulty was the concept of a loading zone. The critical first paragraph of Rule 11 of the Site Manager's Rules read:

"The loading zone is defined by the swing-circle of the excavator arm and manoeuvring zone of the truck under load. On no account should any other vehicle enter this loading zone unless the vehicles are stationary without the permission of the other vehicle operators".

12.2.6.2 The swing-circle of the excavator arm was understood to have the same meaning as the swing radius of an excavator (indeed the former expression is if anything clearer in meaning). Of more difficulty – and the subject of anxious consideration with many witnesses – was the meaning of the phrase "manoeuvring zone of the truck under load."

12.2.6.3 The phrase "under load" was not itself defined, but on a plain reading it may be thought to mean actually being loaded, although when a dump truck is actually being loaded it does not move at all. Similarly, the reference is in the

singular “the truck under load”, so that, even if the phrase “under load” should be understood more broadly as referring to a vehicle that is manoeuvring itself in and out of position at the dump truck, it would not obviously refer to other dump trucks which might be commencing the process of manoeuvring. This is not mere nit picking over a practical document; witnesses were of very different views as to what a loading zone was.

12.2.6.4 The matter was particularly focused by the reconstruction of the accident. In the plans prepared for the Inquiry, SCC marked out in green an area shaped like a D with a tail or a filled in number 2 at the excavator end of the dig area, which included the Land Rover and Mr Murray’s truck and extended out to the front of it, but fell just short of the front of Mr Shannon’s truck. It marked out the path that Mr Murray would have followed if he had started from Mr Shannon’s position and then followed a curve keeping close to the edge of the dig area round to the point at which he would have started to reverse to the excavator, and then the path he would have taken, had he reversed to the excavator, but it also included the ground between the curved route, although a truck would only have manoeuvred in that area if it had taken a sharper turn.

12.2.6.5 Most of the witnesses who had been working in that dig area or who considered the plans or other material considered that it was appropriate for one vehicle to be loaded while another remained in more or less the position taken up by Mr Shannon. Mr Paterson, however, expressed the view that Alan Shannon would not have needed to wait until Peter Murray was loaded and away to start his manoeuvre and said that was not the practice. He stated that how dump truck operators positioned themselves depended on the layout of the dig and how the machine is placed etc, but if there was room, they would always get into reversing position while the previous truck was under load.

12.2.6.6 That approach would certainly explain how the loading zone could encompass the area within the path actually or expected to be taken by Mr Murray, if it was legitimate to treat more than one truck as falling within the scope of the phrase “truck under load”.

12.2.6.7 Mr Polhill of the safety department stated that the definition of loading zone referred to a typical efficient operation where there was one truck and one excavator. He would say it was the manoeuvring path of where a truck could possibly turn, which was similar to an overtaking scenario, like a bike overtaking an articulated truck that decides suddenly to turn right at the next junction. It would depend what “under load” meant – whether it was making a turn to go under the excavator or actually being in the process of getting loaded.

12.2.6.8 Mr Polhill explained that the term had been around for years and SCC started using it when it bought Miller Mining around 2001 and kept it, but the original rules had a diagram which was helpful.

12.2.6.9 On Mr Polhill’s interpretation, Mr Murray was under load. Mr Shannon was in the position just before he moved into being classed as the under load stage; when he started to move, he would be under load, ie when he started to make the turn in order to reverse into the machine, but Mr Polhill accepted that it was not clear

where to draw that line. On the other hand, if Mr Shannon was simply leaving the area and he was not under load at all.

12.2.6.10 Mr Buchanan of the HSE considered that the loading zone, by SCC's definition, would be much less than the green area which had been mapped out. Manoeuvring meant reversing back to go to the machine and it was probably the lower 30 to 40% of the green area. If Messrs French and Ferguson had stopped where shown in the plans prepared for the Inquiry (Crown Productions 62 and 63), he would not say that was within SCC's definition of a loading zone (Day 29, page 165).

12.2.6.11 If senior people and specialists struggled with the definition and application of a loading zone, it is not surprising that operational staff had similar difficulties. Mr Murray thought it was brought out after the accident. He considered that the loading zone in the plans should have been more horseshoe shaped, because it should not include areas you could not drive into. Mr Cullen took it the loading zone was where the bucket would load a truck; he had heard the phrase but not commonly. If he had been asked, he would say it was the dig area.

12.2.6.12 Mr McDougall thought it was the dig area and was surprised that there was a specific definition of loading zone. Mr Ian Davidson, a dump truck driver, thought it was the immediate area where loading was taking place, the radius of the swing of the bucket and the arm on the digger, but he did not know how widely the expression was known. He thought it always meant where loading was taking place.

12.2.6.13 Mr Shannon thought a loading zone was where the trucks were being loaded by excavators. He thought the green area was marked in the plans as a loading zone because that was where heavy plant would be operating, but he was not sure why it did not extend to the end of Mr Cullen's truck.

12.2.6.14 Robert (Ronnie) Stewart, who was the leading driver, thought it was the live area from the first excavator to the last although he also said that he would consider the loading zone marked in green in the plans to be the loading area.

12.2.6.15 Mr McCulloch, who was the supervisor, thought that the loading zone was where trucks were getting loaded at the excavators. He would define loading zone as the dig area, a big area.

12.2.6.16 Thomas Hamilton, the company trainer/assessor thought it was where the trucks were turning before they went into the machine that was loading them; the area they were turning in. He thought that the definition before the accident was the machine radius where they were working, the swing radius. Whether it included anything else depended where the truck was sitting before it reversed in, but not when it was turning.

12.2.6.17 Mr Paterson, the site manager, considered that it was a well known and important term on his site; he would expect everyone to know what it was. He explained that the reason why dump truck drivers might have difficulty defining loading zone, because they spoke in a different way to management on site. He would expect them to know where the loading zone was, that it was the area

immediately where they were getting loaded, rather than by reference to the definition.

12.2.6.18 Mr Paterson would have said that Alan Shannon would have been in the loading zone, because there were two active trucks in the loading zone at that time (although that rather begs the question why Mr Shannon was not shown in the plans prepared by SCC as being in the loading zone).

12.3 *Segregation in practice*

12.3.1 Segregation should have been maintained in the loading zone. Mr Paterson confirmed that Land Rovers were permitted into the excavation or dig area whilst dump trucks were operating. The segregated area was the loading zone.

12.3.2 Obviously, if the understanding of individual plant or light vehicle operators differed as to what the loading zone meant (or whether such a concept existed) there was immediate scope for confusion about the extent of any area within which light and heavy vehicles required to be segregated, other than the swing radius of the excavator.

12.3.3 But a number of witnesses did state that light vehicles entered the loading zone, either as they understood it or as it was represented to them with the assistance of the plans, without the permission of the other vehicle operators. The extreme example of Land Rovers entering the swing radius itself unannounced, as spoken to by Mr McDougall, has already been examined.

12.3.4 Mr Murray said that Land Rovers were circulating in active areas all the time. They could appear in the area where trucks were waiting or queuing to be loaded five to ten times a shift in close proximity to active dump trucks; it was left to them seeing each other. That could include the general foreman too, carrying the site manager. He never had a near miss but sometimes they were a nuisance. It was common for supervisors, general foreman and even the site manager to enter loading zones. The area was not cleared for them. But he agreed that the culture was that light vehicles should not come into proximity with big vehicles without suitable communication, which would be visual, depending on ability to see.

12.3.5 Mr Cullen was surprised by the appearance of Land Rovers on a couple of occasions; they just seemed to appear, probably both on haul roads and dig areas. It could have resulted in collisions if he had acted or driven in a different way; this happened when he was stationary and a collision was a real risk. He did not report it, because it was the general foreman or the supervisor: "If they don't know any better what chance has the rest of us got" (Day 3, page 189). All of a sudden a Land Rover would whizz past. Somebody could have collided into them. He had not witnessed dangerous driving, but had witnessed bad driving. In the case of the general foreman or supervisor he would not think anything would come of it if reported them to the site manager and there would probably be a reluctance to tell tales.

12.3.6 Mr Cullen did not recall ever getting a fright from a light vehicle appearing where he was intending to take a route that could have led him to make contact with it. On the other hand, he stated that fitters would not clear the area

themselves – supervisors or somebody would come up to the cab and notify you if there was somebody in vicinity with a site radio.

12.3.7 Mr McDougall said that Land Rovers did come into dig area unannounced, now and again. It was supervisors in particular. He was not aware of any rule against it and he was more likely to see them in a larger area, but it was the last thing on your mind, when you were trying to keep trucks coming in and out safely to you, you were not looking out for them. The dig area would not always be cleared for a supervisor or fitter. He was not aware of any rule prior to the accident that said the area had to be cleared. If a supervisor wanted to clear an area, a dig surrounding a particular excavator, if drivers were working off more than one machine, he would probably do it by talking to the leading driver who would stop trucks individually and tell them to go to another excavator or park up. He was aware of fitters clearing an area themselves, that was common, by eye to eye contact and hand signals. If he broke down he would shout on the radio for the workshop and only if he could not get the fitters, would he then shout for the supervisor and then for the leading driver and tell him he could put his trucks elsewhere.

12.3.8 Mr McDougall considered that the driving of the Land Rover involved in the accident was not unusual; he had seen it happen before in a similar manner, in that there were still trucks in the area, but he could not say how common it was. He was not aware of any rules prohibiting it. There was nothing to stop the Land Rover entering to the point where he saw it.

12.3.9 Mr Davidson had experience at Pennyvenie of Land Rovers coming into the dig areas while he was working, while he was waiting to be loaded. He was aware of them on every occasion; he would have seen them in mirrors, cameras or through the windscreen, depending on their direction. They would not come in needlessly; fitters might go down if a machine needed fixed and supervisors and foremen might be in dig areas. It was not really common and sometimes maybe happened once or twice a shift, but it was not as common as four or five times a day

12.3.10 Before the accident, if a Land Rover was in a dig area, he would stop and stay where he was until it left the area or someone gave him a hand signal to tell him what to do. Operations might continue, depending on how close they were: dig areas vary in size. A Land Rover driver would probably have been entitled to drive up the centre of a horseshoe shaped dig as long as he stayed outwith the radius of the excavator swing arm. The action of supervisors entering live dig areas was not of concern to him, because he was always aware of Land Rovers. Over the course of a 12 hour shift, he had never been taken by surprise by the presence of a Land Rover. He had seen Land Rovers drive into dig areas on occasion, contrary to the rules. He thought at the time they should not be doing that, they were not supposed to be buzzing in and out like that. Although he immediately said that was a bad choice of words, he did maintain that he had seen them going into digs on occasion when he did not have a radio - but he always saw them (Day 6, page171-2).

12.3.11 As a dump truck operator he did not have experience of a light vehicle driver putting his vehicle in a position where it could not easily be seen by others. He had always seen any Land Rovers – he never had any close runs with a Land Rover, or a near miss. He never had any dangerous interaction with Land Rovers or witnessed

any such interaction. He was never taken by surprise by a vehicle: they might be unexpected, but he saw them. He agreed that as a general rule Land Rovers stayed clear of heavy plant and appeared to know to do so and that there was emphasis on eye to eye contact; Land Rovers could make eye to eye contact with traffic facing them and it was safely done.

12.3.12 Mr Davidson had never experienced a Land Rover passing on the blind side, but he explained that was because for him it was the offside and if you were watching and see them come in and go out, you were not blind. Land Rovers had travelled along the offside (Day 6, pages 155-6). On the other hand, he agreed that placed a great deal of emphasis on the driver's attention span and in hindsight it was not a good system; it was relying on individual drivers to see what was happening. He was not aware of Land Rovers entering what would be described as loading zones while he worked there.

12.3.13 Mr Shannon said that it was very common for Land Rovers to be in the same dig as him – he would see them more than once per shift and he might see them in dig areas all the time in a shift. If you did not have a site radio, you would not know they were coming. Fitters and management would be in Land Rovers in dig areas. If a Land Rover came into a dig area all the trucks did not have to stop. Operations would continue. Before the accident it caused him concern that Land Rovers were interacting or moving in the same areas as his truck, but he did not raise that concern with anyone. He was concerned about the way they moved about, they were roaming freely. There were occasions when it caused him a problem as a dump truck operator, because they were getting in close when he was driving to and from the dig. They could be on the near side, offside, back and front, in haul roads and in the dig. Trucks were not pulled to the side to allow for access of Land Rovers.

12.3.14 If people in Land Rovers were coming into a dig area, they would just come in anywhere. He had experience of light vehicles coming into loading areas unannounced and of light vehicles entering loading zones when vehicles were not stationary. There would always be a Land Rover moving between the heavy vehicles, but he was not aware of any other occasion when he was taken completely by surprise by a Land Rover. He agreed that he could not tell of any occasion when a Land Rover to his knowledge was in a position of danger in relation to a truck and the truck did not know about it.

12.3.15 Mr Robertson, the general foreman at the time, said that the position of the Land Rover in the 2005 accident was wrong; he would not have put himself in that position and others did not really do that, although he could not say they did not do it when he was not there. As far as he knew, if fitters were going into a live dig area they would sit and wait until the area was cleared. That is what he would have done. The general foreman and supervisors would clear a dig area, or the charge hand fitter– Brian French – could do that, but he would first need to notify the general foreman or a supervisor. Land Rover drivers were not really entitled to clear dig areas themselves by physically going in and indicating that other vehicles should leave. The general foreman would go in, park up, and tell them to leave the area, mostly by eye-to-eye contact, or by use of the radio if they had it. Brian French could do it after speaking to him. There was no set of written instructions on how to do it.

12.3.16 It was not necessarily common for Land Rovers to be in live dig areas and it was not common to see Land Rovers in the loading zone, including the area where trucks are waiting to get in to the shovel. He had not really seen that, although it had happened in the past, with Alexander McCulloch in 2005, but that was more or less the only time. It was addressed through toolbox talks and safety bulletins and it was preached in the industry that Land Rovers should not go near dump trucks without them being immobilised. That was the position in SCC before the 2007 accident.

12.3.17 He denied that the coal supervisor, fitters and even he would routinely be in and around live digs – they would not be in the actual working area of the shovels and the turning area of the trucks. He agreed there could be the odd occasion when a Land Rover entered somewhere it should not be, but mostly nine times out of ten he would speak to them and advise them they should not be there. It was very rare and happened less than once a month.

12.3.18 On occasions when Land Rovers did come into dig areas that was achievable in a safe manner. The actual dig area, where the turning point and the shovel were, had to be cleared before they were allowed to enter it. He had seen and chastised drivers coming in to a dig area without suitable measures taken. It would maybe be someone getting too close to another vehicle.

12.3.19 He agreed with the solicitor for SCC that there was effectively a rule of segregation. Land Rover drivers would know that the dig area should be cleared of big vehicles, or they should be immobilised and there was no reason to think any of them did not know that.

12.3.20 Robert (Ronnie) Stewart, the leading driver, said that “Land Rovers were here, there and everywhere” (Day 13, page 166). If there was a steady stream of traffic a Land Rover could just stay behind the last one and go into the area and park up. They would not need to clear an area unless it was a breakdown – not just to put a Land Rover in. They were in dig areas constantly and operations would not stop because there was a Land Rover in a dig area. He had cleared areas, but they could be cleared without him being there. He agreed that, if a fitter wanted area cleared, he could radio the excavator operator and the dropping of the bucket should signal to the drivers to go somewhere else. It did not require a supervisor or anyone else to come in and tell the drivers what to do. That was how it worked near enough all the time. Asked whose responsibility it was to see that the fitters got into the machine safely, he replied that the fitters were responsible to tell folk they were going in to the dig, but he did not know if they told the supervisor and it then became his responsibility.

12.3.21 He had seen fitters going into dig areas and clearing them themselves by signaling to dump truck drivers without radios to go away – the fitters would do that when there was a problem – that was perfectly acceptable and common enough. He did not agree with the suggestion that a supervisor or the general foreman would arrange for him to come in and clear the trucks away. Land Rovers would normally come in and just do what the fitters had done in the 2007 accident: they would come in, give themselves plenty of room to go into the breakdown or whatever it was and they would generally be vigilant; or they could wait outside until the dig area was cleared.

12.3.22 According to Mr Stewart, the frequency of Land Rovers in live dig areas did not change after the 2005 accident. Asked if Land Rovers always entered live dig areas safely he replied “I never knew anything that was unsafe before it [the 2007 accident], because I never knew of anybody that had been in an accident wi’ a Land Rover prior to the two that you’ve mentioned [2005 and 2007 accidents]” (Day 13, page 189). It was possible to have a Land Rover coming in to the dig and dump trucks going out at the same time. Land Rovers would come in, in a channel between loaded trucks and empty trucks, which would be safe. Some might queue to get in, but he would say the norm was just to come in between the trucks and try to get in safely. Land Rovers were coming in and out all the time. He would say it was safe because he had never been involved in any accidents. Land Rovers could come in on the offside of vehicles like Mr Cullen’s at various times through the day – supervision, fitters everything came in like that, it was common. If the Land Rover in the 2007 accident came in the centre of the dig area as was suggested in the plans prepared by SCC, that was something that would happen at various times, whether it was fitters or supervision.

12.3.23 David Frew, who was a dump truck driver, said that Land Rovers were always on site, but nine times out of ten the driver would speak on the “walkie talkie” and tell them they were coming in to the dig; most of the time he knew they were coming in. He did not always have a radio in his truck. You would have to use vision and have your wits about you. Operations did not stop if a Land Rover entered into a dig area. Nine times out of ten when the Land Rover came in to the area he did see it. But he was taken by surprise by Land Rovers coming up on the offside; he had seen them flying about - not any particular fitters, but it would include the foreman flying in to the dig area and cutting across trucks when they are driving down with a load on them (Day 15, page 59). It could be in any area. Fitters would not do that; he believed most of them were very cautious. He supposed he had experience of Land Rovers coming into the dig area unannounced, but he would see them; it did happen that they had not announced it over the radio.

12.3.24 He was not aware of situations where digs would effectively be cleared by management to allow fitters to come in; he would not say that happened then. Rules about Land Rovers only entering the dig area in a safe manner with the area cleared of trucks were put in place after the accident. In his opinion, fitters drove more safely than management.

12.3.25 He could not remember being taken unawares by arrival of a Land Rover; mostly when they drove in they made it possible for truck drivers to see them. The layout in Mr McDougall’s dig area was a regular occurrence and Land Rovers would come into the middle if they needed to maintain the excavator. You could get Land Rovers running into digs all the time to speak to somebody about something.

12.3.26 Derek Kyle, who was the site engineer, said it was quite a regular thing for Land Rovers to come into a dig area, although he agreed that he did not see it on a regular basis, since he was only up on site maybe once a day, but it was normal. He agreed he had no reason to believe it was happening in a way that was unsafe. He would not say that Land Rovers had put themselves as close to a truck as in the accident unless they felt they had made contact in some way. From time to time he

would go in to a dig area without supervisors knowing. The area would not have to be cleared.

12.3.27 Alexander McCulloch, the shift supervisor, said that he would wait until trucks were out of the road. He always did that, except for the one occasion when he was involved in the 2005 accident. If Land Rover drivers knew a truck had a radio they would shout at the truck driver on the radio, saying they were going in and asking them to sit there. He did not know if people would drive into live digs without having informed everyone in the dig they were coming in. Others would usually wait until the trucks were out.

12.3.28 Land Rovers would on occasion enter a loading zone, maybe if they were going in to look at the coal. Trucks would still be working, but the Land Rover would keep out of their way, as far away from the trucks as it could. If a Land Rover came into a live dig area, dump trucks were expected to stay out of the road of the Land Rover. You should not drive a Land Rover near them, but he could not remember if there was an acceptable distance.

12.3.29 He would not say that Land Rovers would be seen in dig areas as many as ten times a shift. He agreed that he was aware, as a supervisor, that Land Rovers would frequently drive through the channel in the gap in an area like the one shown in the plans prepared by SCC for the Inquiry and into the green marked loading zone area when vehicles were at work. He was happy enough as supervisor that it took place sometimes.

12.3.30 Land Rovers were only allowed to enter live dig areas when it was safe and operators had to use their own initiative to know it was safe; it was left to Land Rover drivers' common sense.

12.3.31 If an excavator broke down, the driver would shout on the radio either to the supervisor or general foreman and they would get the fitters; they would shout for the fitters to come up and get the truck drivers parked up in a safe position and let the fitters in. On occasions an excavator driver would shout on the fitters himself, but the procedure was that it was supposed to go through the supervisor or general foreman. It was not supposed to happen, but occasionally you could have fitters coming in to dig areas before trucks had been cleared away. It did not happen very often and they would normally get in at piece breaks. He was not aware of any case aside from the 2007 accident where fitters would just go in and get it going themselves.

12.3.32 In cross examination for SCC he agreed, somewhat contrary to his earlier position, that the procedure for a Land Rover entering the dig area was that it would always wait for the area to be cleared by someone in a supervisory role. In the absence of radios, the dig area should have been cleared before a Land Rover came into it. He would wait for trucks without radios to move away and he took it that was what everybody did. He agreed that was what he saw to be practice. Fitters were definitely not allowed to go into a live dig area and clear it themselves, because it was unsafe. On the other hand, he accepted that he himself may have gone into a dig area and cleared it himself by pointing and gestures, although he could not remember having done so.

12.3.33 The dig area at the scene of the accident in 2007 was a standard layout, and the position of Mr Shannon's truck as shown waiting in the plan (Crown production 61) prepared by SCC was the way it would work. He thought it looked a pretty tight dig. A Land Rover would not be entitled to drive in the middle of the dig area – it was too unsafe.

12.3.34 Asked what the fitters should have done without a radio, he said "They had went to the general foreman. He had a radio. So why did he not radio me?" (Day 17, pages 10-11). They were not entitled to clear the area themselves.

12.3.35 David Paterson, the site manager, explained that absolute segregation was very difficult to achieve in order to allow the site to function. Segregation in extreme danger areas was possible, and that was what the company rules were set up to do. Before the 2007 accident there would be Land Rovers in the dig area; that was fairly common – but in haul roads and safe areas. A safe area was when you could place your vehicle with the knowledge of the drivers round about you, out of danger of vehicles travelling past you, where there was a risk that material could fall off. You could not designate an area in advance, because by tomorrow it might not be a safe area.

12.3.36 He considered that it was for the general foreman and the supervisor to control movements in the dig. That was how it worked as far as he was concerned. If the supervisor or General Foreman saw someone was not driving in accordance with the rules, he would expect them to stop the person, put them right and make a record of it, e.g. in the daily report book or, if it was more serious, to park them up and take them to the site office - to him. He never saw, nor was aware of, Land Rovers entering loading zones.

12.3.37 If the leading driver was not asked to clear the area, the Land Rover driver should not do it. The leading driver would contact the dump trucks by radio, or possibly pass out hand signals to them, as to what he wanted them to do and would move them to a different area, either to a park up area or split them between other excavators. Contact could be eye to eye contact, hand signals, or even word of mouth. Mostly when there was a breakdown in the excavation, the leading driver should be getting involved, because the supervisor was relying on him for organisation of the truck fleet. He was not aware of any custom and practice for fitters to clear areas themselves. He would expect the fitter to contact whichever supervisor was in control of the dig that day and it was for supervisors to decide how the area was to be cleared.

12.3.38 He would expect that, as Messrs French and Ferguson progressed up to the area, they would make contact with the supervisor who was in control of the full area, to arrange what he would want to do. He thought that was what was happening, because it was a production issue as well. He did not think supervision would take kindly to fitters going and stopping production without their knowledge. He did not agree that a practice had developed of the fitters clearing the area themselves.

12.3.39 Land Rovers would not be entitled to come in through the channel in the middle of the plans prepared by SCC for the Inquiry in parallel to Mr Murray's truck.

They should have followed the route of the trucks, otherwise they were in breach of the overtaking rules. They should have sat behind Kevin Cullen.

12.3.40 He was surprised at the suggestion that unexpected Land Rovers would come into the dig area five to ten times a shift and that the general foreman would come into the loading zone unannounced. When he was told that Kevin Cullen said it was not unusual for Land Rovers to be driving up the middle of the plans prepared by SCC for the Inquiry, Mr Paterson said he had never seen that happening.

12.3.41 Hugh Phillips, the dump truck driver who trained Mr Shannon, said it was common practice for Land Rovers to be in dig areas – including fitters, supervisors and the foreman. You would get Land Rovers moving freely in and about the loading zone before the accident, maybe if a machine had broken down or the supervisor or whoever wanted to speak to one of the dump truck drivers. Nine times out of ten if they wanted to catch a driver's attention they would come up his left hand side and sound their horn. It was commonplace for Land Rovers to come into a dig or loading zone.

12.3.42 He agreed that when Land Rovers came up on the offside they did it safely – by stopping and looking at the driver. He agreed that he would not know what steps a Land Rover may have taken to draw himself to the attention of another lorry or for the lorry driver to be aware of his approach, unless he was sitting in the machine that was being loaded and was facing out. He agreed he would not necessarily be aware if a Land Rover had been able to make radio contact with a Terex driver, or was seen in mirror.

12.3.43 It was common for Land Rovers to enter digs along the middle of the dig area which was suggested as the route of the Land Rover in the plans prepared by SCC for the Inquiry, with dump trucks operating in cycles as shown in the plans. He agreed with hindsight that Land Rover drivers were taking risks, including routinely supervisors, general foreman and fitters.

12.3.44 Thomas Hamilton, the company trainer/assessor, agreed that Land Rover drivers were required effectively to position their vehicles where they best thought was safe; that was how it worked in reality. Sometimes Land Rover drivers, including fitters, would tell the general foreman or supervisor that they were going up to a machine, but there was no hard and fast rule that if a fitter or supervisor was going into the dig they would have to speak to someone in overall control. He would say that fitters were entitled to clear areas themselves using eye to eye contact.

12.3.45 Prior to the accident it was not prohibited for a Land Rover to come in the centre of the dig area and stopping was not prohibited. If possible they would come in on the driver's side and catch their eye; usually he would see drivers coming in on the left hand side. He agreed it could be done safely if everybody had radios and the Land Rover driver could alert them, or if they came in far enough away from the waiting truck to be within its eye sight.

12.3.46 Alec Ritchie, the other company trainer/assessor, said that prior to 2007 there were situations where light vehicle operators were driving their vehicles into

live dig areas potentially with active operations ongoing. They were advised not to do it. In most cases supervisors would be advised of the situation.

12.3.47 Andrew Polhill, of the safety department, was not aware before 2005 of there being a problem at Pennyvenie of light vehicles putting themselves in dangerous situations in relation to large vehicles, or between the 2005 and 2007 accidents. You would need to examine the circumstances to know if Land Rovers were coming into uncleared dig areas unsafely. He had seen Land Rovers drive up the middle of a dig area, but only in controlled circumstances where everyone was told to freeze. He questioned how such a manoeuvre could be carried out safely without communication and how much risk was being taken. He considered that overtaking dump trucks in the absence of radios was very risky, due to visibility and the inability of a Land Rover to out manoeuvre a dump truck in rough terrain.

12.3.48 If there had been a supervisor present to enforce the rules, assess the risk and make sure traffic was organised properly the accident would not have happened.

12.3.49 Ian Munro, the environment safety manager, considered that the Land Rover did not observe the left hand rule of the road, but it was more about the overtaking rule, which was breached because of the failure to communicate with the dump truck driver.

13 Communication

13.1 Radio

13.1.1 Given the nature and scale of operations at a significant opencast site and the ever-changing layout of parts of the dig area, it might be thought that radio would be the routine means of communication between plant, vehicles and supervisors and, where necessary between operators. Radio is not a new technology. Almost a century ago, the British Wreck Commissioner's Inquiry Report into the sinking of the Titanic recommended that all foreign-going passenger and emigrant steamships should be fitted with wireless telegraphy, worked with a sufficient number of trained operators to secure a continuous service by night and day and where practicable a silent chamber for "receiving" messages should form part of the installation: Report of the Inquiry, 30 July, 1912.

13.1.2 Norrie Buchanan of the HSE had been an opencast mine manager in the 1990s. When he started in the opencast industry not all plant would have radios – it was similar to what there was at Pennyvenie - but he worked up to 100% capacity, seeing production benefits. In the sites he managed most of the plant was equipped with two way radios. He stopped being a manager around 1999/2000. All his dump trucks had radio by then. His last opencast employer was AMEC Mining.

13.1.3 Mr Polhill of the safety department had worked for Miller Mining (which was taken over by SCC) until 2001 and they required that every item of heavy plant, dump trucks, excavators and dozers would be fitted with a radio. He recommended that SCC had standards for radio coverage, but the best influence he could give was during audits, to recommend managers to have a radio allocation list which was carried out through risk assessment. He recommended a radio policy to various

managers, various senior managers, directors – as he put it, everybody would have heard him. He was told it was up to managers to decide what they needed in operational vehicles.

13.1.4 A number of operators gave evidence of working for companies or at sites where there was very limited radio coverage and certainly, in 2007 it was not the norm for opencast coal mines to have a universal radio policy. Typically – and in Pennyvenie in 2007 – the radios were on an open channel, so that everyone who had access to a radio could, in principle, hear every message. The site engineers (i.e. the surveyors) had a separate channel for their own communication, but that is not relevant to this Inquiry.

13.1.5 As Mr McDougall recognised, since individual operators did not know which dump trucks had radios, it was difficult to use radio as an aid to communication.

13.2 Radios in dump trucks

13.2.1 Mr Paterson explained that there were up to 23 dump trucks on their records as operating on the day of the accident, about 14 of which had radios – and there were thus about nine trucks without radios. That was the way the industry worked and he would doubt any similar type company was “fully radioed”.

13.2.2 There was no set pattern that would say who had a radio, but they would split them up in order to ensure they had adequate coverage and that messages could be passed on to trucks for them to pass on by word of mouth or hand signals.

13.2.3 Alan Shannon stated that he spoke to the leading driver, Ronnie Stewart sometime between around Christmas time in 2006 and the course of February 2007 to ask if he could be placed in a truck with a radio, because he had communication difficulties; he was not able to understand Mr Stewart’s instructions because he could not hear him shouting from cab to cab. Mr Stewart refused, because it might distract him. Mr Shannon denied the suggestion by SCC’s solicitor that what he had been saying was that he had heard an employee who drove a Caterpillar 777 was leaving and he would like to drive a Caterpillar 777.

13.2.4 Mr Stewart stated that he was always advocating for more radios, as shop steward for Pennyvenie and health and safety representative. He spoke to supervision and the manager, Mr Paterson, who said he was trying his hardest to get them. He thought that was less than a month before the accident. It was always on the agenda at health and safety meetings and it was always getting mentioned that they were getting more radios. It was an ongoing thing for months that they were trying to source radios. While he thought that the minutes would record that discussion, there was no such record in the minutes. Mr Stewart’s motive was to get the full site on radios, because that would have improved health and safety.

13.2.5 Mr Stewart recalled Mr Shannon requesting a truck with a radio, after he had asked him about an incident with the grader (which I deal with later), because there was a driver leaving to go somewhere else and his truck had a site radio in it; Mr Shannon said he thought it would help him. Mr Stewart did not think that Mr

Shannon explained anything about having difficulty hearing or understanding instructions. He spoke to Hugh Phillips, who had trained Mr Shannon, but he thought they only had four or five dump trucks with radios and he needed experienced drivers with site radios so they could help him do his daily duties. In any event there was a major breakdown with another driver's truck and he got the truck with the site radio.

13.2.6 Mr Stewart agreed it may have been a distraction – that was what Mr Phillips said – but he needed somebody more experienced to help with the operation, so they could communicate with the other drivers. Because of the major breakdown the truck never became available for allocation to Mr Shannon, although he would have given it to someone with more experience.

13.2.7 Mr McCulloch, the shift supervisor, said that when new Terex trucks came on site, maybe one or two months before the accident, he asked Mr Paterson for radios for them. Mr Paterson told him that he did not think he could authorise the cost of £3000, but put a requisition in on the computer. Some time later, he went back in to the office again to check about the radios and Lyle Ramsay, the under manager, obviously overheard him and walked through and said, in colourful language, that the production director, Andrew Hodgson “will not buy them. He’ll not sign them off” (Day 17, page 29). His understanding was that Mr Hodgson had considered and had refused the request. Mr Paterson did say that they could get two radios a month.

13.2.8 Mr McCulloch thought that they all needed them, for safety. He thought they did get two radios for Terexes and they would continue to get two per month. He thought he may have asked for a couple of radios before that as replacements.

13.2.9 Mr McCulloch was challenged about this evidence by the solicitor for SCC and it was suggested that he had an issue with Mr Hodgson because he had been reduced from being general foreman in 2007 to a supervisor for not reporting an accident in which someone had been injured under RIDDOR. He accepted that he was disciplined and reduced to supervisor at the House of Water site, but maintained that he had properly reported the accident. Moreover, it was another senior manager rather than Mr Hodgson who did the talking in the disciplinary process. He denied using the hearing as an opportunity to get back at Mr Hodgson.

13.2.10 Mr Robertson explained that people would continue with work if a radio broke down or a handheld radio got lost. It could take a week to get a broken or lost radio replaced.

13.2.11 Mr Paterson said that he was buying radios now and again to try to increase coverage. The coverage they had was better than any site he had worked on since 1983, but the ideal was to have radios in everything. The pitfall to that would be more radio traffic. Full coverage would probably have happened over time, but he did not see it as a must do now necessity. He did not think there was anything to stop him if he had placed a big order, although if he had put in an order for more than £500, it had to be approved by a senior manager or director. He was working towards full coverage and planned to get there eventually.

13.2.12 There was a lot of discussion going on about radios and handsets and it was possible McCulloch may have spoken to him, but he could not recall it.

13.2.13 He did not recall ordering radios for Terexes, but he did order handsets for the fitters. The likelihood was that the Terexes were replacing older trucks and they would remove radios from any that were there and reallocate them to another item of plant. Radios were not absolutely vital because the company and the industry survived without them for a long, long time before (Day 20, page114).

13.2.14 A new Terex truck cost roughly £400,000 and a fixed unit radio roughly £400 to £500.

13.2.15 Mr Paterson stated that they did buy radios now and again and they may have replaced some, but he did not specifically recall ordering radios for the Terexes. It was difficult fully to square that evidence with his evidence of increasing radio coverage. It would cost about £3000 to purchase nine radios. That would need to be signed off by Mr Hodgson if he was ordering them all at once. He could not recall if he requisitioned them and got knocked back; but it was possible.

13.2.16 He could not recall if Ronnie Stewart ever asked for additional radios after a safety committee meeting, but it was possible. He could not recall if he replied that he was trying to get more radios. It would have been his decision to purchase radios. He did not purchase more radios because they had quite good coverage over the amount of plant they were running. Again, it was difficult to square this evidence with a policy of increasing coverage.

13.2.17 He insisted that he had been increasing the radios by two or three a month and there were about half a dozen purchases over the two or three months leading up to the accident, but he agreed that was to replace damaged or lost stock (although he had earlier suggested the stock replacement was a single order). He then maintained that the stock of radios was being built up over a number of years. At the time of the accident they had increased coverage to 66% or 76% and there had been an increase of coverage of a period of years. He was trying to increase the number of radios on site gradually.

13.2.18 In the last two or three months it was really handsets he was buying, but previous to that he claimed that he had been buying occasional fixed units and he considered that there was an increase in fixed units between 2005 and 2007 – but not just for dump trucks, there was other plant too.

13.2.19 In his opinion eye contact was better than radio because radio messages could be misunderstood or broken up. With eye contact you can get a clear impression that somebody had actually seen you.

13.3 *Fitters' radios*

13.3.1 David Oglesby, the plant engineer, who was the line manager of the fitters, was not able to give evidence, but his statement to the HSE was read to the Inquiry. He said that three radio handsets were normally available to the maintenance crew, plus a base set in the fitting shop and in the on-site fitter's

container (which was a cabin near the working area of the dig), although there was not always somebody at these base sets.

13.3.2 The three handsets were distributed – one to Mr Oglesby, one to the shift plant foreman and one to the field fitter crew (of three or four men). According to Mr Oglesby they had three hand held radios up until two months or so before the accident, then one broke down and one was lost on the Friday immediately before the accident, leaving one handset operational in his possession on the day of the accident. There was therefore only one handset in the hands of fitters and it was in the hands of Mr Oglesby.

13.3.3 The broken down radio had been handed into the main site office to Lyle Ramsay (deputy site manager) to send away for repair. He passed it on to one of the engineers who packaged it up for sending for repair but it was left in the reception and was not sent away until after the accident had occurred.

13.3.4 Mr Oglesby agreed that it was normal practice that, even with the three hand held radio sets available, the field fitters would not have a radio set available to them.

