THE HIGH COURT

No Redaction Needed

Record No. 2012/129P

Approved Judgment

BETWEEN:

UNIVERSITY COLLEGE CORK – NATIONAL UNIVERSITY OF IRELAND

Plaintiff

AND

THE ELECTRICITY SUPPLY BOARD

Defendant

JUDGMENT of Mr Justice Max Barrett delivered on 5th October, 2015.

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CHAPTER 1: OVERVIEW.

1. In the waning hours of 19th November, 2009, and on into the early hours of the 20th, a great volume of water that had been released through the Lee Dams and then flowed down the Lee Valley, entered Cork City and flooded the campus of University College Cork. The university claims ESB, as dam operator, is liable in nuisance and negligence for the damage caused. ESB claims the university is liable in contributory negligence. Both are correct.

CHAPTER 2: STATUTORY BEGINNINGS

2. The Act of 1945. Just over 70 years ago the Oireachtas enacted the Electricity (Supply) (Amendment) Act, 1945. The Act states itself in its long title to be concerned with various matters: amendment and extension of earlier Electricity Supply Acts; authorisation of, and provision for the preparation and execution by the Electricity Supply Board, a statutory corporation largely owned by the State, of schemes for the generation of electricity from certain suitable rivers; acquisition and management by ESB of fisheries and fishing rights in such rivers; and the awarding of grants of public moneys to ESB for electrification of rural areas. ESB is a statutory corporation that is largely owned by the State.

3. Preparing and approving schemes. Section 4(1) of the Act of 1945 provides for preparation of hydro-electric schemes:

> "*It shall be lawful for the Board, whenever they think so proper, to prepare and submit to the Minister a scheme for the generation of electricity by means of hydraulic power derived from the waters of any specified river impounded and made available for that purpose by means of a dam and other engineering works to be constructed by the Board under this Act*".

4. Executing approved schemes. Section 6 of the Act of 1945 provides for execution of an approved scheme:

> "*(2) For the purpose of carrying out an approved scheme it shall be lawful for the Board to* [*inter alia*]*...*
>
> *(a) impound, hold up, divert, take, and use the waters of the river to which such approved scheme relates and the waters of any river or stream tributary to, and of any lake, pond, or canal on or connected with, the said river to which such...scheme relates...*

(e) construct and maintain sluices, weirs, dams, embankments, and other similar works (including passages for the ascent and descent of fish);

(f) construct and maintain generating stations, transformer stations, and other stations and places for generating, transforming, storing or otherwise dealing with electricity generated in pursuance of such approved scheme...

(h) subject to the provisions of this Act, close, divert, remove, submerge or otherwise interfere with any public road or bridge;

(i) do any act or thing which may be necessary for or incidental to the doing of anything which the Board is authorised by this subsection to do."

5. Generating and distributing electricity. Section 10 of the Act of 1945 provides for the mandatory generation and distribution of electricity at and from "*hydro-electric works*" completed pursuant to the Act. This last-quoted term is defined in s.2 as meaning "*works for the generation of electricity by means of hydraulic power*". Specifically, s.10 provides, *inter alia*:

"*(1) When an approved scheme has been carried out and the hydro-electric works provided for by such scheme have been completed...the Board shall generate electricity by means of such works and shall transmit and distribute such electricity to such places and in such manner as shall, in the opinion of the Board, be requisite for making such electricity available for the purposes mentioned* [later in s.10]".

6. Section 28 and statutory immunity. Section 28 of the Act of 1945 is concerned with the entitlement to compensation of those interested in fisheries or enjoying fishing rights. Under s.11, in carrying out or operating an authorised scheme, ESB must "*take and make such precautions and provisions as the Minister for Agriculture may consider adequate for the protection of and avoidance of injury to fisheries...provided that the said Minister shall, in consultation with the Board, satisfy himself that taking such precautions and making such provisions will not cause substantial detriment to the works provided for by such approved scheme or substantial hindrance to or substantial increase in the cost of such works.*" The Minister may therefore prescribe measures to be taken by ESB, provided they do not substantially hinder the Scheme. Per s.28(1):

> "*Subject and without prejudice to the power of acquiring fisheries and fishing rights given to the Board by Part III...the Board shall be liable to pay compensation...to every person who suffers loss or damage by reason of an injury to a fishery or fishing right owned by him where such injury is caused during the construction or by the operation generally of hydro-electric works constructed by the Board in pursuance of an approved scheme or by any particular mode or course of or negligence in the operation of such works.*"

7. Section 28(5) then provides: "*No action shall lie at law or in equity against the Board or any contractor or any officer or servant of the Board or of any contractor for or on account of any injury in respect of which...compensation is payable under this section or compensation is expressly declared by this section not to be payable under this section.*"

8. UCC contends that, consistent with the principle '*expressio unius est exclusio alterius*' ('to express one thing excludes all others'), this express exclusion of liability for negligence in one context has the necessary result that in all other circumstances an action in negligence may lie against ESB. There are a couple of reasons why the court is not persuaded that UCC's reading of s.28 is correct. First, s.28 clearly applies only to fisheries and fishing rights in respect of which certain obligations are imposed upon ESB by the Minister for Agriculture. Second, it is not clear to the court that s.28(1) in fact requires negligence, though it is certainly one of the triggers. Hence it seems to the court that s.28 is of little assistance in relation to a critical issue in the within proceedings, *viz.* the scope of any duty of care arising in respect of damage unrelated to fisheries.

9. Section 34 and statutory duty. ESB has placed much reliance on s.34. It provides that: "*From and after the completion of the works provided for by an approved scheme, it shall be lawful for the Board to control and from time to time to alter or otherwise affect, in such manner as the Board shall consider necessary for or incidental to the operation of those works, the level of any lake, pond, or other water on or connected (directly or indirectly) with the river in or on which such works are situate.*" Perhaps no provision of the Act of 1945 has excited more attention than s.34. It is worth pausing to explain why. ESB contends that s.34 empowers it to do something that it could not otherwise do: it confers a power, it does not impose a duty. So, ESB contends, it cannot be found negligent in the exercise of a statutory power without regard to the purpose of that power and the statutory context, and the Act of 1945 nowhere requires of ESB that it provide flood alleviation. Additionally, ESB contends, a party alleging that ESB is liable for flood-damage caused partly by waters released through hydroelectric works established by ESB under the Act of 1945 must establish that ESB is under a positive legal duty to use its power under s.34 to alleviate flooding. A statutory power, ESB contends, cannot be converted by the law of negligence into an actionable duty. There is much in the foregoing that will be re-visited later below.

10. Interim Electricity Generation Licence. Under the Electricity Regulation Act, 1999, the Commission for Energy Regulation is empowered, *inter alia*, to grant licences to persons to generate/supply electricity. Such a licence comes subject to various terms and conditions. ESB holds such a licence. UCC contends the licence is indicative of the scope of the general duty of care to minimise flooding that it contends arises for ESB at common law. This issue is examined in Chapter 49.

CHAPTER 3: THE RIVER LEE AND ITS CATCHMENT.

11. Source and flow of river Lee. The river Lee rises near the Cork-Kerry border. It flows almost east along a narrow valley for about 65 kilometres towards Cork City, draining over 1,100 kilometres of land. There are two man-made reservoirs in the catchment, Carrigadrohid and Inniscarra. The catchment upstream of the reservoirs is steep, apart from a stretch that forms a narrow lake called Lough Allua. There is a bend on the river at Inniscarra, downstream of the Inniscarra Reservoir. It is useful to consider this as dividing the catchment into upper and lower parts. The upper and lower valleys are two of a series of valleys in Munster that run from west to east, with high mountains in the west. Along the valleys, the lateral side-slopes are steep in the northern slope and low in the southern.

12. Characteristics of catchment. In the upper catchment, the river Lee flows from the mountains onto a large floodplain and through Lough Allua, before entering Carrigadrohid Reservoir. Its flood-flows are partly attenuated by the floodplain and lough. In contrast, the tributaries flowing directly to the reservoirs from the north, (the rivers Sullane, Laney and Dripsey) are steep and have little or no floodplain. They therefore generate 'flashy' floods.

Their total area is greater than that of the river Lee. Fast run-off occurs from the high rainfall areas to the north. The percentage run-off during floods is high (around 70%). The Lee Scheme allows for 85% run-off; the 2009 percentage was within this range. Below Inniscarra and the bend in the river, the configuration is similar: high slopes and large areas to the north; flat, smaller areas to the south. The river Shournagh rises in the Boggeragh Mountains to the north and flows in a south-easterly direction to enter the lower Lee Valley downstream of Leemount Bridge. It has a relatively steep catchment, with a quick response to flood events. Its neighbouring tributary is the North Bride, located directly north of Cork City and culverted at Blackpool, from where it feeds into the North Channel at Christy Ring Bridge. On the flat southern side, the river Bride, and the main lower Lee Valley have floodplains and deep gravel deposits; their time to peak run-off is slower. The Bride rises in an undulating area southwest of Carrigadrohid and flows eastwards alongside the Lee Reservoirs to enter the river Lee immediately below the dividing bend. A smaller southern tributary, the river Curragheen, flows in a north-easterly direction to its confluence with the south channel of the river Lee, downstream of Victoria Cross in Cork City. It is joined by the river Glasheen at Victoria Cross, just before entering the South Channel.

CHAPTER 4: THE RIVER LEE WITHIN CORK CITY.

13. A city on a floodplain. The Lee Valley contains a flat floodplain. Cork City is situated in a narrow estuarine section, where water-retaining gravel deposits underneath are up to 60m deep. This deep-buried valley extends from the Bride tributary through to Cork City. Its soils and hydrology have been extensively studied. The City was built on the original estuary by reclaiming the marshland, raising ground-levels in places and filling in most channels. A unique feature is the narrow stretch of estuarine floodplain.