13.3.5 Mr James Willison, the nightshift foreman fitter was also unable to give evidence and his statement to the HSE was also read to the Inquiry. He made an entry in the shift log book for the fitters for Friday 23 February 2007 regarding a handset radio belonging to the field fitters being lost on that shift. He explained that the fitters had a fixed base set in their workshop, one in the foreman fitter's office and a fixed base set in the field fitter's cabin. There were also four handsets, but two had been lost for three months and not replaced and the one lost on that shift was another one short. He had asked for a handset for every fitter.

13.3.6 Hugh Kirkwood was a fitter's mate. He stated that Colin Ferguson always made sure he had a radio to hand and if he did not have a radio to hand he would get a shot of a radio. Mr Ferguson knew it was important that you get your message relayed, so he always tried to get a radio if he did not have one. That was to help him get his job done and know where he needed to be.

13.3.7 As a fitter's mate Mr Kirkwood was aware of times when it was not possible to get a radio and it was necessary to go into the field, effectively, without radios. Sometimes he did not have a radio and people would come up in dump trucks, stopping to relay a message to him.

13.3.8 Mr Paterson did not recall fitters being without radios, because he said he had purchased four or five handsets for the use of Castlebridge Plant in about October 2006, to replenish damaged stock. Although each fitter did not have a portable handset, they swapped from shift to shift and the radios would be passed between the men operating on field. Some men were workshop based and did not go up to the site very often. If there were a few handsets in the system that should have covered the number of fitters that needed to go on site. If a handset broke down, if they needed a replacement they could generally have it within four or five days, a week at the maximum.

13.3.9 He was not aware of fitters going down into the dig without radios. It was not against the rules (they did not have strict radio rules then) but it was against good practice. He agreed it was possible that there were only three handsets between the maintenance crew at the time.

13.3.10 There was a base set at the foreman fitter's cabin, the workshop and at the on-site fitters cabin. It was 5 miles from the workshop to the dig area. They had a 40 foot cabin up site, at the mouth of the dig area, near the truck parking area. They had a tea point and some spares there. It was not in the area where the trucks were running, but out at the entrance to it.

13.3.11 There were possibly three handheld radios allocated to employees: one to Mr Oglesby, one to the foreman (Mr French) and one to the field fitter crew, which was three or four men. Generally they travelled about in pairs most of the time. Occasionally they would not be in pairs, if it was a very small job, but when he saw them they were usually in pairs.

13.3.12 He was unaware that one of the three handheld radios broke down possibly two months before the accident and was given to the deputy site manager, left packaged up for some significant time and not sent away until the day after the accident.

13.3.13 He was surprised that the fitters were using two handsets between them, because he said that he bought them four or five in November 2006 (sic) and nobody had reported any wastage or breakage to him or losses. He thought that two handsets between the fitters would probably not be enough to work safely, but it would depend who had custody of the radios.

13.3.14 The fact that one of the handsets was lost on the night shift before the accident came to light on the evening of the accident. He understood that the night shift fitters on the Friday night before the accident had lost one handset. He spoke to the night shift foreman, James Willison and he said he had recorded it in the supervisor's diary (which was used for communication between shifts) and he told Brian French on the Saturday morning.

13.3.15 There were radios available in the office, held by his deputy manager and engineers, so there was capacity to provide a radio to replace a missing radio. It was common knowledge that there were handsets available. He had no idea why Mr French and Mr Ferguson did not come and get a handset from him. There were no spares as such, but people could still borrow one from people who were in the office all day.

13.3.16 He would not have expected the fitters to keep working without a radio, since they could always get one, but he agreed there was no absolute bar on coming into the dig area without a radio.

13.3.17 The radio list which was completed as at the day of the accident at Mr Buchanan's request, listed the fitting shop office and fitting shop as having radios, but otherwise the only radios listed for fitters were Dave Oglesby, who had a handset and Brian French, whose handset was shared with the nightshift. Mr Paterson was

not sure if there were other radios that the fitters had access to, but there probably would have been other handsets about. He could only assume that what was listed was all they could find at the time on the site.

13.4 *Radios generally at Pennyvenie and in SCC sites*

13.4.1 In response to the question whether it was ever suggested from the safety department that he should get more radios, Mr Paterson recalled reference to the formulation of a radio list, from recently reading minutes. It was not about getting radios, but it was about getting a radio list. The purpose was to monitor what radios there were on the site and he remembered making up the list.

13.4.2 The radio list which was completed as at the day of the accident for the HSE was updating one prepared previously. It listed the dump trucks on site – 14 with, and 9 without radios. Some items of plant, including the 9 dump trucks, which did not have radios were colour coded on the list as “no radio, but req’d” – meaning required. The document was prepared towards the end of the day of the accident. SCC had decided that day that the radios were necessary, but he did know why it was decided that they were now required.

13.4.3 Thomas Hamilton thought Pennyvenie had more radios than any of the rest of the SCC sites and that there would be maybe five or six radios missing from Pennyvenie. There were sites that were worse; some had only five or six radios on the site. He did not have any concern before the accident that Land Rovers were coming into a live dig area without having radios. He believed they always had handheld radios at their disposal.

13.4.4 As already noted, Mr Polhill, the safety adviser, was told it was up to managers to decide what they needed in operational vehicles. He thought directors and senior managers left it to site managers. He did not know about spending limits, but when he was a manager for nine or ten months in 2008 he simply ordered radios and they arrived. He was shocked after the accident to see that the Terex trucks did not have radios, especially after the encouragement he had given.

13.4.5 He agreed in hindsight that it was not safe not to have a written rule that you cannot move about on the site unless you can communicate with people by radio. It was too high a risk for a Land Rover to overtake a dump truck in the absence of radios. He agreed that the absence of a rule prohibiting Land Rovers moving on site without a radio was, in hindsight, a systematic failure. If there had been a rule stopping Messrs French and Ferguson going onto the dig area without a radio there is a higher probability that the risk could have been reduced.

13.4.6 He advised Mr Paterson and every manager to get a site list for radios. That would tell the manager if he had enough radios to carry out operations efficiently and safely. His advice was to assess what he needed and get the radios to do the job. But his advice was that all items of operational plant should have radios. He was comfortable that Mr Paterson would get the radios he needed to do the job.

13.4.7 His audit report for Pennyvenie of 7 March 2006 (SCC Production 16) under “Suggested Improvements” noted “Review radio deployment for necessary

communication. List of site radio deployment suggested, avoiding heavy plant accidents.” That recommendation was raised by him after he had been on site carrying out an audit, but it was an improvement he was trying to promote throughout the company.

13.4.8 The maximum time he usually gave anyone to meet their target was three months and the target date for this action was 7 June 2006, with action to be taken by David Paterson. He remembered getting an email back from Mr Paterson confirming he had taken action about compiling the radio list. It was not company policy to demand a radio in every vehicle, so he could only advise that they covered everything they needed to cover operations. Mr Paterson’s comments against the action were “Purchase of additional radios ongoing. Most heavy plant fitted”. Mr Polhill was not told how many additional radios had been purchased.

13.4.9 In the next audit report (SCC Production 17) the action summary recorded, under review of radio deployment “ongoing list to make”; he thought that Mr Paterson said that he had fitted all the radios he needed to fit and just needed to update the list. He could only take Mr Paterson’s word for it. The subject did not come up again in the subsequent audit reports. It would only be dropped from audit reports if the manager had submitted proof enough that he had complied with the action and Mr Polhill considered that he must have seen something to demonstrate that. He thought that Mr Paterson flashed it up on the computer screen, saying “that’s our work in progress”, but Mr Polhill only got the actual list after the accident (Day 27, page 140-1).

13.4.10 Mr Polhill could not say if the radio list as of 26 February 2007, produced immediately after the accident, was exactly the same as what was flashed up to him, but he recognised the gap analysis to identify what was required and installed. It showed that 9 dump trucks out of 23 were not fitted with radios – i.e. 35-37% were without radios. There was no policy or guidelines as to what the level should be, but to him that would not be enough – he would want one in every vehicle.

13.4.11 It is necessary to use radio properly – speak clearly into microphone and confirm you have understood the message; using the radio while trying to drive could be an issue. There can be radio blind spots. In the hierarchy of control – avoid, segregate, mitigate – radio is probably in the mitigation element.

13.4.12 Alec Ritchie, one of the two company trainer/assessors, had also worked at Miller Mining, where all vehicles had radios and the company had a universal radio policy, pretty much from when he started in the industry in the early 1990s. That was an absolute aid to safety. He thought all light vehicles were fitted with radios, but if they were not fitted there were handheld radios available as well.

13.4.13 There was a difference between Miller Mining and SCC, because of the restriction on communication in consequence of the absence of a universal radio policy, which meant that at SCC there was more emphasis on drivers having to manage situations and be aware of visibility. He raised the fact that the position had been better at Miller Mining on numerous occasions, with site managers and the safety department; he first raised it eight or nine years ago, at the same sort of time as Mr Polhill. He was aware of Mr Polhill’s views – they discussed them and they knew

there was a better way “it was alien to us to go anywhere without communication” (Day 31, page 48). SCC bought Miller Mining and he did not know what stopped it happening under SCC.

13.4.14 Mr Munro, the environment safety manager, gave evidence that there was nothing in the minutes of the Quarries National Joint Advisory Committee (QNJAC - an HSE sponsored committee, including trade associations, trade union and professional bodies) suggesting an all radios policy. The industry is represented on QNJAC by COALPRO and, equally, the minutes of the COALPRO Health and Safety Committee for the period from January 2002 to January 2010 made it clear that the question of an all radio policy was never brought to its attention before the 2007 accident.

13.4.15 There was no radio policy at SCC prior to the accident. Historically radios were issued to key personnel and that was still the same in some opencast sites. He thought that the site manager’s spending authority was about £2000, but he was not aware of any restrictions on purchasing radios.

13.4.16 He was aware of Mr Polhill’s recommendations, but he was not aware of any resistance to them. Managers were all actioned to make an assessment of operations to find out which of vehicles would benefit from radios, with a view to keeping vehicles apart and segregating light from heavy vehicles. The criteria was if there was a risk of collisions; he would say all dump trucks should have radios, unless there was absolutely no risk of any interaction with light vehicles.

13.4.17 As far as he was concerned, Mr Paterson had made an assessment that radios were required; they just had not been fitted to all the trucks. They were not difficult to source.

13.4.18 He agreed it was a simple task to identify which vehicles had a radio and needed a radio, but the audit reports suggested it had not be done in three months. He considered the objective was to make sure that key personnel had radios. He was not aware that Mr Polhill was telling the manager that he must get radios in all his vehicles. His department was there to advise and support the operational team.

13.4.19 If the radio list produced after the accident showed that Mr Paterson needed radios for eight trucks it would not have been unreasonable to expect him to get them in a much shorter period than the eight months that had elapsed since the target date for the preparation of a radio list. He agreed it would have been better to prepare the list and then work out how many more were needed.

13.4.20 The audit point dropped off after June 2006; Mr Munro understood it had been addressed by drawing up the list and assessing which vehicles required radios and that there was an ongoing programme of buying them.

13.4.21 On Mr Polhill’s view that all vehicles should have a radio, he said that was what the assessment said in the radio allocation list. The assessment was that they were not fitted, but required. It was a status report on the day of the accident, but he thought it was available earlier. He thought that SCC would have got to a position of having universal radios.

13.4.22 On some sites prior to 2007 the managers had assessed that all vehicles needed radios. He discovered after the accident that Powharnal had 100% coverage and others were working towards it. After the 2005 accident the aspiration may have been to fit all trucks with radios. He thought that before the 2006 audits there had been discussion in head office with operations people and they had addressed it on the basis that they should maybe be looking at radio deployment.

13.4.23 It was important to know who you were speaking to on the radio. There was also a risk of people using radios to get closer to each other without actually seeing each other. If a Land Rover wanted to pass on offside, he had to be sure he was speaking to the right person – there was a need for radio procedures, call signs on radios and things like that. Only one person can speak at a time. There was also an element of misuse. There was a concern that people might rely on radio rather than the traffic management rules which were then in place. The prime control mechanism was still segregation.

13.5 HSE views on radios

13.5.1 One of Mr Ferreira's recommendations was

“(4) Consider more active means of alerting the drivers' attention to the presence of smaller vehicles and pedestrians within the working area, such as two-way radio communication”.

13.5.2 He was alerted to absence of two-way radios before he arrived on site. The use of radios to alert staff to the presence of vehicles would be more effective in helping to direct attention to the appropriate area or issue instructions. Two-way radio should not be seen as preferable to segregation: segregation is at the top of the hierarchy of controls, but a lot of these measures compliment each other and it is useful to have several layers in case one fails.

13.5.3 Mr Buchanan said that working practices at SCC in relation to radios were not out of the ordinary by comparison with other non-SCC sites at which he later served notices, but he did not accept that eye to eye contact could be better than radio and he did not follow the argument about the danger of over-reliance on radios.

13.5.4 The likelihood was that the accident would not have happened if the dump truck and Land Rover both had radios; he would have expected them to use them. But it is a more efficient system if every vehicle has radios and there are clear regulations for using them.

13.5.5 The Quarries Regulations and ACOP do not say anything about radios, although he would be in favour of including radio in the ACOP as a potential aid to segregation.

13.5.6 I have already described Mr Buchanan's own experience of all radio policy as a manager. For him, the benefits of radio absolutely outweighed the risks. There could be abuse, but that was for management to deal with.

13.5.7 He could not understand the logic of the allocation of radios at the Pennyvenie site. Having radios in Caterpillar 777 as opposed to TR 100 dump trucks defied logic. If he had to make a decision the priority would be Terexes.

13.5.8 In his opinion, if there had been two-way radio, improved visibility, such as extended buggy whips (flags and flashing lights on a two to three metre flexible pole above a light vehicle) and strict and rigid control procedures, or any of them had been in place, the risk of the accident would have been greatly reduced – particularly with two-way radios.

13.5.9 Mr Ian Waugh, now retired Chief Inspector of Mines pointed out that radios had been in use for many years, going back to the 1980s. They were a benefit for both production and safety. It would be the norm to see radios and none of his inspectors had come across the sort of incident where the lack of a radio had posed this set of questions.

13.5.10 Nowhere in the regulations, in ACOP, in the guidance, or indeed the pamphlet regularly issued by the HSE (the Quarry Fact File, issued every six months) was there anything which required or promoted the use of radios. They are mentioned in the Quarries Regulations in relation to escape and rescue and there is a warning against use in some circumstances where blasting is used and there can be stray currents. In hindsight he would use radio to ‘reinforce’ the guidance, because he would not wish to move the emphasis away from the hierarchy of management and controlled segregation, thinking that radios are a replacement for that segregation.

13.5.11 Inspectors would see radios in use on a site and would expect them to be used as a tool. Prior to the accident he thought most vehicles had radios – most of the big vehicles and the service vehicles. That is the practice he would expect to see and would normally see. The HSE has since raised the bar – they now expect use of radios to be universal.

13.5.12 He had prepared a summary of HSE inspection visits (Crown Production 17), which included a summary of information that he had about inspectors’ visits to Scottish Coal sites, including a reference in June 2005 at the Broken Cross opencast site to the 2005 accident at Pennyvenie being used as an example to prompt “discussion about collision avoidance including, cautionary zones, visibility aids, wider use of radio communication and electronic warning systems”. The report stated that “it was agreed this would be raised at other sites in the group and an initiative launched” but the record of a follow-up inspection in October 2005 recorded that the relevant manager “had left the company and work had not progressed”. He agreed that was effectively the action for the HSE following upon the 2005 report and accident. He very frankly said that he wished that HSE had done more to pursue that, although he was not convinced that his inspector did nothing about it, because of all the various other contacts that were going on, including headquarters discussions with SCC. Because it was “vehicle bread and butter management”, it would be raised at almost every inspection (Day 32, page 79).

13.5.13 He did not think it ever occurred to inspectors to say that operators must make more use of radios and make them mandatory. When an inspector was faced with a double fatality, a good inspector would obviously ask “is there any action I can take now to absolutely make sure this isn’t going to happen again next week”. Radio was one of those apparent features (Day 32, page 43-4).

13.5.14 ACOP and the Regulations obviously could benefit from being reinforced with reference to radios. Because a company the size of Scottish Coal had now embraced radio, the HSE could show that it was reasonably practicable for other operators to do so in terms of weighing up the benefits and the costs and an argument could be made that a failure to do so could be a breach of Section 2 of the 1974 Act. Health and safety evolves and radios are now universally used in opencast in the United Kingdom.

13.5.15 Colin Martin, the HSE specialist inspector who wrote the main HSE accident report, accepted that it was possible that if everybody had radios, there might be an over reliance on expecting communication from somebody who was about to put himself into a position that he should not be in. The overarching rule on these sites in relation to the management of vehicle movement had to be to try to ensure segregation of small vehicles from moving big vehicles; radios, properly used and functioning, might be an aid to this – a supplement.

13.5.16 He agreed with Mr Buchanan that some radios are no answer – it was all or nothing. If there were problems with receipt of messages, they could be mitigated by rules – e.g. that you must get an acknowledgement.

13.5.17 In his report (Crown Production 28) he wrote

“8.4 Scottish Coal Company’s Site Procedures dictate that communication between vehicles, the site office and workshop is by radio”.

13.5.18 He thought he got that information from their procedures. When it was explained to him that there had been evidence that that particular section of the procedures related to emergency situations, where the primary control was by radio, but that eye to eye direct vision was the method to be used generally for communicating, he said that his understanding, in particular in relation to maintenance duties, was that radio communication should be used because it meant a much, much smaller vehicle and personnel entering a dangerous area.

13.5.19 It was not a good idea for drivers of these trucks to be expected effectively to use hand signals, flash their lights, even get out of their vehicles and indicate for large vehicles to stop, because if you could not see a Land Rover at that size, a human being was even more vulnerable. He did not consider that communication could be carried out safely at night time with hand signals in the absence of radios.

13.5.20 It struck him as bizarre that these trucks did not have radios and the Land Rover in question did not have a radio, which was fairly fundamental to improve safety on the site.

13.5.21 With reference to the Safety Alert (Annex E) bullet point for plant operators

“Listen for radio communication, informing you of where light vehicles maybe situated”

he commented that, if Scottish Coal had identified that as something which may assist in preventing such accidents following the 2005 accident, it was surprising that 18 months later, approximately 30 per cent of the excavator trucks did not have radios.

13.5.22 One radio was useless, so unless all of the vehicles were fitted with them then it did not make any sense. Since the policy that had been adopted was one of only prime vehicles and managers having radios, that would tend to suggest radios were used as an aid to production as opposed to an aid to safety.

13.5.23 In the Site Manager’s Vehicle Rules (Annex C), in Rule 11 it is stated:

“On no account should any other vehicle enter this loading zone, unless the vehicles are stationary, without the permission of the vehicle operators.”

13.5.24 In the absence of radios, that was not possible, because you would not know what permission you were getting. Fundamentally, from a maintenance perspective, if they were expecting to do work on the excavator, radio communication should have been made and the vehicles should have vacated before the Land Rover ever approached.

13.5.25 Rule 13.1 states

“There must be effective communication between personnel at all times. This may be visual using recognised hand signals or through direct verbal contact using radios where appropriate.”

13.5.26 Having sat in that truck it was his view that that was, effectively, unworkable. He thought it was obvious to the employer that radios were required and the rules conveyed some of that in referring to radios as an aid.

13.5.27 Rule 13.3 states

“ Maintenance personnel intending to work on vehicles during service intervals or break times must always ensure that other drivers and pedestrians are aware of their presence before approaching in a vehicle.”

13.5.28 In the absence of radios, that was not at all workable.

13.5.29 He agreed that it would be useful if the ACOP were updated to make reference to radios with a suggestion that universal radios should be considered under risk assessment. He agreed that it would be useful to have something as explicit as “Rules should be created to avoid interaction between small vehicles and large vehicles wherever possible” or something as explicit as an instruction, “You must consider arranging your systems to avoid such interaction” (Day 33, pages 87-8).

13.5.30 There would be occasions where vehicles would have to interact in connection with maintenance, but for the normal day to day running of a site, if it could be set up to avoid interaction, that was how it should be done.

13.5.31 The conclusions in his report (Annex H) include

“9.4. Scottish Coal Company’s Site Procedures dictate that communication between vehicles should be by radio.”

13.5.32 He accepted that was taken from their emergency procedures, as opposed to their actual general rules, but he thought that made the situation even worse for Scottish Coal – “why are some vehicles with a radio and others without? There’s no point” (Day 33, page 89).

13.6 Non-radio communication

13.6.1 The Site Manager’s Vehicle Rules, rule 13.1 General, included (see Annex C):

“There must be effective communication between personnel at all times. This may be visual using recognised hand signals or through direct verbal contact using radios where appropriate.”

13.6.2 It was doubtful whether there was a system of recognised hand signals. Although some hand signals were widely known by witnesses, these were very limited, most notably right arm upwards with palm facing outwards for “stop” (a signal generally familiar to road users), both arms raised with palms facing outwards raised for “emergency stop”, using both hands to simulate breaking a stick, meaning “broken down” and drawing a finger (or hand) across the throat, to mean switch off the engine, or possibly park up and switch off the engine (according to Mr Stewart, Day 13, page 172). There was no recognised signal for fitters or Land Rovers generally coming into the area, although there was an informal hand signal, which was not at all widely understood by witnesses, of three fingers placed across the upper arm in an indication of stripes, to mean a supervisor or general foreman was in or approaching the area.

13.6.3 Beyond that, there seemed little or no general knowledge of hand signals, although there was some guidance available in the particular context of reversing safely and that was incorporated in a toolbox talk on 15 April 2005 (SCC Production 11 – toolbox talk on 15 April 2005 on ARV appreciation and reversing safely).

13.6.4 A number of Terex drivers were asked about receiving training on sounding the horn, using two blasts before moving off and three before reversing, but most of them had not heard of that. Mr Robertson was familiar with it, but from his account that may have been more with reference to moving from a hard stand or service bay.

13.6.5 Horns were not generally used for communication, because diggers used horns to indicate that trucks were loaded and the nature of the load, e.g. one blast for

rock, two short blasts for, say, peat, since different loads would go to different tipping areas. A long horn signal was also used for blasting.

13.6.6 Eye to eye contact was essential for communication in the absence of radios.

13.6.7 Communication other than by radio was by a mixture of hand signals and direct oral communication, the latter normally achieved after the operators of the relevant vehicles had attracted attention to each other by hand signals or vehicle signals – typically by flashing lights or putting on the hazard indicator, but also by sounding the horn in some circumstances. The leading driver had a radio and could pass messages to dump truck drivers by pulling up alongside them and (literally) shouting across the cabs (and engine noise).

13.6.8 Mr Murray explained that if a Land Rover driver wanted to speak to a dump truck driver, he could stop on a haul road and the driver might get out and call the dump truck driver over; the dump truck driver could stop behind or parallel with him and go down and see him them, but he could struggle to understand what was said.

13.6.9 A number of witnesses referred to the significance of an excavator bucket being lowered. Mr Murray acknowledged that it might mean the excavator driver had found a problem and therefore that small vehicles might be approaching, but it could simply be for the excavator operator to go to toilet. There was no general understanding that the bucket going down was a signal, although some, but not all experienced witnesses acknowledged that it would raise the possibility of a Land Rover entering the area.

13.6.10 Mr Shannon claimed he was given specific training that if an excavator bucket dropped the machine was stopping working and he should go and find another excavator. He said that Mr Phillips told him to do that.

13.6.11 Mr Cullen pointed out that cab to cab communication was not safe – the trucks could slide into each other – but it was common. There was a lot of guesswork prior to the introduction of radios.

13.6.12 Mr Robertson, on the other hand, considered that mechanisms of communication, including hand signals, eye-to-eye contact and cab-to-cab contact, were successful in ensuring suitable segregation of small vehicles from big vehicles.

13.6.13 Mr Paterson went so far as to state his belief that line of sight was always the best method of communication if you could see eye to eye. A message could go across broken up on the radio and there could be confusion as to who was speaking to whom. Radios were not the be all and end all. He accepted there was possible scope for confusion in a system of communication by flashing lights, pointing fingers, hand signals at night and shouting over loud engines, but he thought that communication worked well on site prior to the accident and it was industry standard.

13.6.14 Mr Polhill pointed out that it was necessary to be reasonably close to be seen in direct line of sight. Radios could keep a much greater segregation distance.

Eye to eye would probably need to be used at 30 – 30 m maximum in order to understand the hand signals.

13.6.15 He considered that if an excavator puts its bucket on the ground that would be a signal that nobody should move - that was almost industry standard practice: if the bucket goes down, the trucks wait in line. He had seen that at Pennyvenie and every other site.

13.6.16 That was the opposite of Mr Shannon's understanding, but more generally the issue was perhaps more about whether trucks were operating off one or more than one excavator. Certainly, the understanding of different truck drivers as to what it was appropriate to do when a bucket was lowered or indeed there was a breakdown was clearly very different. I examine this issue further in the next section.

14 Working pattern

14.1 *Single or multiple excavators*

14.1.1 Mr Murray thought he would generally be instructed by the leading driver to work off one machine, but he may be allocated to work off more than one machine.

14.1.2 Mr Cullen said that sometimes the leading driver would tell you to work from more than one machine and you would go to whichever first available, usually in close proximity.

14.1.3 Mr McDougall's understanding was that there were not designated vehicles to an excavator, but a truck would come back if an excavator had a bucket in the air (which nobody doubted meant that the excavator was operating and ready to load a truck). The leading driver might tell them he needed so many trucks and that they would be taking the tea break with him. If there were two or three excavators working in the same region, with trucks at one and another was short, they would run between the three, but they would be told which to stop at for tea. Dump truck drivers were expected to use their own initiative.

14.1.4 Mr Shannon said that he was generally instructed to work from more than one excavator, by the leading driver – Ronnie Stewart on the day shift. He was usually instructed to work off about four excavators. On any day, he was told he was working in the advanced dig (i.e. the less deep and generally less challenging part of the deep). He could then go to any machine in the advanced dig.

14.1.5 Mr Robertson said that trucks were allocated to excavators by the leading driver, depending on how close the excavators were – if there were two excavators in the one dig area, the trucks were intermixed to keep them going. They could have six trucks running off two excavators, but it could change during the day. They could be allocated to two excavators, or three if they were in close proximity. If the excavator broke down, they could go to another shovel or the leading driver would pull them away. He would more or less expect drivers to use their initiative.

14.1.6 Mr Stewart, who, as leading driver, was responsible for allocation of dump trucks to excavators, explained that he would find out how many excavators there were and liaise with the supervisor, who might stipulate he needed five at one excavator for an operational reason, but otherwise he would just allocate them as necessary and park up any that he did not need. If the excavators were in close vicinity (which was common) the trucks would just run between them, but arrange tea breaks so that everybody knew what tea break they were on. They could work off three or four excavators if they were in the same area. If there were four excavators operating, he could have whole shift running between all of them. At the time of the accident quite often the drivers were running between the five excavators. The day of the accident was one of the first times for a while that he could allocate trucks per excavator, because there were two excavators at the back, two in the middle and one as they were coming out of the dig area.

14.1.7 He took account of the experience of drivers – putting less experienced drivers on an easy dig and an easy tip – but if it were harder and tighter going into the excavators he would put experienced men including himself on them. If an excavator broke down the trucks would stop and he would reallocate them to other excavators or, if he did not need them, pull them up to the tea cabin and they could do servicing. They would sit there to see how big a breakdown it was. If they were running between excavators, they would be expected to go and find another one until he told them what he needed. Even if he was allocated to a specific excavator, he would never criticise a driver who saw a breakdown and went to look for another one nearby.

14.1.8 Some drivers would go to another excavator and others would park up in a safe area; if it was five minutes they would just sit where they were. Experienced drivers would know what to do.

14.1.9 Mr Frew stated that the leading driver would issue instructions, but he would go to the nearest digger unless he was told different.

14.1.10 Mr McCulloch, the supervisor, said that the leading driver would tell drivers which excavators to work from. They could run off two machines, but he would not say they would run off more than that. There were no occasions when they would work off whatever machine they could find.

14.1.11 The SCC accident report (SCC Production 3) said that on the day of the accident there were six excavators operating in close proximity to each other and that the drivers were under instruction to go to whichever excavator was available for loading; clearly that was not what McCulloch understood happened on the site and it was also inconsistent, in other respects, with most eye witness evidence at the Inquiry, but given the lapse of time it may nonetheless have more accurately reflected the position at the site on the day. In any event, that was not the usual procedure.

14.1.12 Paragraph 7 of the SCC report on the accident (SCC Production 3) records that Mr Shannon had been allocated to work with five of the six RH 120 excavators, including number 3589 (Mr McDougall's excavator), in whose loading zone the incident occurred. Mr McCulloch did not remember that, but he did agree

that it would indeed seem that trucks could operate off any diggers in Area 0 (the whole dig area) that day.

14.1.13 Mr Paterson considered that, if there were three diggers working together and they needed ten trucks between them, they would be allocated to work between them. The only time men were really allocated to a digger would be if there was a specific task or that excavator was maybe working in an area himself. On the day of the accident there were three diggers at the one end of the pit and there was x number of trucks allocated to them.

14.1.14 If a driver came down the ramp and saw an excavator to which he was allocated had his bucket grounded, Mr Paterson would expect the driver to wait for instructions from the leading driver or supervisor, but if he was designated to work between the three, he would expect him to go to one of the others. If one excavator was broken down, the leading driver might park three of the trucks up. Rather than move onto the next excavator, Mr Paterson would expect the driver to await instructions, but if there were maybe 9 or 10 trucks in that area it was a possibility they would go to another excavator and that was not against the rules.

14.1.15 Mr Polhill stated that, as a manager he would never allocate trucks to run off more than one machine. A driver would only go to another machine if he was instructed to do so by a supervisor. He only discovered the Pennyvenie practice quite a while after the 2007 accident. It was not a good idea for efficiency – the man on the ground does not have full appreciation of gaps or queues.

14.1.16 Mr Munro explained that the practice at Pennyvenie of truck drivers being allocated to a group of excavators was not common in SCC. It introduced an element of choice to the operator and, if somebody made a wrong decision, it could create a hazard. It was easier to monitor if supervisors know what the cycle was.

14.1.17 Mr Buchanan of the HSE described the allocation of trucks to excavators on the day of accident as a free for all. He had never operated a system like that – it was chaos; the supervisor should have control. It seriously increased the risk of collision. He was not aware of other sites that operated like Pennyvenie. Uncontrolled traffic movement would be the greatest concern.

14.1.18 When he was a manager he set up a control cabin that the foreman could use to oversee the site, for production reasons.

14.2 Giving way

14.2.1 Rule 7 of the Site Manager's Vehicle Rules (Annex C) was quite clear in stating

“Loaded vehicles have priority over empty vehicles.
Light and ancillary vehicles must give way to heavy vehicles.”

14.2.2 This was reinforced by a Give Way poster which was displayed (SCC Production 13) and which stated:

“Light ancillary vehicles must give way to heavy vehicles
Empty vehicles must give way to loaded vehicles”

14.2.3 There was a surprising degree of apparent ignorance of the give way rule by plant operators and light vehicle drivers.

14.2.4 Mr Murray thought there was no pecking order, but if a Land Rover was coming towards you in a tiny area you would stop – but you would carry on if the area was wide enough. Mr Cullen was trained by Ronnie Stewart and said he was told by him that obviously Land Rovers had the right of way.

14.2.5 On the other hand, Mr Stewart was clear that loaded truck always had right of way and Land Rovers should give way to trucks – that should have been an absolute. But if you saw a Land Rover coming in, you could wave them past you if there was plenty of room. That was perhaps more about courtesy than right of way.

14.2.6 Mr McDougall said a light vehicle should give way, but in practice it was the other way, the bigger trucks would slow.

14.2.7 Mr Shannon had experience of dump truck drivers giving way to light vehicles.

14.2.8 Mr Frew thought it was common sense for the truck to give way. He did not know if there was a written down rule, but that was general courtesy.

14.2.9 Mr Robertson, the general foreman said that everyone gave way to loaded vehicles. Dump trucks would give way to light vehicles depending on the situation, but when he was confronted with the rule he acknowledged that he had misinterpreted it.

14.2.10 Mr McCulloch, the supervisor was clear that light vehicles had to give way to trucks at all times. To his knowledge the site was always run on that basis. All light vehicles give way to dump trucks – it did not matter whether they were loaded or unloaded.

14.3 Full lock and blind spot

14.3.1 Mr Murray picked up, rather than was trained, that you should not turn as far as you could go before setting off. He had probably carried out such a manoeuvre if he had full visibility. He had not turned into blind spots often, but he knew to avoid doing so because it was risky. He would expect any competent driver to know turning into a blind spot was inherently dangerous and he was not aware of an inclination of drivers to do it. You would struggle to see Land Rovers on your offside – it is a blind spot. He was not given any instructions on how to deal with blind spots other than to adjust the mirrors, but they could not eliminate the blind spot completely. If a Land Rover was parked in a certain way you would not see it. The Terex had a big nose on it and it was harder to judge the front of it; they were worse than Caterpillar trucks for blind spots.

14.3.2 On the other hand, Mr Murray accepted that he or another driver could have been involved in the kind of accident that occurred. There was no hard and fast rule against a manoeuvre like that carried out by Mr Shannon.

14.3.3 Mr Cullen said he was not trained or warned about full lock, but it was common sense not to use it, because you could be going into a potential blind spot. He always made sure his wheels were straightened up when he stopped.

14.3.4 He possibly used full lock when he was coming out of the workshop area or something like that if the particular area was tight with other plant. He was not sure he had seen other drivers use full lock, but he had seen other drivers do sharp right hand turns and he would probably not think of reporting it if someone made sharp right hand turn whilst moving off. It was a bad idea and dangerous practice to turn into a blind spot, but although he had probably not done it, he could not say he had never done it.

14.3.5 The Terex blind spot was well known, but he had no recollection of any training about it, just on the job experience. The blind spot was to the offside at the front wheels and just right behind from the wheel.

14.3.6 Mr Cullen's signature was on the attendance record for the toolbox talk on 18 April 2005 which included all round vehicle appreciation, but it appears to have been based on Caterpillar dozers and to have been given before there were Terex trucks on site. He had seen the Safety Alert (Annex E) which was issued after the 2005 accident and the poster/flyer which was displayed by SCC (Crown production 21, last page) which was headed "Check your blind spots before moving off. If you don't you'll only see this", with pictures of and from the cab of a Caterpillar 785 dump truck with blind spot and of the 2005 accident and also showing a Land Rover several yards from the truck. He thought that poster/flyer was used at a talk about ensuring he checked blind spots.

14.3.7 He thought he was told when he was trained that there were potential blind spots and to try his best to set the mirrors up; if it was not in training, there was definitely paper work. He was not trained or warned about full lock – it was common sense not to use it. He had no recollection of being told to get out of his seat and check the blind spot if he was sitting stationary for a time. He never did that, nor was he aware of people doing it.

14.3.8 Under reference to the Safety Alert bullet point "Double check areas that are known blind stops (sic), such as cab struts", he said he would routinely look round struts. It might be possible to do that from a Terex, but he was not sure. He did not recall it being suggested you should get up and go over to the offside and look out the window.

14.3.9 Mr McDougall did not remember being told not to use right hand lock on dump trucks; he might do it coming out of a dig if it was tight. He was not really aware of blind spots on Terex and Caterpillar dump trucks. He knew the Terex had a blind spot and it was generally known to Terex drivers. He was prepared to agree that if you were standing still for a while and not keeping a very close eye out for anything that might have entered blind spot it would be crazy to turn sharply into it.

14.3.10 Mr Davidson had no specific training on blind spots, but was made aware of them. He said it was suggested that if you were stationary for a while, you should get out the seat and look down. With reference to the Safety Alert advice “Double check areas that are known blind spots, such as cab struts” – he said that he did do that, but he accepted that, if he were queuing in a horseshoe waiting to be loaded, he would not get out of his seat and go and check his blind spot, because he would have been aware if anything had driven into his blind spot and he had not seen others do that.

14.3.11 In his view “A blind spot’s only a blind spot if something’s sitting in it” (Day 6, page 133). It was not a blind spot if you were watching all round you and could see somebody coming into the blind spot or if they came into an area and they did not go back out of the blind spot – because you knew they were there.

14.3.12 He would not move away with full lock on. If he was loaded it could cause the vehicle to be unstable. He would always start with the wheels straight and then turn. If he was not loaded it was not so much of a problem, but he had never experienced pulling away on full lock, he was always told to keep his wheels straight.

14.3.13 He might have to turn right for operational reason, but he would always start with his wheels straight forward and drive forward and then turn, for the stability of the vehicle, but it was also a safety benefit, because he would be better able ensure that nothing had been sitting in the blind spot.

14.3.14 Brian Roberston, the general foreman, stated that blind spots on Caterpillars and Terexes were well known to Land Rover drivers and he would have expected Messrs French and Ferguson to know about them. He thought there was not really a blind spot to the front right hand side of the Terex. The trucks had convex mirrors there to see down at the side, plus the visibility to the back, like a car’s wing mirror and a camera at the back, but he later agreed the blind spot was more extensive in a Terex than a Caterpillar, particularly to front off-side.

14.3.15 It was emphasised in the additional training for Land Rover drivers that one way of avoiding such an accident was if people did not turn sharply into a blind spot. He agreed that you could not comply with the rule about ensuring the area around you is clear before moving off in a Terex simply by looking in the mirrors and rear view camera. He agreed that, in order to comply, a driver would not be able to turn sharply into the blind spot unless he got up out of his seat and checked the blind spot.

14.3.16 In training, drivers would be told to drive off in a straight line, just like you were going to try and join a motorway – i.e. pull forward and get a bit of a view of what is going on, or like pulling away from the kerb. He agreed that would eliminate the blind spot, because the further you go forward the mirrors could see further out, but he later conceded that you would not eliminate the blind spot by driving forward first, but would limit it.

14.3.17 He was vague as to whether he had seen people put full lock on and then just turn the truck round, but eventually conceded that he supposed he had seen it before.

14.3.18 He thought that, if you were in a Terex and had checked all mirrors thoroughly and the rear view monitor, you would be safe enough to apply full lock. It was left to Land Rover drivers to assess what the blind spot was, what they were doing and where they were going in deciding what was a safe distance. There was nothing in the Site Manager's Vehicle rules to say drivers should not move off using full lock. In normal operation a Terex driver would have to drive through a blind spot.

14.3.19 Robert Stewart thought it was 4 or 5 metres before you were clear of a blind spot, but there was a chart that showed you when they were visible; it was to make drivers aware just how far something had to be away before it was out of view or in view. After the 2005 accident the Safety Alert was used at a toolbox talk which also had focus on blind spots of trucks and there was some teaching on distances a Land Rover would need to be away from a big truck not to be in blind spot. It was possibly delivered by Mr Paterson, but everyone knew about it already.

14.3.20 Different drivers might be told different things about how to deal with a blind spot. He never saw people get out of their seat and look out the offside. Full lock was not prohibited and he could not think of any reason why he would not use full lock. He did not think it was said in training that you could not do it. He would check his mirrors before moving off, but there was no reason why he could not turn right straight away if he had checked them thoroughly and he had definitely done that in the past.

14.3.21 There was no prohibition on full right hand lock in a loading zone, if it was safe to do so.

14.3.22 In the Safety Alert photograph of the 2005 accident, there was a degree of lock in the dump truck's wheel, but he would not criticise the driver taking off that way. The excavator was over to the left and he was moving round in an arc with a view to reversing into it.

14.3.23 He would normally drive forward a wee bit and then manoeuvre, just to make sure it was clear. Some drivers would drive forward a wee bit and some would just turn to the right – it was not hard and fast.

14.3.24 He had seen visibility surveys. He did not know of any consideration being given to dealing with the blind spot from the nose, which was ahead of the mirrors. Terex drivers were trained to be very observant and drive as carefully as they could. The blind spot would be well known to drivers of large trucks. Land Rover drivers would be able to accommodate blind spots, by driving further out to avoid driving into the blind spot.

14.3.25 He agreed the Safety Alert bullet points for plant operators were part of the training at a toolbox talk. He agreed that it would be obvious to everyone after the training that checking mirrors and CCTV camera was not adequate for checking

whether there was anything in your blind spot and he agreed it would be dangerous to turn blindly into a blind spot.

14.3.26 He agreed drivers were trained if possible to take off driving forward – that would be the norm and he trained them that way, but he did not think he mentioned full lock turn in training, because they did not do such turns that often.

14.3.27 He had only done full lock turns if he knew he was definitely clear. He would not do it willy nilly, just where it may be the only way to do it, where it was absolutely necessary. He would definitely have driven round the arc of the dig area in the accident site and not turned sharply into the blind spot.

14.3.28 It was not a good system where people had to figure out whether they were in a blind spot, but that was the reality of how Land Rovers had to drive on site.

14.3.29 Mr Frew, who had accepted voluntary redundancy and had a somewhat jaundiced view of management, expressed the view that if he had been getting out of the truck to check blind spots all the time he would have been reprimanded. It was possible he was trained to do that, but he could not remember. If you were not sure and thought there was anybody in danger you probably would get out, but if he was told to do it all the time he would have done it all the time.

14.3.30 But he agreed everybody knew you should not drive into a blind spot without checking it. If you set the mirrors properly and checked them you would see most things, but if a Land Rover drove alongside you, unless it was a good few metres away you might not see it.

14.3.31 There was no rule against applying full right hand lock. If Mr Shannon thought the road was clear, in turning full lock he was taking the shortest route to get into position to reverse back to where Mr Murray had been – that was what management expected you to do.

14.3.32 He did not really know whether he was ever trained he should or should not do full lock. He would try to drive so he could see everything in his mirror, but it was not possible all the time. It is possible he would have taken the same route as Mr Shannon – probably most drivers would have done so. If he was following Mr Murray out, he might have taken that route or followed the arc of the dig area. He did not think he would have been breaking any rules.

14.3.33 He would not say he was trained to drive forward a certain distance before turning right. He agreed you ought not to turn into a blind spot until you have made sure there was nothing in it and that was covered in training, but if every driver had to do what he was supposed to do with checking blind spots, someone would be told off about it for holding up production. He was unable to give any example of that happening.

14.3.34 He agreed in cross-examination that he would not turn into a blind spot unless he had no other option, which did not seem consistent with his comments about Mr Shannon's manoeuvre. He agreed that if he had the option to turn sharp

right into a blind spot without checking it or driving round the gentle curve he would take the latter option and most of his fellow drivers would do the same.

14.3.35 Challenged about the apparent contradiction in his evidence, he said he was talking about coming into the dig to park his vehicle to reverse back to get a load; “it was the only time I’d say tae take a different route. You always take the safest route possible” (Day 15, page 206).

14.3.36 He would not take sharp right out unless he was forced to and left without any other option, but he was not certain there was any rule stopping him from applying full lock when he was setting off.

14.3.37 Mr McCulloch was involved in testing drivers and signing them off as competent, although by 2007 they were bringing in a company trainer for that purpose. He would not have signed a driver off as competent if he could not handle the truck in a tight space and unless he was satisfied the driver knew that turning into a blind space was not a good idea, but he agreed he was not specifically testing people on knowledge of a blind spot. He did understand it to be part of training that people were taught not to drive into blind spots.

14.3.38 He was aware that the Terex TR 100 had a substantial blind spot; he knew that from testing people in them. He agreed that driving into a blind spot without being certain there was nothing in it was a dangerous manoeuvre.

14.3.39 He was aware when he was involved in the 2005 accident that he had ended up in the blind spot of the truck. He was trained that he should not be in the blind side. He had been told in induction not to be near trucks.

14.3.40 You were allowed to turn the wheel and set off; there was no rule prohibiting that, but you were not allowed to apply full lock and set off, “birling” the truck around. In certain areas you could do that – if you were on the tip, out of the road of everything, but not in tight spaces. You could do it in the dig if you were out of the road of everything, but you would not just do it in a haul road. It was acceptable in the dig, to go into the machine.

14.3.41 You would have to turn over blind spots when you were going in to a machine – you would look in the mirrors, look in the camera. He was not aware of drivers getting out of their seat and going and looking down to the front offside to check if it was safe.

14.3.42 If you were driving a Terex and sat and turned the wheels you would burst the steering hose, so you should move off before you turn the wheel but there was nothing in the rules and regulations. Turning right in a stationary position was acceptable if the driver knew everything was clear – after checking everything.

14.3.43 Mr Paterson agreed that the plant operators’ guidance in the Safety Alert (Annex E) did not say “don’t turn into blind spots”, but he was pretty sure he would have told the men not to do that without checking in toolbox talks. It probably was not suggested they should get up out of their seat, “because by the time you get back in and sit in, in the seat something else could have changed” (Day 22, page 54).

While he would not expect drivers to get out of their seat, equally he would not expect them to turn on their right hand lock into that area because that was not good practice.

14.3.44 There were blind spots on all dump trucks, in light of their size, which were large enough to swallow up a Land Rover. They used an All Round Visibility (ARV) package as part of induction to show trainee drivers or experienced drivers coming in to the site and it showed pictures from the driver's view of what you could see, eg looking to the right through the door post on the trucks. Because of rollover protection cabs the door posts or struts were quite substantial and created a significant blind spot in both directions. Drivers were told to move their head. He explained it as the same as moving out from a junction on the road, when you look out for a motorbike. According to him, the trainers and competence assessors went through that with them, explaining the blind spots. He was pretty sure it was in the competence assessment sheets and he knew they did it at induction, because they would record it in the induction training paperwork. The paperwork for Mr Shannon's induction did not mention ARV survey or appreciation and he had no recollection of being told anything about the dangers of blind spots

14.3.45 According to Mr Paterson, drivers would be told to move their heads and use mirrors and cameras. They would be told to get out of their seat and check blind spots if they were not sure what was in there. He did not know for a fact they were told that while driving under supervision, but he did know for a fact that they did get told it at the office base, by whoever was doing the induction. He was not 100% sure what training was given on use of right-hand lock, but he thought the company trainer would go through that with them when he was doing the competency assessment.

14.3.46 He later said that he could not recall saying they were told to get out of their seat and go and check the blind spot, but he believed they would be told not to drive into their blind spot, to drive forward into the area offside to the front so that they could see it. They tried to train operators always to check the blind spot before any manoeuvre. He agreed it was possible that there would be occasions when drivers did not check.

14.3.47 It did not particularly register with him that, in the Terex, even with a convex mirror to the front, there was a huge area on the right hand side that drivers could not see, but it was common knowledge that they had problems on the front offside, because of the door pillar and the size of the vehicles. The nose of the Terex was a systemic problem, because of its length.

14.3.48 He knew from looking at the ARV survey that you could put two or three Land Rovers in a blind spot, but he did not know what he did about it at the time apart from the extra mirrors at the front; there could be a problem of how many things you can give a guy to look at.

14.3.49 Setting off right hand generally was not prohibited, but it was custom and practice to drive forward and turn right. The driver should deal with the problem of the nose on the Terex by not turning sharp right, but by going forward into the area that he can see in front of him and out to the right. He would expect that to be covered by the company's competence assessor during the driving test. As regards

Mr Shannon's manoeuvre at the time of the accident, it was not written down but it was not good practice to turn into the blind area.

14.3.50 Mr Phillips, who had trained Mr Shannon, said that the blind spot created by the nose was not a problem to him. Bizarrely, he thought the visibility on the offside was slightly better on a Terex than a Caterpillar 777. He had not heard anyone complaining about the visibility, but they did complain about the vehicle by comparison to the Caterpillar 777, which tended to be allocated to more experienced drivers because it could deal better with a more difficult digging area, e.g. a steep ramped area.

14.3.51 Mr Phillips stated that right hand lock was not prohibited, but he would not apply it when moving off from a stationary position and would always pull away straight so he could see where he was going; then if he needed to turn right hand down he could do so.

14.3.52 He would tell trainee drivers to set off straight ahead. He personally told them to go straight ahead, then turn. People have spun trucks round in the narrowest turning circle and he did not know of any ban on that. Pressed, he agreed he had seen people applying right hand lock and setting off and that he had not reported that, but it did not happen all the time.

14.3.53 He did not show trainee drivers the ARV surveys while he was training them, but he would point out that areas were hard to see.

14.3.54 He had seen people get out of their seat and go and look out the door in the dig area, but not very often.

14.3.55 Mr Hamilton was aware of the problem with the Terex, it was still in evidence. He spoke to drivers about it when he was doing the training and he watched them manoeuvring when they were in the areas, to see that they were using their visual aids and were aware of it.

14.3.56 He would not expect operators to get out their seats when they had been sitting stationary in the cycle waiting on another truck coming out. The only right hand lock you would do would mostly be in a dig area, to get turned to position yourself for the digger. When moving off, mostly, if possible you would try and drive the length of your own vehicle before doing a right hand lock, but that was not always possible. It was not practicable to have a rule against turning into blind spots.

14.3.57 He disagreed with Mr Phillips' view that the TR 100 had only slightly lesser visibility than 777 – he would say it had far less (As noted, Mr Phillips seemed to consider that the Terex had better visibility, at least in some respects).

14.3.58 In Mr Hamilton's opinion, there was no point in getting out of your seat and walking over to the other side of the cab while operational in a dig area, because by the time you got your seat belt back on something could have come in and you were back to square one.

14.3.59 Mr Ritchie stated that full lock was not prohibited – in some instances you might have to do it, depending on where the vehicle was parked. He did not recall telling Mr Munro that drivers were told not to turn full lock. A driver could at that time potentially drive into a blind spot or into an area they could not see. The recommended training was looking at the aids available, making sure the surrounding area was clear before any manoeuvre.

14.3.60 Mr Ritchie stated, somewhat surprisingly, that if you were turning right and checked your mirrors correctly and used your field of vision there would be no blind spot and you would be able to see everything that was going on round to your right, although later he stated that the blind spot followed you – if you were moving it was continuously in front of you. When you were driving to the right hand side your mirrors were picking up the area that you are driving into but there was still a gap – you could probably see a metre out using the mirrors. If you were unsure, you should not turn sharp right.

14.3.61 The practice most of the time was to drive forward and then turn, having ensured that what you were turning into was clear, but there was occasion when you had to turn sharp right. He would expect a trainer to say it was not best practice to turn sharp into a blind spot if it was not necessary to do it.

14.3.62 He was not teaching or training operators to drive forward into their field of vision before turning right, but if an opportunity came up it would have been noticed on the day, although it was not a specific item in the training package. If it happened it could be addressed.

14.3.63 He was satisfied on a scale of 1 to 10 that Messrs Ferguson and French came away from their training with a good working understanding of the existence and extent of the blind spot to the right hand front of a TR 100.

14.3.64 Mr Polhill said that when he sat in the Terex truck he raised the question, “what did the driver do wrong? He’s merely turning to the right and followed the next truck” (Day 27, page 100). There had “probably been a knee-jerk reaction and he’s followed the truck quite quickly. It may reduce the time he assessed the situation before he made the turn.....But just simply turning to the right in a vehicle that can turn to the right and following the next vehicle, I don’t think is doing anything wrong” (Day 27, page 101).

14.3.65 If he saw the bucket go down, if the system of work was that it was acceptable for them to go to another excavator, he was entitled to follow that. There was no hard and fast rule that when the bucket went down you must stop.

14.3.66 He would only have expected the driver of a Terex to get out of his seat and go across the catwalk and inspect the blind spot if there was doubt or reason to suspect that somebody or something might be there. He would not have expected Mr Shannon to get out of his vehicle, go to the catwalk and look down.

14.3.67 He agreed with the suggestion that a driver would know it was dangerous to turn sharply into blind spot, but they had to be able to turn right. The only way you

could check the blind spot in a Terex at that time would be to get out of your seat, walk through the catwalk and have a look down.

14.3.68 Trucks will manoeuvre through the blind spot when parking up, going in for breaks and going to the tip area. In his experience he had observed many almost full lock turns by drivers on sites. It was first he had heard that if you did not drive forwards into your field of vision and then turn right you would be infringing rules of good practice.

14.3.69 Mr Munro considered that the person who started Mr Shannon under close supervision (i.e. Mr Phillips) should have made him aware of the blind spot and they would do that at the safety induction as well; a member of the management team would have shown him the ARV assessment and told him about the Site Manager's Vehicle rules at the induction before he went in the truck. However, only the latter was documented.

14.3.70 It was Mr Munro's understanding that drivers were trained not to turn into their blind spot. It was the person who did the training that told them that. He got this from Messrs Ritchie and Hamilton – he understood they may have got it from the drivers who were doing the sitting in training.

14.3.71 He did not agree with Mr Polhill's statement that driving through blind spots was routine. It was not his understanding of how these vehicles operated.

14.3.72 Mr Buchanan of the HSE accepted that a dump truck operator would from time to time be driving through a blind spot in the ordinary use of a vehicle, not only in the dig but also in other parts of site, like haul roads and when parking up. If, on a hypothetical proposition, Mr Shannon was told to leave, he would not have any problem with him almost applying full lock and doing a sharper turn to get out.

14.3.73 Mr Martin of the HSE saw a statement suggesting that Alan Shannon applied full lock when turning right. He thought that sort of manoeuvre in a dump truck with these blind spots was something they were doing day and daily. It was just part of their duty. He did not think that Mr Shannon's failure to spot the Land Rover's approach was a significant failing on his part. He did not think it should it have been obvious to someone in Mr Shannon's position that the Land Rover was approaching.

14.3.74 I will deal with Mr Shannon's understanding of full lock and the blind spot and the question of his training on these topics in the next section.

15 Alan Shannon's training and experience on site

15.1 Mr Shannon was a time-served joiner who had been latterly employed full time by East Ayrshire Council, but had applied to work for SCC as a better paid career change, when he was 25. He stayed near Dalmellington at the time. He had friends who worked at Pennyvenie, including Hugh Phillips. They lived nearby and Mr Phillips encouraged him to apply for work. He had no previous experience with heavy vehicles of any sort. He went up to the site at Pennyvenie on a number of occasions to enquire about vacancies and was eventually accepted.

15.2 He started on a Monday, with induction training at the Pennyvenie opencast site. He recollected that David Paterson, the site manager took him through the induction process, but when shown his induction and training paperwork (Crown Production 31C) he eventually agreed that Lyle Ramsay, the deputy manager conducted most of it. As he recalled, the induction was maybe four hours, although he agreed that the paperwork showed it was only two and a half hours. He was given Operating Procedures to read, including Site Rules, but could not remember if he was given health and safety materials or shown any DVDs or videos, although he agreed that the records showed these were covered.

15.3 He said that he read the site rules that day, all of them, the whole book. He was asked to sign for materials, but could not remember if he was given copies to take home. He did not recall whether Mr Ramsay went over the material with him.

15.4 The records showed he had been given the Pennyvenie Toolbox talk pack, but he did not remember what it was. He did remember reading the dump truck risk assessment and the universal hazards risk assessment. There was a lot of reading involved and that took a while. He remembered filling in the four page induction questionnaire.

15.5 His training record said he was on a three-month trial period and would be assessed monthly, but that did not happen and he was not aware of it. The commencement of the contract was 20 November 2006 and the three months would have been up on 20 February 2007, but he was never told if he had successfully completed it.

15.6 He did not feel that he had a particularly good grasp of the paperwork by the time he had read it all. He may have read the papers again, but he did not remember. When he started he was not told how long the training period would be.

15.7 Mr Shannon completed his training record for his dump truck training. The entries were made by Mr Shannon, with comments by Hugh Phillips and by Billy McNeillie (not a witness) on the fourth day. Each box was a day's work and it was completed every day. He was placed in a truck beside an experienced driver, Hugh Phillips and stayed with him until the end of the shift. He got a turn at driving that first day.

15.8 The training record for the first day shows, after induction, 8 ½ hours "drive TR 100 under instruction from Hugh Phillips". They were driving turn about.

Mr Phillips's comment was "not bad first day: coming along fine". The first day driving was the first time he had been in a dump truck. It was a bit challenging, getting used to the size of the vehicle.

15.9 Day 2 shows 8 hours, but "stood down and sent home due to bad weather". 8 hours was the standard hours without overtime and the other 4 hours on a 12 hour shift were overtime. There was no driving that day, for most of the trucks.

15.10 Day 3 shows 11 hours "drive TR 100 under instruction from Hugh Phillips". He was driving more that day, most of the time. It was noted by Mr Phillips that there was a "vast improvement from Monday, good". He felt he had a bit more control. He was doing manoeuvres into the digger. He was not sure whether that involved driving in an arc and then reversing, because there were different ways, the way diggers were placed. He agreed that it was clear by that day that there a bit of a blind spot to the right.

15.11 Day 4 shows 5 hours "drive TR 100 under instruction Hugh Phillips" then 3 hours "stood down due to bad weather" and then 3 hours "sit in with W McNeillie and go down to see hole". He was put in Mr McNeillie's truck to see how they operated at the main dig, known as the "hole"; before that he was at the advanced dig. More experienced drivers were in the main dig – it was tighter for moving. Mr Phillips had commented "Practice reverse at face shovel"; that was about a correct manoeuvre to the face shovel, which he was struggling with a bit.

15.12 Day 5 (Friday) shows 7 hours "drive TR 100 under instruction Hugh Phillips", then 2 hours "sit driving test T Hamilton". The trainer's comments were – "everything okay".

15.13 Mr Shannon thought he got on okay and passed the test, but he was told to practice reversing. He agreed that the assessment record for the first test on 24 November 2006 was ticked as "no" in "Section 9 - manoeuvring and control", against

3 -- overall steering ability

4 -- adequate handling in tight spaces.

15.14 What went wrong was reversing into the face shovel and was maybe about positioning. He agreed that he did struggle with the face shovel to start off with.

15.15 The conclusion at page 12 was that he was not deemed competent and further training was required. The next page was a further training action plan and said that

"Alan has problems with getting in to the digger and manoeuvres in tip but just needed more time and is OK to drive him self. Spoke to leading driver to keep him OK"

15.16 He considered that the outcome was that he was entitled to drive himself, but the fact there were issues about his manoeuvring of the vehicle did affect his confidence a bit.

15.17 He was tested on manoeuvring into the excavators, but was not sure if he was given a U-turn to do. He did not think he was given a U-turn to do to the left and the right. He received further training and filled in a further training record, but this time there were no trainer's comments, because he was doing it himself.

15.18 On the third day of the second week, he was retested, there were no issues and he passed the test and was issued with a site licence. He continued to fill in the plant operation training record for a two further days, because he had to fill out two weeks' worth, but could not remember who told him to do that. He understood that was standard practice.

15.19 The last entry was 1 December 2006 – 1 ½ hours “drive 777 under instruction Harry McKay” – by the time he left Scottish Coal he was qualified to drive 777s and he was tested on the 777 by Harry McKay (who was not a witness) that day.

15.20 He felt quite equipped and competent to be driving trucks on his own from the second Monday. He was happy to drive the truck and had no concerns about it.

15.21 Mr Shannon did not remember being told anything about the dangers of blind spots at his induction. He did recall being shown a picture of the 2005 accident by Mr Paterson on a computer and Mr Paterson said to him that he did not want this to happen again. He thought that Mr Paterson did not give any specific advice or instruction or say anything about background or how the accident was caused, but he eventually conceded that Mr Paterson may have said how the incident happened and that he had some sort of recollection that Mr Paterson did tell him something about what happened and indeed that it was possible that Mr Paterson told him that part of the cause of the accident was the large vehicle turning into its blind spot and hitting the small vehicle.

15.22 He was not sure if he was trained or instructed in training in how to deal with blind spots on the TR 100. He could not remember being told in training when taking off from a standing start that he should have his wheels pointing forward if possible. He agreed that it was clear by the second day of training that there a bit of a blind spot to the right. He knew that the blind spots on the TR 100 are the front at the nose – from the front of the cab to the front of the nose on the right-hand side of the truck, because of the nose of the truck. He could not say that he knew how far away a Land Rover could be and still be in a blind spot. There were no visual aids prior to the accident that would help see into that area, and you would not see what was in that area if you moved to the left or right in the seat or leaned forward or backwards.

15.23 He agreed it rung some sort of bell that part of his training was that, even if he was intending to turn right, he should begin by driving forward to make sure it was safe to be turning right, but he said he was not trained that he must drive within his field of vision if at all possible and only drive into areas he could see ahead of him. As far as he understood, there was no bar on putting on full lock and accelerating off from a stationery position, effectively, “birling” the truck round. He was not told that was something he should not do. He was not sure if common sense

would tell him that it was not a good idea, to “birle” his truck round, although he agreed that in hindsight turning sharply into a blind spot on the offside was unsafe.

15.24 He claimed that, by the time he had finished his training, he did not know to check known blind spots such as cab struts. Pressed about looking to the side when coming out of the side of the road in a car, he agreed, eventually, but forcefully that this was in order to check the blind spot and he agreed that by the time he had passed his test he would know the truck had a significant blind spot on the offside.

15.25 He did agree that by the time he was finished induction training, he knew to check mirrors and cameras before moving off and he checked mirrors and cameras habitually before moving off.

15.26 He did not remember a discussion with Mr Phillips about the 2005 incident as part of his training, but it was possible, and he would not deny it if Mr Phillips said it happened (I do not have such a discussion noted in Mr Phillips’s evidence, which was given subsequent to that of Mr Shannon).

15.27 He could not remember being given any instruction on wheel spin. Lack of traction could cause that. He had experienced it prior to the accident, with rainy, muddy weather, but there was nothing else that he was aware of that caused it. If your wheels start spinning, you would normally keep the truck going and keep going in the direction you were going. If you were not going anywhere a dozer would help you. The training on wheel spin was just to keep the truck going. Hugh Phillips said that: keep powering on. When you were first aware of it, you would keep driving the truck to try to find traction. If the wheels were spinning, you would accelerate.

15.28 Instruction on dealing with boulders or large pieces of stone was to avoid them, because they could damage the truck. He was not aware of the instructor or him having, or indeed struggling, to get over boulders or large stones during training. He was not sure if that was a common thing. You could only notice a boulder when you came up against it. Sometimes they would fall in front of the truck and you could not avoid them.

15.29 He agreed the training was to see if you could avoid going over it. He agreed you should reverse away from it if the opportunity was there or go round it if there was room. He agreed that in accordance with training you would not go back again and have another run at it, far less do that a couple of times and you would not rev up the engine with a view to surmounting it. There was rough terrain at Pennyvenie. Hugh Phillips told him to avoid large objects: avoid large rocks and keep out of their way.

15.30 He was not aware of speed limits, but was trained by Hugh Phillips to drive at whatever speed he was comfortable with. He was not 100% sure but thought he would travel at less than 20 mph.

15.31 He agreed (eventually) that there was an incident with a grader on 16 February 2006, although he was not disciplined for that. It happened on a haul road, three truck lengths wide; the grader was coming towards him on the same lane he was in. There was a loaded truck behind the grader, which moved out to overtake the

grader and Mr Shannon had to go in the space in the middle. He was supposed to have given way to the grader and moved out of his road. He could not fully remember what advice he was given, but he took it on board.

15.32 Mr Robertson said that as a site manager he would not really have allowed a driver to get behind the wheel so quickly. It was unusual and it might have concerned him at the time. He did not really have any experience of anyone with no experience driving within one week; he would expect it to be longer. He would say it should be considerably longer: "I just can't believe it's just a week that he was driving on his own" (Day 12, page 44). He agreed that, although it could take three to six weeks for some people to become competent, it could be a much shorter period for others. He would not expect someone to be actually driving until they had a couple of days of learning the basics.

15.33 Mr McCulloch said that sitting the test so soon was a matter for the company trainer, but he agreed it was unusual after five days. It might be months before someone was left on their own. He thought it was too soon for him to be driving on his own on the Monday after he started. Five days training in a dump truck for somebody who had just started should never happen; he could not be sufficiently trained in that time. However, he did concede that he had no cause to doubt the judgment of the company trainers, or concerns about Hugh Phillips' abilities as a trainer. He would agree that if Mr Hamilton said that Mr Shannon was competent, he was competent.

15.34 Mr Paterson knew Mr Shannon because they lived in a small village, but he was not friendly with him. He was constantly coming to the site, chasing a job. He had a lot of potential trainees, but Mr Shannon's name eventually came to the top of the list.

15.35 Mr Paterson knew that Mr Shannon had no HGV or large vehicle experience; they would look for relevant experience first, and if applicants did not have that, they would look at other things. He would not just take anyone on; he would speak to them and see what their attitude was, like through a face to face interview. He spoke to Mr Shannon regularly because he was on site more or less every week for weeks looking for work. It was not like a formal interview process with adverts. When a job came up, they looked at the list and would call them up, or if they were lucky there was a vacancy and they might get the chance of a trainee staff position.

15.36 Training records are held on site and a copy of training by trainers goes to a central office for storage. The training record of Alan Shannon (Crown production 31C) listed the documents he was given on the day of induction. He, or Mr Ramsay, the deputy manager, would go through so much of it, maybe let him watch a video, but they would still have to go through it in quite heavy detail. He would expect it to take half a day, maybe more - maybe 4 to 5 or 5 ½ hours. A questionnaire was completed at the end of the induction process.

15.37 The Site Manager's Vehicle rules are extremely important. Aside from the competency test, there was not any further checking of the driver's knowledge of the rules, but the leading driver obviously would be monitoring any newly qualified

drivers and their operation about the pit. He agreed the questionnaire was a simple test and some questions suggested their own answers, but it was of use and is still used.

15.38 The inductor would go through risk assessment with the trainee.

15.39 The next three months would be a trial period and he completed that successfully. It was a negative reporting system – if the recruit got to the end of the three months and it had not been extended or the individual paid off, then that was him out of the trial period. Employees were not told that their trial period had been completed – they were told at the start that if they did not hear back, everything was okay.

15.40 The training record was completed by the trainee in conjunction with his trainer. This was the main process for recording what the trainee was doing. His induction training was noted as 2 ½ hours, which is how long it must have been, although he would think up to 4 to 5 hours would be normal.

15.41 He would not expect a driver to get straight into the driver's seat once he was placed with the training driver, although he agreed this could be an example of lack of detail in the guidance.

15.42 The training comments on the first day are the sort of level he would have expected from a trainee driver.

15.43 The record shows that he was not driving on day 2 because of bad weather. It was usually the site foreman and manager who decided on that. It was most likely that everybody on the site was stood down, not just trainee drivers, but he would not know without checking the records. It might be that certain bits of the pit were closed if the conditions were too bad there.

15.44 There was a reference to practising reversing at a face shovel; that involves the use of mirrors to line the skip up with a certain part of the excavator bucket and takes a bit of practice.

15.45 On the Friday he sat the test. When Mr Paterson came in to the industry, people would go out with a driver and be shown how to drive in two loads and then get put out to drive. Mr Shannon must have picked it up fairly quickly, because Thomas Hamilton was very conscientious and would not sign off someone if he was not happy he could do the job. He could pass someone with the requirement to monitor, or a straightforward no comment.

15.46 Mr Paterson would not say that sitting the test after five days, with one day when there was no driving, was common, but it was not unknown. He would have known that Mr Shannon was driving on his own after five days when Thomas Hamilton gave him the competence assessment back, because he would have had to issue a site licence based on that.

15.47 He recognised the competence checklist as the checklist that Thomas Hamilton used. Asked about testing on blind spots, he referred to entries on the

checklist about daily maintenance checks, mirrors and cameras adjusted correctly. He did not think it made reference to blind spots.

15.48 If SCC did not know what Alan Shannon was told by Hugh Phillips and there was nothing there about no right-hand lock and checking for that in the competency assessment, he could only go by what company trainers told him they actually did when they carried out the competency assessment.

15.49 Asked whether thought had been given after the accident in 2005 with Alexander McCulloch, to writing down anywhere in the training packages that blind spots were an issue that had to be addressed, he said that the accident was formed into a toolbox talk and that would have been added to the toolbox talk package. He did not think it was ever written into the competence assessment, but there were other ways it was pointed out to employees. Mr Shannon would not have got the toolbox talk, but they would go through the full toolbox talk package at induction.

15.50 The training record showed he received a toolbox talk package, but not what it contained and Mr Paterson later stated that he could not recall if Alan Shannon got the particular toolbox talk material. He told him to use the mirrors which were available and move his head to try and see, but he was trained on the Terex and the bigger Caterpillar trucks (such as was involved in the 2005 accident) were away by then.

15.51 Mr Paterson agreed that moving your head did not eliminate all blind spots with the Terex, particularly to the front offside. He could not recall if he highlighted that to Alan Shannon, but he would be surprised if it was not mentioned by him or the deputy manager.

15.52 They generally went through the visibility package with new starts with the range of vehicles, including bulldozers, to make them aware that other vehicles have visibility issues as well. They used drawings and surveys etc. Generally what they would tell dump truck drivers about the Terex was that there were blind spots and you need to use visibility aids, mirrors, cameras, direct line of sight, be aware of danger to the right and not turn into that area.

15.53 Asked if it was reasonable to expect a driver to take in all of the induction material in 2 ½ hours, he explained that, because Mr Shannon was pestering them for a job, he gave him stuff to take away a week or fortnight before he got his start, to look through and to give him heads up – that was probably the Site Manager's Vehicle and General Rules and the safety and environment induction document.

15.54 On whether he was assessed as competent, the assessment says "no", but it looked as if that was scored out on the form and he would have said it should be "yes" from the further training plan which said he just needed more time and was okay to drive himself. You can be competent if you need further training on a specific issue.

15.55 The training record showed that he was driving on his own in the second week. The site was quite open – there was one big haul road through the middle and it was quite straightforward at the time, so he would have said that was acceptable.

15.56 He was not competent to say whether Mr Shannon was competent as he had never driven a dump truck, but he relied on company trainers; if he had concerns he would not have let it happen. If the trainer said he was competent, he was not a position to assess him and he had to a certain extent to accept it.

15.57 He agreed that, as Mr Robertson had suggested, training could take a month or two, but he disagreed with Alexander McCulloch if he said that five days training for a new start should not have happened. If they were concerned about the length of Mr Shannon's training they should have raised their concerns with him at that time.

15.58 He was not totally surprised about Mr Shannon being assessed after four days, but it depended how quickly he picked up the operation of the item of plant. He stated that it depended on the person in training how long it would be before he took a test – some picked it up really well, others did not. It takes what it takes – as far as he was concerned, if they were ready in a week or a month, that was fine.

15.59 He agreed that what Hugh Phillips told Mr Shannon was not written down and that he had no documentation to contradict Mr Shannon's claim that he was not specifically trained that right hand turns with full lock were prohibited.

15.60 He remembered showing Alan Shannon the 2005 incident to warn him of the dangers of light vehicles being where they should not be. He recalled showing him pictures and telling him what had happened, that the truck had driven forward and round to his right and that the vehicle was hidden behind the door post. It was not a right lock turn. He remembered telling Mr Shannon the failings of the supervisor going in to that area; he did not just say "we don't want this to happen again". He thought he showed it to Mr Shannon on a computer screen and in the safety alerts (although earlier in his evidence he was not 100% sure whether he showed him it on a computer screen or from one of the safety flyers). He remembered showing Mr Shannon photographs of the accident and he replied something along the lines of "holy shit, that will never happen to me" (Day 18, page 53).

15.61 He disagreed that SCC failed in training because they were not clear as to how to deal with the blind spot, but he could not say what was actually passed on to Mr Shannon. He agreed that if they did not give the trainer a training pack which stated what the driver must know, there was no way of knowing what Mr Shannon was told to do. He agreed there would be value in a training pack for the trainers, although there had been improvements since the accident.

15.62 There was no written monthly assessment, but he was being monitored; it was a negative recording system. The company did not use an appraisal system. Mr Shannon was only with the company for three months and in all likelihood there would have been another assessment carried out round about that time, if there was any other fault picked up with him; otherwise he would have been reassessed every three years.

15.63 The incident with the grader was a small concern. The grader drives along with a blade in the centre of it, grading, smoothing off, the roads. The grader sometimes has to drive on the “wrong side” of the road, because it angles the blade and works from one side to the other. If an empty truck was coming back on a haul road to the loading area, it could encounter a grader on the wrong side, because they work from one side to another. The dump truck would pull in behind that, e.g. to save a loaded dump truck driver coming down the hill having to brake for the grader – so they would swop sides.

15.64 The dump truck had right of way, but it was custom and practice that if an empty truck was coming behind the grader he would pull in behind it on the wrong side of the road to let a loaded truck come down the hill, saving him having to brake with a load on the hill. Mr Shannon was not familiar with how to work the system. They put the company trainer with him for an hour or so to show him how to work in the vicinity of and interact with that vehicle.

15.65 Mr Phillips, who trained Mr Shannon in his dump truck, had no training as a trainer. He had trained three or four men before Mr Shannon at Pennyvenie, but he had trained men at a previous SCC opencast site. He did not remember being given any materials or paperwork to assist him. He did not make reference to the Site Manager’s Vehicle Rules, but taught operators through his experience.

15.66 He had known Mr Shannon and his whole family for a number of years, since he was a teenager; they used to go quad biking together, he lived only 50 or 60 metres away and Mr Shannon asked Mr Phillips to put a good word in for him about a job, which he did.

15.67 He was picked to train Mr Shannon. He did not tell the manager they were friends, but they lived in Drumellan which is a small community where everybody knows everybody. He thought Mr Shannon was with him for a week and then somebody else had him. Initially, his position was that Mr Shannon was not driving at all during the first week, although maybe on the Thursday or Friday he had a couple of hours in with him. Even when he was shown Mr Shannon’s training record for the first day with the record “Drive TR 100 under instruction from Hugh Phillips”, he insisted that Mr Shannon was not driving the first day. “You don’t just go straight into a truck and start driving” (Day 23, page 161). “He’s made a mistake there. He wasn’t driving the truck the first day.... He’s maybe sitting in the passenger seat, but he’s certainly not driving it straightaway” (Day 23, page 162).