14. The modern city and the river. The river Lee flows through Cork City and bifurcates into the North and South Channels, leaving the centre of the city as an island (Central Island), orientated essentially east-west between the two channels. The remainder of Cork City is built on land which rises from the North and South Channels. To the north, the land rises steeply. To the south it rises more gently. The key features of the North and South Channel include: (a) the Waterworks Weir at Sunday's Well, located across the Lee, just upstream of the bifurcation forming the North and South Channels. This weir defines the extent of the extreme tidal influence in the Channels; (b) the Salmon Weir, situated across the North Channel at the bifurcation between the North and South Channels. This roughly-formed weir has a lowered section through which water enters the North Channel at low-flows. At high flows the weir is overtopped and water is transferred into the North Channel over the full length of the weir; (c) various watercourses that flow in culverts underneath city streets and buildings; (d) two partly-open watercourses: one extending from the North Channel (this cuts through UCC's North Mall Complex and is known as the 'Mill Race'), and another that extends from the South Channel; (e) historic quay-walls along some sections of both North and South Channels that canalise the river; and (f) vehicle and pedestrian bridges that cross both North and South Channels, some impeding channel-flow at high-flow. The two principal tributaries flowing into the river Lee within Cork City are the river Bride North which flows into the North Channel, and the river Curragheen (incorporating flows from the river Glasheen). The river Lee flows into Cork Harbour ten kilometres east of Cork City. Water-levels in the Lee are monitored at the Waterworks Weir, at one of the UCC buildings in the Lee Maltings complex, in the South Channel some distance downstream of UCC campus, and at the dockland area downstream.

15. UCC buildings. Urban development on Central Island was as follows: the original city developed along Main Street, which runs north-south; the eastern area developed next; development of the western area followed. Before about 1990, UCC's main campus area was on the south side of the South Channel, on high ground more than 10m above the average level of the river. The UCC buildings mentioned below were affected by the flooding of November 2009.

16. [1] *Western Gateway Building.* A purpose-built teaching-block for IT, teaching and research purposes. Completed in 2009. Sits on Central Island, adjacent to the north bank of the South Channel.

17. [2] *Maltings Complex.* A complex of new/existing buildings developed from 1967 onwards on Central Island, adjacent to the south bank of the North Channel. Contains the Tyndall National Institute, a research centre of international standing. Used for laboratory, teaching and office purposes.

18. [3] *University Hall.* Comprises purpose-built student accommodation constructed in about 2004, adjacent to the north bank of the Curraheen. Made up of four blocks.

19. [4] *Glucksman Gallery.* A purpose-built art gallery, cultural and educational facility, with restaurant. Completed in 2004. Sits adjacent to the south bank of the South Channel.

20. [5] *Victoria Lodge.* Purpose-built student accommodation completed in 2003. Sits adjacent to the south bank of the river Curragheen. Comprises five linked blocks with accommodation.

21. [6] *North Mall Complex.* Comprises the Enterprise Centre and the Butler Building. Located adjacent to the north bank of the North Channel and the Mill Race. The Enterprise Centre and Butler Building contain laboratories, teaching facilities and library.

22. [7] *Connolly Complex.* Comprises the Connolly Building, Granary Theatre, Muskerry Villas (Nos. 1 and 2), the old Presentation Brothers' College Building, a link-building between the College Building and the Granary Theatre, and No.20 Dyke Parade, all set around a courtyard. Situate on Central Island, adjacent to the north bank of the South Channel. Most of these buildings, likely constructed at various times over the 19th and 20th centuries, were acquired by UCC in 1990. The Granary Theatre was constructed for UCC around 1994. It comprises lecture-rooms, academic offices and a performing arts facility.

23. [8] *Castlewhite Apartments.* Purpose-built student accommodation completed in 1991 on Central Island, adjacent to the north bank of the South Channel. The buildings are set out in 'U'-shapes around a series of five courtyards.

24. [9] *Mardyke Pavilion.* A sports-pavilion on Central Island, adjacent to the south bank of the North Channel, constructed in or about 1903. Modernised and extended after the flooding, with accommodation on two levels. There are also a running-track, sports pitches and an indoor sports-complex.

25. [10] *Western Road Houses.* Five groups of properties (Nos. 2–8 Bloomfield Terrace, Nos.1–5 Brighton Villas, Nos. 1 & 2 Lucan Place, The Laurels and Roseleigh, all on Western Road, and Ferry Lodge on Mardyke Walk). All, with the possible exception of Ferry Lodge, constructed during the late-Victorian or Edwardian eras. Acquired by UCC between 1967 and 2008. Located on Central Island. Used mostly as offices and academic facilities.

26. For convenience, *Table 1* in Appendix A to this judgment identifies (i) various of UCC's properties in Cork City affected by the flood-event of November 2009, (ii) which of those properties were constructed and/or acquired by UCC, and, (iii) insofar as buildings wholly or partly constructed by UCC are concerned, the key dates as regards planning/construction of same. For the avoidance of doubt, the appendices to this judgment form a part of the judgment.

CHAPTER 5: HISTORY OF FLOODING IN CORK CITY.

27. Cork City is susceptible to fluvial and tidal flooding. The most serious floods have been caused by river-flows, sometimes exacerbated by tidal water-levels. Tidal water levels are the dominant cause of the highest water-levels in the eastern part of the city only. Over the years, many flooding events have occurred. The detail of some of the most prominent is set out in Appendix B. There were at least 292 flood events in the city between 1841 and 1988. Before construction of the Lee Scheme, significant floods occurred on the river Lee in 1633, 1789, 1853, 1875 and 1916. Significant floods also occurred on other occasions.

CHAPTER 6: OVERVIEW OF THE LEE HYDROELECTRIC SCHEME.

28. Approval of Scheme. Pursuant to the Act of 1945, ESB submitted to the Minister for Industry and Commerce a scheme for the generation of electricity by means of hydraulic power derived from the waters of the river Lee. On 1st December, 1949, the Minister approved the proposed scheme via the River Lee Hydro-Electric Scheme Approval Order, 1949. The scheme as approved was built between 1952 and 1957 at a cost of IR£4.5m.

29. General description. The Lee Scheme comprises power stations and associated dams and reservoirs approximately 14km upstream of Cork City. The dam at Inniscarra impounds a reservoir known as the Inniscarra Reservoir. It has two generators with a total capacity of 19MW. Carrigadrohid Station sits upstream of Inniscarra Reservoir. It has one generator with a capacity of 8MW. It impounds a reservoir known as Carrigadrohid Reservoir. Water is discharged from this dam directly into the Inniscarra Reservoir. The two dams are constructed in cascade formation so that the discharge from one forms part of the in-flow to the other.

30. Carrigadrohid Dam and Reservoir. Carrigdrohid Dam is the upper dam. It is situated approximately 13km upstream of Innsicarra Dam and about 27km west of Cork City. It covers an area of about 9km^2 and has a capacity of 16.2 x 10^6 cubic metres at a water level of 64.50m. The Dam is of a concrete gravity construction. It is 21.64m high and 106.7m long. It has a conventional triangular cross-section with an almost vertical up-stream slope. The Dam crest is 1.61m wide. It contains an access walkway at an elevation of 67.22m. The walkway is formed of pre-cast concrete 'U'-shaped sections extending from an elevation of 67.22 to 68.35m. In practice, once water reaches crest level it will flow over the top of the Dam as there is no parapet wall upstream of the power house/intake. The Dam is constructed of nine concrete-block sections. Two form the intake to the turbine; one contains the control sluices, one a fish-pass; the remainder are standard gravity blocks. The concrete block section narrows near the crest of the Dam. This narrow section is reinforced.

31. Spillways. A dam is built with a 'spillway' so as to be able to pass flows, in effect overflow, when a reservoir is full. The size of the overflow and 'freeboard' (the distance between the top of the dam and the water level when full) are dictated by the 'design flood', which in the case of the Scheme is the 10,000-year design flood. At Carrigadrohid Dam, the spillway consists of three deep sluices which have a combined discharge capacity of approximately 600m^3/s with the reservoir at a level of 67.22m, when fully opened. Each sluice is 3.05m wide and 4.88m high and fitted with control gates. An auxiliary spillway was added in 1991 to allow the Dam to pass safely the design flood overflow. This un-gated spillway has an approximate discharge capacity of 250m^3/s at dam crest level. It comprises a 50 metre-long weir and has a crest level of 65.20m. (An auxiliary spillway is a spillway constructed to provide additional capacity, usually when the original spillway is found inadequate. It is common for such spillway to start operating at a higher level to that of the main spillway).

32. Fish pass. A fish pass is incorporated into the Dam structure. It is suitable for operation over a range of upstream water levels between 61.00m and 66.15m and over the full range of downstream water levels between 48.8m and 52.44m. Average discharge through the fish pass is 0.5m^3/s.

33. Inniscarra Dam and Reservoir. Inniscarra Dam is situated approximately 13km downstream of Carrigadrohid Dam and about 14km west of Cork City. The Reservoir covers an area of about 5km^2 and has a capacity of 16.2 x 10^3 cubic metres (at a water level of 49.50m). The dam is a concrete diamond-headed buttress dam and contains a 19MW generation station. It is 45m high and approximately 274m long. The dam crest is 2.3m wide and includes an access walkway at an elevation of 52.03m. The walkway is formed of pre-cast concrete 'U'-shaped sections which form a 1.10m parapet or wave wall, extending from an elevation of 52.03m. to 53.13m. In practice, once water reaches crest level, it will flow over the top of the dam, as there is no parapet wall upstream of the in-take. There is an auxiliary spillway which has side-walls built to crest level. The top of the concrete dam section is relatively narrow and is reinforced.

34. **Spillway.** The spillway at Inniscarra Dam comprises three overflow spillway flood control gates. These have a combined discharge capacity, when fully opened, of approximately 900m^3/s, at a reservoir level of 50.90m. Each gate is 12.19m wide and 5.79m high, with a sill level of 45.11m. The gates are normally operated by remote-control from the control room. They can also be operated by push-button controls, or manual operation.

35. **Scour.** Inniscarra Dam has a 2.13m-diameter circular scour outlet culvert. On the downstream end there is a 'Howell-Burger' dispenser valve which disperses the flow of up to 30m^3/s over a large area of the stilling basin, thereby reducing the risk of erosion at the toe of the Dam by reducing the energy of the flow.

36. **Fish pass.** A fish pass (average discharge: 0.4m^3/s) is incorporated into the Dam structure. It is suitable for operation over a range of upstream water levels between 45.70m and 50.90m and over the full range of downstream water levels.

37. **Size of Scheme.** Although the Dams appear to maximise storage for electricity generation, they are relatively small compared, *e.g.*, with most hydroelectric schemes in the United Kingdom that have comparative 'heads', *i.e.* height difference between upstream/downstream levels. They are also relatively small in terms of storage. Based on average rainfall in the

catchment area, at average annual in-flow rates and no discharge, the reservoirs would fill from empty to 'MaxNOL' (of which more anon) in 18/26 days for Carrigadrohid/Inniscarra.

38. Fresh-water supply. Water is supplied to County Cork from Inniscarra Reservoir via an outlet at 44.5m. The present agreement between ESB and Cork County Council provides for 228,000m^3 of water to be provided from the reservoir each day. The consideration charged derives ultimately from the loss of generation potential represented by extracted water.

39. River-flow levels. By agreement with Cork County Council, if the level of Inniscarra Reservoir falls below 45.70m, ESB must discharge at least 1.5m^3/s into the river below Innsicarra to compensate for a loss of minimum flow.

40. Fishery protection. At a precautionary water-level of 46.00m at Inniscarra Reservoir, ESB is required to convene a meeting with Cork County Council and the Department of Fisheries to decide on optimum management of the available remaining waters. This arrangement enables Cork County Council to meet certain requirements of the Department of Agriculture, Food and the Marine in respect of fishery protection on the Lee.

41. Wetland protection. Approximately 7km upstream of Carrigadrohid Dam, there are protected wetlands in the Gearagh National Nature Reserve. This is a noted sanctuary for migrating birds. To ensure maintenance of the wetlands, ESB has agreed that Carrigadrohid Reservoir will be maintained so far as possible at a minimum of 63.40m between April and October each year.

CHAPTER 7: HISTORY AND DEVELOPMENT OF UCC CAMPUS.

42. 1845–1972. UCC was established as Queen's College Cork in 1845. The main campus is located on an escarpment overlooking the river Lee and sits about one mile west of Cork City centre. From the Victorian era right up to 1972, developments at UCC were undertaken on an *ad hoc* basis. By the late-1960s, it was decided to commission a master-plan on the physical development of UCC's campus.

43. Master-plans. Four campus master-plans have now been produced to guide development of UCC's campus, *viz.* the Campus Development Plan (1972), the Development Plan Review (1993), the Master-plan Review (2004), and the UCC Master-plan Review (2011). At the time of the 1972 plan, the UCC student population comprised circa. 4,000 people. The master-plan established a framework for the continuing development of UCC's campus and brought a clear vision to its physical development. Creation of such a plan is a detailed process that can take several months. It takes into account various issues, *e.g.* planning guidelines and constraints, environmental factors, conservation objectives, and access issues. It also explores opportunities for future development. The 1972 master-plan was based on four principles: the desirability of a compact campus; creation of an east-west pedestrian spine; recognition of the importance of courtyards and external linking spaces; and grouping buildings into distinct zones. A number of major projects occurred under the auspices of the 1972 master-plan, including the Food Science and Technology Building (1980), the Boole Library and Lecture Theatres (1983) and Castlewhite Student Accommodation (1991).

44. The Development Plan Review (1993). The 1993 Review was commissioned at a time of dramatic increase in student numbers (then some 9,400 students). A number of projects envisioned in the 1993 Review were subsequently completed, including the Food Sciences Building Extension (1994), the Granary Theatre (1994), the O'Rahilly Building (Phase 1) (1998), the Student Centre/Devere Hall (1996), the O'Rahilly Building (Phase 2) (2000), the Butler Plant Sciences Building (2000), and Mardyke Arena Sports Centre (2001). Significant land acquisitions were also made between 1993 and 2000, including the Presentation College Building (now Connolly Building) and the former Cork Greyhound Track (where the Western Gateway Building is located).

45. The Master-plan Review (2004). The 2004 Review was written against a back-drop of still-increasing student numbers. The Review assessed the capacity of UCC's land-holdings to meet this rise in numbers and addressed numerous strategic issues, focusing principally on developing and re-consolidating a sustainable campus with strong links to the City. The period 2002 to 2009 saw expansion in UCC's building-stock. Capital projects completed/acquired at this time include the Biosciences Institute (2002), the Student Centre Extension (2003), the Lewis Glucksman Gallery (2004), the Environmental Research Institute (2005), the Brookfield Health Sciences Complex (2005), Victoria Lodge (2006), the Postgraduate Research Library (2007), the Cavanagh Pharmacy Building (2007), the Biosciences Institute Extension (2008), the Tyndall National Institute (Lee Maltings) (2009), Western Gateway Building (2009), and University Hall Student Residence (2009).

46. History and Development of Tyndall National Institute. The complex of buildings known popularly as the 'Lee Maltings' that sits adjacent to the river Lee dates ultimately to the 18th century. UCC purchased the site from Beamish & Crawford in 1968 and work commenced on converting the buildings for university, laboratory and teaching uses. In 1979, as part of an incentive package to attract the semi-conductor manufacturing industry to Ireland, our

Government agreed to provide a silicon wafer/fabrication laboratory for R&D and specialised training purposes to be used by organisations expected to locate in Ireland. In 1981, it was decided to establish the National Micro-Electronics Research Centre (NMRC) in Cork. The Lee Maltings became home to the fledgling NMRC. Over the succeeding years, it became one of the largest research centres in Ireland. In 2002, an international panel of experts carried out a review of the NMRC. Following this, a new facility to build on the existing strengths of the NMRC was initiated. The Tyndall National Institute was established in 2004, under a formal agreement between the Minister for Enterprise, Trade & Innovation and UCC. A significant investment in the Tyndall Institute of €50 million enabled construction of the new research building and the substantial upgrading of support buildings and other infrastructure. The Tyndall Institute now occupies the entire Lee Maltings.

47. The Buildings Committee. On 21st February, 1974, a Buildings Committee was created by UCC's Governing Body. Its terms of reference included monitoring the progress and development of the College Development Plan, and making recommendations on capital projects. Mr Poland, the Director of Buildings and Estates at UCC, avers in an affidavit of 7th May, 2014, (para. 1.16) that "*In essence the Buildings Committee was an oversight committee for capital development.*" It comprised a distinguished collection of academic and non-academic university staff. The Buildings Committee was extant at the time the Glucksman Gallery and Western Gateway were developed. Following its establishment, the Buildings Committee became the forum for all staff to raise concerns internally about proposed development. Concerned staff could write directly to the Buildings Committee or separately raise concerns with a member thereof. To Mr Poland's recollection, with the exception of the Western Gateway Building, "*nobody within UCC ever raised concerns about flooding issues*". (Poland Affidavit No.2, 7th May, 2014, para. 1.17). Mr McAuliffe, a former Secretary of the

Buildings Committee, recalls in affidavit evidence that "*flooding may have been raised as an issue at meetings for the Western Gateway...other than that, no concerns or objections were raised.*"

48. Previous History of Flooding at UCC. Mr Poland's second affidavit is of some interest in what he has to say about the risk of flooding that UCC perceived to arise over the years:

> "2.1 **[1]** *Prior to November 2009, UCC had experienced very little historical flooding.* **[2]** *Practically none of the buildings damaged by the November 2009 flood had been flooded previously.* **[3]** *Some minor tidal flooding was experienced at the Lee Maltings site area; however, the extent of the damage was not significant. I, along with other members of the Building & Estates team, was aware of the risk of tidal flooding to the Lee Maltings site. This was (and remains) a known and predictable risk...*
>
> *2.2 ...***[4]** [T]*he risk of fluvial flooding was not a concern to UCC. I was not employed by UCC at the time of the 1986 fluvial flood, but I am aware that none of the main campus buildings were damaged in that flood.*
>
> *2.3* **[5]** *I was also aware that a bridge on the Western Road had been destroyed by fluvial flooding in 1916.* **[6]** *I am surprised to read that ESB believe we should have operated on the basis that the dams were not present.* **[7]** *At no time did any of the many professionals we engaged to develop the campus nor any of the planning authorities suggest to me that the flood risk for UCC was based on the flooding experienced in Cork in 1916.* **[8]** *The ESB's position ignores the fundamental fact that the construction of the Inniscarra and Carrigadrohid dams significantly changed the position in relation to flood control and water*

regulation on the River Lee. **[9]** *The dams were regarded by UCC as promoting the regulation of the flow of water in the river and affording a high level of protection from fluvial flooding to downstream properties.* **[10]** *In fact, the River Lee Hydroelectric Scheme brochure published by ESB says 'flooding downstream of Inniscarra has been minimised by the presence of the dam.'* **[11]** *If ESB had wanted to operate as it now suggests, I would have expected it to set this out in its brochure and advise all downstream residents that the dams do not provide flood protection.*

2.4 **[12]** *Overall, there was a strong sense that any risk of fluvial flooding was significantly, if not completely, reduced by virtue of the presence of the dams.* **[13]** *We relied on the engineering judgement of our design team to construct new buildings at levels above historical flood levels and in line with best practice.* **[14]** *Protection from fluvial flooding never formed a part of the UCC Masterplans for campus development.*" (Poland Affidavit No.2, paras. 2.1–2.4).