15.68 When it was pointed out that, two days later, Mr Phillips had noted “Vast improvement from Monday”, he agreed that entry suggested that Mr Shannon was indeed driving on the Monday. Then, in an astonishing effort to explain his previous evidence, Mr Phillips announced “I’ve actually picked you up wrong. I actually thought you were meaning after the accident this is the training records, not before the accident” (Day 23, page 163) and agreed that Mr Shannon was driving on his first day.

15.69 On the Thursday he or Mr McNeillie had noted “practice reverse at face shovel”. Mr Shannon had a problem reversing to the face shovel, but he had mastered the back actor. He was always going too far in towards the face shovel

when he was reversing and Mr Phillips had to keep going on about it, so he got him to practise at that particular machine.

15.70 He insisted that he told Mr Shannon he had to drive forward and then turn and that he told every driver that. He was teaching him in the easiest part of the dig, so he agreed he may only have told him that once.

15.71 He told Mr Shannon there was a significant blind spot on the offside of the TR 100 and that if necessary he should cross the truck if he was not sure that the blind spot was safe to be turned into. He told Mr Shannon that if he came up against something which could cause damage if he went over it, he should stop, reverse back, get out and check what it was; he was 100% sure that he told Mr Shannon that.

15.72 He did not know whose decision it was for Mr Shannon to sit the test on the Friday. He took the truck up to see Mr Hamilton, the company trainer, who asked if he was okay and Mr Phillips said “aye, near enough” or “I don’t see why not” (Day 24, page 46). He did not consider that it was really unusual prior to the accident to be tested on the fourth day of driving; some folk were better at picking it up than others. Asked if a driver would be competent after 3 ½ days training he said “you would get by” and “if he was a danger to anybody he would have been pulled off the truck and retrained or whatever” (Day 23, page 168).

15.73 He did not have any concerns about Mr Shannon’s competence to drive a dump truck after four days, although he was a bit apprehensive, which was understandable to start off with. He did not think that he knew that Mr Shannon was handed the keys to drive himself the next Monday subject to being tested again.

15.74 He was attentive and keen and always asking questions, but sometimes Mr Phillips thought his mind might be on something else when he was trying to tell him something and sometimes Mr Phillips thought he was not listening to him. He was more interested in running before he would walk, as if he was wanting to drive a digger or grader or dozer. He was keen, maybe over-keen, but that was not a bad thing.

15.75 When things came up on the radio, if Mr Shannon did not pick it up or hear he would ask what that was about and Mr Phillips would try to explain it.

15.76 Mr Phillips thought that they drove on the same shift once he was passed as competent; Mr Phillips paid attention to his driving and, if he thought he was doing something that was not right, spoke to him at the piece cabin, or when he was out walking his dog and would meet Mr Shannon, who would ask him how he was doing. Mr Phillips would tell him if other drivers had raised anything about his driving.

15.77 The grader incident was mentioned, but he had told Mr Shannon how to deal with that. One other incident which he recalled was when the leading driver said that Mr Shannon was told to go and grease his truck, and after he was away for a long time, Mr Phillips went to look for him and found him sleeping.

15.78 The expression “time is money” is one which was used – he used it as a supervisor and he did say it to Mr Shannon.

15.79 Mr Hamilton, the company trainer/assessor who assessed Mr Shannon, said that he would test knowledge of the blind spot and how to deal with it by asking operators questions around the manoeuvre. If they were in an area they should check their mirrors before moving, make sure they were clean, and that they were aware of where they were. He would ask them if they knew about blind spots. If there was a lack of understanding they could not pass – they would fail under head 9.3 or 9.4 of the assessment checklist (overall steering ability or adequate handling in tight spaces). He agreed he was satisfied that he asked Mr Shannon that sort of question and got an appropriate response.

15.80 If a driver applied right hand lock in a test he would say that was a fail. He was just testing for an awareness of what would be in their area. He agreed that it would be better to have a clear policy and train everybody on it.

15.81 He did not see the training sheet which Mr Shannon and Mr Phillips had completed and which described his training in the truck before he assessed Mr Shannon, but he knew he had started on the Monday of that week. He was a bit wary of how Mr Shannon picked it up. It was not really unusual for a new driver to sit the test so quickly; it varied and a couple of drivers would have done it at various sites.

15.82 He would start with the questionnaire which was prepared by the safety department and covered the driver’s experience.

15.83 He was asked to identify anything in the assessment checklist and form relating to blind spots and pointed to section 9.7 – “attention to other plant during manoeuvres”. He would assess the driver on his awareness of the plant round about him in the area he was turning into or moving into. He agreed that he would be tested in the easiest part of the dig, but he would be presented with the likelihood of turning into the blind spot when he would have to turn to get positioned against the machine. He was looking for general awareness of what was going on in mirrors, as to where he was going.

15.84 There was nothing in the test which would have specifically examined right hand lock from setting off.

15.85 Mr Shannon failed the test, because of a problem getting into the digger and manoeuvring in the tip. The form was not well completed in respect of whether he passed or failed, but Mr Hamilton was clear that he was not competent. He failed him on overall steering ability and adequate handling in tight spaces. On the last page he had noted that “Alan has problems with getting in to the digger and manoeuvres in tip but just needs more time and is OK to drive himself. Spoke to leading driver to keep him OK”.

15.86 If Mr Shannon had shown any inclination of turning sharp right into a blind spot without first having checked what was there, Mr Hamilton would have failed him under one of the same two headings.

15.87 He agreed that he might not have had to turn sharp right from a standing position and he would not be able to see into it anyway from a Terex TR 100.

15.88 He was looking for the leading driver to monitor him in the area he was training, where there were just two or three trucks. He regarded retesting as mandatory in this situation and he reassessed Mr Shannon on 29 November 2006 and found him competent.

15.89 In the second week he should have been driving under supervision – just supervised in the upper area by the leading drive, not supervised by a driver sitting in the cab with him.

15.90 He agreed he wanted to ensure drivers knew not to drive over an obstacle, since it might damage the vehicle. He did not give them any training on how to deal with resistance. What he would ask them would depend on the conditions on the day. He did not remember if he asked Mr Shannon about that. He agreed, however, that he would not think he would have passed him as competent if had not asked him something along the lines of what he should do if he came into contact with something and did not know what it was.

15.91 Mr Hamilton was brought back in to give Mr Shannon further advice about the grader. He retrained him in working with the grader – that took about two hours. The problem was that he was trying to go through a gap that was not there. He was trying to catch up with the other drivers to show them he was as good as the rest of them. He was able to interface appropriately with the grader and the message was understood.

15.92 Mr Ritchie, the other company trainer/assessor considered that it was not unusual for a new start with no experience to sit the test on the Friday of the first week, but qualified that by saying that would maybe not to get the test, but certainly to be driving within two or three days. He would like it to have been in his second week, as a personal view. At that time a leading driver or supervisor would make the decision to get the assessors in on the basis that the man was ready for his test. Five days from start to sitting the test was on the short side of things, but others had done the same thing.

15.93 He would have considered the training record for the time he had been sitting in with the training driver before assessing an operator in 2007, but the form in Mr Shannon's case was very vague. It is possible the driving part of the test would have been as short as two hours, but the paperwork would take about an hour after that. The paperwork involved going through the checklist, line by line.

15.94 Mr Polhill considered that sitting the test on the first Friday was not allowing a driver a lot of time to be classed as competent. He would say that was unusual if a driver had no experience. There was not enough experience there to his mind, assuming he would be driving unsupervised. That was not acceptable. That was the length of time years ago, but at that time it was a lot to do with the quality of recruits.

15.95 There should have been an initial assessment by the manager in relation to what training he needed. He considered that Mr Shannon's training was not in accordance with how SCC operated on other sites. He also stated that the induction material was far too much to take in in one morning. The manager might give the recruit the stuff to take away and digest and bring it back a week or two later (although it will be recalled that Mr Paterson thought that he did in fact give Mr Paterson some of the material before he started).

15.96 The absence of feedback during or at the end of the three month probationary period was not good; HSE guidance on managing health and safety means that processes should be there for feedback. He should have had what they do now – job coaching and then mentoring and guidance, which can be done by people outside the cab monitoring him.

15.97 On the other hand, Mr Polhill agreed that Mr Hamilton is a skilled and experienced individual whose judgment can be relied upon and there was nothing in the paperwork, including the second week of training and the second assessment that would have given him pause to ponder whether he should have been giving him a site licence.

15.98 Mr Munro, the environment safety manager, agreed that the competence assessment checklist made no specific mention of blind spots, but point 5 mentioned use of mirrors, cameras etc and he would expect it to be covered there. He agreed that the testing of adequate handling in tight spaces could only be dealt with on testing or instruction if people were aware of blind spots.

15.99 He satisfied himself that Mr Shannon would have had the training he would have been expected to have on blind spots and that was a routine part of training for dump truck drivers. The person who started him under close supervision should have made him aware of the blind spot and that should have been included at the safety induction as well; a member of the management team would have shown him the ARV assessment and told him about the Site Manager's Vehicle rules at the induction before he went in the truck.

15.100 The reality, as explored in detail with the relevant witnesses was far less reassuring as regards the detail of his training.

15.101 Mr Munro stated that there should have been an assessment on day one, as to what he needed and an action plan. He did not think that a new driver being assessed on the first Friday and given the keys the next Monday was usual, but the trainers were qualified to make that assessment and the system was adequate if it was used properly.

15.102 It was his understanding that drivers were trained not to turn into their blind spot. Pressed as to who would have done that, he said it was the person who did the training who told them that. He understood this from Messrs Ritchie and Hamilton and he understood they may have got it from the drivers who were doing the "sitting in" training.

15.103 In cross-examination on behalf of SCC he agreed with the proposition that it could not be said it was due care and attention for Shannon to turn sharply to his right into a known blind spot without checking that it did not have anything in it, although he had not reached such a conclusion in his investigation report (SCC Production 3) which focused more on the Land Rover.

16 Alan Shannon's driving, generally

16.1 Mr Murray was concerned about Mr Shannon's over-confidence and his attitude, from speaking to others. He was okay as a driver, but he was maybe a bit over-confident for someone who had only been in the job for three months. His demeanour and talk sounded over-confident.

16.2 Mr Cullen commented that Mr Shannon's driving was fine but he went maybe a bit fast for the length of time he had been driving.

16.3 Mr McDougall had seen him driving and thought "he was a wee bit kind of over confident for a new start" (Day 5, page 174). His view of Mr Shannon was largely formed from speaking with others on the site. He did not see him do anything dangerous, or he would have reported it.

16.4 Mr Davidson had heard through the grapevine that Mr Shannon was a bit of a boy racer, a Jack the Lad kind of thing, by which he did not mean flying about the place, just that he was over-confident for length of time he had been working, over-exuberant.

16.5 Mr Phillips thought he was just the same as any driver, but was perhaps a bit too fast for the time he had been doing it. He was told on numerous occasions not to try to keep up with the boys who had been doing it for years.

16.6 Mr Hamilton, who was assessing him, observed that he was kind of cocky. He was very, very sure of himself – he would not expect that of an operator with no prior experience after a week.

17 Newspapers

17.1 The Site Manager's Vehicle Rules (Annex C) provided:

"The reading of newspapers, magazines etc and use of mobile phones is strictly prohibited while operating quarry vehicles."

17.2 Mr Murray stated that he, like everyone else, read newspapers all the time, all day, but they needed to be sneaky about it. He was warned by Mr Paterson about it about two or three months before the accident, but it was just a ticking off. The strict prohibition was not treated very seriously. The leading driver (Ronnie Stewart) read newspapers too and they used to swap papers. He would not read a newspaper while he was being loaded.

17.3 He was aware of someone reading newspaper on shift on the last shift he worked at the House of Water site before coming to court to give evidence, but he did not do it himself.

17.4 Mr Cullen said it did happen on odd occasions; he would assume when he saw a driver's head bowed and he also did it, on the odd time when he was getting loaded. He had to do it on the fly, because it could result in disciplinary action and you could lose your job; it was seriously viewed, because you were not alert to what is going on and that was emphasised at toolbox talks.

17.5 Mr McDougall was aware of people reading in cabs of dump trucks and excavators, but he never did it. It was common for dump truck drivers and he had seen it from his excavator. He was not aware of anyone being caught or if it was against the rules; it was against the rules now and there would be disciplinary action. Anyone reading a newspaper now would know the supervisor was coming, because of the radio.

17.6 He could not remember a talk about reading in cabs, but there had been such talks since the accident. He was not sure that he was aware before the accident that people should not be reading in the cab, but he did not do it.

17.7 Mr Davidson took newspapers into his cab when he had worked at Law Mining in the past. There was no rule against it there and he usually just read the paper at tea breaks. He would have a newspaper in his bag at SCC, but it was against company policy to read it in the cab. It was possible other drivers did read papers in the cab, but he could not really see into their cabs and they could have had a paper on the other seat.

17.8 He was not aware of anyone being disciplined, but he knew it was against policy. He had heard about the notion of other drivers doing it. Everyone took their piece bag in the cab. There was no reason to have a newspaper out in a cab unless they were parked at the piece cabin.

17.9 Prior to the accident supervisors would drive in and out of dig areas unannounced. Reading a newspaper was gross misconduct, but he had not seen drivers doing it while working at SCC. He would be surprised if a driver was only given a ticking off for reading in the cab.

17.10 Mr Shannon understood that reading material – newspapers and magazines – was not allowed. You were allowed to read in a tea break and lunch break. He was possibly told that in training. It was his normal practice to take a newspaper to work and read it at breaks. He never read newspapers in the cab outwith break time. He could see other drivers doing that, but had never reported anyone for doing it because he was new. He normally kept his newspaper in his bag when he was at work.

17.11 He would see other drivers reading papers when they were being loaded – it was very common. It would be in view in front of them. They would usually be holding the paper up with both hands. He did not know how that was done without management knowing or if it was done in their view. He knew it was against the

rules, but he was not aware if management did anything to stop it. He was not aware of anyone being disciplined for it. He was not aware that a driver was reprimanded for reading papers during his shift.

17.12 Mr Robertson stated that reading newspapers and using mobile phones were a disciplinary offence and he would have jumped on it. Personally, he would have dismissed offenders. He never saw it, but if they were caught they would be taken straight down to the office for disciplinary procedure. He was not really aware of anyone being caught while he was at SCC. He would not really agree with the site manager's decision just to tell a dump truck driver not to do it again. He had not seen it at the House of Water site, where he is now general foreman, but he would take anyone he caught reading a newspaper straight to the manager. It was a serious disciplinary offence to read newspapers; the men knew that and they knew his attitude to it. It is a distraction.

17.13 Mr Stewart said they were banned from reading newspapers unless they were parked up in a safe area or on a tea break. He did read them on site years ago when it was allowed. They were not stopped from taking them into the cab. He never saw other drivers doing it. He would definitely see breaching the rule as a serious matter and would expect management to discipline any breach. He was surprised that a colleague was caught by Mr Paterson and not disciplined. They would be reminded about the rule at toolbox talks and reminders would be attached to their payslips.

17.14 Mr Frew said that on occasions he took a newspaper into the cab. Most drivers would read while getting loaded or waiting to be loaded. He did not read them a lot, but a lot of drivers were never without them. He did not know if it was against the rules or if anyone was disciplined, but he was not scared of management. He would not say it was a strict rule but it was mentioned a few times that they were going to stop papers. He thought that was mainly about productivity. He accepted it was said by management that they were going to enforce a ban.

17.15 Mr McCulloch did not allow reading of newspapers and if he caught anyone doing that, they would be taken straight down to the office, but he never caught anyone reading a newspaper. He could not remember if he ever did it when he was a dump truck driver, but it was common for other dump truck drivers to do it when he was on the excavators. When the site manager started they made up a rule that they were not allowed to read papers. They were told not to do it by supervisors, the general foreman and the site manager. It was not common for people to be disciplined for it at Pennyvenie; he did not catch or discipline anyone. He had no idea why people were not caught, but he had never seen anyone reading papers.

17.16 Mr Paterson said that reading newspapers was against the rules. It used to be common practice to read the paper, while trucks were being loaded, but it was seriously tightened up from the mid-1990s. It was made a serious breach of discipline. He would say it became very occasional after the mid-1990s.

17.17 He could remember two drivers he caught at Pennyvenie by name. He used to walk on the top of the quarry to see what was going on. He remembered seeing Peter Murray and Andy Taylor reading papers and he seriously chastised

them: Both incidents were definitely prior to the accident in 2007. "Seriously chastised" meant being pulled down out of the vehicle, given a serious dressing down and warned that if it happened again it would proceed into serious disciplinary action.

17.18 He recalled posting a memo on the notice board to ensure that others knew about that and he was pretty sure it was covered in a toolbox talk, but he did not know when that was. He did not know if that was before or after he caught Peter Murray. He did not regard it as a light ticking off from him – he did not normally miss people when they did things wrong.

17.19 It was a distraction from what was going on round about you. He did not think it was a serious or reoccurring problem, because he was up there with an eye open and only saw two people do it. He had searched someone's bag once and got into serious arguments with the trade union for breach of personal privacy. Employees are permitted to have newspapers in the cab, but they are instructed via the rules that they are not to be read while operating.

17.20 He would be surprised if somebody brazenly had a newspaper out on the steering wheel.

17.21 He agreed that the rule in the Site Manager's Vehicle Rules was unambiguous. Whether breaching the rules was a minor indiscretion or quite serious would depend on the nature of the breach. Reading newspapers is a rule breached, but if the offender held his hands up, it might not proceed to disciplinary action, although he might make a record in his site notebook or in his daily diary. There are different ways to discipline people. There are some employees you can speak to and alter the way they think.

17.22 He could not recall how he caught Peter Murray reading a paper, but he remembered Andy Taylor, because Mr Paterson was walking round the top of the pit and was looking down into his item of plant. Mr Taylor was under load at the excavator. Neither case was formally noted in the disciplinary record. He thought that both men were experienced and speaking to them and verbally disciplining them was adequate. He must have got good responses from them, because he did issue warnings when required.

17.23 There was no set instruction as to how reading newspapers was dealt with at that time but now there is an absolute minimum of a final written warning.

17.24 There was no record of anyone being disciplined at Pennyvenie for reading newspapers from 12 January 2005 to 21 July 2008, when the record produced for the Inquiry ends.

17.25 Mr Phillips agreed he had seen other drivers reading a paper if a machine was broken down and they were waiting in a queue and it was quite common, but he was "too tight" to buy a paper. He could not say whether management was aware of it and he did not know if the ban was strictly enforced. He did hammer it home in training – "How are you going to learn your trade if you're looking at the paper" (Day 23, page 156).

17.26 Mr Polhill had spotted reading of newspapers in one or two audits in 2002 and 2003 and they were dealt with quite severely. There should have been formal discipline, but discipline did not need to be punishment. Coaching or firm advice might suffice – it was horses for courses; but you need to monitor somebody who has done something wrong. Whatever the level of response, it should be recorded, perhaps in the manager's diary. That would be different from the discipline book, which records offences beginning at the higher level of verbal warnings.

17.27 Mr Buchanan of the HSE also said he would expect a record of any warnings. He had asked SCC, who said they did not have a system to check and search for contraband and had also said they did not have any record of relevant disciplinary action.

18 Changes after the accident

18.1 General

18.1.1 An Addendum to the Site Manager's Vehicle rules was issued immediately after the accident (Annex D). It was intended to ensure that under no circumstances did any light vehicles enter an operational area while loading was taking place. SCC introduced a greater degree of supervisory control over the operations by making the drivers of light vehicles stop at a fixed point, which was defined locally by each site manager and then the supervisor required to take control and make sure that all the dump trucks were moved from the area before allowing light vehicles to proceed. The Addendum was now a rule on its own in the current edition of the rules, largely in these terms (Annex F). If anything it was strengthened, because the rules now define points where everyone must go to and stop before going any further, and there must be contact with the supervisor.

18.1.2 Mr Murray agreed that what happened now went beyond the Addendum. Employees were made aware of the Addendum straightaway at a site meeting held after the accident and before their return to work, by which time radios were already fitted in all vehicles or at least handheld radios were available to all employees.

18.2 Segregation

18.2.1 Mr Paterson explained what loading zones were now - it was now more or less the full dig, the mouth of the dig to where the excavator was working.

18.2.2 After the accident, the procedure when the excavator broke down was that the supervisor was contacted and he contacted the fitting department and the area where the excavator was cleared, totally. The fitter's Land Rover would come on the site, stop at a designated area and the supervisor would go and escort the fitter to the broken down excavator. This happened and worked effectively.

18.2.3 Separate roads were put in for Land Rovers along the haul roads so they and dump trucks would not meet.

18.2.4 A supervisor's cabin or perch was introduced, so that the supervisor could look out over the site to avoid Land Rovers going into the dig area. If anyone entered

the dig areas the supervisor was contacted. There was a red sign that nobody could pass without authorisation. If a fitter wanted to go to an excavator he would stop at the sign and contact the supervisor, who would inform the digger drivers and the dump truck drivers would be cleared from that area.

18.2.5 He described the perches as like being at a football match, where you were looking down – it probably cut the time supervisors needed to be on site by half.

18.2.6 Pennyvenie was the first site to put a traffic management plan in place: there was none prior to the accident. There were now rules on passing authorisation points, on reaching any of which drivers required to contact a supervisor and detail their route plan. They received instructions or permission and would proceed to the holding area and contact the supervisor. They had to request permission and instructions before leaving the area.

18.2.7 Before the accident, Mr Paterson considered that contact should have been made with the supervisor at the entrance to the dig area – but it was now about two miles back from there. There were now two access points, because there were now two active dig areas. There were stopping points where drivers required to speak to a supervisor. Drivers would go to a holding area while the supervisor worked out how to get them to the area in the dig.

18.2.8 It could hinder operations at times, because the supervisor may have to stop a load of trucks running in haul roads and there was a lot more radio communication. It was not a major problem, but took a lot of organisation. There was now a supervisor in the cabin all the time.

18.2.9 He would not say there were significant cost implications for SCC in having someone sitting in the cabin all the time and he was not aware of any effect on production.

18.2.10 The new traffic management scheme at Pennyvenie was now universal across all SCC sites and he had since visited other similar type companies in Wales, Scotland and the main English company to try and promote that approach as well.

18.2.11 Segregation was still the primary safety measure in relation to transport issues.

18.2.12 Mr Cullen considered that the rule that the area was cleared before Land Rovers enter was now very strictly enforced and did not slow production down. He had not known a Land Rover to come into a dig area unannounced since the accident – they would always radio and vehicles would always stop.

18.2.13 Mr McDougall also described the new procedures for the entry of Land Rovers to the active dig area. If they were going to an excavator, the supervisor would tell the machine operator to stop his machine. The trucks would go to the truck park or another excavator and the area would then be cleared for them to go in. At the end they would radio that they were ready to leave and make their way back by the holding bay and service road. There was no interaction or contact with dump trucks on service roads.

18.2.14 He described the service road as a single track higher road, built up with berms alongside it, so there was no contact with heavy vehicles. There were two holding bays – one where vehicles would be crossing through a section, the other at a cross roads, where the road to the right would lead to Chalmerston North Face or to the left to the Despatch Point. The supervisors controlled the stop points. The system now segregated Land Rovers from heavy vehicles, to an extent, but it ensured that no-one left the holding bay until authorisation was given, supervision had cleared the area and they could enter safely. These procedures were always followed.

18.2.15 Supervisors would pick topics – e.g. tipping procedure – and watch and see what was happening and then question some of the drivers and machine operators. Supervisors and Health and Safety representatives could do that. Health and safety representatives, including maybe a dozer driver, a truck driver, men from the water watch and fitters, carry out safety audits. Spot checking was mostly done by the supervisors.

18.2.16 Nobody now goes about the site just “willy-nilly” or anything. It is all done through the site radios and supervision. Mr McDougall was aware of a change in culture and emphasis at the sites – they were now more safety conscious.

18.2.17 Mr Robertson left Pennyvenie shortly after the accident, but had been general foreman at the House of Water site since early 2009. A similar approach now applies throughout SCC sites. He now required to spend less of his time in the dig, although he did make it clear that he could not see everything from the perch.

18.2.18 Mr Murray conceded that the site became very safe, with a lot of toolbox talks and meetings. It was, however, starting to slack off by time he left Pennyvenie (about six months later), the supervisor had started running about the site again and Land Rovers were appearing in the digs without the area being cleared. The position was similar at the House of Water site, where he now works as a leading driver. When he arrived there all employees had radios and there was a similar system with perch for supervisors at the start, but it was slackening off with Land Rovers driving about the site, about the digs, although it was safer than before because of the site radios.

18.2.19 Mr Murray seemed to be alone in his impression that segregation was not completely effective. Mr Cullen had not known a Land Rover to come into a dig area unannounced since the accident – they would always radio and vehicles would always stop. Mr McDougall, like Mr Murray, now works at House of Water. He would not see Land Rovers in dig areas with dump trucks now; communication would prevent that. The system of supervisors organising entry to the dig area was similar at Pennyvenie before he left and it worked effectively. The changes had not made the job more difficult.

18.2.20 Mr Stewart considered that the new system was definitely better from a safety point of view. Mr Kyle said the difference between now and then was night and day. Mr McCulloch found the supervisor’s perches were useful, because you could see everything and every movement and that reduced the time he required to be

out down in the dig. He would spend 90% of day in the perch as opposed to down in the dig. He agreed there was now a true system of segregation.

18.3 *Site Manager's Vehicle Rules*

The Site Manager's Vehicle rules were reissued – from December 2008, current at June 2009 (Annex F contains key extracts) including the requirement, where possible, not to use right hand lock from a parked position. Where it is not possible, the driver must exit the cab to ensure the area to turn into is checked and clear to turn into before moving off.

18.4 *Radio*

18.4.1 As effectively required by the HSE prohibition notice, following the accident all vehicles were parked up until radios were provided for every vehicle and a written site radio procedure was introduced and training provided for all employees. There was now a site radio procedure, followed by site radio instructions, and guidance for the use of site radios.

18.4.2 Mr Paterson described problems with frivolous behaviour, playing music, squawking, making noises, which led to them getting radios that could be micro-chipped. There were three or four radios on site with screens in front of them which would tell management who the last responder was, which helped if someone was mucking about. They had very seldom had a radio problem since the “chip” went in.

18.4.3 The open channel can cause problems, because as soon as somebody keys the microphone, nobody else can speak - and when they release it, it takes two or three seconds to clear again, so there can only be one person speaking at one time. There were probably 70-90 radios active on a dayshift now and it might be necessary to queue and wait to be able to get on the radio. There was always a risk, if you did not get acknowledgement and understanding back, that a message has not been understood or the wrong person responds, but the numbers of items of plant are now next to the radio so that operators realise which item of plant they are driving.

18.4.4 Mr Paterson still maintained that radio was a substitute for visual contact and eye to eye contact, but that eye to eye contact was always better. In hindsight, however, he accepted that radio was an improvement. It could save lives if used properly.

18.4.5 Witnesses generally considered that universal radio was a benefit and made the job safer and easier to do for management. As Mr Cullen noted, radios made things easier, you knew what was happening and it was not guess work. Mr Murray noted that batteries for the transmitter sometimes failed and the job was stopped straightaway.

18.4.6 Mr McDougall explained that if people did not stop and radio now, there would be disciplinary action. There would be an Accident Prevention Report. Anybody on site could fill in such reports and they were used. If anybody did not have a radio, nobody would move until they got one or the radio was fixed. It was

now impossible for a light vehicle to enter the dig area without prior radio communication.

18.4.7 Mr Davidson worked at Pennyvenie for about a year after the accident. Radio had improved the situation with breakdowns or buckets on the ground – you knew what was happening and had more information; it was good for keeping Land Rovers and dump trucks apart, because Land Rovers were able to contact all the trucks. There had never been a situation since the 2007 accident where he had come across Land Rovers in dig areas without knowing of them being there.

18.4.8 Mr Robertson considered that supervisors had more control over the dig with the extra radios. There were less Land Rover movements and there was less chance of interaction with dump trucks. Radios and segregation made it safer for plant to move around, for people to move around and for people to speak to one another. He did not consider that there was really any loss of time.

18.4.9 There were other teething troubles with the all radio policy. There was excessive use which could interfere with signal. Range of transmission could be a problem and they had moved the radio mast because of a blind spot. They had now also put in bouncer aerials at different points to improve coverage, but there could still be places that were out of range.

18.4.10 Mr Robertson agreed there could be a danger in over-reliance on radio. If you did not get a response, you should not proceed until you get contact. He tried to enforce the rule that you must receive signal back from the person you called. Radio protocols were designed to ensure messages were received and understood.

18.4.11 Mr Buchanan of the HSE observed that universal radios were in use in Scotland right across the field now.

18.5 *Buggy whips etc*

18.5.1 Buggy whips were introduced after the accident, in addition to flashing lights on the roof of Land Rovers

18.5.2 Mr Paterson explained that SCC had used a combination of buggy whips and standardisation of reflective markings for all types of Land Rover to improve conspicuity. Buggy whips were not fitted immediately; he thought it was done during 2008, after a trial run at one of the sites before the accident, but there were problems with lack of robustness, with snapping at the bottom edge above the spring mount. He could not source anything suitable and had to get them from America. There were still similar difficulties at first, but they came back with a more flexible spring mount and they were now better.

18.5.3 Mr Polhill recognised that buggy whips had been around a while, but the old ones were quite brittle and broke off. He got involved in looking at them after the 2007 accident.

18.5.4 Mr Robertson had experienced them in an Australian run site in Ghana. He had experienced no difficulty with them, but they did need repair sometimes, although he had not experienced them falling off.

18.5.5 Mr Waugh of the HSE stated that buggy whips and poles with flashing lights were encouraged by inspectors and encouraged in their guidance, going back to a report in 1977. During all that period different systems had been tried. They became commonplace around 2000. Even in 2007, they would not be universal in every machine. There may be problems with them, but they were not unfixable and they were relatively inexpensive.

18.6 CCTV

18.6.1 Mr Munro explained that the Terex TR 100 now came fitted with offside cameras. SCC now fitted offside cameras in all their large dump trucks, not just Terex trucks. There was still something of a blind spot, but it was very much reduced – e.g. at the cab strut. He would expect to see a Land Rover in the monitor if he was going to turn sharp right. If a Land Rover put itself in the same position as in the accident now, it would be capable of being seen on CCTV.

18.6.2 He had researched what was available on the market and what was used elsewhere in the world, along with a consultant who was formerly with the HSE and that involved discussion with suppliers, trade associations, safety professionals and internet research. They spoke to Brigade Electronics, Spillard Safety Systems, Vision Techniques and Banlaw Systems. They discovered no other UK opencast operators used offside CCTV. It was used exclusively for reversing or rear view purposes.

18.6.3 Mr Robertson explained that all their trucks, including Caterpillars, now had offside cameras. There had been a concern about glare at night, but it was an aid. Cameras were still useful at night, because operators can see lights. Large excavators now have them too.

18.6.4 Mr Murray commented that the front offside camera was not welcomed at first because it was another camera, but seen as a benefit as time went on. There were now nine mirrors or visual aids to check. Mr Cullen did not remember opposition to the offside camera, but it was not a burning issue either. Mr Davidson had been in a Terex with the additional offside camera fitted and found it beneficial, with no problems for the driver. It was not confusing to have so many visual aids.

18.6.5 Mr Stewart said there was some concern at the time that the offside camera was another thing to look at, but his concern was more that he did not want drivers to get too dependent on cameras and stop looking at mirrors. It had worked out fine.

18.6.6 Mr Ferreira of the Health and Safety Laboratory agreed that the positioning of the new monitor, at the right hand front strut, was suitable: he would want to put it to the right hand side of the cab, so it was roughly in view or within a peripheral view. He thought that would be compliant with good ergonomic practice, including an intuitive element, in that the screen would be in the direction the driver

was going in or intending to go in. He agreed that the location of vision aids can be critical.

18.6.7 Mr Dale Camsell of Terex explained that he was not aware of any other operator fitting offside CCTV to their vehicles before the accident or since the accident. They had not as yet introduced a front offside camera as a standard visual aid, although they have adapted and added other visual aids over the years and have been considering fitting such a camera as standard. One of the things they had looked at was a Land Rover with six cameras pasted digitally into a 360 degree view, but the result was disappointing. One issue which was raised in relation to offside CCTV was how any monitor or monitors would be placed in the cab and the desirability of avoiding confusion as to which view was on display, since rear view cameras are now standard.

18.6.8 There was discussion with Mr Camsell in particular on whether it would be useful to pursue a standard industry practice or agreement, in the manufacturing industry, on offside monitors, through the industry's trade association and he undertook to pursue that matter as well as the possible development of a new formal standard (although the latter may be more difficult to attain).

18.7 *Training after the accident*

18.7.1 Mr Munro explained that SCC was now moving towards having all training done by qualified trainers. They have had their first batch of about 20 trainers trained by the Mineral Products Qualifications Council (MPQC) and at the time he was giving evidence a new batch was just starting. Some training was currently still given by competent drivers selected by site managers, but he considered that they would probably be able to have all training delivered by trained trainers by the end of 2011. The checklist available to assessors was still very similar to that used for Mr Shannon, although he thought it had been refreshed, but he could not recall if it dealt with turning into blind spots.

18.7.2 In fact, the new checklist (SCC Production 20) does not deal specifically with blind spots but does deal more fully than before with parking and records the duration of training in hours.

18.7.3 Mr Buchanan of the HSE met SCC and other operators because he felt they were not meeting training requirements for supervisors, but he accepted that SCC had embraced it with enthusiasm and had since led the vanguard. He accepted that they had expanded their training of assessors and was more than satisfied with that.

18.7.4 Mr Buchanan agreed that it would be useful for the competence assessment checklist to cover turning into a blind spot unless the driver was sure there was no danger.

18.7.5 Mr Paterson confirmed that no changes had been made since 2006/07 in relation to the way the training of operators was recorded: the company did not as yet have a fully structured training package that they follow, e.g. ticking off what operators are being trained on.

18.8 *General*

18.8.1 Mr Munro agreed that none of the changes could not have been put in place after the 2005 accident. The vantage point or perch was recommended long before the 2007 accident, by Mr Polhill, after the 2005 accident. They did run a campaign encouraging supervisors to use vantage points.

18.8.2 SCC employees, including Mr Paterson, who was, at the time of the Inquiry, seconded to the safety department, have been active in encouraging other operators to follow their example in relation to CCTV and traffic management.

19 Causes of deaths and approach to identifying causes of accident

Parties largely directed their submissions to particular heads of statutory finding under Section 6(1) of the 1976 Act and it is convenient, so far as possible, to consider them under these headings. Because of a degree of overlap it is to a large extent necessary to consider the submissions of parties in turn, but not in relation to the first issues which I shall address, in relation to where and when the deaths and accident took place and the cause or causes of the deaths (which were not in dispute) and the general approach to be taken to the cause or causes of the accident and the identification of proximate cause. While all parties made written submissions on findings, these were inevitably elaborated on in oral submission and there was also a degree of duplication. I have endeavoured to marshal the proposed findings in Annex J, for ease of reference.

19.1 Section 6(1)(a) - Where and when the deaths and any accident resulting in the deaths took place

Parties were agreed and the evidence was clear as to the place and time of death, i.e.

(1) In terms of section 6(1) (a) of the Fatal Accidents and Sudden Deaths Inquiry (Scotland) Act 1976 (the 1976 Act), Brian French, born 21 June 1968, who normally resided at 19 Polmeur Road, Kirkconnel, and Colin William Ferguson, born 27 November 1969, who normally resided at 49 Coylebank, Prestwick died at the Pennyvenie Opencast Coal Mine Site near Dalmellington on 26 February 2007 at around 1300 hours while working in the course of their employment respectively as a foreman fitter and fitter with Castlebdrige Plant Limited.

19.2 Section 6(1)(b) - The cause or causes of the deaths

Parties were also agreed and again the evidence was clear as to the employment of Mr French and Mr Ferguson, as well as in relation to the causes of their deaths, which were described in the evidence of Dr Nairn, the consultant pathologist and his joint report with Dr Graham, i.e.

(2) In terms of section 6(1)(b) of the 1976 Act the cause of death of Brian French was 1a) Multiple injuries due to 1b) Accident at work; and in respect of Colin William Ferguson the cause of death was 1a) Asphyxia due to 1b) Crush Injury to chest due to 1c) Accident at work.