49. Re: "**[1]** *Prior to November 2009, UCC had experienced very little historical flooding.*" This seems a revealing averment. Although UCC may have observed little historical flooding since its establishment in 1849, the City of Cork, as indicated above, sits on a floodplain with a long history of flooding. Re: "**[2]** *Practically none of the buildings damaged by the November 2009 flood had been flooded previously.*" This is unsurprising. Most of the buildings were new buildings and the flood was the first major flood in some years, albeit one of many floods to have afflicted Cork City over the years. Re: "**[3]** *Some minor tidal flooding was experienced at the Lee Maltings site area; however, the extent of the damage was not significant. I, along with other members of the Building & Estates team, was aware of the risk of tidal flooding...*". Tidal flooding is of little relevance to the within proceedings. Re. "**[4]** *the risk of fluvial flooding was* *not a concern to UCC. I was not employed by UCC at the time of the 1986 fluvial flood, but I am aware that none of the main campus buildings were damaged in that flood.*" The court cannot but arch an eyebrow at the averment that a significant property-owner whose premises straddle a river with a long history of flooding would not be concerned about flooding. As to the 1986 flood, much of the development of UCC's property portfolio followed the 1986 flood. Re. "**[5]** *I was also aware that a bridge on the Western Road had been destroyed by fluvial flooding in 1916.*" UCC and its staff were not properly aware, as they ought to have been, of the long history of flooding before and after 1916 and its effects. Re. "**[6]** *I am surprised to read that ESB believe we should have operated on the basis that the dams were not present.*" Mr Poland is not alone in his sense of surprise. Re. "**[7]** *At no time did any of the many professionals we engaged to develop the campus...suggest to me that the flood risk for UCC was based on the flooding experienced in Cork in 1916.*" The critical point is not that there was a big flood in 1916 but that the river Lee has repeatedly flooded throughout recorded history; this is a fact of which UCC cannot but have been aware given its long presence in Cork City. Re. "**[8]** *The ESB's position ignores the fundamental fact that the construction of the Inniscarra and Carrigadrohid dams significantly changed the position in relation to flood control and water regulation on the River Lee.*" This is true. Re. "**[9]** *The dams were regarded by UCC as promoting the regulation of the flow of water in the river and affording a high level of protection from fluvial flooding to downstream properties.*" In truth, it seems to the court from the evidence and argument before it that UCC viewed the Lee Scheme as the 'be all and end all' to flood relief. Any such understanding was wrong. Re. "**[10]** *In fact, the River Lee Hydroelectric Scheme brochure published by ESB says 'flooding downstream of Inniscarra has been minimised by the presence of the dam.'*" It is only fair to note that this statement is preceded by the statement: "*Occasional flooding of the valley downstream of Inniscarra has always been and will continue to be inevitable.*" However, it is the case that ESB has, over the years, touted itself as the 'all singing, all dancing' darling of flood attenuation in the Lee Valley. Re. "**[11]** *If ESB had wanted to operate as it now suggests, I would have expected it to set this out in its brochure and advise all downstream residents that the dams do not provide flood protection.*" There was, at best, a blurred message emanating from ESB. It touted the flood alleviation benefits of its dams to the world, yet now comes to court claiming that the world got the 'wrong end of the stick' and that it is in fact subject to a self-negating duty of care which requires of it that it do precisely nothing as regards flood alleviation. Re. "**[12]** *Overall, there was a strong sense that any risk of fluvial flooding was significantly, if not completely, reduced by virtue of the presence of the dams.*" See comment re. [11]. Re. "**[13]** *We relied on the engineering judgement of our design team to construct new buildings at levels above historical flood levels and in line with best practice.*" This is the key-stone of UCC's unsuccessful defence to the claim of contributory negligence made by ESB, and is considered later below. Re. "**[14]** *Protection from fluvial flooding never formed a part of the UCC Masterplans for campus development.*" That a university developing on a river-plain that has flooded repeatedly over the centuries, and that had been reported and was generally known to have so flooded, could have eschewed consideration in its various master-plans of the need for protection from fluvial flooding, beggars belief.

50. Mitigation of Flood Risks Known to UCC. UCC underwent significant development in the ten years prior to 2009, resulting in a 50% increase in building stock. New buildings designed and constructed include the Glucksman Gallery and the Western Gateway Building (both of which flooded in 2009) and the Environmental Research Institute (which did not). As part of this development programme, UCC commissioned professional design teams to design the new buildings, obtain planning permission and oversee construction. Multi-national consultancy firms expressed an interest in, and were shortlisted to tender for, UCC's various development projects. Once a preferred tenderer was selected, approval was sought from the Buildings Committee, and the relevant tenderer, if approved, was engaged. Per Mr Poland:

> "*As part of the design process for each building, where necessary, UCC's consultants assessed the history of flooding at the relevant...site, the potential for flood risk and advised on appropriate mitigation measures....Each consulting engineering firm/architect prepared their analysis on a per site basis, and drew relevant conclusions as to the appropriate finished level floor height of each building. I was aware that the minimum finished floor level height required to obtain planning permission for buildings in Cork City Centre is 3.1m...(which is the level that is still applied by Cork City Council as the planning authority for the city). UCC's consultants recommended finished floor levels that were not only above this minimum requirement, but which also factored in any historical flooding at the relevant site and the location of the site itself....I did not enquire with the consultants as to the temporal scope of the historical flood history considered by the relevant design teams. I trusted the professionals engaged to follow best practice...*".

51. A few points arise. First, the court has been provided with expert evidence as to what flood-history risk assessment that it would have been appropriate to undertake, but which was not done. Second, the minimum finished floor level to which Mr Poland refers is related, and derives from, tidal flood risk, not fluvial flood risk. Third, the court notes Mr Poland's assertion that "*I trusted the professionals engaged to follow best practice and advise me accordingly.*" The court considers, in Chapter 55, the related issue of whether one may always resile from liability for one's actions provided they are informed by independent professional advice.

52. Flood protection and flooding at Glucksman Gallery. The Glucksman Gallery is a cultural and educational visual arts institution. It is located at the main entrance to UCC on Western Road. It was constructed on a relatively small 'footprint' in a sensitive environmental area. In the late-1990s, after UCC decided to commission construction of the Gallery, there were various presentations about the impact of the building before the Buildings Committee (Poland Affidavit No.2, para. 3.6). As part of the planning application process, O'Donnell and Twomey Architects prepared an architect's report dated November, 2000, which included consideration of potential flood risks. The Gallery was proposed to be, and was, built, on the site of an old tennis-court to minimise the impact on mature gardens and trees, and to maintain as much green area as possible. O'Donnell and Twomey concluded that shallow flooding occurred historically on the lower ground, although the tennis court did not flood. They proposed that the Gallery restaurant be raised 500mm above the existing tennis-court level, "*enough to be above any potential flood risk*". (Poland Affidavit No.2, para. 3.7).

53. Flood protection and flooding at Western Gateway. At some 25,000m^2, the Western Gateway Building, completed in 2009, is the largest building on UCC's campus. It accommodates, *inter alia*, the Computer Science, Maths, Pharmacology and Physiology Departments, UCC's Technology Transfer Office, various incubation facilities and lecture theatres. A pedestrian bridge links the Western Gateway to the Brookfield Health Sciences Complex. UCC acquired the Western Gateway site, an old greyhound track, in 1996 and took occupation in the early-2000s. In 1999/2000, UCC engaged a design team to advise on the design of the Western Gateway and to obtain planning permission for its development.

Although the proposed building did not trigger the legal requirement for an Environmental Impact Assessment, UCC commissioned an Environmental Impact Statement. "*It was well known to UCC when the site was acquired that it was subject to periodic flooding. Accordingly, flood risk assessment was considered in the EIS and formed part of the design process for the Western Gateway Building.*" (Poland Affidavit No.2, para. 3.12). In March 2001, UCC applied for planning permission for the construction and use for academic purposes of a new three-storey building and "*the raising of the site level above flood level*". (Poland Affidavit No.2, para. 3.13). An Environmental Impact Statement accompanied the planning application stating, *inter alia*, that "*The building and car park as designed are above recorded flood levels and should not be subject to flooding*". In the end, at a height of 4.8m, the ground-floor level of the Western Gateway Building is higher than any other building in its vicinity and was 1.7m higher than the highest recorded flood at the old greyhound track-site.

54. Flood protection and flooding at the Environmental Research Institute. UCC's Environmental Research Institute was established in 2000 and supports environmental research and education at UCC. The building, completed in 2009, is a three-storey 2,890m^2 structure, comprising laboratories, meeting-rooms and adjacent car-parking. M.C. O'Sullivan & Co. (MCOS) were engaged by UCC as consultant architects on the team that designed the Institute and obtained planning permission. Notably, the Institute was not flooded in November 2009. ESB contends that this is because MCOS engaged in appropriate analysis of flood-risks arising, something UCC and its other advisors did not do. The fact that MCOS acted differently from such other consultants as were engaged by UCC over the years is not disputed between the parties. What appears to be disputed is the cause for their approaching matters differently. ESB contends that the cause is competence. UCC contends that it was to do with changing planning practices in planning. Mr Poland avers:

"[I]*t may be useful to the Court if I briefly outline the assessment carried out by MCOS regarding flood risk at the site and the requirements of Cork County Council ....At the time, the focus of planning authorities on flood related issues was beginning to change. Principally, Cork County Council required that any floodplain area loss arising from the development of the Environmental Research Institute be replaced elsewhere within the site. MCOS had assessed that the main consequence of developing the site would be to reduce the floodplain area by less than 0.5%. To mitigate this effect, the lost storage volume was replaced by excavating elsewhere on the site to neutralise...impact on the floodplain. MCOS also assessed historical flooding at the site, which had reached 4.5m...in February 2002. The design flood level was taken to be 5.0m...and the proposed finished floor level permitted by Cork County Council is 5.5m...*". (Poland Affidavit No.2, para. 3.20).

55. Whatever about the floodplain point, it is, for UCC, an inconvenient truth that it was MCOS' competent assessment of historical flooding that led to its pitching the level of the Environmental Research Institute at what was subsequently proven to be a suitable height.

56. UCC's response to the flooding of November, 2009. Mr Poland accepts that "*UCC was unprepared for a flood of the scale and volume experienced on 19/20 November 2009*". (Poland Affidavit No.2, para. 4.1). His view is that the blame for this rests with ESB:

"*4.1...* **[1]** *The simple truth is that UCC had never before experienced flooding of this nature.* **[2]** *UCC had emergency plans and protective measures to deal with* *known risks.* **[3]** *ESB never informed us that we should operate and protect ourselves as if the dams did not exist.* **[4]** *We had no experience of anything resembling what happened on 19/20 November 2009.* **[5]** *We understood ESB's warnings on the day as being not much different to previous warnings.* **[6]** *ESB failed to provide information in its possession which could have assisted us in managing flood risk and now seeks to infer that we should have known about the risk.* **[7]** *Whilst we were on alert following the warnings, we never anticipated flooding of the scale and volume experienced and we received no information from ESB to initiate emergency response procedures to evacuate students.* **[8]** *Despite this, I believe our response to the flood that night was appropriate in the circumstances and, indeed, was widely commented on as being very positive.*

4.2 **[9]** *If the warnings had said vast quantities of water would flood our campus akin to the dams not being there, which had never happened in my time in UCC, or simply said there is likely to be 1m of water on the Western Road, I would have appreciated the impact and acted differently.* **[10]** *No member of ESB had ever advised me it was a major risk or ever alerted me to the fact that fluvial flooding was a reasonable possibility.* **[11]** *Even if ESB had given us this information on the morning of 19 November 2009, I believe it would have been too late to put meaningful defences in place. We could have done a few things like close the campus, evacuate students and move equipment off floors, but no amount of effort in such a short timeframe would have kept the flood waters at bay given their scale.* **[12]** *Even if we had five or six days' notice, it would have been an enormous exercise to protect UCC against the extent of flooding that occurred.* **[13]** *I fail to understand why ESB did not properly inform all potentially affected downstream land owners of the impact of discharges of water under its* *regulations. Had it done so, I would have had an opportunity to implement proper flood protection for the campus.*" (Poland Affidavit No.2, para. 4.2).

57. ESB's response to these assertions in the course of the hearings might be described as a John McEnroe-esque 'You cannot be serious'. The court would note as follows. Re. "**[1]** *The simple truth is that UCC had never before experienced flooding of this nature.*" The 'simple truth' is Cork City had experienced serious flooding on multiple occasions in the past, many documented, a notorious fact of which UCC cannot but have known. The flooded premises were all situate in or about the area where flooding previously occurred. Re. "**[2]** *UCC had emergency plans and protective measures to deal with known risks.*" If the court might be forgiven a Rumsfeld-esque moment, it is not unreasonable that when it comes to emergency planning and protective measures, one should not merely be alive to "*known risks*" (or 'known knowns'). There are also 'known unknowns', such that Cork City is situate in a plain which the river Lee has long and regularly flooded and will do so again and again in the future to a scale and level that cannot now be known. To this risk, UCC appears never to have given adequate attention. Re. "**[3]** *ESB never informed us that we should operate and protect ourselves as if the dams did not exist.*" In truth, ESB did the contrary, touting to the world the wonders of the Lee Scheme when it came to flood alleviation. Re. "**[4]** *We had no experience of anything resembling what happened on 19/20 November 2009*". See the responses to [1] and [2]. Re. "**[5]** *We understood ESB's warnings on the day as being not much different to previous warnings.* **[6]** *ESB failed to provide information in its possession which could have assisted us in managing flood risk and now seeks to infer that we should have known about the risk.* **[7]** *Whilst we were on alert following the warnings, we never anticipated flooding of the scale and volume experienced and we received no information from ESB to initiate emergency response procedures to evacuate students*... **[9]** *If the warnings had said vast quantities of water would* *flood our campus akin to the dams not being there, which had never happened in my time in UCC, or simply said there is likely to be 1m of water on the Western Road, I would have appreciated the impact and acted differently.*" The issues concerning the warnings given by ESB on the 19th are principally addressed in Chapter 18. Re. "**[8]** *Despite this, I believe our response to the flood that night was appropriate in the circumstances and, indeed, was widely commented on as being very positive.*" There is a lot more that UCC could have done in advance of the flood events of November 2009 in terms of flood preparedness: on the 19th it made the best of its previous bad preparation. Re. "**[10]** *No member of ESB had ever advised me it was a major risk or ever alerted me to the fact that fluvial flooding was a reasonable possibility.*" See the responses to [1] and [2]. As to the specific warnings on 19th November, see further Chapter 18. Re. "**[11]** *Even if ESB had given us this information on the morning of 19 November 2009, I believe it would have been too late to put meaningful defences in place. We could have done a few things like close the campus, evacuate students and move equipment off floors, but no amount of effort in such a short timeframe would have kept the flood waters at bay given their scale.* **[12]** *Even if we had five or six days' notice, it would have been an enormous exercise to protect UCC against the extent of flooding that occurred.*" These are significant admissions, not least as regards the assessment of damages. Re. "**[13]** *I fail to understand why ESB did not properly inform all potentially affected downstream land owners of the impact of discharges of water under its regulations.*" The adequacy of ESB's warnings on the 19th is a focus of Chapter 18.

58. Heightened awareness of flood risk. Since the flood events of 2009, UCC is now "*acutely aware*" of fluvial flood-risk. (Poland Affidavit No.2, para. 5.1). It has incurred expenditure of approximately €2m designing and implementing flood defences in many buildings affected by the flood. UCC has also drawn up a detailed emergency response plan. It is difficult to see how, with reasonable foresight, all of these measures could not have been effected before November 2009.

CHAPTER 8: RESERVOIR TYPES.

59. Purpose(s) of reservoirs. A reservoir's primary purpose is to store water. The way a reservoir generally functions is that a dam forms a wall across a river valley; water is then retained behind the dam to form the reservoir and is allowed out of the reservoir via the outlet/s. Dams also have a spillway to discharge surplus water in the event of high in-flow; this spillway has a lower crest level than the dam, so preventing water from passing over the dam-crest and compromising structural stability/safety. One reservoir can serve numerous purposes, *e.g.* water supply, generation of hydroelectricity, flood control. Mr David Ramsbottom, an expert witness called by ESB, indicates that: "*Reservoirs have a number of different purposes. These include water supply...generation of hydroelectricity and flood control. These different functions* [Mr Ramsbottom uses the terms 'purpose' and 'function' interchangeably]... *affect the size and location of...dams.*" (Ramsbottom Report, para. 5.2). There are three principal types of reservoir: hydropower; flood-control; and dual-purpose.

60. Flood-control reservoir. A flood-control reservoir is designed to maintain storage volume that can be used to store water when floods occur. The maximum potential flood volume storable sits between the maximum and minimum water levels. In practice, the water level is normally above the minimum level to maintain normal river-flow through the outlet. The maximum design water-level for flood control may be lower than the spillway crest to take account of wind/wave fluctuations and to provide an operational safety margin. The design storage volume of a flood-control reservoir is the volume between the maximum design water level for flood control and the upper limit of the normal operating range. A flood-storage reservoir is kept as empty as possible so that as much storage volume as possible is available when required.

61. Hydropower reservoir. In a hydropower reservoir, minimum operating level is affected by the requirements of power station turbines. There is normally a minimum operating 'head' below which turbines cannot be operated. A hydropower reservoir therefore operates within a relatively narrow band of water-levels. In practice, the maximum water level for normal operation may be lower than the spillway crest to take account of wind/wave fluctuations and provide an operational safety margin. Storage available for power generation is the volume below maximum normal operating level and above minimum operating level. A commercial objective of such a scheme is to utilise storage to maximise power.

62. Comparison of flood-control/hydropower reservoirs. A flood-control reservoir maintains an empty volume for storage of flood-flows. A hydropower reservoir maintains high water-levels to generate electricity. Water discharge outlets in a pure flood-control dam are generally located at a low level to permit greater emptying. In a pure hydropower dam, outlet gates may be located near the dam-crest, limiting the ability of the dam to reduce water-levels other than by turbine usage.

63. Dual-purpose reservoirs. A reservoir, by design or use, may have or acquire a duality/multiplicity of purposes. In a reservoir intended to provide hydropower and flood storage volume, it is necessary to compromise flood volume and power generation capacity. The flood storage and power generation volume of a dual-purpose reservoir will generally be reduced compared with that of a similar-sized, single-purpose reservoir. (Ramsbottom Report, para. 5.24).

64. The 'design flood'. Every reservoir has a 'design flood' for dam safety purposes. The return period of a design flood is very high. The ability to discharge the design flood is a fundamental dam-safety requirement. An inability to meet the design flood would result in release of most or all water stored in a reservoir in a short timeframe. ESB's "*Flood Control and Dam Safety Review*" (1987) determined that the Lee Dams should be capable of safely passing, without overtopping, a flood with an annual probability of 0.01% (a 10,000-year flood). Spilling instructions at the Scheme are designed to ensure the Dams are capable of passing extreme floods up to this magnitude. This is achieved by providing gates and/or a fixed spillway with the required capacity. ESB maintains that as the magnitude of a severe flood is not known in advance, every severe storm event must be regarded as being capable of developing into the design flood, even when (as with the storm-event of November 2009) dealing with a storm that is patently of a much lesser strength.