19.2.1 I do not think it necessary to say any more in relation to these matters, except to note that the emergency response, both by SCC and the emergency services was timely and appropriate. There was some initial difficulty in raising the supervisor by radio, but that did not appear to involve any significant delay and, although the men at the accident scene were unclear as to responsibilities, it is clear that, once contacted, Mr McCulloch, the supervisor took all necessary action.

19.2.2 As I have already noted, the accident was not survivable.

19.3 Submissions on Section 6(1)(b) - The cause or causes of any accident resulting in the deaths and the approach to identifying the cause of the accident

19.3.1 The Crown and the solicitors for Lorna French, Alan Shannon and Terex Ltd suggested an approach to this finding whereby the cause of the accident should be determined with a view to the potential findings as to reasonable precautions, defects in system of working and other relevant facts (in terms of subsection (1)(c) to (e)) and that an appropriate way of identifying the cause of the accident was to consider what had been established as the primary and overwhelming cause of the accident.

19.3.2 It was submitted that the primary cause of the accident resulting in the deaths of Mr French and Mr Ferguson was

the absence of an effective system of segregation between large vehicles, in this case dump trucks, and light vehicles i.e. Land Rovers.

19.3.3 It was suggested that all reasonable precautions, which would require to be considered under section 6(1)(c), were subordinate to an effective system of segregation. There were detailed submissions in support of and, in particular from Scottish Coal, against that argument, to which I will return, but at this stage I will concentrate on the question whether, as the Crown in particular submitted, it is appropriate in a fatal accident inquiry for the cause of death to be identified as the main underlying cause, instead of the proximate cause and also on what should be identified as the proximate cause, if it is appropriate to make a finding as to proximate cause.

19.3.4 I invited parties to address me on the approach to be taken to section 6(1)(b), including whether a hierarchical approach, analogous to that for death registration might be appropriate. In a death certificate the disease or condition that led directly to the death is stated and the certificate may work back to the underlying condition and also record other conditions contributing to the death.

19.3.5 The Procurator Fiscal Depute submitted that to concentrate on the factual or proximate approach would be to detract from the purpose of the Inquiry, which, he said, was effectively to learn lessons. It should be “right square” at the beginning of any determination that the cause of the accident was a lack of effective segregation. Such a determination would send out a message to the industry. It would involve a purposive approach to what was intended by the 1976 Act. There was, of course, a potential overlap between what might be included as cause of the accident under Section 6(1)(b) and other possible findings, in particular as to reasonable precautions whereby the accident might have been avoided. As regards cause of the accident, the Court could take a literal or a wider approach, but in his submission the wider approach was to be preferred.

19.3.6 He was able to point me to two relatively recent fatal accident inquiries where a wider approach had been taken.

19.3.7 He was able to identify the first case by description only, as a recent case where there had been a prosecution for careless driving and the Sheriff had identified

two causes – the collision and the careless driving. From his submissions, I conclude that this may have been the inquiry into the death of Jason McIntyre at Fort William, on 20 May 2010 where Sheriff Douglas Small determined

“That the accident which resulted in Jason Macintyre's death was caused by a failure on the part of Robert MacTaggart to observe Jason Macintyre when he made a right hand turn on the A82 into Carrs Corner across the path of Jason Macintyre who, at the time, was cycling in the opposite direction. That Robert MacTaggart's failure was as a consequence of a lack of attention on his part and a failure to keep a proper lookout of the road ahead of him.”

19.3.8 The case to which the Procurator Fiscal Depute more specifically referred was the fatal accident inquiry into the death of Laura McDairmant, at Kirkcudbright on 24 June 2010, where Sheriff Johanna Johnston QC determined that:

“The cause of the accident was the use of the pool at the Grey Mare's Tail Burn, Galloway Forest Park by the Barcaple Centre for the activity of jumping from height into water. The site was unsafe and should not have been used for the activity. There was a rock ledge protruding from the pool underneath the jumping off point. There was a danger that a participant would fall onto that rock ledge. Laura McDairmant jumped from a height of approximately 9.5 metres above the surface of a pool of water there. She landed on the protruding ledge of rocks and sustained the injuries, which caused her death”.

19.3.9 The Procurator Fiscal Depute was involved in that latter case, but he suggested that the approach taken there was consistent with what he was suggesting here, because the actions of the deceased and Mr Shannon had to be put in context. He accepted that there was, however, room for a hierarchical approach that would allow me to determine the proximate cause, along with an additional cause that the accident was caused by the failure of SCC to ensure segregation. The fact that a failure of segregation could also be identified as a defect in the system of working under section 6(1)(d) did not prevent it being determined as the cause.

19.3.10 The Procurator Fiscal Depute did not make submissions as to the proximate cause, but the solicitor for SCC and the solicitor for the HSE suggested that I should make findings as to cause which were essentially or at least largely proximate in character.

19.3.11 The solicitor for SCC suggested that I should determine the cause of the accident to be a combination of two features:

- (a) *The driver of the Landrover (Colin Ferguson) driving the Landrover along the offside of the Terex 100 truck stopping it in the blind spot of the Terex 100 and;*
- (b) *The Terex 100's driver (Mr Shannon) turning sharply into what he knew or ought to have known was the blind spot, thereby colliding with the Landrover and killing its occupants.*

19.3.12 The Procurator Fiscal Depute accepted that the SCC suggestions might be appropriate if the Court were to include in the determination the proximate cause or causes of the deaths.

19.3.13 The solicitor for Lorna French adopted the Crown argument on actual and proximate cause of the accident.

19.3.14 The solicitor for Alan Shannon considered that to restrict the interpretation of Section 6(1)(b) to the proximate causes would give rise to an artificial result. The Court was entitled to take a purposive interpretation. If the Court was to consider a proximate cause he would have no difficulty with it being that the TR 100 driver turned sharply to the right, thereby colliding with the Land Rover and killing its occupants – i.e:

(b) The Terex 100's driver (Mr Shannon) turning sharply to the right, thereby colliding with the Landrover and killing its occupants.

19.3.15 The Solicitor for SCC agreed that it was possible under Section 6(1)(b) to find one of several features that could be identified as causes of the accident and that it was possible to read the Act in a manner which allowed the broad line that the Crown was suggesting, but he considered that was not appropriate. Lessons could, as he put it, ring out the better and more clearly if the scheme of the Act was followed and, insofar as it was possible to do so, findings under one paragraph of Section 6(1) were not conflated with findings under other paragraphs. He agreed that it was possible to look at a primary or overwhelming cause, but unless there was a proximate cause along the lines suggested by SCC the determination would be incomplete.

19.3.16 In support of his submissions in respect of the cause of the accident and the terms of his proposed proximate cause(s) he stressed that in his submission the matter was not one of "blame" - it was just a matter of fact that the accident was caused by the unhappy coincidence of the two errors by the deceased and Mr Shannon.

19.3.17 The Court should look at the proximate or real causes of the accident and then analyse in terms of section 6(1)(c) to (e) the factual matrix against which the accident happened and seek to determine whether there were reasonable precautions whereby the accident might have been avoided and systemic failures which contributed to the accident, in accordance with the scheme of Section 6(1).

19.3.18 Messrs French and Ferguson knew or ought to have known that in stopping where they did they were or were likely to be in the dump truck's blind spot. They had had suitable training following the 2005 accident and were or ought to have been alert to the risks inherent in the manoeuvre in which they became involved, in particular stopping the Land Rover where it did in relation to the Terex 100. It was, in his submission, beyond dispute on the evidence that was a mistake which contributed to and was a proximate cause of the accident.

19.3.19 In his submission it was beyond dispute in the case of Mr Shannon that he turned sharp right into what he knew or ought to have known was a blind spot. There

was evidence to the effect that upon encountering the resistance represented by his vehicle having collided with the Land Rover he (twice) allowed his vehicle to fall back then "revved up" enabling his vehicle to surmount and crush the Land Rover. There was conflicting evidence as to whether or not the driver of the TR100 would have felt resistance represented by colliding with the Land Rover, but the fact that he allowed the vehicle to fall back then revved up and proceeded to "mount" the Land Rover was strongly indicative of his having felt resistance.

19.3.20 In acting as he did, he acted contrary to both common sense and his training. In accordance with both, he should not have turned sharp right into the blind spot. He should instead have driven forward before turning right thereby allowing him to turn right into what by then would not have been a blind spot. That was in accordance with his training. It was also in accordance with lessons that ought to have been learned arising out of the 2005 accident, the details of which had been brought to his attention. That his actions in turning into the blind spot contributed to and were to that extent one of the causes of the accident was, in his submission, beyond dispute.

19.3.21 SCC's position was that segregation of these two vehicles was ineffective, but that did nothing to identify the cause or proximate cause of the accident. The court would be entitled to find there are several causes, including some hierarchy of causes, but since the Act provides for findings as to reasonable precautions and systemic failings, the proper place for these was in findings under Section 6(1)(c) and (d). It would be confusing and unnecessary to identify systemic failings as the cause of the accident, especially when the court required to confine itself (under Section 6(1)(b)) to systemic failings that caused (rather than contributed to) the accident.

19.3.22 The Solicitor for the HSE approached the cause or causes of the accident from what he described as a very straightforward factual level: why should an apparently routine and, on the face of it, innocuous manoeuvre have resulted in the deaths of two men working on a site? The answer was because Mr Shannon, the driver, could not see the Land Rover. If he could have seen the Land Rover the accident would not have occurred. It was on that basis that he proposed a finding as to cause which emphasised the inability of Mr Shannon to see the Land Rover:

the inability of Mr Shannon in the Terex TR100 dump truck to see the Land Rover operated by Mr Ferguson and Mr French which was located in the dump truck's front offside blind spot, as a result of which the dump truck collided with and crushed the Land Rover.

19.3.23 He saw no reason why the court could not, if it chose, make findings under this heading concerning underlying causes within a hierarchical approach.

19.3.24 The solicitor for Mrs L French submitted that without a hierarchical approach there would be a real danger to any layman or non-legal person reading the determination that the causes or headlines became the proximate causes, rather than the core issue which he and others believed to be segregation.

19.3.25 On a literal approach, a proximate cause was that which is in a natural and unbroken sequence of events and unbroken by any new independent cause, which produces an event without which the injury would not have occurred (apparently on the basis of case law going back at least to *Milwaukee and Saint Paul Railway Co v Kellogg* (1876) 94 U.S. 469, 24 L.Ed. 256).

19.3.26 If it had not been Messrs French and Ferguson who had died, it would have been somebody else – this was an accident waiting to happen. Not to class the cause of this accident as segregation may somewhat detract from the overall desired effect of any determination.

19.4 Discussion and finding on proximate cause

19.4.1 On the basis of the limited submissions addressed to the question of proximate as opposed to (or in addition to) underlying cause I would be reluctant to depart from what appears to be conventional practice in recording the proximate cause in my determination, although there seems to me no reason in principle or, from the limited examples considered, practice why the causes of the accident should not include any underlying cause. Indeed, in the inquiry into the death of Laura McDairmant, the proximate cause was in fact recorded in the determination.

19.4.2 Turning to the specification of the proximate cause, on the basis of the evidence I do not consider that it was clearly established that the final position of the Land Rover before Mr Shannon started to drive was wholly in Mr Shannon's blind spot: it may have been, but in the absence of precise measurements of the starting positions of both vehicles and bearing in mind the evidence of Mr Murray that the Land Rover moved forward after reversing, I cannot be satisfied that it was wholly obscured. But from the reconstruction evidence it is clear that, even when visible in the vicinity of the dump truck, its conspicuity would have been very limited because of partial masking and the absence of contrast between the Land Rover, dump truck and the landscape. Wherever the Land Rover was, it was not conspicuous to the dump truck driver.

19.4.3 The solicitor for SCC suggested that I find expressly as part of the cause of the accident that Mr Shannon turned sharply into what he knew or ought to have known was the blind spot. It is clear on the evidence that he did turn sharply on full right hand lock and was turning into his blind spot, but I am not prepared to include the statement that he knew or ought to have known that he was turning into a blind spot. There was no convincing evidence that he was taught not to carry out such a manoeuvre. The evidence of Mr Phillips as regards how Mr Shannon was trained was wholly compromised by his unconvincing efforts to explain away the inconsistency of his initial evidence with the written records, such as they are, of Mr Shannon's training. In the absence of any written record on what Mr Shannon was told by him, I am not prepared to accept Mr Phillips's claims. It was, in any event, not at all clear that he would have been tested on his knowledge of the blind spot and how to deal with it by Mr Hamilton.

19.4.4 While I found Mr Shannon unconvincing and evasive on the subject of what he was told by Mr Paterson about the 2005 accident, it was not clear on the whole evidence that he was told anything like enough to alert him to the extent of the

blind spot on a Terex TR100. Finally, and probably most telling, was the opinion of experienced drivers and senior personnel that he did nothing wrong – including Mr Murray, but most notably, Mr Polhill.

19.4.5 Even if he had been thoroughly trained on the matter, that is no guarantee that his driving would have reflected that training. That is a common feature of any activity, but in the culture of this site, where there was evidence that inherently dangerous operations were tolerated and even indulged in by management, the effectiveness of even highly pointed training was weakened. In contrast to the training of Mr Shannon, on which I can only be certain that it was inadequate in length and recording, the training of Messrs French and Ferguson was well documented. They were both trained and tested explicitly on the dangers of visibility as between dump trucks and light vehicles and Mr French was also trained at a higher level on the specific matter of clearing an area to avoid such accidents, including a practical exercise. Despite that, they drove into a dangerous situation, although in doing so they were driving in a manner which was, according to many witnesses, not at all out of the ordinary and was firmly in accordance with the culture of the site, or its custom and practice, to borrow a phrase to which Mr Paterson had frequent recourse.

19.4.6 I consider that the proximate cause can be simply stated:

A Terex TR 100 dump truck, driven by Alan Shannon, turned sharply to the right on moving off from a stationary position and collided with and crushed a Land Rover, driven by Colin Ferguson and occupied by him and Brian French, which was sitting stationary to the front offside of the dump truck in an area which would have afforded no or limited visibility to Alan Shannon, killing both of the occupants of the Land Rover.

19.5 Broader approach to causes of the accident

19.5.1 If I were to conclude, as was suggested by the Crown and the solicitors for Mrs L French, Alan Shannon and Terex, that I should identify lack of segregation as the main underlying cause, I consider it would be open to me to do so as part of my formal finding under Section 6(1)(b) and, indeed, to identify that ahead of the proximate cause in my finding (rather as did Sheriff Johnston identify the use of the pool in the inquiry into the death of Laura McDairmant), but I shall return to that question and, if appropriate, the precise terms of my finding in light of my consideration of the broader submissions of parties and in particular on the question of segregation.

19.5.2 More generally, however, while recognising that it would be open to me to include other causal factors within the Section 6(1)(b) finding, I think it is desirable to avoid unnecessary duplication between formal findings and to accept that findings as to reasonable precautions may include causative aspects, but note that findings as to systemic defects must be causative (since in terms of the Act they can only be expressed if they contributed to the death or accident).

20 Submissions of parties on segregation and other findings

Because the submissions in relation to findings on reasonable precautions, systemic defects and other factors to some extent overlap, and indeed submissions as regards segregation are potentially relevant to all or any of the statutory headings for such findings, as well as the cause or causes of the accident, it is convenient to set out briefly the submissions of parties in turn on all of these issues.

20.1 Crown submissions

20.1.1 Segregation

20.1.2 The Procurator Fiscal Depute submitted that the primary cause of the accident resulting in the deaths of Mr French and Mr Ferguson was the absence of an effective system of segregation between large vehicles, in this case dump trucks, and light vehicles i.e. Land Rovers. He submitted that all reasonable precautions which required to be considered under subsection 6(1)(c) were subordinate to an effective system of segregation. Universal radios, visual aids such as cameras, improved conspicuity of vehicles, driver training and driver awareness were all clearly secondary to effective segregation in an opencast environment.

20.1.3 No-one disputed that the pinnacle of the hierarchy of control measures was segregation. The reasons for this were well explained by Mr Ferreira, the HSL ergonomist. Although SCC accepted that, they suggested that the primary control following the 2005 accident was indeed segregation.

20.1.4 The ACOP explains the need for vehicle rules on the basis of fatal accidents and states “Good, well-enforced, vehicles rules can make a significant contribution to reducing deaths and injuries”. Of key importance, it was submitted are the words “well-enforced”. It was submitted that for a system to be effective it must be enforced. It was for this reason that it was submitted that there was not an effective system of segregation at Pennyvenie.

20.1.5 Given the overwhelming weight of evidence from witnesses to the inquiry that segregation should be the primary control, the Court could include the suggested finding in terms of section 6(1)(b) that the cause of the accident resulting in death was the absence of effective segregation of heavy and light vehicles at the opencast coal site.

20.1.6 Despite the fact that segregation should have been the key safety measure it was submitted that the Site Manager’s Vehicle Rules, as they were written then, were not clear that segregation was the primary control other than in very limited areas. As an example the rules concentrated on specific areas on the site such as “restricted areas” in terms of Rule 14 and “Loading Zones” in terms of Rule 11. By inference it was submitted that interaction between light vehicles and dump trucks was not prohibited elsewhere.

20.1.7 Mr Paterson the site manager gave evidence that Land Rovers were permitted into the excavation or dig area whilst dump trucks were operating. The segregated area particular to this accident was the loading zone.

20.1.8 It was Mr Paterson's evidence that he believed those employed at Pennyvenie well understood the term "loading zone" and the implications of this, but there was a great deal of confusion among witnesses as to what a loading zone was and even the definition of a loading zone and the diagrams provided by Scottish Coal for the Inquiry did not match. In the plans the loading zone extended much further than the swing radius of the excavator arm and the manoeuvring zone of the truck (singular) under load must surely be a fan shape emanating from the front and rear of Peter Murray's Caterpillar 777D truck; a truck cannot set off at 90 degrees to itself. Even Mr Paterson had difficulty explaining why the entire green area in the plans was a loading zone.

20.1.9 Despite a significant body of evidence before the Inquiry that Land Rovers were being driven into loading zones without areas being cleared there was no evidence of disciplinary action being taken for that at Pennyvenie between 12 January 2005 and February 2007 (the period for which disciplinary records were produced to the Inquiry).

20.1.10 There was no effective enforcement of even the limited rules of segregation that did exist pre-2007. What was in place was a system of managed interaction, rather than segregation, but it became the situation that Land Rovers and dump trucks were interacting on a frequent basis without adequate planning, control and management.

20.1.11 Any attempt to suggest segregation was effective could be dismissed on the basis that no-one knew what a loading zone was.

20.1.12 I could take it from the evidence of Messrs Murray, Cullen, Kyle and almost accepted by Mr Paterson that Land Rovers were in the dig area on a routine basis and the loading zone definition relied on by Mr Paterson was an artificial definition because of the element of discretion whereby drivers could go to another digger; there was no train-like system where everyone would know where everyone was going in a cycle. There was too much scope for interpretation.

20.1.13 Mr Paterson said segregation depended on eye to eye contact, but Mr Polhill said if you are making eye to eye contact between a Land Rover and a dump truck you are too close; it could not work at night. (I did not have Mr Polhill noted as saying that they would be too close, nor is it in the transcript, although it may well have been the sense of what he said.)

20.1.14 There were striking similarities between the 2005 and 2007 incidents. The 2005 accident should have been a wake up call. The only difference between the accidents in terms of changes that followed was that two men actually died in 2007.

20.1.15 In terms of Regulation 11 of the Quarries Regulations 1999, the operator was required regularly to review health and safety measures. The approved code of practice (ACOP) states at paragraph 85 that –

“Reviews are likely to be required when equipment or working practices change significantly, when new technology is introduced and after accidents

including near misses. Such incidents provide opportunities to identify weaknesses and to change people's attitudes for the better. This opportunity should not be missed. But it is also important to identify the root causes of an incident in any investigation".

20.1.16 Scottish Coal failed to identify the "root cause" of the 2005 accident and missed an opportunity to identify a weakness in their systems.

20.1.17 SCC's letter to the HSE reporting on the 2005 accident stated that the Supervisor in question "has admitted blame" and that was eloquent of SCC's attitude in not looking at themselves and their own rules and procedures, to see if they contributed or could be improved.

20.1.18 Retraining after the 2005 accident supported the idea of interaction – it was about the dangers of getting too close and about people judging distances. Messrs French and Ferguson were trained, but there was nothing in the evidence to suggest that they did anything in the course of their employment that day that was unusual.

20.1.19 Several of the bullet points of advice in the Safety Alert that was issued following the 2005 accident (Annex E) tend to suggest that there was to be interaction between light and heavy vehicles. The third bullet point was that a driver should never assume that a dump truck driver was aware of his presence. In the absence of radios it was difficult to know how the driver could ever do anything but assume knowledge of his presence.

20.1.20 An example of the folly of that piece of advice could be found in the evidence of Duncan McDougall, who explained that at the time of the accident he had eye to eye contact but was not sure if Alan Shannon was signaling to Kevin Cullen or him. The system of communication was woeful and the dogmatic approach of Mr Paterson that eye-to-eye contact was important, essential and worked did not stand up to questioning.

20.1.21 A system should have been developed following the 2005 accident to ensure firstly, effective segregation and secondly, if that was not possible, a clear traffic management procedure that did not allow for operators of such massive machinery to have to hope a Land Rover was not in their blind spot. There was no traffic management system prior to 2007. Only Mr Paterson suggested there was one, by custom and practice, but he could not point to any rules or procedures.

20.1.22 That should be contrasted with Mr Oglesby's evidence that a fitter would drive up to the excavator and try to gain attention by hand signals or by flashing lights. No-one was controlling traffic movements for Land Rovers that day. Mr French had spoken to Mr Robertson, the most senior man on the site, but nobody was able to give a consistent answer as to how his approach to the excavator should have been managed – it was haphazard and uncontrolled.

20.1.23 Mr Paterson expected the leading driver or supervisor to take control, but Mr Stewart, the leading driver said he was not regularly involved in the process.

20.1.24 Brian Robertson, the general foreman on site said that he would have waited until the area was clear of trucks before he went in to the area. He said that it was Brian French's responsibility to ensure the area was clear before going in but that there was no definitive procedure. If Brian French had a radio he could have told the excavator driver to ground his bucket and this would have had the desired effect.

20.1.25 Mr McDougall said that he would radio the workshop first and contact the supervisor if he could not get the workshop, if he was broken down, but drivers had different views on what they would do – some would sit where they were, some would go and “park up regimental” (i.e. park in line in a safe area) and some would go and look for another excavator – all of which was symptomatic of a lack of effective management of movements.

20.1.26 There was nothing in the rules that stopped the fitters going in without a radio. Mr Paterson confirmed that there was nothing in the rules to prevent it but it was “against good practice”. It was submitted that there was no acceptable explanation as to how segregation could be ensured on the Pennyvenie site prior to 2007 in the absence of universal radios.

20.1.27 The procedure in place seemed to involve a haphazard system of passing on information. If a leading driver was called, he could try and drive from cab to cab with each of the trucks to tell them to park up or go to a different area. Those who had radios could be requested to try and catch the attention of their colleagues and pass on the instruction to them.

20.1.28 Segregation, as the court was advised by Jeremy Ferreira, is a passive control. Once in place it does not fundamentally rely on employees getting things right. The rules that were supposed to be followed at Pennyvenie prior to the accident in 2007 required employees constantly to make correct judgements with potentially horrific consequences for failure.

20.1.29 SCC accepted in pleading guilty to the indictment that there was a lack of effective system of segregation. What exists now is true segregation.

20.1.30 Section 6(1)(c) - reasonable precautions

20.1.31 The Crown suggested a number of possible reasonable precautions:

(a) if the occupants of the Land Rover had obtained access to a radio which could have allowed for communication with the leading driver or supervisor to allow drivers to be alerted to their presence.

(b) having universal radios on site and requiring use of such radios.

20.1.32 The Site Manager's Vehicle Rules prohibited overtaking unless there had been communication between the person overtaking and those being overtaken. The question was whether the deceased were “overtaking” or simply passing parked vehicles. There was no definition within the rules of what overtaking was. Mr Paterson suggested in his evidence that by taking the route the deceased took the overtaking rules applied.

20.1.33 Whether the rule applied or not, and it was submitted it did not, the deceased would have had no reason to believe that Alan Shannon or Kevin Cullen's trucks were going to move. The loading cycle was underway. They would have been able to see that Peter Murray's truck was under load as they approached. The route they took would have allowed for the only truck likely to move to have a clear view of them.

20.1.34 It was submitted that there could be no criticism of the deceased for taking the route they adopted, given what appeared to be the custom and practice on site at the time.

20.1.35 In his written submissions the Procurator Fiscal Depute suggested that a reasonable precaution which might have prevented their deaths (in the absence of radios) would have been to have joined the queue of dump trucks and waited until the area was clear before approaching Duncan McDougall's excavator. However, he noted that, as with other reasonable precautions suggested, it was apparent that the deceased acted in a manner that was entirely within the custom and practice of the site. As I understood his oral submissions, he did not consider that it would in fact have been a reasonable precaution for Messrs French and Ferguson not to enter along a route similar to that they took, because it was in accordance with what was expected of them.

20.1.36 A reasonable precaution that might have prevented the deaths of Mr French and Mr Ferguson would have been

(c) if Alan Shannon had not read a newspaper whilst waiting to be loaded.

20.1.37 It would be a step too far to determine that a reasonable precaution which might have prevented the deaths would have been a total ban on newspapers in the cabs of trucks.

20.1.38 Given the tenor of Mr Ferreira's evidence it was submitted that

(d) fitting of additional aids to conspicuity, in particular buggy whips to Land Rovers and offside cameras to dump trucks

was a reasonable precaution that might have prevented the deaths of Mr French and Mr Ferguson. The fact that buggy whips are now fitted and are effective suggests that as at February 2007 buggy whips were a reasonable precaution that that might have prevented the deaths of Mr French and Mr Ferguson and fitting an off-side camera would have been a reasonable precaution given the information on the risk that was available to Scottish Coal pre 2007 and the fact that such cameras also are in operation now.

20.1.39 There was a question whether it would have been a reasonable precaution for Alan Shannon to have driven forward and then turned right. Given that he had been driving a Terex TR100 for three months it was submitted that the area of obscured visibility at the front right hand quarter would have been known to him and as such as reasonable precaution would have been

(e) if Alan Shannon had driven forward and then turned right.

20.1.40 It would have been a reasonable precaution

(f) if Alan Shannon had reversed or stopped when faced with an obstruction large enough to offer resistance to a 100 tonne truck that has 2 metre diameter wheels.

20.1.41 Section 6(1)(d) – defects in system of working

20.1.42 The Procurator Fiscal Depute submitted that

(a) there was a lack of any proper system of communication on the site.

20.1.43 The system that existed was akin to one of Chinese whispers. A site which had such massive machinery moving around should not have been run on a basis of eye to eye contact, flashing headlights, informal hand signals and shouting over the top of engine noise. Duncan McDougall gave evidence that at the time of the accident he believed Alan Shannon signalled to him in a questioning / shrugging motion but in hindsight stated that it may have been Kevin Cullen that was being gestured toward.

(b) There was a lack of any effective system for dealing with breakdown and unplanned maintenance situations.

20.1.43 Some witnesses said the dump truck driver should sit where he was, some said he should go and park up “regimental”, some said he should go and seek another load.

20.1.44 There were numerous rules in the Site Manager’s Rules covering cordoning off of vehicles and communication with quarry vehicles when maintenance was taking place, but there was nothing to tell dump truck drivers what to do once a breakdown occurred. On the date in question Mr Shannon was confronted with an apparent breakdown situation. He therefore was perfectly within his rights at that time to seek another load.

(c) There was an inadequate system of traffic management.

20.1.45 It was evident that there was no overall control of traffic movements prior to the accident. Mr Paterson was the only person to suggest he would expect a light vehicle driver to communicate with a supervisor before entering the dig area.

If a system of traffic management existed then everyone would have known it and have been able to explain it to the Inquiry.

(d) There was inadequate training of dump truck operators.

20.1.46 Training drivers were not trained or provided with materials to ensure that all important aspects were covered. Mr Phillips did not make reference to the Site

Manager's Vehicle Rules when training drivers but taught them through his experience. The Approved Code of Practice (ACOP) specifically cautions against the practice of staff training new starts because bad habits could be picked up. Many witnesses to the Inquiry were of the opinion that the training regime was too short in respect of a man who had no experience whatsoever of driving a large vehicle.

20.1.47 The system for assessing, training and certifying drivers to enable them to receive a site licence was not wholly satisfactory and lacked system and clearly detailed procedure. It was submitted that this was indeed surprising when that description was used by Sheriff J D Allan in his determination following the Fatal Accident Inquiry into the circumstances of the death of William Hiddlestone in February 1998, which was produced to this Inquiry. Mr Paterson had been site manager (for Crouch Mining) in that case and stated in evidence that he had given evidence at that Fatal Accident Inquiry.

20.1.48 There was no bar on the general foreman permitting someone with little or no experience to drive without being tested. The driving test need not take place until three months after starting and a new driver could be authorised to drive *ad interim* by the general foreman or site manager. In practice the manager at Pennyvenie would bring in the company trainer for the initial assessment in substitution for the test by the general foreman. It was apparent from consideration of the new procedures that the three month before testing period still remained which, it was said, was frightening indeed, as it seems the rules could permit a general foreman who was non-qualified, in terms of driving experience, to permit an inexperienced driver to work on a site. It may well be that in reality this would not happen but it was submitted there was scope for this within the rules.

20.1.49 The fact that Alan Shannon could say that he was not trained on use of right hand lock, which tended to be supported by other witnesses who also explained they were not trained on the issue, led to the clear inference that the training system was inadequate and was directly linked to the deaths of Mr Ferguson and Mr French.

20.1.50 Section 6(1)(e) – any other relevant factors

20.1.51 (a) The role of the safety department

20.1.52 The Procurator Fiscal Depute suggested that

Scottish Coal did not place enough importance on the role and opinion of their trained safety advisers pre-2007. Scottish Coal should have systems in place that allow safety managers to effectively stop proceedings.

The policy of letting Site Managers investigate their own accidents and near misses was fraught with danger. There was a lack of objectivity in investigations.

If there had been an effective investigation of the 2005 accident that might have led to questions being asked about whether this was the wrong way to do this.

20.1.54 (b) Discipline

There was inconsistency in relation to handling of reading of newspapers. A more consistent categorisation of disciplinary matters across the company would be of benefit.

20.1.55 (c) Health and Safety Executive etc

20.1.56 Given the advances in technology it was submitted that

Inspectors should be as a matter of course making enquiry about radio usage and traffic management as part of their inspections.

Segregation as successfully organised at Pennyvenie now will not always be possible due to the changing geography in quarries and opencast sites. The HSE however should be constantly pressing home the message that it is for the duty holder to ensure proper job site organisation and systems to deal with the dangers posed by such massive machinery.

The Quarries Regulations Approved Code of Practice should be updated to make crystal clear the dangers of blind spots in dump trucks and that segregation is the key to doing this; reference should be included to the duty holder considering the use of technology such as radios to aid in achieving segregation and effective traffic management.

20.1.57 It was further submitted that

The HSE should work with the Quarries Joint National Advisory Committee to raise these issues ahead of any proposed update to the Code of Practice.

The HSE should consider whether to call on police for assistance, e.g. from crash investigators in relation to measurements and plans etc of accident scenes.

20.2 Submissions for Mrs L French

20.2.1 Section 6(1)(c) - reasonable precautions

20.2.2 The solicitor for Miss L French supported the Crown's submission on having universal radios on site and requiring use of such radios and drew attention to the evidence of Mr Martin of the HSE who described it as "bizarre" that there were vehicles on site without radios at the time of the accident as this was "fundamental and I would have thought to improve safety on the site" (Day 33, page 47). Further, Ian Waugh, HSE, had commented that if his inspectors had been on site in 2007 and observed that plant was operating without radios then he would have expected them to question the site manager as to why this was the case.

20.2.3 On the entry of Messrs French and Ferguson into the dig area, he adopted the Crown's submission, but highlighted the divide between management and others on practice, submitting that if the drivers' evidence was to be preferred, managerial

supervision was, at the very least, inadequate. He conceded that the deceased had not followed the advice in the company safety alert issued in 2005, but that must be taken within the context of what was a regular and unremarkable activity endorsed by management through their tolerance.

20.2.4 On the driving of Alan Shannon he submitted that little, if any, weight should be given to his testimony.

20.2.5 On the question of his reading a newspaper he drew attention to the evidence (of Mr Stewart) that Mr Shannon was eager to retrieve his possessions from the truck. There was no plausible explanation offered by Mr Shannon to explain that. Peter Murray's emphatic evidence should be preferred to that of Mr Shannon.

20.2.6 On the question of Mr Shannon's actions when he met resistance, he submitted that he should have taken some action to see what the problem was. He drew attention to the evidence of Thomas Hamilton, company assessor/trainer, who commented that he was certain he told Mr. Shannon that if you come up against resistance you should reverse back and check what it is. (Mr Hamilton's evidence was rather limited: he did not give any training to Mr Shannon on how to deal with resistance and he did not specifically remember asking Mr Shannon how he would deal with such a situation, but he agreed with the suggestion in cross examination by the solicitor for SCC that he thought that he probably would not have passed Mr Shannon as competent if he had not asked him something along the lines as to whether he knew that if you come into contact with something and do not know what it is you would get assistance or reverse, if that was safe until you see it and find another way round it.)

20.2.7 Messrs Cullen and McDougall described the length of time from the Terex impacting with the Land Rover to it stopping as ranging between 10 and 30 seconds. Even in an opencast context, given Mr Hamilton's evidence, it was suggested that Mr Shannon was acting contrary to his training in attempting to tackle the resistance by driving over it.

20.3 Submissions for Mr Alan Shannon

20.3.1 Section 6(1)(c) - reasonable precautions

20.3.2 Mr Shannon's solicitor submitted that the overtaking rule as specified in the Site Manager's Vehicle Rules applied and that the deceased, by their actions, breached this rule.

20.3.3 He submitted that the route taken by the deceased was, on any analysis, unsafe. Mr Polhill questioned how such a manoeuvre could be carried out safely without communication and how much risk was being taken. He said that overtaking dump trucks in the absence of radios was too high a risk. It was a very risky manoeuvre due to visibility.

20.3.4 While the Crown had submitted that the dump truck operated by Alan Shannon was part of a loading cycle and therefore had no reason to move off, in the absence of any clear definition in the Site Manager Vehicle Rules as to what

constituted "overtaking" it was submitted that a literal interpretation be applied and the use of the word in its normal context and usage be preferred.

20.3.5 On that basis it was submitted that overtaking simply meant "to pass". This definition had a common sense approach and, in the context of working in an open cast mine, a health and safety approach. The overtaking rule was enshrined in the Site Manager's Vehicle Rules. It was well apparent to the deceased that passing a large dump truck along its offside would place them in its blind spot. It was upon that basis that it was submitted that the overtaking rule as specified in the Site Manager's Vehicle Rules applied and that the deceased, by their actions, breached this rule.

20.3.6 He accepted there was some force in the argument that a rule was weakened if people had to work out what is meant by overtaking, but the issue about offside blind spots was a hazard known to all who operate in an opencast mine and to attempt to pass through it without any prior warning or notification was inherently dangerous and unwise.

20.3.7 There was evidence that on that day dump truck operators, such as Mr Shannon, were permitted to operate from more than one excavator; Mr Shannon was entitled to move from excavator to excavator depending upon the situation he faced at any given moment during his shift. This policy of operating from more than one excavator would have been known to the deceased given their many years of service at the site. Mr Polhill's evidence supported Mr Shannon's understanding that he was entitled to move off towards another excavator.

20.3.8 Stripping away all the additional reasonable precautions which might have avoided the accident resulting in the death of the deceased it was submitted that above and beyond all others the decision by the deceased to travel along the offside of Mr Shannon's Terex TR100 resulted in the accident which caused their deaths.

20.3.9 Thus it would have been a reasonable precaution

(a) if the deceased had not decided to travel along the offside of Mr Shannon's Terex TR100 dump truck.

20.3.10 Had the deceased not travelled into the dig as they did on that day the accident would definitely not happened.

20.3.11 On the question of Mr Shannon reading a newspaper, his solicitor submitted that this evidence was uncorroborated; Mr Shannon indicated that this was a dream move for him and saw it as a job for life. He had previously given up a very secure job with the Local Authority to make a career out of working in the open cast and following in his father's footsteps. Given that Mr Shannon had only started with Scottish Coal weeks beforehand, it was submitted that it would be unlikely for him flagrantly to flout the company's rules and subject himself to the possibility of formal disciplinary action and prejudice the possibility of his remaining with the company.

20.3.12 On the other hand he submitted that the Crown's position that it would be a step too far to ban newspapers altogether had no evidential basis – the statutory test

was reasonable precaution, not whether it was a step too far. A blanket ban on reading newspapers would be a reasonable precaution when weighed up against the danger it was designed to prevent. There was nothing to stop SCC introducing a blanket ban.