CHAPTER 9: MAXNOL AND TTOL.

65. MaxNOL defined. The acronym 'MaxNOL' stands for "*Maximum Normal Operating Level*". It is defined in the Lee Regulations (at *iv*) as meaning "*the highest level allowable in the operation of the reservoir under normal operating conditions. It can only be exceeded under special flood instructions*". Once MaxNOL is reached, water must be discharged in accordance with the Lee Regulations (of which more anon). There is a science to the calculation of MaxNOL; it is not a matter of dam-operator whim.

66. Use of space above MaxNOL. To use reservoir storage above MaxNOL for normal operational purposes or to incorporate potential overtopping into a discharge scheme for flood management is an unacceptable risk to dam safety. The level above MaxNOL is neither available for hydro-electric generation purposes, nor discretionary attenuation. Once a reservoir level exceeds MaxNOL, discharges must be such as will safely return the reservoir to normal conditions.

67. TTOL. Target Top Operating Levels (TTOLs) for both Carrigadrohid and Inniscarra Reservoirs are prescribed in the 'Water Management Guidelines' contained within the Lee Regulations. The term "*Target Top Operating Level*" is defined in the definitions section (at *iv*) of the Regulations as "*the top operating level which the station shall endeavour to maintain during non-flood conditions.*" The definition further indicates that "[TTOL] *varies throughout the year to take account of seasonal factors such as low flows in summer and likely floods in winter.*" ESB's Chief Civil Engineer describes TTOLs as "*basically economic targets, whose main purposes are to provide for optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs.*" (O'Mahony Affidavit, 35). TTOL is higher in summer to allow for greater storage of water during dry periods. TTOL is lower in winter when in-flows are higher, so as to avoid/reduce the need for spilling of water, *i.e.* non-mandatory discharges. Whatever the season, TTOL is lower than MaxNOL. UCC contends that this lower level offers a level at which generating potential at the Lee Dams can be optimised while ensuring that water levels are generally kept lower. On the basis of the evidence before it, the court accepts this contention.

68. Is TTOL a level? One might think from the above-quoted extract from the Lee Regulations that the answer to this is 'yes'. Yet ESB has contended in these proceedings that

TTOL is the bottom of an economic sub-band. Dr Bree, a distinguished civil engineer called by ESB, avers in his affidavit evidence (para. 31) that TTOL – "*the top operating level which the station shall endeavor to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – is in truth the marker for an economic sub-band that sits between TTOL and MaxNOL. One will search in vain for a document which pre-dates these proceedings that posits this notion. Yet Dr Andy Hughes, a distinguished civil engineer, also called by ESB, adds his imprimatur to this concept, describing TTOL as the marker for an economic sub-band between TTOL and MaxNOL. (Hughes Report, para. 4.47). It did not seem to the court that Dr Hughes was always consistent in this regard. In the course of his oral evidence, he indicated that TTOL is a level:

"*Counsel* [UCC] – *...The difference, Dr Hughes, between a band and a level is very obvious to you?*

Dr Hughes – *It is. But as I say, I think if those who were able – were given the ability to redraft those rules now, particularly in the light of this case, they'd re-write them in a different way...*

– *Well, they may well, and they might do lots of things in the light of this case. But your role as an expert is to give evidence with regard to the correct factual position. And the position in the regulations, whether you agree with it or disagree with it or whatever significance, is this is a level?*

– *Yes, I agree it's my position to give you that role. But I'm also giving you the benefit of my experience, that although* *it's stated as a level and it is clearly stated as top operating level – my experience is also that it will always operate as a band. And as I've just said, if somebody was going to write these regulations in a different way, they would write them in a different way, they'd call them something different, they wouldn't call them regulations and they would write it, I certainly have learned from this case I would write things in a different way.*

– *Dr Hughes, it is not just stated as a level, it is in fact a level. Perhaps a level that cannot always be maintained but a level nevertheless.*

– *I accept that....It says it's a level and it's therefore stated and defined as a particular level.*

– *...Yes. And the obligation is to endeavour to maintain that level. That's a clear obligation?*

– *Well, it's not an obligation, it is something that the company has decided, through analysis, that that is where they should operate for their own purposes....*

– *Yeah. And I think you're aware that ESB have maintained water levels much closer to TTOL since 2009? You're aware of that, aren't you?*

– *I'm not actually. I haven't done any analysis of where the water levels have been since 2009.*" (Transcript, Day 67, pp.131–132).

69. Obligation to achieve TTOL. When it comes to TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – there was a notable dichotomy between what ESB contended at trial and what its own pre-trial documentation appeared to contemplate. The language of ESB's operational rules suggests that water levels ought to be heading towards TTOL from wherever they start. When it was put to Dr Bree by counsel for UCC that the 'HCC Operating Instructions' instruct operatives to strive to achieve TTOL, he admitted that that is what it says:

"*Counsel* – ...[T]*his is a document we've looked at previously, Dr Bree, it's the Lee Stations Hydro Control Centre Operating Instructions, Inniscarra and Carrigadrohid Stations....So these are the operating instructions, this is the handbook, the bible for the operators of the stations, isn't that so?*

Dr Bree – *I presume so, yeah. I have not studied it...*

– *...And you see the normal operating level there is between 61 and 64.5 for Carrigadrohid. Do you see that?*

– *Yes.*

– *And that's MinNOL and MaxNOL.*

– *That's exactly what I was saying, yeah. Normal operation is anywhere in max to min.*

– *Yes. And where is the economic sub-band between TTOL and MaxNOL.*

– *It's within that.*

- *It's within that?*
- *And the bottom end of it below TTOL within that is the reserve.*
- *Okay. So in looking at the operating levels here and putting this document together, everybody forgot to mention that while that's the normal parameters between MinNOL and MaxNOL, in fact there is a sub-band between TTOL and MaxNOL and that's where you're supposed to be operating?*
- *Yeah, you'd have to ask the people who prepared it....Maybe they didn't put everything into this.*
- *They didn't. Okay. So that was just an oversight that they didn't put it in. Would you turn on to page 104 please?*
- *Mm hmm.*
- ...[T]*hose are the instructions to the operators: 'Keep your levels and maintain them as close as possible to those winter and summer operating levels'. You see that?*
- *Yes....*
- *So what the operators of the station are being told is they are to maintain water levels a TTOL on a seasonal basis?*
- *Hmm...Yeah, it says 'as close as possible', but I would not read – that's not what TTOL is. The instruction is between TTOL and MaxNOL, that's the area that you operate....*
- *Dr Bree, your proposition that TTOL represents the area between TTOL and MaxNOL is totally inconsistent with the contents of this document.*

- *Just with that one, maybe with that one statement, 'as close as possible'. I would say you'd need to be in that band between TTOL – you can be anywhere between min and max, but economically it's best to be between TTOL and max. So...*
- *This document is saying precisely the opposite, Dr Bree. It's telling the operators that they should strive to achieve TTOL, maintain levels 'as close as possible'.*
- *Yes, I...Okay, well that's what it says.*
- *That I suggest to you is how TTOL is supposed to be interpreted and applied, it is a level and as the regulations suggest, the operators have to endeavour to achieve it.*
- *But from looking at the records, I don't see that they've done that.*
- *Well, that indeed is the point, Dr Bree.*" (Transcript, Day 75, pp.190–193).

70. Dr Hughes also accepted that the obligation under the Lee Regulations is to endeavour to achieve TTOL. (Transcript, Day 67, p.127). The role of the Hydro Control Centre (HCC) is considered later below.

71. Some summary conclusions regarding TTOL. The notion that TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – is the bottom of an economic sub-band is not accepted by the court. This contention flies in the face of the factors mentioned hereafter. First, that TTOL is a level is apparent from its definition in the Lee Regulations and from a diagram in Appendix 6 of those Regulations. Second, in the Lee Stations HCC Operating Instructions, a document drafted by a former Lee Station Plant Manager with other station staff, not only is it stated that the Lee Reservoirs should be maintained as close as possible to TTOL; no mention is made of the sub-band above TTOL. Third, at a lecture given on 24th October 2007, by Mr Buckley, a former Lee Station Plant Manager and Mr Jack O'Keeffe, a former ESB Chief Civil Engineer, to the Chartered Institution of Building Services Engineers (CIBSE) to mark the 50th anniversary of the Lee Scheme, Mr Buckley referred to TTOL as a level to be attained. Fourth, all of ESB's flood reports before November 2009 refer to TTOL as a level. Fifth, efforts to portray TTOL as the start of an economic sub-band between it and MaxNOL flounder on fact and in the evidence of Drs Hughes and Bree.

CHAPTER 10: THE LEE REGULATIONS.

72. Use and substance of operational rules. Procedures for dam-operation are typically contained in operational rules. Rules related to flood discharge are a fundamental requirement for dam safety. Such rules typically possess the following features: (1) the first priority is to ensure dam integrity; (2) when water level exceeds a specified critical level, water must be discharged in accordance with a specified schedule; (3) during a rising flood, outflow must not exceed peak in-flow; additionally the rate of rise downstream ought not to exceed the natural rate of rise, though this cannot always be avoided; and (4) there may be a discretionary clause permitting higher downstream discharges when the reservoir level is below critical level. This discretionary clause may permit creation of additional reservoir storage if a flood forecast is received. This is achieved by discharging water downstream up to a rate that does not cause flooding of other people's property. Item (3) springs from what was referred to in shorthand throughout the proceedings as the 'do not worsen nature' rule whereby ESB seeks at all times to operate the Lee Scheme in such a manner as not to worsen the previous 'natural' conditions that pertained at the site of the Lee Scheme before the reservoirs and dams were completed in 1957.

73. The Lee Regulations: overview. The operating system for the Scheme is contained in an ESB document entitled "*Regulations and Guidelines for the Control of the River Lee*" ("the Lee Regulations"). The Lee Regulations have no statutory standing. They are in-house rules conceived within ESB Group, amended on a rolling basis, and applied by ESB staff. The first version issued in 1957. They have been subject to ongoing variation since, in light of ESB's continuing operational experience. Thus there were revisions in 1983, 1984, 1988, 1995, 2000 and 2003. There have been some interim changes, including a modification to the 2003 version following a flood event in 2006.

74. Dam integrity. Dam integrity requirements form a significant element of the Lee Regulations. This is because both Lee Dams are 'Category A' dams whose breach would endanger the lives of a downstream community. Consequently, during flood periods, there is a general requirement that the Lee Regulations be complied with rigorously. However, as will be seen, full compliance was not attained in November 2009; indeed waters were at one point held back at Carrigadrohid Reservoir in conscious breach of same.

75. Water discharge-levels. The water discharges specified in the Lee Regulations increase incrementally as reservoir levels increase. This is because, even during extreme floods, ESB seeks to avoid large increases in downstream discharges. Per ESB's Chief Civil Engineer: "*Incremental increases in discharges allow people downstream of the dams to observe* *corresponding incremental increases in water levels, which provides them with time to reach higher ground, even if they have not heard warnings.*" (O'Mahony Affidavit, p.23).

76. Communication breakdown between dams. During floods, the requirements of the Lee Regulations for both dams are implemented from the control room at Inniscarra Power Station, under the Hydrometric Officer's instruction. There is also a requirement for personnel to be in place at both dams. This ensures required gate movements are witnessed to ensure they are being done correctly. It also provides for the situation when communication could be lost. Should communication be lost, the physical presence of personnel at each location ensures, insofar as possible, that the Lee Regulations can be implemented independently at each dam.

77. Evolution of Lee Regulations. Changes to the Regulations have resulted from ESB's practical experience of operating dams/associated power stations. They also resulted from ESB-commissioned studies such as the Flood Control and Dam Safety Studies of the 1980s. The initial version of the Regulations was based on the requirements of the approval order. Thereafter they were modified by reference to operational experience. However, the ESB-commissioned "*Flood Control and Dam Safety Review*" (1987) identified that flood-handling capacity at Carrigadrohid was inadequate to meet the advancing requirements of design flood standards. One of the Review recommendations was that the Lee Regulations be modified on an interim basis to require a higher rate of increase in discharge at Carrigadrohid during early flood-stages. Pending the issue of revised regulations, ESB's then Chief Civil Engineer lowered the high-water level of storage.

78. The "*Regulations for Control of the River Lee*" (1988), was an interim document, issued pending completion of certain dam-improvement works. The format of the Regulations was revised to improve clarity; various diagrams were re-drawn. Spilling instructions were modified to deal with extreme floods. As regards Inniscarra, the regulations were intended to address floods having an expected annual probability occurrence of 1/10,000. As regards Carrigadrohid, the regulations were intended to be capable of dealing with floods having an expected annual probability of occurrence of 1/7,000. The document stated that after completion of dam improvement works, it would be amended so that a 1/10,000-year flood could be managed at Carrigadrohid. Floods were now managed by discharging specified amounts at specified reservoir-levels, to ensure that extreme design floods could be safely managed. In addition, peak discharge at Inniscarra was not to exceed peak in-flow during a rising flood. During the falling flood, discharges were to be reduced in conjunction with decreases in levels/in-flows. If a following flood caused water-levels to rise above specified heights, there was a requirement to revert to the discharges prescribed for rising floods. Construction of an overflow spillway at the right abutment of Carrigadrohid Dam was completed in 1991. Draft revised water control regulations were produced to take account of the dam improvement works on the Lee Dams, including the auxiliary spillway.

79. Revised regulations issued in 1995. In them, the spilling instructions were modified to enable the dams to cater for extreme floods. The revised regulations meant that both Carrigadrohid and Inniscarra Dams were capable of dealing safely with floods having an expected annual probability of occurrence of 1 in 10,000. Again, floods fell to be managed by discharging specified amounts at specified reservoir levels. In addition, peak discharge at Inniscarra was not allowed to exceed peak in-flow during the rising flood. During the falling flood, discharge was generally to be kept below the peak in-flow that occurred during the rising flood. During the falling flood, discharges were to be reduced in conjunction with decreases in reservoir levels. If a following flood caused levels to rise above specified levels, there was a requirement to revert to the discharges prescribed for a rising flood.

80. The Lee Regulations were again revised in 2000, now divided into two sections, respectively comprising regulations and guidelines. The regulations had to be applied when reservoir levels reached MaxNOL, then 64.50m at Carrigadrohid, and 50.00m at Inniscarra. Up to these levels, the Station Manager, on the advice of the Hydrometric Officer, had the option of spilling to increase storage and/or reduce flooding at a later stage. This appears to be the first time that the regulations referred to discretionary spilling in advance of what is strictly required once a flood is declared. During a rising flood, peak discharge was not to exceed peak in-flow. The tables indicating how discharges were to be managed during floods did not change from the 1995 version, except for maintaining discharges to lower levels in Inniscarra Reservoir during a falling flood. The guidelines section of the document indicated that the Station Manager, on the advice of the Hydrometric Officer, had the option of spilling below water levels prescribed for spilling, in order to increase storage and/or reduce flooding at a later stage. This option could be exercised when all available information indicated that spilling would be likely within hours/days.

81. The Regulations were revised again in 2003 to take account of a new centralised Hydro Control Centre based in Turlough Hill, County Wicklow. With the advent of the HCC, it was no longer necessary to have 24-hour staff for normal operation at ESB's hydro-generating stations. The current version of the Lee Regulations reflects the role of the HCC in station operations: the HCC is responsible for normal operation of the Lee Stations; however management of water levels and flood management are dealt with locally.

82. Due to the nature of flooding of December 2006 on the River Lee, discharges from Inniscarra increased rapidly during a rising flood. To address this issue, pending a formal revision of the Regulations, the Chief Civil Engineer issued an amendment which had the effect of commencing mandatory spilling at an earlier point of a flood, *i.e.* at 49.50m instead of 50.00m. However, during non-flood periods, the reservoir could still be allowed to rise to 50.00m, without a requirement to discharge water through the spillway gates.

83. For the sake of completeness, it is worth mentioning that, in September 2010, the Office of Public Works (OPW) requested ESB to examine any interim measures, in relation to the operation of the Lee Dams, that might be put in place on a pilot basis, with a view to increasing the level of flood protection downstream. Following this request, the mandatory spilling level during the winter period was lowered by 0.5m in each reservoir. In effect, during the winter period, MaxNOL levels were reduced to 64.00m at Carrigadrohid and 49.00m at Inniscarra. Pending implementation of the State-sponsored 'Lee Catchment Flood Risk Assessment Management Study' (CFRAMS) flood risk management plan, ESB has continued to implement these lower water levels each winter since 2010.

84. General structure of current Lee Regulations. The Lee Regulations comprise three Parts: Part I ("*Regulations for Flood Management*"); Part II ("*Water Management Guidelines*"); and Part III ("*Specific Staff Responsibilities*"). There are also various Appendices, of limited interest in the context of this case. During normal periods, flows generally pass through the turbines, with the Lee Stations striving to optimise water-use for electricity generation, while ensuring they discharge a constant minimum flow of 1.5m^3/s to the River Lee downstream of Inniscarra Dam.

85. **Summary of staff responsibilities.** There are seven key categories of person in the dam operation structure: (1) the Responsible Engineer (ESB's Chief Civil Engineer), responsible for overall dam safety; (2) the Generation Group Manager, responsible for hydro-station operations; (3) the Hydro-Stations Manager, accountable to the Generation Group Manager for safety, efficiency and maintenance; (4) the Supervising Engineer, who has local control of the Lee Dams; (5) the Plant Manager, who manages dam operations and reports to the Hydro Stations Manager; (6) other local staff, who do maintenance, monitoring, operations and testing; and (7) the HCC Operators, who monitor dam behaviour, particularly when the Lee Stations are un-manned. During normal operating conditions, the Hydrometric Officer and Local Plant Controller liaise with the HCC, ESB's Energy Management Centre (EMC) and Eirgrid, the transmission system operator. They provide advice, as required, to the Hydro Manager on optimal water usage. Early each day, the Local Plant Controller prepares running targets, following discussions with the Hydrometric Officer, and communicates these and any other relevant information to the HCC, EMC, and Eirgrid. On commencement of a flood period, the Hydrometric Officer notifies ESB's Chief Civil Engineer and the Hydro Stations Manager that the river Lee is in flood. During such periods, the Lee Regulations provide that the top priority is managing the flood to avoid risk to dam integrity. During flood periods, the Hydrometric Officer must continuously monitor and assess prevailing conditions, and decide on necessary actions, using the Lee Regulations to determine discharge levels. If necessary, the Hydrometric Officer prepares instructions for operation of spillway gates. These instructions are passed to the Plant Manager who instructs the Local Plant Controller. When the Plant Manager is unavailable, the Local Plant Controller has standing instructions to implement the Supervising Engineer's instructions. Management of floods is always carried out locally. During flood periods, the Chief Civil Engineer is contacted, if and as required by the Hydrometric Officer, to discuss flood-management.