20.3.13 As a reasonable precaution that would presumably be:

(b) a prohibition on taking newspapers into vehicles.

20.3.14 On the actings of Mr Shannon in performing a full lock right hand turn he resisted the Crown's submission, which appeared to be predicated upon analysis of the events with the wisdom of hindsight. It was submitted that this was the wrong approach to adopt and that in terms of the subsection a reasonable precaution can only be taken by a person if they are, or should have been, at the time leading up to the accident in possession of facts that would lead a reasonable person to take such precautions. It was therefore essential to ascertain the person's state of knowledge at the material time.

20.3.15 He drew attention to the fact that two experienced drivers gave evidence to the effect that they were not trained not to make such turns. All of the dump truck drivers who gave evidence to the inquiry said that what Mr Shannon did was not prohibited and something that they themselves would have done in the past. The custom and practice that existed at the site at the time allowed full right hand lock turns to be made at any location on the opencast. The practice was not viewed as being wrong or unnecessary. Even Mr Polhill in his evidence could find nothing wrong in the manoeuvre performed by Mr Shannon. He asked "What did the driver do wrong?" Mr Polhill did not think he wasn't doing anything wrong (Day 27, page 100).

20.3.16 The Crown had argued that because Mr Cullen knew, after having driven dump trucks for a while, that it was common sense not to make such a manoeuvre, Mr Shannon should have known likewise. It was submitted that this was the wrong test. He had only been driving his dump truck for a matter of weeks. During that time he witnessed other more experienced dump truck drivers such as Peter Murray perform full right hand lock turns.

20.3.17 Moreover, he was entitled to make such a manoeuvre based upon what he expected his fellow workers to be doing. It was said that Mr Shannon was aware of the Safety Alert as it formed part of his induction training. He was, therefore entitled to assume that his work colleagues were also aware of its terms and he had a legitimate right to expect that others, in particular light vehicle operatives, would adhere to its terms. He had a legitimate right to expect that a light vehicle would not have been parked in his front offside blind spot standing the terms of the Safety Alert. It was not a reasonable precaution that Mr Shannon was aware of, based on all these factors.

20.3.18 On the question of his response to meeting resistance, again the Crown appeared to making submissions based upon the wisdom of hindsight. It would only have been a reasonable precaution to have reversed if that was something that Mr Shannon ought to have been aware of having to do in such circumstances. He

accepted that Mr Hamilton said that he covered it, but in the absence of anything in the training records about what to do on meeting resistance his evidence should be treated accordingly.

20.3.19 Whilst these may not have been reasonable precautions available to Mr Shannon it was submitted that they were reasonable precautions that could have been taken by Scottish Coal, i.e. presumably

(c) If Scottish Coal had ensured that dump truck drivers drove forward before turning right and

(d) If Scottish Coal had ensured that dump truck drivers reversed or stopped when faced with an obstruction large enough to offer resistance

20.3.20 Section 6(1)(d) - defects in system of working

The solicitor for Alan Shannon adopted the Crown's submissions and pointed out that

The system of dump trucks being entitled to operate off more than one excavator created a system of uncertainty for dump truck and light vehicle drivers and created confusion as to what should happen when an excavator dropped its bucket.

Mr Polhill described it as chaotic and inherently unsafe; it was a defective system because it created uncertainty and uncontrollable dangers.

20.3.21 Section 6(1)(e) – any other relevant factors

The Crown's submissions were adopted in full.

20.4 Submissions for SCC

20.4.1 Segregation

20.4.2 In light of the Crown's submission that absence of effective segregation of heavy and light vehicles was the cause of the accident, the solicitor for SCC addressed that issue along with the subsidiary question whether the absence of effective segregation was a systemic defect under Section 6(1)(d). While he accepted that the proper place for any finding of absence of effective segregation was as a finding as to defects in the system of working, he did not accept that the Court should make any finding that there was in fact an absence of effective segregation.

20.4.3 He accepted that segregation should have been the key safety measure and that segregation was at the top of the pyramid of controls and was paramount, but he considered that the Crown overstated the position in maintaining that prior to the accident there was no management system at SCC Pennyvenie and that everything relied on custom and practice. Messrs Paterson, Polhill and Munro spoke to Site Manager's Vehicle Rules which were designed to attempt to secure segregation of large and small vehicles and the solicitor for SCC referred specifically to a number of these, including the second paragraph of Rule 7 – driving a quarry vehicle:

“Ensure that the area around the vehicle is clear before moving away or altering direction”.

20.4.4 Rule 8 on parking was also relevant. He drew attention in particular to Rule 11 – loading procedures – and especially to the following passages::

“Whilst loading is underway no vehicle should be parked within the loading zone other than for the purpose of being loaded.

When a dump truck has been loaded it should leave the loading zone and proceed to the tipping area without delay.

Light vehicles or pedestrians are not to enter the loading zone until excavators and dump trucks are stationary and permission is obtained from the vehicle operators.

The excavator operator must not signal permission to enter a loading zone until the excavator bucket is placed on the ground.

When the last person leaves the loading zone, they must give a clear communication to the excavator driver so that loading may be resumed.”

20.4.5 These rules should not be scrutinised as if the Court were dealing with the minutiae of a conveyancing document, but with a measure of common sense and in the context of training and what happened on the ground. Custom and practice was not necessarily an evil thing as long as it was disseminated and well known amongst the workforce as to what the rules meant in practice.

20.4.6 These were rules in which operatives were trained and which represented an element of traffic management system. They were part of a traffic management system which was designed to and which did as a matter of fact operate, by and large, so as to ensure segregation of large and small vehicles before the accident. There was plenty of evidence of interaction, but scant evidence of unsafe interaction on any kind of routine basis or any significant basis between large and small vehicles.

20.4.7 The Court should consider carefully what Mr Cullen said about interaction of vehicles on Day 5, pages 29-42; any notion that he was talking about routine unsafe interaction was at least seriously diluted. He considered that the same could be said of Mr Murray, on Day 3, at pages 13-21 and Mr Kyle on Day 16, at pages 86 to around 90.

20.4.8 No driver was prepared to say that interaction between large and small vehicles was happening in a manner that was thought to be unsafe or that did not involve suitable communication, other than one or two instances – and that was not the same as a systemic defect – and was certainly not the same as a systemic defect that as a matter of fact contributed to this accident.

20.4.9 There was a lack of segregation between these particular two vehicles, but it could not be said it arose out of any systemic failure which did as a matter of fact contribute to the deaths or the accident.

20.4.10 *Section 6(1)(c) - reasonable precautions*

20.4.11 The solicitor for SCC agreed with the Procurator Fiscal Depute that it was implicit in the admission of guilt by SCC in the criminal case that the deceased were operating in an environment that to some extent could have been better, but had the Land Rover not been driven along the offside of the dump truck and stopped on its blind spot the accident would not have occurred and it was therefore a reasonable precaution whereby the accident might have been avoided if the vehicle had not been so driven – i.e. a reasonable precaution would be

(a) if the deceased had not decided to travel along the offside of Mr Shannon's Terex TR100 dump truck, stopping in its blind spot.

20.4.12 Likewise, it was plain on the evidence that the accident would have been avoided had Mr Shannon not turned sharply into the blind spot of his vehicle. His not having done so was therefore a reasonable precaution whereby this accident might have been avoided – i.e. a reasonable precaution would be

(b) if Alan Shannon had not turned sharply into the blind spot of his vehicle.

20.4.13 The solicitor for SCC agreed that if all relevant operatives had radios the accident might have been avoided, but it should be made clear that would not necessarily have avoided the accident. Eloquent testimony to that proposition was provided by the circumstances of the 2005 accident - in which both operatives did have radios. This reflected the undoubted fact that no matter how good the system, accidents - even tragic accidents - will happen. It was therefore conceded that

(c) provision of radios for all relevant operatives

was a reasonable precaution whereby this accident might have been avoided.

20.4.14 He agreed that the same could be said in respect of lack of buggy whips, i.e.

(d) attachment of buggy whips to all Land Rovers

was a reasonable precaution whereby the accident might have been avoided, although the addition to a Land Rover of a single buggy whip might not have avoided the accident, since it was easy enough to envisage a buggy whip being obscured by parts of the Terex truck.

20.4.15 Whilst it cannot be said that if he had been paying attention and not reading his newspaper Alan Shannon would have spotted the approach from his rear of the Land Rover, the solicitor for SCC submitted that had Mr Shannon not been reading a newspaper he might have spotted the Land Rover. The video evidence suggested that he might have been able to spot it if he had been alert enough. He referred to Mr Murray's evidence, supported by the finding of the newspaper on the seat and Mr Shannon's over-keenness to get back up in the cab, as spoken to by Mr Stewart.

20.4.16 Accordingly a reasonable precaution whereby the accident might have been avoided would have been

(e) if Mr Shannon had paid more attention and in particular had not been reading a newspaper in the cab of his vehicle.

20.4.17 He submitted that fitting of a front offside camera to the dump truck was not a reasonable precaution whereby the accident might have been avoided. Whether or not something is a reasonable precaution depends on the whole prevailing circumstances. There was evidence from, amongst others, Ian Munro, David Paterson and Andrew Polhill as to why such cameras were not fitted and indeed were not fitted until some time after the accident. In Norman Buchanan's evidence it was in effect conceded (rightly) that in determining whether or not a particular measure should properly be described as a reasonable precaution regard should be had to the industry standard and he conceded that there was no industry standard applicable at the time whereby offside cameras and monitors were fitted.

20.4.18 There were legitimate issues expressed in the course of the Inquiry as to whether or not the fitting of an offside camera and monitor was a good idea and practical difficulties were encountered and expressed in their operation (particularly with regard to screen glare). It was significant that the fitting of an offside camera (unlike operating an "all radios" policy) was not the subject of any recommendation, notice of requirement imposed by the HSE.

20.4.19 It would be an over-application of the benefit of hindsight to categorise the lack of fitting of an offside camera (that no one else had thought of fitting) to these trucks as a reasonable precaution; SCC do rather lead the way in terms of safety in the industry and were commended for that by Mr Buchanan. The Inquiry also heard about SCC participation in COALPRO and that at neither COALPRO nor QNJAC was offside CCTV ever suggested.

20.4.20 Section 6(1)(d) - defects in system of working

20.4.21. The solicitor for SCC resisted the conclusion that the non-operation on an "all radios" policy represented a systemic defect which as a matter of fact contributed to the accident. He submitted that the system that SCC had in operation at Pennyvenie in relation to radios was that they had adopted an all-radios policy and were in the course of implementing it, albeit perhaps too slowly in the way it turned out.

20.4.22 A replacement radio was available to Messrs French and Ferguson but was not collected and it could not be said against that factual background that the lack of an all-radios policy was a system defect that as a matter of fact did contribute to the accident.

20.4.23 Their not having a radio did not arise out of any system failure. It was worth bearing in mind in this context that the 2005 accident happened despite both operatives concerned having radios.

20.4.24 He resisted the conclusion that there was a systemic defect in the system for managing and supervising movement of vehicles in the dig area which as a matter of fact contributed to the accident. The accident was an instance of a failure in segregation, but that was not eloquent of a systems failure which contributed to the deaths. It spoke rather of mistakes having been made within a system which generally speaking was designed to ensure segregation and generally did ensure segregation or only safe interaction in the absence of segregation.

20.4.25 The 2005 accident and this accident were isolated examples of a system that generally worked breaking down.

20.4.26 The system defects that contributed to the causes of the accident were firstly the Land Rover finding itself where it did. That was not a failure of there being a traffic management system in place – there was a traffic management system which discouraged and prevented interaction other than safe interaction between vehicles – and it could not be said that there was a system defect that actually contributed to that cause of the accident arising out of failure in the training of Mr Ferguson or Mr French, who were both well trained. They did not take a radio with them; their radio was lost and that was just a mistake, but it was not a system failure that did contribute to the accident.

20.4.27 Scottish Coal Company Limited pled guilty on indictment to a breach of section 3(1) and section 33(1)(a) of the Health and Safety at Work Etc. Act 1974 in relation to circumstances surrounding the deaths of these two men. In so doing, the solicitor for Scottish Coal Company Limited stated that they accepted quite properly that they failed in certain respects so far as was reasonably practicable to provide a safe system of work for the movement of vehicles such as would have prevented this accident, but in what respects the company accepted that it failed to provide that system was not at all clear from his submissions, which appeared rather to be directed towards rejecting any defects in the systems of work of Scottish Coal (and Castlebridge Plant).

20.4.28 He conceded that, on the evidence before the inquiry and based on the plea of guilty to the criminal charge, supervision of the traffic management on the site could have been better, but his submission was that, in looking at the causes of the accident the lack or failures in supervision of the traffic management on the site could not be seen to have been a cause of the accident (or, it would seem, to have contributed to the accident). The context of criminal proceedings and Fatal Accident Inquiry was different and at the stage of the criminal proceedings an approach was taken to the loading zone which was now open to question.

20.4.29 He would also resist a conclusion that there were defects in the training of Mr Shannon which did as a matter of fact contribute to the accident. He conceded that there may be room for comment on training in the identification of other facts that are relevant to the circumstances of the death (under Section 6(1)(e)), but to conclude that any training failure contributed to the accident, the Court would have to be satisfied on the balance of probabilities that Mr Shannon did not get suitable training to discourage him making the *ex facie* dangerous manoeuvre which he did make.

20.4.30 Alternatively, the court would have to conclude that the deceased were inadequately trained so as to know that stopping their vehicle where they did was dangerous and should not happen. The Land Rover training package was spoken to in evidence and was, in his submission, not identified as being defective. The post-2005 accident training and notification to operatives was adequate and sufficient and it was clear on the evidence that the two deceased workers, diligent as they were, knew or ought to have known that what they did was inherently dangerous if they failed adequately to communicate their presence to all other relevant personnel.

20.4.31 Section 6(1)(e) – any other relevant factors

20.4.32 Although the prohibition notices applied in their terms only to the Pennyvenie site, Scottish Coal responsibly ensured the introduction of an "all radios" policy thereafter and immediately at all sites. It should, in his submission, be noted that

(a) an all radios policy had already been adopted at Pennyvenie and it was in the process of being introduced incrementally.

20.4.33 There was no convincing evidence that the lack of more speedy introduction was due to financial constraints imposed by Scottish Coal, its board or management. That was more than adequately spoken to by David Paterson, Ian Munro and Andrew Polhill.

20.4.34 In relation to Mr Polhill's evidence, it cannot be said that he was repeatedly making a serious issue of the lack of an all radios policy being applied at Pennyvenie. His recommendation that there should be such a policy was accepted and was in the course of implementation.

20.4.35 It was worth noting that

(b) without being obliged to do by the HSE, Scottish Coal, after suitable consultation with employees and researching of the market introduced and led the industry in introducing offside CCTV cameras in large dump trucks. They also swiftly introduced an effective and workable system for physically ensuring the segregation of large and small vehicles in or around live dig areas.

20.4.36 It was also worthy of note that

(b) Scottish Coal and other operators collaborate systematically with the Health and Safety Executive on safety advisory bodies such as the Quarries National Joint Advisory Committee. Scottish Coal also takes a leading role in COALPRO which likewise through the vehicle of its safety committee regularly looks at safety issues arising in the industry. The existence of these organisations and participation in their deliberations is to be commended.

20.4.37 He considered that it could be observed that

(c) it is incumbent upon manufacturers and users of dump trucks to regularly monitor and ensure the introduction of suitable and sufficient controls so as to keep up with technology in a manner that maintains or indeed improves safety.

20.4.38 It was worth noting the evidence accepted by Mr Buchanan of the HSE that

(d) Scottish Coal takes a leading role in the promoting of health and safety within the industry.

20.4.39 In relation to training, it might be worth suggesting that

(e) consideration is given to those involved in providing training providing that training against a more detailed checklist of competencies than exists at present.

20.4.40 He understood that there is a COALPRO competence working group and a checklist was being provided giving more detail as to what training had to involve and what ought to be tested in the assessment process. A suggestion of introduction of a more detailed checklist against which training and competency testing could be delivered would be timely.

20.4.41 The Crown submissions had attempted to draw a distinction between overtaking and simply passing parked vehicles, but Mr Munro suggested that to all intents and purposes overtaking and passing parked vehicles was the same thing, in the sense that the risk of interaction was the same and it was wrong to suggest that there can be no criticism of the deceased for the route adopted by passing on the offside of parked or stopped trucks. The overtaking rules could be said in context to be designed to prevent that, particularly when training on that rule was weighed in the balance together with the bullet points in the Safety Alert following the 2005 accident.

20.4.42 The Crown had commented that the driving test need not take place until three months after starting, but the evidence was that the site manager or general foreman made an initial assessment and a formal assessment was carried out by a trained instructor, using the same checklist. That was used for Mr Shannon, except that he had an extra competence assessment with Mr Hamilton within the three month period.

20.4.43 The Crown had described the new procedures requiring a three month period before testing as frightening, but he considered that the evidence of Messrs Ritchie and Munro made it clear that the initial assessment was now carried out by an MPQC qualified instructor, with a further assessment within three months by an MPQC qualified assessor and the training was carried out in accordance with a pre-agreed training plan (The evidence indicated that this approach would be fully rolled out by the end of 2011).

20.4.44 He accepted that the competence scheme may need to be updated to reflect that initial and further assessment should be carried out by properly trained trainers or assessors, i.e.

(f) the competence assessment scheme may need to be updated to reflect that initial and further assessment should be carried out by properly trained trainers or assessors.

20.4.45 The Inquiry heard evidence as to the incidence and frequency of HSE inspections of opencast sites. It was not in dispute that, prior to the issuing of the notice by Mr Buchannan, the HSE had never suggested or insisted in the application of an all radios policy. As already mentioned, the application of an all radios policy as a health and safety issue within the industry had, according to the evidence, not been raised in COALPRO or QNJAC.

20.4.46 However, it was clear from the evidence that Mr Buchannan of the HSE had been of the view for sometime that an all radios policy was essential.

20.4.47 Perhaps

(g) the HSE should consider systematically disseminating the advisability of practices which HSE inspectors identify ought, in the interest of safety, to be introduced.

20.4.48 It was said (and not contested) during the Inquiry that the formal procedures for changing regulations and formal guidance are lengthy and complex. Accordingly perhaps some thought should be given by the HSE in consultation, no doubt, with the industry for a speedier more efficient mechanism for the dissemination of good and important best practice identified by inspectors such as Mr Buchannan. i.e.

(h) the HSE should consider, in consultation with the industry, a speedier, more efficient mechanism for the dissemination of good and important best practice identified by inspectors.

20.5 Submissions for HSE

20.5.1 Segregation

20.5.2 The solicitor for the HSE recognised that, while it was the case that both the Site Manager's Vehicle Rules and the Safety Alert were in certain respects unclear or, on a practical level unworkable they nevertheless contained some directions which if strictly followed may have reduced the risk of the accident occurring. The Safety Alert instructed light vehicle drivers never to put their vehicle in the position where it could not easily be seen by others, never to drive or park their vehicle anywhere near the back or front of dump trucks or large plant and never to assume the dump truck operators were aware of their presence.

20.5.2 The rules were impractical and not really capable of being given reality because in practice Land Rover drivers, as an ordinary part of their duties, were expected and indeed required to go into live dig areas. The site was run in a way which was inconsistent with these rules having any value.

20.5.3 Witnesses were unclear about the definition of the "loading zone" in the Site Manager's Vehicle Rules and about the meaning of a dump truck being "under load" in rule 11. Some witnesses felt that a vehicle was under load at the point when it moved off from its queuing position to collect a load from the excavator. That could potentially extend the loading zone from the excavator up to Mr Shannon's vehicle. Other witnesses thought the loading zone embraced a smaller area around the excavator but in general there was a lack of understanding and confusion about the term. Drivers were unclear whether large vehicles should give way to light vehicles or vice versa.

20.5.4 Lip service was paid to any exclusion, because the practice was for vehicles to go into the live dig area.

20.5.5 Rules requiring permission to be given by certain vehicle operators before light vehicles could enter the loading zone or before loading could resume appeared to be largely ineffective and impractical in the day to day operation of the dig because of a lack of effective means of communication. There was an absence of clear evidence of a useful system of hand signals which was widely used and understood.

20.5.6 Although one of the main purposes of the Site Manager's Vehicle Rules and the Safety Alert was to try and exclude light vehicles from the live dig area when large vehicles were moving, and otherwise to provide for safe interaction between the two types of vehicle, the evidence indicated that in practice the Site Manager's Vehicle Rules and the Safety Alert directions were not followed on site.

20.5.7 It was routine for Land Rovers to habitually enter live dig areas unannounced to carry out site inspections or maintenance on excavators. The arrangement that day, which was commonplace, was for the drivers to work off a number of excavators which were close by. When the excavator dropped its bucket the dump truck drivers could either remain stationary and wait for it to resume operation or move off to find another excavator. This practice was stated in evidence by Mr McDougall. The evidence was confused as to whether operators were operating off more than one excavator. Mr Cullen's evidence was that he was waiting and would wait until Mr McDougall's machine was freed up. (His evidence was perhaps not so clear cut as that, although he did say that just waiting was an option).

20.5.8 Mr Cullen said that he might well have carried out the same manoeuvre as Mr Shannon in turning hard right to leave the dig when the excavator dropped its bucket. There was no rule preventing Mr Shannon executing a hard right hand turn. Mr Polhill had never heard of the manoeuvre described as being bad practice or of there being a rule or practice which disapproved of the manoeuvre because it required the operator to drive through his blind spot. It was an ordinary everyday vehicle manoeuvre.

20.5.9 The evidence indicated that dump truck drivers not only required to routinely drive their dump truck in and through the vehicle's blind spot within the dig area but also in other areas of the site, including on the haul road, when the vehicles were parked up before and after the shift and when they were parked up for tea breaks.

20.5.10 Not only did the evidence indicate a failure by supervisory staff to ensure compliance with the existing rules, but it appeared that supervisory and management staff were themselves frequently involved in breaching the existing rules by entering unannounced into the live dig areas in the course of managing the site and carrying out other supervisory duties.

20.5.11 This issue impinged on whether or not it could be said that failings by the Land Rover driver or Mr Shannon contributed to the accident. Were it the case that there were clear rules supervised and enforced which were not complied with, that would be one position, but the situation was that a completely different practice was followed and in such circumstances employees would not normally be expected to be found at fault or to have failed by doing nothing more than following the approved ordinary practices in place with the sufferance of their employers. Trained as he was, Mr Shannon was expected to operate a vehicle in a live dig area from which he could not properly see out front offside. He was expected to do that in circumstances where as a matter of ordinary practice light vehicles could be in the area.

20.5.12 The same considerations applied to the Land Rover operators. They were expected to be in the live dig area in the presence of large trucks operated by men like Mr Shannon who could not properly see. The men did not do anything that could be said to be a failing because they were following this unsafe practice which was being followed with the knowledge of the company's managers.

20.5.13 In ordinary use there was no rule requiring drivers to get out of their seats nor was there any practice to do this in normal usage of the vehicle. The only occasion when drivers might get out of their seat and walk over to the off side to check the position was when they were entering their vehicle after a lengthy stop or when they were moving off at the start of a shift. The matter was in any event left to the discretion of the driver since there was no rule.

20.5.14 If the other operators including Mr Shannon were equipped with two way radios then he could have been warned and the accident may have been prevented.

20.5.15 At the time of the accident Scottish Coal operated an inadequate system for training new dump truck drivers which was not sufficient to ensure that they were competent to safely handle such large and potentially dangerous vehicles. The inadequacy of the training regime was widely acknowledged in evidence including by general foreman, Brian Robertson, by Andrew Polhill, the site safety adviser for Scottish Coal and by witnesses from the Health and Safety Executive. Since the accident a more structured and effective approach to training has been introduced. While the training regime has been substantially improved, there was still the risk that a new driver could be permitted to work unsupervised on site a number of weeks prior to being properly tested because of the continued rule permitting a period of three months before testing.

20.5.16 Whether or not Mr Shannon had been reading a newspaper it was doubtful that he would have had any more of an opportunity to observe the approaching Land Rover. Reference was made to the evidence of Mr Ferreira, the HSL Ergonomist. There was a lack of conspicuity between the colouring of the Land

Rover and the body of Mr Shannon's truck with little or no contrast. The truck's equipment on the off side created further obstructions and barriers. A driver could not be expected to constantly be watching his mirrors which at best might only provide a restricted or fleeting view of an approaching vehicle. He stated on page 12 of his report that the reconstruction demonstrated that "the image of the Land Rover as it approached along the off side was particularly difficult to detect". It also appeared that Kevin Cullen's truck which was located behind Mr Shannon may to some extent have limited his rear view.

20.5.17 On page 13, 3.4 of his report Mr Ferreira states:-

"It is especially difficult to direct attention to several different objects or places on a regular and high frequency basis while waiting for any period of time. A more active means of alerting the operators' attention to entry of smaller vehicles in the dig area would be required".

20.5.18 Close analysis of the evidence indicated that Scottish Coal's rules prior to February 2007 did not seek to segregate but rather attempted to safely manage the interaction of large and small vehicles in the live dig area. Ultimately, it appeared that at the time of the accident the rules had little application in the day to day activities on site. Segregation, in the true sense of the word was given effect to and was made a reality only after the accident occurred.

20.5.19 Section 6(1)(c) - reasonable precautions

20.5.20 It was suggested that the installation of visual and communication aids would have improved the situation and might have avoided the accident. Reasonable precautions would have been:

1. *Installation of additional visual and communication aids as follows:-*
 - (a) *in the dump truck a front off side camera and monitor which might have alerted the driver to the presence of the Land Rover;*
 - (b) *in the dump truck a two way communication radio which could have been used to alert the driver to the presence of the Land Rover; and*
 - (c) *on the Land Rover modifications to make it more visible such as installation of a buggy whip with a flashing beacon.*
2. *By otherwise alerting the dump truck driver to the presence of the Land Rover in close proximity such as by direct communication with Mr Shannon by another operator.*
3. *The implementation and management of an effective system for the segregation of large dump trucks and smaller vehicles such as Land Rovers would have been likely to significantly reduce the risk of such an accident.*

20.5.21 There seemed to have been a lapse of a number of seconds between Mr Shannon setting off to execute the turn before striking the Land Rover – not only would a routine system of alert of a Land Rover entering the dig have been effective to flag up its presence, but even if it had not been picked up, if radios had been provided, warning would have been shouted to Mr Shannon.

20.5.22 The solicitor for the HSE accepted that there was a distinction between the practice in using radios and using front offside cameras – there was more widespread recognition of radios. That did not mean that it would not have been a reasonable step to take; the court did hear from Mr Buchanan about its use by some operators and that front offside cameras were not uncommon in some sectors of the construction industry. It was not therefore an unusual or novel form of technology. The clear risks had been identified.

20.5.23 Section 6(1)(d) - defects in system of working

1. *Absence of an effective system segregating large and small vehicles in the dig area;*
2. *A failure to effectively manage and supervise activities in the dig area involving the interaction of large and small vehicles including the practice of small vehicles routinely entering the operational or "live" dig area when dump trucks were moving, including at the time of the accident;*
3. *Inadequate training of dump truck operators;*
4. *Lack of adequate plant and equipment in both the dump trucks and Land Rovers comprising visual aids such as front off side cameras on the dump trucks to eliminate the front off side blind spot, on the Land Rovers buggy whips with flashing beacons and prominent body paint to increase visibility and absence of two way radios for both large and small vehicles.*

20.5.24 Section 6(1)(e) - any other relevant factors

1. *A similar accident occurred at the Pennyvenie site in March 2005 but the site operator, the Scottish Coal Company Limited ("Scottish Coal") failed to introduce an effective and safe system which changed unsafe practices, which appear to have continued and which ultimately led to the accident.*
2. *The effective introduction by Scottish Coal post accident of universal radios and off side front cameras on all large dump trucks such as the Terex TR 100. Evidence at the inquiry indicates that off side front cameras have substantially improved the driver's visibility by eliminating or reducing the off side blind spot. This has improved safe use of the dump trucks not only in the dig area but also in other parts of the site where the driver will routinely require to drive into or through his blind spot.*
3. *Evidence showed that universal introduction of site operators' radios in vehicles across both Scottish Coal's various sites and in the remainder of the Scottish open cast industry has improved communication and safety in the movement and interaction of large and small vehicles on site. Evidence has indicated that effective off side front cameras and radios can be installed at relatively low cost.*

20.5.25 Recommendations directed towards avoiding a similar accident occurring:-

20.5.26 The Health and Safety Executive would welcome any recommendations from the court that

(a) Awareness should be raised within the open cast coal mining industry of the availability, benefits and utility of off side front cameras and two way radios, such as by placing information on the Health and Safety Executive's website which can be accessed by the industry, by raising these matters with any working groups concerned with update of the guidance attached to the relevant Approved Code of Practice ("ACOP") and by advising organisations concerned with safety within the industry such as the Quarries National Joint Advisory Committee ("QNJAC") and the coal producers organisation, the Confederation of UK Coal Producers ("COALPRO").

20.5.27 Any such recommendations should recognise that

(b) the primary control measure is an effective system of segregation of large and small vehicles in quarries.

20.5.28 Both Mr Buchanan and Mr Waugh of HSE accepted that it would be of benefit in preventing recurrence of a similar accident to raise awareness of the usefulness and availability of both radios and off side front cameras in large dump trucks of the type involved in the accident.

20.5.29 Echoing the submission for SCC, the solicitor for HSE submitted that it is incumbent both upon the manufacturers and users of such equipment to introduce suitable and sufficient controls and to keep up with technology to maintain safety

20.5.30 The solicitor for the HSE agreed that the Quarries Regulations did not raise the issue of segregation directly. There is, however, a working group currently reviewing the provisions and the guidance attached to the ACOP.

20.6 Submissions for Terex Ltd

20.6.1 Section 6(1)(c) - reasonable precautions

20.6.2 On additional aids to conspicuity of vehicles, the solicitor for Terex indicated that they would adopt the position of SCC on the effectively non-existent use of offside cameras at the time of the 2007 accident. It was an unusual and exotic technology and indeed Mr Ferreira in his recommendations made no mention of fitting of offside cameras and said that he had not seen them or considered them at that time. Mr Camsell of Terex said that he was unaware of other operators worldwide fitting offside cameras in the opencast industry at the time of the accident. There was evidence of practical issues around the introduction of offside technology – it was not simply a case of fit it and everything will be better.

20.6.3 The Terex TR100 vehicle which was supplied to Scottish Coal and driven by Alan Shannon satisfied the visibility requirements laid down by the Supply of Machinery Safety Regulations 1992. Terex placed warnings in their operator's manual which was supplied to Scottish Coal in relation to visibility and site arrangements. Mr Camsell had confirmed that on delivery of a Terex vehicle to site, a Terex demonstration driver attended the site and provided a familiarisation procedure to a nominated representative of Scottish Coal.

20.6.4 Following the introduction of the new visibility standards which were released in 2006 (ISO5006 2006) Terex carried out modifications to TR 100 vehicles including the introduction of additional visibility aids which allowed them to comply with the new 2006 standards, notwithstanding that they apply only to dump trucks up to 50 tonnes unladen. The importance of site management and visibility are covered in detail in the operator's manual, including instructions on adjustment of visibility aids and diagrams in relation to visibility around the vehicle.

20.6.5 At the time of the accident in 2007, offside cameras were not in widespread use within the opencast mining industry. Indeed, in the findings made within his report, Mr Ferreira of the HSL made no recommendation that offside cameras should be fitted to dump trucks. He did not consider their use. There was no Regulation or Standard in relation to the use of offside cameras within the opencast industry.

20.6.6 It was submitted that the use of additional aids to conspicuity was of necessity a site-specific issue which required to be considered by users in the context of overall management of their site. Mr Camsell is a member of a committee which is involved in the revision of ISO5006 which is due to take place in 2011 and aims to raise the issue of the increasing availability of offside cameras in connection with development of standards.

20.6.7 Section 6(1)(e) - any other relevant factors

20.6.8 Terex endorsed the HSE's comments in relation to proposed recommendations from the Court that

awareness should be raised within the opencast coal mining industry of the availability, benefits and utility of offside front cameras, such as by placing information on the Health and Safety Executive's website; by raising these matters with any working groups concerned with update of the guidance attached to the relevant Approved Code of Practice, and by advising organisations concerned with safety within the industries such as the Quarries National Joint Advisory Committee and the coal producers organisation, the Confederation of UK Coal Producers.

20.6.9 On the possibility of recommendations about the use of offside camera technology, the manufacturers had not been standing still and Mr Camsell had described that, when he spoke of ongoing trial of offside cameras and the recent introduction of a six camera system.

20.6.10 There had been an initial meeting in relation to standards and the issues of the limitations of the current standard and of evolving technology in relation to offside cameras had been raised.

20.6.11 In discussion during the evidence, the question of an industry standard had been raised as a possible recommendation, for the industry itself.

21 Discussion and Conclusions on submissions

21.1 Witnesses

21.1.1 In assessing the evidence of witnesses, I found the vast bulk of them to be truthful and largely reliable and doing their best to assist the Inquiry. In a number of cases I am sure that the combination of passage of time and their continuing to work on the same or other sites under new procedures has to some inevitable extent confused them in their recall.

21.1.2 In a small number of cases I have significant reservations about the evidence of witnesses. Mr Shannon was a particularly difficult witness. He has apparently been traumatised by his experience and has had subsequent problems with alcohol and required medication following the accident. Taking account of all of that, I did not find his frequent recourse to having no memory of key events – not just in relation to the accident – wholly plausible. It was difficult to explain why some aspects of his training and experience were very clear and others were not recalled at all. I am reluctant to place reliance on his evidence without corroboration.

21.1.3 Mr Frew appeared to have an axe to grind against SCC and was significantly less than frank about his own somewhat chequered work and discipline record and I was not willing to place particular reliance on his evidence.

21.1.4 As I have already noted, the evidence of Mr Phillips as regards how he trained Mr Paterson was wholly compromised by his unconvincing efforts to explain away the inconsistency of his initial evidence with the written records, such as they are, of Mr Shannon's training. I have treated the remainder of his evidence with caution.

20.1.5 Mr Paterson was a more difficult witness to assess. On the whole I considered that he was doing his best to tell the truth, but that his evidence was coloured by his unreasonable and at times naïve reliance on rules and procedures (written and customary), even where the written rules were evidently inadequate. On the subject of radios, I did not accept his evidence concerning the conversations with Mr McCulloch about more radios; I considered that he would have remembered such conversations and concluded that Mr McCulloch's evidence was to be preferred. More generally on radios, I found his efforts to convince the court that he was trying to increase radio coverage unconvincing and at points contradictory.

21.1.6 His seemed firmly and perversely to be of the view that communication by radio was second best to face to face communication by hand signals. Radios as he saw it, were not absolutely vital because the company and the industry survived without them "for a long, long time before" (Day 20, page 114). One wonders

whether, in a previous age, he might have made the same comment about deep mining and the Davy lamp.

21.2 Segregation

21.2.1 It was accepted that segregation is or should be the primary control to avoid accidents between heavy and light vehicles. As Mr Ferreira stated, segregation would probably have the greatest possibility of reducing the level of risk. Once it is in place it becomes almost a passive control, in that it does not require anyone to do anything to get it right: someone has to violate the measures in place for it to fail. Passive controls are more desirable because they essentially work on their own as a control measure – they do not rely on other controls, like mirrors which rely on a person actually looking at the mirror at the right time and taking appropriate action.

21.2.2 There was a significant body of evidence from operators, including the leading driver, to the effect that there was regular interaction in dig areas between small vehicles and dump trucks and that it was not general practice for dig areas to be cleared before Land Rovers approached excavators. Only Mr Paterson and (to some extent) Mr Robertson were prepared to say that dig areas would be cleared before Land Rovers approached excavators. Even Mr Robertson agreed there could be the odd occasion when a Land Rover entered somewhere it should not be, mostly nine times out of ten he would speak to them and advise them they should not be there.

21.2.3 Mr Hamilton, one of the two company trainers thought that fitters were entitled to clear areas themselves using eye to eye contact and his colleague Mr Ritchie said that prior to 2007 there were situations where light vehicle operators were driving their vehicles into live dig areas potentially with active operations ongoing, although they were advised not to do it and in most cases supervisors would be advised of the situation. Mr Kyle, the site engineer, said it was quite a regular thing for Land Rovers to come in to dig areas. From time to time he would go in to a dig area without supervisors knowing and the area would not have to be cleared. Mr Oglesby – who was the plant engineer and in overall charge of the fitters – said in his statement that a fitter would drive up to the excavator and try to gain attention by hand signals or by flashing lights.

21.2.4 It was submitted by the solicitor for SCC that there was scant evidence of unsafe interaction, specifically under reference to the evidence of Messrs Cullen, Murray and Kyle, stating that any suggestion that they were talking about routine unsafe interaction was at least diluted.

21.2.5 It was clear from Mr Cullen's evidence that he had been surprised by the presence of Land Rovers on a couple of occasions; they just seemed to appear, probably both on haul roads and dig areas and that could have resulted in collisions if he had acted or driven in a different way; it happened when he was stationary, but as far as he was concerned collision was a real risk.

21.2.6 Mr Murray said that he saw Land Rovers circulating in active areas all the time. They would be in the area where trucks were waiting or queuing to be loaded five to ten times a shift (eliciting the reaction: "that's just the supervisor's Land Rover") (Day 1, page 140) in close proximity to active dump trucks - and it was left

to them seeing each other. He never had a near miss but sometimes they were a nuisance.

21.2.7 It was true that Mr Kyle said that he had no reason to believe that Land Rovers were coming into dig areas in a way that was unsafe, but he stressed that, although it was quite a regular thing for Land Rovers to come into a dig area, he did not see that on a regular basis and was only up on site maybe once a day. He was less well placed than other witnesses to form a view on what was unsafe.

21.2.8 The solicitor for SCC submitted that there was no driver who was prepared to say that interaction between large and small vehicles was happening in a manner that was thought to be unsafe or that did not involve suitable communication, other than one or two instances – and that was not the same as a systemic defect and was certainly not the same as a systemic defect that as a matter of fact contributed to this accident.

21.2.9 I considered that Mr Polhill's evidence that you would need to examine the circumstances to know if Land Rovers were coming into uncleared dig areas unsafely was very telling. Obviously, if there is a near miss, interaction is unsafe, but if, as was clear from the evidence, interaction was regularly unannounced, whether it was in fact unsafe, in the sense that there was potential for an accident, would be dependent on the alertness of the drivers – and whether they were looking in the right direction or in the right visual aid at the right time.

21.2.10 There was some discussion in evidence about theories of probability in respect of the number of near misses or potential accidents that there might be for every actual accident. There was no clear evidence as to how reliable these theories are in the context of plant of the nature used on an opencast site, but the nature of the heavy plant used did clearly mean that any accident was more likely to have catastrophic consequences.

21.2.11 There was much discussion of the Site Manager's Vehicle Rules and the solicitor for SCC placed great emphasis on these as establishing a system of segregation. But that appeared to turn to a great extent on the interpretation of these rules and observance. The only relevant area within which any sort of segregation was required by the rules was the loading zone, but no two witnesses were able to agree what the loading zone was with reference to the accident and, on one possible interpretation, it did not include the area where the Land Rover ended up.

21.2.12 Even if it is understood what the loading zone is, the weakness in confining segregation to a very small and movable area is that there can be dangerous and largely uncontrolled interaction outside that area.

21.2.13 There was significant discussion of the overtaking rules, but again it was not generally accepted that the manoeuvre carried out by Messrs French and Ferguson in passing the dump trucks driven by Messrs Cullen and Shannon was in the nature of overtaking. Careful dictionary or conveyancing-type analysis indeed misses the point: it is whether and how the rules are understood by those working under them that matters. And then it is how and whether they are applied that really matters. The ACOP identified the need for "Good, well-enforced, vehicles rules".

21.2.14 There was nothing in the rules that stopped Messrs French and Ferguson going in to the dig area without a radio. The only system of communication available to them would have been hand signals. Mr Paterson had a naïve belief in the virtue of eye-to-eye contact and hand signals, but the eye witness evidence from the accident is very telling as to the weakness of relying on such contact. Mr MacDougall explained that at the time of the accident he had eye to eye contact but was not sure of Alan Shannon was signalling to Kevin Cullen or him.

21.2.15 I agree with the Crown submission that there was no acceptable explanation of how segregation could be ensured on the Pennyvenie site prior to 2007 in the absence of universal radios.

21.2.16 But I conclude that the overall approach to segregation was fatally flawed: it was unclear in its scope, it was not rigorously observed in practice and it relied on methods of communication that were themselves unreliable. Had there been an adequate system of segregation, properly enforced, the accident would not have occurred and **I therefore have no difficulty in concluding that the underlying cause of the accident was an absence of an effective system of segregation between large and small vehicles.**

21.3 *Finding as to cause of the accident*

21.3.1 Accordingly, I find that

(3) In terms of section 6(1)(b) of the 1976 Act the cause or causes of the accident resulting in the deaths was the absence of an effective system of segregation between large and small vehicles, whereby a Terex TR 100 dump truck, driven by Alan Shannon, turned sharply to the right on moving off from a stationary position and collided with and crushed a Land Rover, driven by Colin Ferguson and occupied by him and Brian French, which was sitting stationary to the front offside of the dump truck in an area which would have afforded no or limited visibility to Alan Shannon, killing both of the occupants of the Land Rover.

21.4 *Section 6(1)(c) – reasonable precautions*

I will deal with what might be regarded as more specific possible precautions before turning to those of more general application

21.4.1 *Radios*

The Crown invited me to find that it would have been a reasonable precaution if the occupants of the Land Rover had obtained access to a radio which could have allowed for communication with the leading driver or supervisor to allow drivers to be alerted to their presence. The test is not whether the accident would have been avoided, but whether it might have been avoided and, having regard to all the evidence, in the context of how the site actually operated, I conclude that the accident might have been avoided

If the deceased had obtained access to a radio and used it to request the leading driver, the supervisor or the excavator operator to alert others to their entry to the dig area.

21.4.2 *Communication*

I agree with the solicitor for the HSE's submission at least in circumstances where there was inadequate radio coverage that it would have been a reasonable precaution:

If the dump truck driver, Alan Shannon, had been alerted to the presence of the Land Rover in close proximity by means such as direct communication with Mr Shannon by another operator.

21.4.3 *Actions of the deceased*

21.4.3.1 The solicitor for Scottish Coal invited me to find it would have been a reasonable precaution if the deceased had not decided to travel along the offside of Mr Shannon's Terex TR100 dump truck, stopping in its blind spot and the solicitor for Alan Shannon made a similar submission.

21.4.3.2 The Procurator Fiscal Depute submitted that there could be no criticism or the deceased for the route adopted given what appeared to be the custom and practice on site at the time. He did not consider that it would have been a reasonable precaution for Messrs French and Ferguson not to enter along a route similar to what they did, because it was in accordance with what was expected of them. The solicitor for the HSE made submissions to similar effect.

21.4.3.3 A finding as to reasonable precautions can, of course, be informed by hindsight, but when it relates to the conduct of individual operators I consider that it is reasonable to examine it in the context of the system under which they were operating. Certainly they had both been trained in the limited visibility from dump trucks and should have been aware that they were placing themselves in a dangerous position, but in the absence of any properly enforced system of segregation, I do not consider it appropriate to highlight their conduct in this regard in this way.

21.4.4 *Actions of Alan Shannon*

There were a number of suggested findings

21.4.4.1 *Reading of a newspaper*

21.4.4.2 The Crown suggested a finding:

If Alan Shannon had not read a newspaper whilst waiting to be loaded

21.4.4.3 The solicitor for SCC suggested a variant:

If Alan Shannon had paid more attention and in particular had not been reading a newspaper in the cab of his vehicle.

21.4.4.4 I am satisfied that Mr Shannon was indeed reading a newspaper. I found Mr Murray's evidence in this regard credible and reliable. It would not require corroboration, but it was strongly corroborated by the evidence of the newspaper being found on the passenger seat and also supported by the evidence of Mr Stewart who spoke of Mr Shannon's anxiety to return to the cab and retrieve his bag – an anxiety which it was difficult to understand. I considered Mr Shannon's evidence as to the circumstances in which the newspaper ended up on the seat as highly improbable. It was suggested on Mr Shannon's behalf that, as an inexperienced driver he would have been unlikely to risk his job by reading a newspaper, but standing the body of evidence that he was doing just that I conclude that it was consistent with the evidence about his generally over-confident behaviour on the site.

21.4.4.5 I was not asked to conclude that if he had not read the newspaper the accident would not have happened. As I have already observed, his ability to see the Land Rover would have been very limited, even if he had been more attentive; but by reading the newspaper he has effectively deprived himself of the opportunity of seeing the vehicle as it passed. I consider that the relevant precaution is properly stated in the context of paying attention and thus as proposed by Scottish Coal and I therefore find that it would have been a reasonable precaution

If Alan Shannon had paid more attention and in particular had not been reading a newspaper in the cab of his vehicle.

21.4.4.5 Use of full lock or sharp turn

21.4.4.6 The Crown proposed a finding:

If Alan Shannon had driven forward and then turned right.

21.4.4.7 Scottish Coal proposed a variant:

If Alan Shannon had not turned sharply into the blind spot of his vehicle.

21.4.4.8 Mr Shannon's solicitor resisted those findings on the basis that a reasonable precaution can only be taken by a person if they are, or should have been, at the time leading up to the accident in possession of facts that would lead a reasonable person to take such precaution. All of the dump truck drivers who gave evidence to the inquiry said that what Mr Shannon did was not prohibited and something that they themselves would have done in the past. As Mr Polhill rhetorically asked "What did the driver do wrong?" That comment rather undermined suggestions that Mr Shannon's driving flew in the face of common sense.

21.4.4.9 Moreover, it was submitted that he was entitled to make such a manoeuvre based upon what he expected his fellow workers to be doing. He was entitled to assume from the Safety Alert which he had been shown at induction that his work colleagues were also aware of its terms and he had a legitimate right to expect that others, in particular light vehicle operatives, would adhere to its terms.

21.4.4.10 I do not accept Mr Shannon's solicitor's submissions as regards the Safety Alert. In the first place, Mr Shannon did not accept that he had definitely seen it, although he conceded that it may have been shown to him – but neither position would provide any strong basis for his relying upon it. In any event a document which warns plant operators such as dump truck drivers about the requirement to check visibility aids and blind spots and tells them "Always be alert to the presence of light vehicles" is hardly giving them encouragement to treat blind spots as safe places into which to drive.

21.4.4.10 On the other hand, unlike the position of the deceased, who had been trained on visibility appreciation and the risks presented by dump trucks, there was no reliable evidence that Mr Shannon had been trained not to make a sharp turn from a stationary position. There was no requirement to cover it in training or assessment. Mr Phillips stated that he told Mr Shannon he had to drive forward and then turn and that he told every driver that, but I regarded his evidence as to Mr Shannon's training as wholly compromised by his about turn on the length of his training; he was not credible. While Mr Hamilton thought he would have tested Mr Paterson on his knowledge of the blind spot, he accepted that there was nothing in the test which would have specifically examined right hand lock from setting off. It is true that, in cross examination, Mr Shannon conceded that it rang some sort of bell that part of his training was that even if he was intending to turn right he should begin by driving forward to make sure it was safe to be turning right, but this seemed a shaky basis for concluding that he was so trained, standing the absence of documentation and the unreliability of Mr Phillips. Mr Paterson himself had little direct evidence to contribute, having only dealt with the 2005 accident in respect of which his evidence was not, in any event entirely clear.

21.4.4.11 In the absence of any clear evidence that Mr Shannon was trained not to make a sharp turn from a stationary position and standing extensive evidence that such manoeuvres were common on site and in light of earlier consideration of the issue in the context of the cause of the accident, I do not consider that it would be appropriate to highlight Mr Shannon's conduct in this regard in the context of reasonable precautions.

21.4.4.12 Response to meeting resistance

21.4.4.13 The Crown submitted that it would have been a reasonable precaution:

if Alan Shannon had reversed or stopped when faced with an obstruction large enough to offer resistance to a 100 tonne truck that had 2 metre diameter wheels.

21.4.4.14 Mr Shannon had no recollection of meeting an obstruction, rolling back and attempting to surmount it, but it is clear from the evidence of Messrs Cullen and McDougall that he did persist over a period of time in attempting to surmount an obstacle. Mr Shannon's solicitor maintained that it would only have been a reasonable precaution for him to have reversed if that was something that Mr Shannon ought to have been aware of having to do in such circumstances. Although there was no documentary evidence that this was covered in training, Mr Shannon did concede in cross-examination that he was told to avoid boulders or large pieces of

stone and was trained to see if you could avoid going over such an obstruction and reverse away if you could. He agreed that he was told to avoid large objects.

21.4.4.15 While Mr Hamilton's evidence that he probably would have explored the subject with Mr Shannon was weak, I have little difficulty in concluding that, as a matter of common sense as well as in light of Mr Shannon's concession, a driver of heavy plant encountering resistance where there should be none should know not to attempt to surmount it without establishing what the obstacle is and that it can be safely surmounted and I am therefore prepared hold that it would have been a reasonable precaution

If Alan Shannon had reversed or stopped when faced with an obstruction large enough to offer resistance to a 100 tonne truck that had 2 metre diameter wheels.

21.4.5 *Specific precautions by Scottish Coal*

21.4.5.1 In this category I examine precautions which are specific to the accident, although they could clearly be encompassed within more general precautions. Thus, it was suggested by Mr Shannon's solicitor that it would have been a reasonable precaution

If Scottish Coal had ensured that dump truck drivers drove forward before turning right

and

If Scottish Coal had ensured that dump truck drivers reversed or stopped when faced with an obstruction large enough to offer resistance.

21.4.5.2 Although it was not raised as a reasonable precaution in the same way, by parity of reasoning it would be appropriate to consider a reasonable precaution:

If Scottish Coal had ensured that the deceased had not decided to travel along the offside of Mr Shannon's Terex TR100 dump truck.

21.4.5.3 Since I do not consider it appropriate to identify the conduct of the individuals in this context I think it is appropriate to identify the failure by SCC. Accordingly I find that the following would have been reasonable precautions:

If Scottish Coal had ensured that dump truck drivers drove forward before turning right wherever possible.

If Scottish Coal had ensured that dump truck drivers reversed or stopped when faced with an obstruction large enough to offer resistance.

If Scottish Coal had ensured that light vehicles did not travel along blind areas on the offside of dump trucks without advance communication with the dump truck operator.

21.4.6 *General precautions by Scottish Coal*

21.4.6.1 *Newspapers*

21.4.6.2 Mr Shannon's solicitor recommended a general prohibition on taking newspapers into vehicles. While I accept that such a prohibition would be a precaution whereby the accident might have been avoided, I consider that the existence of a rule against reading newspapers ought to be sufficient, if it is rigorously and consistently enforced. The evidence was that it is now rigorously and consistently enforced. I am not prepared to find that a blanket prohibition is a reasonable precaution.

21.4.6.3 *Provision of radios for all operators*

21.4.6.4 It was accepted by parties that such a finding would be appropriate. Provision of radios would not of itself necessarily prevent an accident. It was true that both the relevant operators in the 2005 accident had radios and Mr McCulloch did not attempt to communicate with the dump truck driver, but the context of an operation where only some operators have radios and there are no clear rules or protocols on the use of radios was very different from the system in place now where all operators have radios and have clear rules and guidance on their use. Such a system, which was speedily put in place following the prohibition notice served by Mr Buchanan of the HSE, would self evidently have been much safer.

21.4.6.5 I will return to the question whether failure to provide universal radios was a systemic defect, but I consider that it would have been a reasonable precaution:

If there had been universal radios on site and there had been clear rules and protocols requiring the use of such radios for communication in relation to interaction of vehicles.

21.4.6.6 *Additional aids to conspicuity*

Although the submissions for the HSE were directed to the particular vehicles, I treat them as properly more general in character and essentially to similar effect as those of the Crown. There was broad agreement and I find that it would have been a reasonable precaution

If there had been improved conspicuity of light vehicles, in particular by the attachment of buggy whips to all Land Rovers.

21.4.6.7 Offside camera

21.4.6.8 On the other hand, the solicitor for SCC resisted the submission that installation of front off side cameras and monitors on dump trucks would have been a reasonable precaution. He drew attention to Mr Buchanan's evidence where it was in effect conceded that in determining whether or not a particular measure should properly be described as a reasonable precaution regard should be had to the industry standard; and there was no industry standard applicable at the time whereby offside cameras and monitors were fitted.

21.4.6.9 It was submitted that there were legitimate issues expressed in the course of the Inquiry as to the fitting of an offside camera and practical difficulties in relation to their operation. It would be an over-application of the benefit of hindsight to categorise lack of fitting of an offside camera that no one else had thought of fitting to these trucks as a reasonable precaution.

21.4.6.10 While I accept that off-side cameras were not immediately identified by the HSE as necessary for the safe operation of the site and indeed did not feature in Mr Ferreira's recommendations, it is quite clear on the evidence that an off-side camera and monitor would have improved the dump truck driver's visibility (had he not been reading a newspaper). Although CCTV technology is well established and common in many walks of life, there was little evidence of its use for the purpose of mitigating off-side blind spots and there were undoubtedly issues that required to be addressed in relation to how it could be set up on a dump truck in a way that ensured that it enhanced rather than distracted from the operator's ability to scan multiple visibility aids.

21.4.6.11 Scottish Coal were, of course, well aware of the extent of the extent of the offside blind spot on a Terex TR100 and of the need to apply state of the art in addressing it.

21.4.6.12 With the benefit of hindsight, which I am entitled to bring to bear on this issue, and recognising that installation of offside CCTV would be ahead of the industry and standards, I do conclude that it would have been a reasonable precaution:

If there had been installation of front off side cameras and monitors on dump trucks.

21.4.6.13 Segregation

21.4.6.14 The solicitor for the HSE submitted that the implementation and management of an effective system for the segregation of large dump trucks and smaller vehicles such as Land Rovers would have been likely significantly to reduce the risk of such an accident.

21.4.6.15 I consider that it necessarily follows from my finding as to the cause of the accident that such a system was a reasonable precaution whereby the accident might have been avoided and I therefore find that it would have been a reasonable precaution:

If an effective system for the segregation of large dump trucks and smaller vehicles such as Land Rovers had been implemented and managed.

21.5 *Section 6(1)(d) – defects in system of working*

21.5.1 *Communication and radios*

21.5.1.1 The Crown submitted that there was a lack of any proper system of communication on the site and the absence of universal radio coverage was also relevant to the question of systemic defects.

21.5.1.2 The solicitor for SCC resisted the conclusion that the non-operation on an "all radios" policy represented a systemic defect which as the matter of fact contributed to the accident. He submitted that the system that SCC had in operation at Pennyvenie in relation to radios was that they had adopted an all-radios policy and were in the course of implementing it, albeit perhaps too slowly in the way it turned out.

21.5.1.3 I do not accept that. Mr Paterson's evidence does not support such a contention beyond at best a vague aspiration. He said that he was buying radios now and again to try to increase coverage and that the ideal was to have radios in everything, but although full coverage would probably have happened over time, he did not see it as a "must do now necessity" (Day 18, pages 189-90). He stated that it was only on the day of and after the accident that SCC had decided that radios were necessary on virtually all plant and vehicles and he was not able to say why it was decided that they were then required. Mr Polhill had certainly been urging an all radio policy, but beyond instructing managers to identify the need for radios, the company had done little to adopt or implement such a policy.

21.5.1.4 Mr Paterson's attitude to radio was at best highly sceptical. He had a faith in the use of hand signals which was bizarre. There was no evidence to back up his claim that he was increasing radio coverage. If he had indeed purchased additional handsets for fitters, they had been rapidly depleted by damage and loss. I did not find his evidence as to the conversation with Mr McCulloch about radios to be in any way convincing; on the contrary, I found no reason to disbelieve Mr McCulloch, despite the attempt to discredit him by reference to a claimed grudge against the relevant director, Mr Hodgson, who had refused to sanction the purchase of radios for the Terex, according to what Mr McCulloch had been told by Mr Ramsay. Neither Mr Hodgson nor Mr Ramsay gave evidence.

21.5.1.5 It was suggested by the solicitor for SCC that, since a replacement radio was available to Messrs French and Ferguson but was not collected, it could not be said against that factual background that the lack of an all-radios policy was a system defect that as a matter of fact did contribute to the accident. Moreover, it was worth bearing in mind in this context that the 2005 accident happened despite both operatives concerned having radios.

21.5.1.6 I disagree with these submissions. Indeed, the failure by Mr McCulloch to use the radio for communication with the truck driver in 2005 highlights the need

for a radio policy – not just for allocation of radios, but also as regards their use. Both now exist. It seems to me that it is only if everyone has a radio (and thus knows that everyone else has a radio) and there is a clear protocol and rules as regards communication is it likely that radio would be used when accessing dig areas.

21.5.1.7 I conclude that there was no adequate system of communication on site, including radio communication and that the defects in the system of working which contributed to the deaths or accident included:

The absence of an adequate system of communication on site, including a universal radio policy and clear rules and protocols requiring the use of such radios for communication in relation to interaction of vehicles.

21.5.2 Visibility aids

21.5.2.1 The solicitor for the HSE submitted that the following were system defects:

Lack of adequate plant and equipment in both the dump trucks and Land Rovers comprising visual aids such as front off side cameras on the dump trucks to eliminate the front off side blind spot, on the Land Rovers buggy whips with flashing beacons and prominent body paint to increase visibility and absence of two way radios for both large and small vehicles.

21.5.2.2 I have already addressed the question of radios.

21.5.2.3 Unlike findings as to reasonable precautions, which are properly an exercise in hindsight, I consider that findings as to systemic defects require to be made in context. For reasons which I have explored already in connection with reasonable precautions I do not think that, without hindsight, it could be said that it was a defect in the system of working not to have utilised front offside cameras and I am not prepared to make such a finding.

21.5.2.4 On the other hand, the failure to ensure greater conspicuity of Land Rovers by the simple, readily available and inexpensive expedients of buggy whips and body paint, can readily be identified as steps which were open to SCC and which made the Land Rover occupied by the deceased less visible to Mr Shannon. Whether a more conspicuous Land Rover would have drawn Mr Shannon's attention away from his newspaper is open to question, but I conclude that it is a possibility and thus that the defects in the system of working which contributed to the deaths or accident included:

Lack of aids to conspicuity of Land Rovers, including buggy whips with flashing beacons and prominent body paint.

21.5.3 Segregation and traffic management

21.5.3.1 There were a number of, to some extent overlapping, recommendations from parties as to findings:

Absence of an effective system segregating large and small vehicles in the dig area (HSE)

A failure to effectively manage and supervise activities in the dig area involving the interaction of large and small vehicles including the practice of small vehicles routinely entering the operational or "live" dig area when dump trucks were moving, including at the time of the accident (HSE)

Absence of an effective system for dealing with breakdown and unplanned maintenance situations (Crown)

The system of dump trucks being entitled to operate off more than one excavator, which created a system of uncertainty for dump truck and light vehicle drivers (Alan Shannon)

Inadequate system of traffic management (Crown)

21.5.3.2 In consequence of my finding as to the underlying cause of the accident, a finding as to systemic defect is inevitable in relation to segregation, but the submissions of parties on specific aspects of segregation have assisted me in elaborating on such a finding.

21.5.3.3 The first four heads mentioned above are clearly established in evidence.

21.5.3.4 I have already specifically examined the evidence on the first and second heads and that has also involved the evidence around the system relating to fitters obtaining access to excavators; in that connection there were neither clear rules nor clear, safe, practice.

21.5.3.5 The system of dump trucks being entitled to operate off more than one excavator seemed to be unique to Pennyvenie and was criticised by a number of witnesses including Mr Buchanan (who described it as a free for all: uncontrolled traffic movement would be the greatest concern) and Mr Polhill (who said there was a danger of creating a great big loading zone with multiple excavators and multiple trucks).

21.5.3.6 There is now in place a sophisticated traffic management system which all witnesses acknowledged has improved site safety and safe interaction of vehicles. It does not automatically follow that the absence of such a system was a systemic defect.

21.5.3.7 In the submission of the solicitor for SCC, there was a failure in segregation, but that was not eloquent of a systems failure which contributed to the deaths. It spoke rather of mistakes having been made within a system which generally speaking was designed to ensure segregation and generally did ensure segregation or only safe interaction in the absence of segregation. There was a traffic management system which discouraged and prevented interaction other than safe interaction between vehicles. Traffic management on the site could have been better, but his submission was that in looking at the causes of the accident the lack or failures in

supervision of the traffic management on the site could not be seen to have been a cause of the accident (or, it would seem, to have contributed to the accident).

21.5.3.8 However, given the lack of clear guidance in the Site Manager's Vehicle Rules as to how entry was safely to be effected into the loading zone and the inadequacy of the concept of a loading zone as a criterion for safe interaction of vehicles, I can only conclude that there was no adequate traffic management system.

21.5.3.9 The issue was perhaps focused most clearly in the evidence of Mr Polhill of SCC: if there had been a supervisor present to enforce the rules, assess the risk and make sure traffic was organised properly the accident would not have happened.

21.5.3.10 Considering the proposed findings together and taking account of overlap, I thus find that the defects in the system of working which contributed to the deaths or accident included:

The absence of an effective system of segregation of large and small vehicles in the dig area.

The absence of an adequate system of traffic management.

The practice of small vehicles routinely entering the operational or "live" dig area when dump trucks were moving, including at the time of the accident and the absence of an effective system for dealing with breakdown and unplanned maintenance situations.

The system whereby dump trucks were entitled to operate off more than one excavator, creating uncertainty for dump truck and light vehicle drivers.

21.5.4 Training of dump truck drivers

21.5.4.1 The Crown and the solicitor for the HSE submitted that *inadequate training of dump truck operators* was a system defect.

20.5.4.2 The solicitor for SCC pointed out that to conclude that any training failure contributed to the accident, I would have to be satisfied on the balance of probabilities that Mr Shannon did not get suitable training to discourage him making the *ex facie* dangerous manoeuvre which he did make. I agree. Some of the more general criticisms of the training regime, especially as it applied to Mr Shannon – in particular its length and the lack of training for the trainer – although valid, are not necessarily relevant to the cause or causes of the accident, certainly when it is borne in mind that he was assessed twice by a qualified assessor and reassessed following remedial training and that he had some three months' driving experience by the time of the accident.

21.5.4.3 For the reasons I have already explained, however, I am not at all satisfied that Mr Shannon was trained on the dangers of the blind spot and of carrying out a full right hand lock turn. The system of training was defective in failing to ensure that trainers delivered training on those issues and in failing to ensure that

assessors tested drivers on their knowledge of the issues and how to deal with them. I consider that the absence of any template or checklist for the trainer was directly relevant, because that resulted in an absence of any instruction whatsoever to a trainer on what he is to cover in training.

21.5.4.4 Accordingly, I find that the defects in the system of working which contributed to the accident included:

The failure of the system of training to document the knowledge and competences which those who were training dump truck drivers should ensure were covered in training and to ensure that the trainers and those who assessed the competence of drivers covered knowledge of blind spots and of the circumstances in which sharp right hand turns should be executed.

21.6 *Section 6(1)(e) – any other relevant factors*

The submissions of parties were rather wide-ranging and encompassed suggestions as to findings, in the more conventional sense, as well as observations and recommendations. Section 6(1)(e) is broad in scope and does not require that findings have a causal connection with the deaths and I approach the submissions on that broad basis.

21.6.1 *The role of the safety department*

20.6.1.1 The Crown submitted that Scottish Coal did not place enough importance on the role and opinion of their trained safety advisers pre-2007. They should have had systems in place that allowed safety managers effectively to stop proceedings.

20.6.1.2 Moreover, it was said that the policy of letting site managers investigate their own accidents was fraught with danger and there was a lack of objectivity.

20.6.1.3 I think there is some justification for the view that the advice of Mr Polhill as regards universal radio policy was not taken seriously enough by senior management, but I am not convinced that there was a more general problem in relation to the advice of the safety department, which clearly has access to senior management.

21.6.1.4 I do not consider that the criticism of lack of objectivity in accident investigation is justified. The safety department was significantly involved in the investigation of the 2005 and 2007 accidents. The problem was not in the investigation of the 2005 accident but in the failure of SCC to appreciate that it was a warning about the inadequacy of their traffic management.

21.6.2 *Discipline*

21.6.2.1 The Crown submitted that there was inconsistency in relation to handling of reading of newspapers. A more consistent categorisation of disciplinary matters across the company would be of benefit.

21.6.2.2 I think that it is probably beyond the scope of this Inquiry to comment on the adequacy of the disciplinary system in that way and, in any event, the company policy on reading of newspapers is now unequivocal – a minimum of a final written warning. But I do consider that **greater emphasis could have been given to alerting drivers to the consequences of reading newspapers in their cabs.**

21.6.3 Training

I agree with the solicitor for Scottish Coal's submission, which was in accordance with the views of a number of informed witnesses. In relation to the development of a checklist of competences, since that was already being considered at industry level I consider it appropriate to make my finding on that basis and therefore determine that:

consideration should be given to those involved in providing training in SCC and across the industry providing that training against a more detailed checklist of competencies than exists at present and the competence assessment scheme should be updated to reflect that initial and further assessment should be carried out by properly trained trainers or assessors.

21.6.4 Learning lessons

21.6.4.1 The solicitor for HSE pointed out that SCC had failed to introduce an effective and safe system after the similar accident occurred at the Pennyvenie site in March 2005 in order to change unsafe practices, which appear to have continued and which ultimately led to the accident.

21.6.4.2 I consider that the level of coincidence between the two accidents is so significant that it should be reflected in this way in my formal findings – ie

SCC failed properly to learn from the lessons of the 2005 accident and address the systemic problems that it should have identified.

21.6.5 Health and Safety Executive etc

There were a number of recommendations, which I understood to be generally accepted and which I was willing to adopt:

Given the advances in technology Health and Safety Executive Inspectors should as a matter of course make enquiry about radio usage and traffic management as part of their inspections.

The Health and Safety Executive should consider systematically disseminating the advisability of practices identified by their inspectors which ought, in the interest of safety, to be introduced.

The Health and Safety Executive should consider, in consultation with the industry, a speedier, more efficient mechanism for the dissemination of good and important best practice identified by inspectors.

Although segregation as now successfully organised at Pennyvenie will not always be possible due to the changing geography in quarries and opencast sites, the Health and Safety Executive should constantly press home the message that it is for the duty holder to ensure proper job site organisation and systems to deal with the dangers posed by large machinery.

Awareness should be raised more generally within the open cast coal mining industry of the availability, benefits and utility of off side front cameras and two way radios, such as by placing information on the Health and Safety Executive's website which can be accessed by the industry, by raising these matters with any working groups concerned with update of the guidance attached to the relevant Approved Code of Practice (ACOP) and by advising organisations concerned with safety within the industry such as the Quarries National Joint Advisory Committee (QNJAC) and the coal producers organisation, the Confederation of UK Coal Producers (COALPRO). But it must be recognised that the primary control measure is an effective system of segregation of large and small vehicles in quarries.

Consideration should be given to updating the Quarries Regulations Approved Code of Practice (ACOP) to make crystal clear the dangers of blind spots in dump trucks and that segregation is the key to addressing such dangers; in particular, reference should be included to the duty holder considering the use of technology such as radios to aid in achieving segregation and effective traffic management.

The Health and Safety Executive should work with the Quarries Joint National Advisory Committee to raise these issues ahead of any proposed update to the Code of Practice.

The Health and Safety Executive should consider whether to call on police for assistance, e.g. from crash investigators in relation to measurements and plans etc of accident scenes.

21.6.6 *Scottish Coal and the industry*

The solicitor for SCC invited me to note the company's role in other bodies relevant to health and safety. I consider it appropriate so to record:

Scottish Coal and other operators collaborate systematically with the Health and Safety Executive on safety advisory bodies such as the Quarries National Joint Advisory Committee. Scottish Coal also takes a leading role in COALPRO which likewise through the vehicle of its safety committee regularly looks at safety issues arising in the industry. The existence of these organisations and participation in their deliberations is to be commended.

Scottish Coal takes a leading role in the promoting of health and safety within the industry.

21.6.7 *All radio policy, CCTV and segregation*

21.6.7.1 The solicitor for SCC invited me to find that an all radios policy had already been adopted at Pennyvenie and it was in the process of being introduced incrementally. For the reasons I have already given, I do not accept that SCC had adopted such a policy at Pennyvenie or nationally.

21.6.7.2 Both the solicitor for SCC and the solicitor for the HSE invited me to record the improvements which changes put in place since the accident had brought and in particular the role of SCC in these improvements and changes.

21.6.7.3 I think it appropriate to record SCC's positive response to the legal requirements made of them by the HSE, but also going significantly beyond that. They have been an advocate for, if not a trailblazer of, safer systems of working. While it is to be regretted that some of these lessons were not identified following the non-fatal 2005 accident, SCC's response since 2007 has been creditable.

21.6.7.4 Indeed, in many ways it would have been better if SCC had taken appropriate credit for learning the lessons of the 2007 accident at the Inquiry instead of attempting to justify the unjustifiable in relation in particular to segregation, traffic management and communication as they existed in February 2007. Accordingly, I find:

Universal introduction of site operators' radios in vehicles across both Scottish Coal's various sites and in the remainder of the Scottish open cast industry has improved communication and safety in the movement and interaction of large and small vehicles on site. Evidence has indicated that effective off side front cameras and radios can be installed at relatively low cost.

Without being obliged to do by the Health and Safety Executive, Scottish Coal, after suitable consultation with employees and researching of the market introduced and led the industry in introducing offside CCTV cameras in large dump trucks. They also swiftly introduced an effective and workable system for physically ensuring the segregation of large and small vehicles in or around live dig areas.

The front off side cameras have substantially improved the driver's visibility by eliminating or reducing the off side blind spot. This has improved safe use of the dump trucks not only in the dig area but also in other parts of the site where the driver will routinely require to drive into or through his blind spot.

21.6.8 *Keeping up with technology*

21.6.8.1 The solicitor for SCC submitted that I should make a finding that it is incumbent upon manufacturers and users of dump trucks to regularly monitor and ensure the introduction of suitable and sufficient controls so as to keep up with technology in a manner that maintains or indeed improves safety and the solicitor for the HSE made a similar submission.

21.6.8.2 I heard evidence from Mr Dale Camsell of Terex and I did not understand him or Terex to demur from such a suggestion.

21.6.8.3 I think it appropriate to record:

It is incumbent upon manufacturers and users of dump trucks to regularly monitor and ensure the introduction of suitable and sufficient controls so as to keep up with technology in a manner that maintains or indeed improves safety.

Consideration should be given to the development of international standards or at least standard industry practice on the use of offside cameras in dump trucks which will promote the safe use of such cameras to improve visibility for operators.

22 Concluding observations

22.1 Although it was not the subject of a submission, during his evidence Mr Buchanan of the HSE stated that there were other dangerous occurrences, such as the 2005 incident, which it would be worthwhile to include in the reporting requirements of RIDDOR. Although Section 6(1)(e) is very broad in scope and I have taken a broad approach to the relevant findings, I do not consider that the reportability of the 2005 accident was in any way relevant to the circumstances of the deaths, although I think it is appropriate to flag up the anomaly in the scope of reporting for consideration and I will do that by way of a free-standing recommendation

Consideration should be given to the inclusion in the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR) of dangerous occurrences, where there is no actual injury but there is a high risk of serious injury or fatality.

22.2 Encouraged and to some extent compelled by the HSE, SCC have responded to this accident in a way which is commendable and they have encouraged other operators to learn from their lesson. It is, of course, tragic that it took two deaths for them to learn the lessons of segregation and communication.

22.3 There was only one possible question mark over the new system of working, raised by Mr Murray. I regard him as a credible witness and his warning that there have been occasional slippages from the comprehensive operation of the new system should be heeded. That evidence emphasises the universal truth that systems are critical, but without rigorously enforced compliance even the best systems are not fool proof.

22.3 It is customary to thank the parties to a Fatal Accident Inquiry for their assistance. In this case my gratitude is not merely formulaic. The main burden of presenting the evidence is borne by the Crown and Mr Toal, the Procurator Fiscal Depute shouldered that burden admirably, but all the solicitors for the parties to the Inquiry made the effort to familiarise themselves with the detail of the evidence and greatly assisted the Inquiry throughout its course.

22.4 I offered my condolences to the families and loved ones of Mr French and Mr Ferguson at the outset of the Inquiry and those represented expressed their condolences in their closing submissions. I took the opportunity at the close of the Inquiry to renew these condolences, but also to pay tribute to the families and loved ones and friends of Mr French and Mr Ferguson for their dignified and attentive commitment to the Inquiry. I observed that Fatal Accident Inquiries frequently generate great interest for lawyers and relatively little interest otherwise, but in this Inquiry many of them had been present throughout, or very largely throughout, the Inquiry and I commended them for their patience and dignity and their commitment to learning more about what happened on 26 February 2007 and the events leading up to that day. I hope this determination sheds some light for them on the facts and on the lessons which have been and should be learned from this tragic accident.

Annex A

List of witnesses

Shona Blacklock, Scene Examiner, Scene Examination Branch, Strathclyde Police

Peter Murray, c/o Scottish Coal Company Ltd, House of Water

Robert Kidd, c/o Scottish Ambulance Service, Dalmellington

Kevin Cullen, c/o Scottish Coal Company Ltd, House of Water

Duncan McDougall, c/o Scottish Coal Company Ltd, Pennyvenie

Ian Davidson, c/o Scottish Coal Company Ltd, House of Water

Alan Shannon, Dalmellington

Brian Robertson, c/o Scottish Coal Company Ltd, House of Water

John Alexander, Group Commander, Strathclyde Fire and Rescue
Renfrewshire and Inverclyde Headquarters, Johnstone

Robert Stewart, c/o Scottish Coal Company Ltd, House of Water

David Frew, c/o HSE, Bothwell Street, Glasgow

Derek Kyle, c/o Scottish Coal Company Ltd, Pennyvenie

Alexander McCulloch, c/o HSE Bothwell Street Glasgow

David Paterson, c/o Scottish Coal Company Ltd, Castlebridge Business Park, near
Alloa

Hugh Phillips, c/o Scottish Coal Company Ltd, Dalmellington

Thomas Hamilton, c/o Scottish Coal Company Ltd, Powharnal

Dale Camsell, Terex Construction, Prologis Park, Coventry

Andrew Polhill, c/o Scottish Coal Company Ltd, Castlebridge Business Park, near
Alloa

Ian Munro, c/o Scottish Resources Group, Castlebridge Business Park, near Alloa

Norman Buchanan, c/o HSE, 59 Belford Road, Edinburgh

Jeremy Ferreira, c/o Health and Safety Laboratory, ERGONOMICS Section,
Harpur Hill, Buxton

Alexander Ritchie, c/o Scottish Resources Group, Castlebridge Business Park, near Alloa

Ian Waugh, c/o HSE, Edgar Allen House, 241 Glossop Road, Sheffield

Colin Martin, c/o HSE, 59 Belford Road, Edinburgh

Hugh Kirkwood, Patna

Vanessa Taylor, Kelloholm

Extract from Indictment

(003) On 26 February 2007 at Pennyvenie Open Cast Coal site,
near

Dalmellington, Ayrshire you THE SCOTTISH COAL COMPANY LIMITED being an employer within the meaning of the aftermentioned Act did fail to conduct your undertaking, so far as was reasonably practicable, in such a way as to ensure that persons not in your employment who may have been affected thereby were not exposed to risks to their health and safety, in that you did fail to provide a safe system of work for the movement of vehicles and other mobile plant on said site in that small items of mobile plant inter alia, Land Rovers were not prevented from being operated in close proximity to large items of mobile plant inter alia dump trucks being operated there at a time when said large items of mobile plant were being operated with reduced visual fields, thereby creating a risk of collision between items of plant and did fail to provide the operators of said mobile plant with suitable means of communication to reduce the risk of collision or other equipment such as radar systems, additional closed circuit television or warning systems to reduce the risk of injury to said operators due to collisions between items of mobile plant, whereby Brian French and Colin Ferguson, then employed by Castlebridge Plant Limited at said site, were operating a Land Rover in enclosed proximity to a dump truck then being operated by Alan Shannon, c/o Strathclyde Police, Cumnock, then in your employment, whereby said dump truck collided with said Land Rover and said Brian French and Colin Ferguson were injured and died as a result of the injuries sustained in the collision.

CONTRARY to Section 3(1) and Section 33(1)(a) of the Health and Safety at Work etc Act 1974

(004)/

(Signed) J B KELMAN
PRINCIPAL PROCURATOR FISCAL DEPUTE

Annex C

Site Manager's Vehicle Rules extracts (2006 edition)

.....

7. Driving a Quarry Vehicle

When driving a quarry vehicle the following rules must be observed: -

Ensure that the area around the vehicle is clear before moving away or altering direction.

Drive with due care and attention and driven at a speed, which is appropriate to the prevailing ground, weather and visibility conditions or otherwise complies with local speed limits.

Maintain a safe distance from the vehicle in front so that emergency action can be taken, if required. When stopping behind another vehicle, a minimum of 3 truck lengths must be kept from the vehicle in front, to allow for manoeuvring purposes. Particular care should be taken on haul roads that have been newly sprayed with water for dust suppression purposes.

Vehicles will normally be driven on the left-hand side of the road unless specific instructions are issued or local rules implemented to the contrary.

Loaded vehicles have priority over empty vehicles.

Light and ancillary vehicles must give way to heavy vehicles.

.....

Vehicles must not enter the swing radius of an excavator without permission of the excavator operator.

Broken down vehicles in the quarry will normally be cordoned off by hazard cones or other suitable means to alert other vehicles that a breakdown has occurred and maintenance personnel may be present on foot.

.....

Where repairs, servicing or fuelling etc., have been carried out on quarry vehicles, the attending vehicles and attendants must leave the operational area and then communicate to the quarry vehicle that the area is clear for movement to begin.

.....

Overtaking manoeuvres must only be done when safe to do so and with the full acknowledgement of the drivers in front and to the rear. Signals, radios and direct line of sight must be used. Overtaking must not be attempted on a short road, ramp or blind corner or in wet and slippery or poor visibility conditions.

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The reading of newspapers, magazines etc and use of mobile phones is strictly prohibited while operating quarry vehicles

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8. Parking

.....

Vehicles must be parked in an authorised parking area in accordance with a parking system approved by the Site Manager. If it is not possible to do so or if a vehicle is broken down, permission must be sought from a supervisor to park elsewhere.

When parking or leaving a vehicle the engine must be switched off, ignition key removed, all brakes applied and the appropriate gear selected to suit any gradient. The key, starter handle or any other device for starting vehicles must then be kept in the secure location to prevent unauthorised starting of vehicles.

Quarry vehicles and equipment must be parked a suitable safe distance from a quarry face.

Excavator buckets, dozer blades, ripper teeth and scraper bowls must be lowered to the ground when parking.

Vehicles must not be parked within the swing radius of an excavator or the manoeuvring zone of other operational quarry vehicles.

When it is unavoidable to park light vehicles close to non-operational heavy plant e.g. for maintenance purposes, the heavy plant must be immobilised.

.....

11. Loading procedures

The loading zone is defined by the swing-circle of the excavator arm and manoeuvring zone of the truck under load. On no account should any other vehicle enter this loading zone unless the vehicles are stationary without the permission of the other vehicle operators.

.....

Dump trucks should approach the loading zone in an orderly fashion and should only manoeuvre into position when it is safe to do so.

Whilst loading is underway no vehicle should be parked within the loading zone other than for the purpose of being loaded.

.....

When a dump truck has been loaded it should leave the loading zone and proceed to the tipping area without delay.

Light vehicles or pedestrians are not to enter the loading zone until excavators and dump trucks are stationary and permission is obtained from the vehicle operators.

The excavator operator must not signal permission to enter a loading zone until the excavator bucket is placed on the ground.

When the last person leaves the loading zone, they must give a clear communication to the excavator driver so that loading may be resumed.

.....

13. Fuelling and Servicing

13.1 General

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There must be effective communication between personnel at all times. This may be visual using recognised hand signals or through direct verbal contact using radios where appropriate. The fuel attendant/serviceman must control the fuelling/servicing operation and machine or vehicle operators must act upon any instructions received.

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13.3 Fuelling / servicing of wheeled mobile plant

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Maintenance personnel intending to work on vehicles during service intervals or break times must always ensure that other drivers and pedestrians are aware of their presence before approaching in a vehicle.

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Annex D

Addendum to Site Manager's Vehicle Rules 2007

Scottish Coal

Site Managers Vehicle Rules

Addendum

With immediate effect the entry of non-production type vehicles i.e. any vehicle other than a dump truck is prohibited from entering the loading zone of an excavator while excavation operations are active.

In the event of a breakdown, routine maintenance or any other situation where entry to the loading zone by a vehicle other than a dump truck is required a Supervisor must be contacted immediately.

The Supervisor must make an assessment of each situation and ensure that dump trucks and other vehicles are withdrawn to a place of safety before giving permission for the driver of the non-production type vehicle to enter the excavator loading zone.

At all times when a non-production type vehicle has entered the loading zone the excavator driver must ground the bucket and ensure that the excavator does not move.

The Supervisor in control of the situation must ensure that radio contact is made with the appropriate personnel and must not authorise entry into the loading zone until all plant operators have acknowledged the instructions.

The Supervisor will not authorise dump trucks to re-enter the loading zone until he is satisfied that all non-production type vehicles have been withdrawn to a place of safety.

If at any time anyone has any doubt about these instructions you should stop your vehicle in a safe place and contact your supervisor immediately.

Safety Alert

Below is a photograph of an Incident that occurred on one of our sites recently. Miraculously the driver of the Landrover escaped just before the moment of impact. The incident occurred because the Landrover was driven into a loading zone without any prior communication between the driver and plant operators and therefore the dump truck driver was not aware of its presence. It is imperative that the following basic rules are followed to avoid similar incidents: -

Light Vehicles Drivers

- Never put your vehicle in a position where it cannot easily be seen by others
- Never drive or park your vehicle anywhere near the back or front of dump trucks or large plant
- Never assume that dump truck operators are aware of your presence
- Never enter a loading area if other alternatives are available, for example radio communication to inform other operators of your presence

Plant Operators

- Always check visibility aids i.e. mirrors, cameras before moving off
- Double check areas that are known blind spots (*sic*), such as cab struts
- Listen for radio communication, informing you of where light vehicles maybe situated.
- Always be alert to the presence of light vehicles

**[photograph of Caterpillar 785 dump truck
with Land Rover under front offside wheel]**

The driver of this vehicle was very fortunate - normally there are no second chances with this type of incident.

Interpretation: *To ensure a fuller understanding of the Quarry rules (the following definitions are listed:*

.....

Loading Zone *is an area in which the loading of overburden or minerals is taking place. The boundary of the zone is delineated by the maximum swing radius of the excavator jib and manoeuvring zone of the trucks being loaded or waiting to be loaded.*

.....

Manoeuvring Zone *is the area into which mobile plant may move when setting off, reversing and/or turning.*

.....

2. Competence Assessments and Training

- a) Operator competence assessments will be carried out in accordance with the company Plant Operator Competence Assessment Scheme.
- b) An initial competence assessment will be carried out by an authorised *competent person*. Following which a training plan for the operator will be identified and agreed by the Site Manager.
- c) All training will be recorded using the authorised competence assessment and training log forms and records will be maintained on employee personal files.
- d) Trainee operators must remain under the supervision of an authorised competent person until they are deemed to be competent.
- e) All trainees will be subject to a competence assessment by an in-house Plant Training Instructor within 3 months. Trainees with no previous experience will be subject to a further competence assessment by an in-house Plant Training instructor within a further 6 months.

3. Supervision of Traffic Movements

Supervisors must ensure that: -

- a) Site traffic movements are *organised and controlled* so that vehicles can circulate in a safe manner and the risk of collisions is minimised. *Specifically based on site operations a traffic management plan shall be produced, maintained up to date and reviewed as necessary. The plan will identify traffic routes and traffic flow,*

access and egress points, parking areas, waiting areas, authorisation points, maintenance areas, haul routes and active heavy plant areas.

b) Entry, parking and exit to active heavy plant areas such as haul routes, tips, excavations and workshops by vehicles especially light vehicles and pedestrians Is authorised and controlled so as to limit the risk of collision with heavy plant to as low as is reasonably practicable. Supervision must grant permission to pass any 'authorisation' point as shown on the traffic management plan. This may require stopping, clearing or restricting vehicle movement but should be based on the flowchart at the end of these rules titled OPERATIONAL CONTROL OF VEHICLE MOVEMENTS IN ACTIVE HEAVY PLANT AREAS.

c) They monitor through regular visual inspections from a safe vantage point that site vehicle operations are being carried out in compliance with these rules.

d) Appropriate corrective action is taken to address any breaches of these rules, reporting non-compliances to the Site Manager as appropriate.

e) Wherever possible one way systems are used and reversing movements are minimised.

f) Access to any haul roads or ramps not suitable for use is restricted by placing a physical barrier at the entrance to the restricted area.

g) Haul roads and ramps are suitably constructed avoiding steep gradients, sharp bends or blind dips wherever possible.

4. Vehicle Equipment

.....

e) All vehicle operators will have the use of a site radio. Radios are provided for operational purposes and must be used in accordance with the Site Radio Procedure. Radios must never be used in a frivolous manner. Contact with the site supervisor for breakdowns, emergencies, problems or any other unplanned abnormal event is mandatory.

f) All Land Rovers and light vehicles used in areas of the site where they will interact with dump trucks and other heavy vehicles will be fitted with an elevated flag whip.

g) Unless with the managers written permission the fitting of additional equipment to quarry vehicles is forbidden by employees.

.....

8. Driving a Quarry Vehicle

When driving a quarry vehicle the following rules must be observed: -

- a) All vehicles driven within the quarry must use dipped headlights at all times.
- b) Ensure that the area around the vehicle is clear before moving away or altering direction. *Where possible, large left hand drive vehicles must never be turned using right hand lock from a parked position. The area where the vehicle must turn must be checked and must be clear. Where possible the vehicle must be driven forward prior to turning. Where it is not possible then the driver must exit the cab to ensure the area to turn into is checked and clear to turn into before moving off.*
.....
- d) Maintain a safe distance from the vehicle in front so that emergency action can be taken. *As a practical rule a minimum of 3 truck lengths away from the vehicle in front and further in wet conditions.* Particular care should be taken on haul roads that have been newly sprayed with water for dust suppression purposes.
- f) Loaded vehicles always have priority over empty vehicles.
- g) Light and ancillary vehicles must always give way to heavy vehicles *and not enter heavy vehicle areas without permission from supervisors.*
- h) *Vehicles of similar size and capacity give way to vehicles coming up hill.*
- i) *Always give way to the right hand side at any junction or cross roads. Stop where necessary.*
.....
- l) *Other than for loading purposes, vehicles must not enter the swing radius of an excavator without permission of the excavator operator and the excavator stopped with bucket grounded.*
- m) Broken down vehicles must *be reported immediately to Supervision and* should be cordoned off by hazard cones or other suitable means to alert other vehicles that a breakdown has occurred and maintenance personnel may be present on foot.
.....
- w) *Operators shall inform Supervision of breakdowns and will wait in their vehicle if safe to do so. Under no circumstances shall they investigate breakdowns. This shall be left to supervision or maintenance personnel.*
- x) *All site visitors or sub contractors will be assigned to the control of a Site Supervisor and be escorted by site supervision or other authorised persons to and*

from site. A hand held radio will be given and instructions will be issued to give radio communication to site supervision when they are ready to leave the area. Under no circumstance will visitors / sub contractors leave these areas without permission.

9. Parking

.....

i) *All plant must be withdrawn and parked a safe distance away from a quarry face and in accordance with supervisor's instructions and any excavation and tips rules applying.*

.....

12. Entry into a Loading Zone

a) The loading zone is defined by the swing radius of the excavator jib and manoeuvring zone of the trucks being loaded or waiting to be loaded. On no account should any other vehicle enter this loading zone unless the operator has the permission of a Supervisor *who will assess the course of action to ensure no collision can occur and give instruction to all the vehicle operators.*

b) The entry of non-production type vehicles i.e. any vehicle other than a dump truck into the loading zone of an excavator is prohibited while excavation and loading operations are active.

c) In the event of a breakdown, routine maintenance or any other situation where entry to the loading zone by a vehicle other than a dump truck is required a Supervisor must be contacted immediately.

d) The Supervisor must make an assessment of each situation and ensure that dump trucks and other vehicles are withdrawn to a place of safety before giving permission for the operator of the non-production type vehicle to enter the excavator loading zone.

e) At all times when a non-production type vehicle has entered the loading zone the excavator operator must ground the bucket and ensure that the excavator does not move.

f) The Supervisor in control of the situation must ensure that radio contact is made with the appropriate personnel and must not authorise entry into the loading zone until all plant operators have acknowledged the instructions.

g) The Supervisor will not authorise dump trucks to re-enter the loading zone until he is satisfied that all non-production type vehicles have been withdrawn to a *safe place.*

13. Loading Procedures

[ILLUSTRATION OF WAITING AND LOADING CYCLE AND WARNING ABOUT POOR VISION]

- a) During normal loading operations, when the excavator operator is satisfied that a truck is positioned safely to receive a load *he will discharge the load from the bucket. The horn is there as a warning device should the truck fail to stop.*
- b) On completion of the load and when the excavator operator is satisfied the truck is safely loaded *the excavator horn will be used to inform the track driver to move off. Supervisors will determine the number of horn blasts to use for informing the truck drivers where to tip - useful in cases of different quality materials which may require to be tipped in designated tipping areas.*
- c) The excavator operator must ensure that trucks are loaded with care to avoid jolting the truck so that harm to the truck operator is avoided. Particular care must be taken when handling blocky overburden and large stones.
- d) Dump trucks should approach the loading zone in an orderly fashion and should only manoeuvre into position when it is safe to do so.
- e) Whilst loading is underway no vehicles should be parked within the loading zone other than for the purpose of being loaded.
- f) Under no circumstances should the bucket of an excavator be passed over the cab of any vehicle.
- g) When a dump truck has been loaded it should leave the loading zone and proceed to the tipping area without delay.

.....

Objectives

This report describes work undertaken at the request of Mr Colin Martin, HM Specialist (Mechanical) Inspector of Health and Safety, following a fatal incident at Scottish Coal's Chalmerston/Pennyvenie open cast coal site (OCCS), Dalmellington, Ayrshire on 26th February 2007. The purpose of the visit was to establish the extent of driver visibility from a TEREX TR100 rigid frame dumper involved in the incident. This was accomplished using an HSE visibility test, which has shown to provide a good indication of whether or not the vehicle has any visibility deficiencies and would be likely to meet the requirements of the British and International Standard for operator visibility from earth moving machinery. Other visibility and human factors that may have contributed to the incident were also considered.

Main Findings

Due to its large operating mass, the TEREX TR100 would fall outside the scope of the British and International Standard for visibility from earth moving machinery (BS ISO 5006, 2006). Nonetheless, the visibility test procedures can still be applied.

The HSE visibility test finds that there are significant deficiencies in visibility around the front right quarter of the TEREX TR100. The major obstructions to visibility are the engine casing, cab platform and items along the right side railing.

In addition to the significant obstructions to visibility, other factors might have also contributed to the incident. These would include: the poor conspicuity of the Land Rover (due to its apparent small size and similar colour to the TEREX TR100), the task, and operator expectation.

The visibility assessment suggests that the operator would not have been presented with a reasonable opportunity to view a Land Rover that had travelled forward along the right side of the TEREX TR100 and positioned itself to the front right quarter of the vehicle.

Recommendations

Some recommendations for risk reduction are made and include:

- (1) Ensure the segregation of small vehicles and pedestrians from large machinery, such as the TEREX TR100, with suitable job-site organisation.
- (2) Where possible, reduce the area of obscured visibility to the front right quarter of the TR100. For example, consider whether the locker and cylinders along the cab platform's right side railing could be repositioned to improve driver visibility,
- (3) Make the Land Rovers more conspicuous. This could be accomplished using more suitable painting or markings to increase the contrast between the Land Rovers and the obstructions to visibility on the TEREX TR100.

- (4) Consider more active means of alerting the drivers' attention to the presence of smaller vehicles and pedestrians within the working area, such as two-way radio communication.

9. Conclusions

9.1 Mr. French and Mr. Ferguson driving in a 110" wheelbase Land Rover entered the dig at the Pennyvinie, open cast coal mine operated by Scottish Coal Company to conduct a maintenance inspection of the excavator boom. They overtook two stationary dump trucks and came to a halt in the blind spot of #62 dump truck driven by Mr. Shannon. The Land Rover and all three dump trucks had no radio communication equipment relying solely on visual hand signals. As they made visual contact and signalled to the excavator driver and #56 dump truck driver they were crushed by the offside front wheel of #62 TEREX TR100 rigid body dump truck as it pulled away turning to the right.

9.2 Apparently the Land Rover was parked on the offside of #62 dump truck and was in the driver's blind spot. The similarly white painted Land Rover and dump truck offered no definition to the driver's eye.

9.3 Mr. Shannon followed turning the TEREX TR100 dump truck to the right where the front offside wheel struck the passenger door of the Land Rover before crushing the passenger compartment.

9.4 Scottish Coal Company's Site Procedures dictate that communication between vehicles should be by radio. No radios were fitted to the three dump trucks or to the Land Rover. Had radios been fitted and verbal communication been used between the vehicles then the accident could have been avoided. A radio costs in the region of £300 and is a fraction of the £250,000 cost of the dump truck.

9.5 A similar accident on this Pennyvinie site in March 2005 where the Land Rover driver managed to escape resulted in a company Safety Alert being issued. If the recommendations had been adopted then this accident could have been avoided.

9.6 Similarly Operator Rules for the Pennyvinie site if communicated and followed should have maintained the exclusion of light vehicles such as a Land Rover from the loading zone unless suitable precautions such as verbal communication between the heavy plant vehicles and the light vehicle having being established. Otherwise the light vehicle should have been excluded and should have given way to the heavy vehicles operating in the loading zone.

9.7 The seven mirrors and a reversing camera fitted to the TR100 dump truck offer limited extra vision to the driver. The driver's vision is obstructed over large areas in particular over the offside of the TEREX TR100's protruding engine cover.

9.8 Other vision aids such as, elevated warning beacons, flags, front facing cameras, radar sensors and GPS equipment could have been fitted to the TR100 to further improve the driver's awareness of vehicles entering this blindspot.

9.9 Testing of the #62 TR100's parking brake, service brakes and emergency brakes confirmed that they were operating satisfactorily.

Conclusions

69. The direct cause of this incident was the entry of the Land Rover into the manoeuvring zone of the Terex TR100 dump trucks. Colin Ferguson initially drove the Land Rover past the offside of Kevin Cullen's truck and then stopped in a position that was either wholly or substantially within the blind zone of Alan Shannon's truck.

70. It has been confirmed that Colin Ferguson used hand signals to communicate with Duncan McDougall and Peter Murray but there is no evidence that any attempt was made to communicate with Alan Shannon. If there was an attempt, Alan Shannon has stated that he was not aware of it and it can therefore be assumed that he was not aware of the presence of the Land Rover.

71. It is possible but not proven that Alan Shannon's attention to the events going on around him may have been diverted because he was reading a newspaper at the time. It is important to note that Peter Murray's evidence to this effect has not been corroborated.

72. Alan Shannon witnessed the RH120 moving from the excavation bench and assumed that there was going to be some downtime. When he saw Peter Murray's Cat 777 leaving the area he simply followed. He has confirmed that he turned the steering wheel on right hand lock before moving away, which meant that he was effectively driving the truck into its own blind zone. If he had driven forward into an area that was clearly visible to him before turning, the collision might have been avoided.

73. Having given permission to Brian French to stop the excavators, Brian Robertson was aware that the inspections were to be carried out outwith the normal break times. This information was not communicated to Sandy McCulloch who was in direct charge of the Area O operation. Brian Robertson was not aware that neither Brian French nor Colin Ferguson had a radio with them and assumed that they would communicate with excavator operators and supervisors in the normal manner. Had Sandy McCulloch been notified about the inspections either by Brian Robertson or by Brian French or Colin Ferguson he would probably have made arrangements to redeploy the trucks to another excavator.

74. Although Brian French and Colin Ferguson deviated from their normal routine by not carrying a radio, various other options were available to them to carry out the inspection of the RH120 safely.

75. They could have carried out the inspection at a meal break when the RH120 and dump trucks would have been standing.

76. They could have tried to speak to Sandy McCulloch who always carried a radio and who could have contacted the RH120 operator to request that the excavator be brought off the bench. If they had done so it is likely that by the time the Land Rover arrived at the excavator the dump trucks would have left the area.

77. They could have used the base unit radio in the fitter's cabin located a few hundred yards from the incident location to communicate with the RH120 operator or Sandy McCulloch to seek permission to approach.

78. They could simply have waited in the line of traffic until the dump trucks operated by Peter Murray, Alan Shannon and Kevin Cullen had left the area. The Land Rover would then have been clearly visible from the RH120 and to any other vehicle travelling behind.

79. It is important to emphasise that they had completed a similar task without incident at James McGarva's RH120 some 10 minutes earlier without the use of a radio simply by waiting until dump trucks had cleared the area before approaching the excavator and using hand signals to communicate with the operator.

Recommendations

80. As a consequence of the Prohibition Notice the use of two-way radios in site vehicles is now mandatory at all Scottish Coal sites. This has been supported by written procedures and training for employees. It is essential for anyone using a radio to understand that it should be regarded only as a communication aid and not as a primary safety control measure. The primary control measures to prevent vehicle collisions continue to be those listed in the pre-existing Site Managers Vehicle Rules, which are aimed at drivers being able to see and be seen and keeping vehicles apart so far as is reasonably practicable. It is essential that employees fully understand that a radio will not necessarily keep them safe and therefore important that all site employees receive appropriate information, instruction and training to this effect.

81. The introduction of the addendum to the Site Managers Vehicle Rules requires site supervisors to introduce a greater degree of control over the vehicle movements associated with plant maintenance operations at excavators. This will improve the management control of these operations however it is important that the actions of site supervisors are regularly monitored by both site management and senior management to ensure that there is no complacency in enforcing these rules.

82. The awareness of blind zones has always been an important part of the training provided by Scottish Coal for plant operators and light vehicle drivers. It is essential that this safety message is continually communicated to employees and it is important for site supervisors, most of whom drive Land Rovers, to be proactive and to lead by example. It is recommended that strict disciplinary action be taken against any employee who drives a Land Rover or light vehicle in to a danger zone and that any such action taken should be visible to other employees to ensure that the safety message is being delivered.

83. The reconstruction of the incident has indicated that it is possible that the Land Rover might not have been totally in the blind zone of the Terex TR100. However, because both vehicles were a similar white colour, Alan Shannon, if he was looking, might not have been able to differentiate between the roof of the Land Rover and the front of the Terex TR100. It is therefore recommended that Scottish Coal and Castlebridge Plant investigate the best means of avoiding a similar scenario by

providing distinguishing markings on either the Terex TR100 front bonnet line or the Land Rover roof to provide a contrast in colours.

84. Scottish Coal and Castlebridge Plant should continue to investigate means of making Land Rovers and other light vehicles as highly visible as possible. As a result of this accident a fresh initiative has commenced and trials using the latest technology are ongoing at several Scottish Coal sites. Various options are available including flashing beacons, visibility strips, buggy whip flags etc. It should be noted that the opencast coal industry has made various attempts over a number of years to make Land Rovers and light vehicles more visible and although these measures are important it must be emphasised that the primary control measure must continue to be segregation and for these vehicles to avoid contact with dump trucks and other heavy vehicles by remaining outside their manoeuvring zone.

85. Scottish Coal and Castlebridge Plant should investigate a practical means of providing additional warnings for Land Rover and light vehicle drivers that they are entering a danger zone when they approach a dump truck, particularly on the off-side. This may be as simple as providing a large "Keep Clear" sign or similar on the side of the dump truck.

86. Investigations should be carried out into the possible use of additional visibility aids and warning devices on large dump trucks to alert drivers to the presence of other vehicles although it is important to emphasise that any such measures must be considered as secondary to the primary control measure of segregation.

Annex J

Marshallled Findings proposed by parties to the Inquiry

Section 6(1)(a) - Where and when the deaths and any accident resulting in the deaths took place

(1) In terms of section 6(1) (a) of the Fatal Accidents and Sudden Deaths Inquiry (Scotland) Act 1976 (the 1976 Act), Brian French, born 21 June 1968, who normally resided at 19 Polmeur Road, Kirkconnel, and Colin William Ferguson, born 27 November 1969, who normally resided at 49 Coylebank, Prestwick died at the Pennyvenie Opencast Coal Mine Site near Dalmellington on 26 February 2007 at around 1300 hours while working in the course of their employment respectively as a foreman fitter and fitter with Castlebridge Plant Limited.

Section 6(1)(b) - The cause or causes of the deaths

(2) In terms of section 6(1)(b) of the 1976 Act the cause of death of Brian French was 1a) Multiple injuries due to 1b) Accident at work; and in respect of Colin William Ferguson the cause of death was 1a) Asphyxia due to 1b) Crush Injury to chest due to 1c) Accident at work

Section 6(1)(b) -The cause or causes of any accident resulting in the deaths

The absence of an effective system of segregation between large vehicles, in this case dump trucks, and light vehicles i.e. Land Rovers (Crown)

(a) The driver of the Landrover (Colin Ferguson) driving the Landrover along the offside of the Terex 100 truck stopping it in the blind spot of the Terex 100 and;

(b) The Terex 100's driver (Mr Shannon) turning sharply into what he knew or ought to have known was the blind spot, thereby colliding with the Landrover and killing its occupants (SCC)

(or, as proposed by Alan Shannon:

(b) The Terex 100's driver (Mr Shannon) turning sharply to the right, thereby colliding with the Landrover and killing its occupants.)

The inability of Mr Shannon in the Terex TR100 dump truck to see the Land Rover operated by Mr Ferguson and Mr French which was located in the dump truck's front offside blind spot, as a result of which the dump truck collided with and crushed the Land Rover (HSE).

Section 6(1)(c) - reasonable precautions whereby the death and any accident resulting in the death might have been avoided

If the occupants of the Land Rover had obtained access to a radio which could have allowed for communication with the leading driver or supervisor to allow drivers to be alerted to their presence (Crown)

If the deceased had not decided to travel along the offside of Mr Shannon's Terex TR100 dump truck (Alan Shannon)

If the deceased had not decided to travel along the offside of Mr Shannon's Terex TR100 dump truck, stopping in its blind spot (SCC)

A prohibition on taking newspapers into vehicles (Alan Shannon)

If Alan Shannon had not read a newspaper whilst waiting to be loaded (Crown)

If Alan Shannon had paid more attention and in particular had not been reading a newspaper in the cab of his vehicle. (SCC)

If Alan Shannon had driven forward and then turned right (Crown)

If Alan Shannon had not turned sharply into the blind spot of his vehicle (SCC)

If Scottish Coal should have ensured that dump truck drivers drove forward before turning right (Alan Shannon)

If Alan Shannon had reversed or stopped when faced with an obstruction large enough to offer resistance to a 100 tonne truck that had 2 metre diameter wheels. (Crown)

If Scottish Coal had ensured that dump truck drivers reversed or stopped when faced with an obstruction large enough to offer resistance (Alan Shannon)

Fitting of additional aids to conspicuity, in particular buggy whips to Land Rovers and offside cameras to dump trucks (Crown)

Attachment of buggy whips to all Land Rovers (SCC)

Having universal radios on site and requiring the use of such radios (Crown)

Provision of radios for all relevant operatives (SCC)

Installation of additional visual and communication aids as follows:-

- (a) in the dump truck a front off side camera and monitor which might have alerted the driver to the presence of the Land Rover;
- (b) in the dump truck a two way communication radio which could have been used to alert the driver to the presence of the Land Rover; and
- (c) on the Land Rover modifications to make it more visible such as installation of a buggy whip with a flashing beacon. (HSE)

By alerting the dump truck driver to the presence of the Land Rover in close proximity by means such as direct communication with Mr Shannon by another operator. (HSE)

The implementation and management of an effective system for the segregation of large dump trucks and smaller vehicles such as Land Rovers would have been likely to significantly reduce the risk of such an accident. (HSE)

Section 6(1)(d) – defects in any system of working which contributed to the deaths or accident

There was a lack of any proper system of communication on the site (Crown)

Lack of adequate plant and equipment in both the dump trucks and Land Rovers comprising visual aids such as front off side cameras on the dump trucks to eliminate the front off side blind spot, on the Land Rovers buggy whips with flashing beacons and prominent body paint to increase visibility and absence of two way radios for both large and small vehicles. (HSE)

There was a lack of any effective system for dealing with breakdown and unplanned maintenance situations (Crown)

Absence of an effective system segregating large and small vehicles in the dig area (HSE)

There was an inadequate system of traffic management (Crown)

Inadequate training of dump truck operators (Crown and HSE)

The system of dump trucks being entitled to operate off more than one excavator, which created a system of uncertainty for dump truck and light vehicle drivers (Alan Shannon)

A failure to effectively manage and supervise activities in the dig area involving the interaction of large and small vehicles including the practice of small vehicles routinely entering the operational or "live" dig area when dump trucks were moving, including at the time of the accident (HSE)

6(1)(e) – any other factors which are relevant to the circumstances of the death

The role of the safety department - Scottish Coal did not place enough importance on the role and opinion of their trained safety advisers pre-2007. They should have systems in place that allowed safety managers to effectively stop proceedings. The policy of letting Site Manager's investigate their own accidents was fraught with danger and there was a lack of objectivity (Crown)

Discipline - There was inconsistency in relation to handling of reading of newspapers. A more consistent categorisation of disciplinary matters across the company would be of benefit (Crown).

Training

Consideration should be given to those involved in providing training in SCC providing that training against a more detailed checklist of competencies than exists at present (SCC)

The competence assessment scheme should be updated to reflect that initial and further assessment should be carried out by properly trained trainers or assessors. (SCC)

Learning lessons

A similar accident occurred at the Pennyvenie site in March 2005 but the site operator, the Scottish Coal Company Limited ("Scottish Coal") failed to introduce an effective and safe system which changed unsafe practices, which appear to have continued and which ultimately led to the accident (HSE)

Health and Safety Executive etc

Given the advances in technology Inspectors should be as a matter of course making enquiry about radio usage and traffic management as part of their inspections (Crown)

HSE should consider systematically disseminating the advisability of practices which HSE inspectors identify ought, in the interest of safety, to be introduced (SCC)

HSE should consider, in consultation with the industry, a speedier, more efficient mechanism for the dissemination of good and important best practice identified by inspectors (SCC)

Segregation as successfully organised at Pennyvenie now will not always be possible due to the changing geography in quarries and opencast sites. The HSE however should be constantly pressing home the message that it is for the duty holder to ensure proper job site organisation and systems to deal with the dangers posed by such massive machinery (Crown)

The Quarries Regulations Approved Code of Practice should be updated to make crystal clear the dangers of blind spots in dump trucks and that segregation is the key to doing this; reference should be included to the duty holder considering the use of technology such as radios to aid in achieving segregation and effective traffic management (Crown)

The HSE should work with the Quarries Joint National Advisory Committee to raise these issues ahead of any proposed update to the Code of Practice. (Crown)

The HSE should consider whether to call on police for assistance, e.g. from crash investigators in relation to measurements and plans etc of accident scenes (Crown)

Scottish Coal and other operators collaborate systematically with the Health and Safety Executive on safety advisory bodies such as the Quarries National Joint

Advisory Committee. Scottish Coal also takes a leading role in COALPRO which likewise through the vehicle of its safety committee regularly looks at safety issues arising in the industry. The existence of these organisations and participation in their deliberations is to be commended (SCC)

Scottish Coal takes a leading role in the promoting of health and safety within the industry. (SCC)

Awareness should be raised within the open cast coal mining industry of the availability, benefits and utility of off side front cameras and two way radios, such as by placing information on the Health and Safety Executive's website which can be accessed by the industry, by raising these matters with any working groups concerned with update of the guidance attached to the relevant Approved Code of Practice ("ACOP") and by advising organisations concerned with safety within the industry such as the Quarries National Joint Advisory Committee ("QNJAC") and the coal producers organisation, the Confederation of UK Coal Producers ("COALPRO"). But it must be recognised that the primary control measure is an effective system of segregation of large and small vehicles in quarries. (HSE and Terex)

All radio policy, CCTV and segregation

An all radios policy had already been adopted at Pennyvenie and it was in the process of being introduced incrementally (SCC)

Universal introduction of site operators' radios in vehicles across both Scottish Coal's various sites and in the remainder of the Scottish open cast industry has improved communication and safety in the movement and interaction of large and small vehicles on site. Evidence has indicated that effective off side front cameras and radios can be installed at relatively low cost (HSE)

Without being obliged to do by the HSE, Scottish Coal, after suitable consultation with employees and researching of the market introduced and led the industry in introducing offside CCTV cameras in large dump trucks. They also swiftly introduced an effective and workable system for physically ensuring the segregation of large and small vehicles in or around live dig areas (SCC)

The effective introduction by Scottish Coal post accident of universal radios and off side front cameras on all large dump trucks such as the Terex TR100. Evidence at the inquiry indicates that off side front cameras have substantially improved the driver's visibility by eliminating or reducing the off side blind spot. This has improved safe use of the dump trucks not only in the dig area but also in other parts of the site where the driver will routinely require to drive into or through his blind spot (HSE)

Keeping up with technology

It is incumbent upon manufacturers and users of dump trucks to regularly monitor and ensure the introduction of suitable and sufficient controls so as to keep up with technology in a manner that maintains or indeed improves safety (SCC)