86. Part I ("Regulations for Flood Management"). In general, the Lee Reservoirs "*are treated as being independent of each other*". (Lee Regs, para. 1.1). Spilling instructions at the Dams have been modified to deal with extreme floods. (Lee Regs, para. 1.1). The Lee Regulations have as their objective that Carrigadrohid and Inniscarra shall be capable of passing floods with an expected annual occurrence of 1:10,000. (Lee Regs, para. 1.1). Lesser floods are not a key focus. The Regulations provide, at para. 1.1, that they must be applied when water levels reach MaxNOL. At this level mandatory discharges are effected in accordance with tables in the Regulations. The Lee Regulations also provide for discretionary spilling. Per para. 1.1:

> "*Up to these levels, the Hydro Manager on the advice of the Hydrometric Officer has the option of spilling in order to increase storage and/or to reduce flooding at a later stage. The peak discharge shall not be allowed to exceed the peak in-flow during the rising flood.*"

87. Additionally, Part 2 ("*Water Management Guidelines*") provides at para. 2.2(c):

> "*The Hydro Manager, on the advice of the Hydrometric Officer, has the option of spilling below the levels prescribed in the Regulations for spilling, in order to increase storage and/or to reduce flooding at a later stage. This option may be exercised when all the available information indicates that spilling will be likely, under the Regulations, within hours/days. However...peak discharge from either reservoir shall not be allowed to exceed the peak in-flow to the Catchment during the rising flood. The same notification to downstream to residents shall apply*

whether the spilling is in accordance with this Guideline or the Regulations in Part I. This Guideline may be applied even if it results in inundation of land, carparks and roads if, in the judgment of the Hydrometric Officer, it reduces the effect of subsequent flooding. Discharges likely to cause flooding of dwellings shall only occur when the level of the Reservoir dictates that such discharges are necessary in accordance with the Regulations. (See Appendix 5)."

88. Appendix 5 is short but significant. Under the heading "*Guideline Information*", it states: "*It is known that, to date, flooding of houses has not occurred downstream of Inniscarra for discharges from Inniscarra of up to 250m^3/s.*"

89. The quoted clauses were first included in the 2000 version of the Lee Regulations. They are intended to allow the flood storage capacity of the Reservoirs to be increased. Before these clauses were included, local knowledge of handling floods was applied, water being discharged at lower levels than specified in the Regulations. Thus the discretionary clauses cast existing, flexible practice in a newly formalised vein.

90. On and before, 19th/20th November 2009, based on information available at the time, the discretion to discharge through Inniscarra Dam ahead of the requirements of the Lee Regulations was utilised. A discharge of 150m^3/s was passed through the dam from early-morning on 16th November, continuing until discharges increased following flood in-flows on the 19th. Based on operational experience, a discharge of 150m^3/s is considered by ESB to be the discharge that largely remains within the banks of the river Lee downstream of Inniscarra. Higher discharges start to cause flooding, first of land, then roads, later buildings. When considering discharges that breach river-channel capacity, *i.e.* greater than 150m^3/s, the Lee

Regulations require that discharge not exceed peak in-flow; this is a practical manifestation of what is known as the 'do not worsen nature' rule.

91. A few points might be noted. First, the Hydrometric Officer may engage in discretionary spilling to increase storage and/or reduce later flooding. Second, the Hydrometric Officer's actions are subject to the 'golden rule' that peak discharge must not exceed peak in-flow during the rising flood. Third, ESB's approach to advance discharges from Inniscarra is to release these to a maximum of $150m^3/s$ until in-flows exceed this value. As mentioned, Appendix 5 of the Regulations states: "*It is known that, to date, flooding of houses has not occurred downstream of Inniscarra for discharges from Inniscarra of up to $250m^3/s$.*" However, ESB does not consider it appropriate to increase discharges up to $250m^3/s$ until in-flows have increased to this value; this is because if discharges of $250m^3/s$ were released, based on a forecast, and forecast rainfall did not arrive, unnecessary downstream flooding would have occurred. Notably, on 19th November, 2009, ESB failed, for a few critical hours, to increase water discharges above 250m3/s even when inflow was higher, and thus it could have discharged to that level without breaching its 'do not worsen nature' rule. (See further Chapter 51). Had it done so, the later flooding would have been alleviated.

92. Flood periods. Under the heading "*Flood Period*", the Lee Regulations state that a flood period begins when, in the judgment of the Hydrometric Officer, conditions and all available information are such that spilling may be necessary. (Lee Regs, para. 1.2). The flood period continues until the Hydrometric Officer is satisfied normal conditions prevail. (Lee Regs, para. 1.2). The Regulations provide that during the flood period "*the top priority is the proper management of the flood to avoid any risk to dam safety*". (Lee Regs, para. 1.2). The reference to "*dam safety*" is in truth a reference to 'dam integrity'. The Regulations provide: "*All other* *factors such as efficiency of generation, system requirements, environmental, social, legal and economic considerations are secondary.*" The only other provision of significance under the heading "*Flood Period*" (at para. 1.2) is the following:

> "*Before spilling at Inniscarra, the Local Plant Controller shall notify downstream residents and interested parties of the intention to spill. A list shall be kept in the Control Room at Inniscarra Station and shall be updated from time to time.*
> *When the total discharge from Inniscarra is such that roads are likely to be flooded, i.e. greater than 150m*^{3}*/s, a more general public warning shall be given through the relevant authorities and the media. A separate list of up to date contact numbers shall be kept in the Control Room at Inniscarra Station for this purpose.*"

93. During daylight hours, when a station is coming on-load, an alarm is sounded downstream by way of alert to anglers and other river-users.

94. Notifications and warnings. Leaving aside the sounding of alarms, why does ESB provide the above-mentioned notifications/warnings? This is an issue to which the court returns later below. For now it suffices to outline briefly how the notification/warning process operates. Initially the process was an informal way of notifying residents downstream of Inniscarra Dam that discharges additional to normal turbine operation would occur. This, *e.g.*, enabled people to take precautionary arrangements such as moving livestock. Over the years, more people requested that they be added to the warning list. This developed into an 'opt-in' warning-scheme that now includes around 60 recipients. Notifying them can take two hours or more. UCC is on the warning-list. Apparently, it first went onto the list in 2004 when it acquired the site of an old greyhound track that was prone to flooding from the River Lee and whose owner had been on the list since about 1984. (Browne Affidavit, p.8). There are a number of difficulties with the notification/warning process. *E.g.* (1) in substance, the warnings "*primarily give an indication of discharge from Inniscarra* [Dam] *at the time of the warning*" (Hughes Report, para. 7.28); but the significance of discharge levels is unlikely to be readily comprehensible to most warning/notification recipients; (2) as Dr Hughes, an expert witness called by ESB, further noted: the slowness of phoning 60 recipients "*is clearly not ideal*" (Hughes Report, para. 7.57); and (3) the warning process does not adhere to "[c]*urrent best practice* [which] *would include the use of additional media such as SMS text messaging... internet, passive voice messaging (call to access)*". (Hughes Report, para. 7.57). The court considers the issue of warnings in detail in Chapter 18.

95. ESB's Flood Model. During a flood in February 1997, 230m^3/s of water was discharged from Inniscarra Dam for two to three hours. This yielded flooding of some downstream lands, and the commencement of related litigation. Thereafter, ESB's Chief Civil Engineer requested ESBI, an intra-ESB group engineering consultancy, to develop a proposal for operating guidelines in conjunction with a flood forecasting model. The purpose of the proposed model was to predict likely reservoir-levels at the Lee Dams, using various criteria. In June 1997, ESBI put forward a proposal for the development of a river Lee flood management model which would (a) predict the in-flow to Carrigadrohid/Inniscarra Reservoirs and likely levels, and (b) predict in-flow to Carrigadrohid/Inniscarra Reservoirs and likely levels based on meteorological forecasts and dam running-régime. A software package was developed and the Flood Model was introduced at Inniscarra later in 1997. Its operation during flood events on the river Lee in November 1997/January 1998 improved knowledge of the response of the catchment. Various meetings regarding the Model then took place and tests were carried out against actual events to ensure it was running correctly. A user guide was developed, the current version being a revised version of February 1998. The Model was first referenced in the Lee Regulations in November 2000. Over the years, it has been used to predict if and when MaxNOL will be reached and whether advance spilling will be required. Model-derived data is intended to be operated in conjunction with the Lee Regulations and staff experience.

96. Up to and through the flood-event of 2009, running the model was subject to various deficiencies: (1) it was difficult to use and required manual data input; (2) the fact that data needed to be inputted manually meant it was not of much use in the stressful conditions that typically pertain during a serious flood event; (3) Mr Mangan, a key ESB witness in this regard, indicated that there was "*an error in the actual coding of the model*....[b]*ecause if you put in one day rainfall, that wouldn't give you an adequate indication of the impact of rainfall.*" (Transcript, Day 77, p.21); (4) there were a number of ways the model yielded unsatisfactory results: underestimating predicted discharges and giving other unsatisfactory results; using discharge rules that did not accord with the Lee Regulations; giving inconsistent results; and yielding inaccurate results; and (5) the model took no account of prior catchment saturation. As a result, its practical usefulness might charitably be described as 'variable'.

97. Flood operations: Carrigadrohid. During a flood, in-flow to Carrigadrohid Reservoir must be calculated hourly. (Lee Regs, para. 1.4.1.1). Critically, "*[t]he peak discharge shall not be allowed to exceed the peak in-flow during the rising flood*". (Lee Regs, para. 1.4.1.1). In a "*flood period*", when the level of the reservoir is above 64.00m, the turbine must be put on load to match in-flow up to the full input of the turbine. (Lee Regs, para. 1.4.1.1). Total discharge must be effected consistent with a table of discharges in the Lee Regulations. (Lee Regs, para. 1.4.1.1). Various tables identify the dam-gate openings needed to produce the required discharge when one, two and three of the dam-gates are available. (Lee Regs, para. 1.4.1.2). As mentioned previously, the incremental discharges provided for in the tables seek to enhance downstream safety by giving people a staggered basis on which to respond to flood events:

> "*[T]o avoid sudden large discharges and rapidly rising water levels downstream of both dams, the spilling instructions provide for incremental increases....This is particularly important at Inniscarra Dam, where sudden increases in river flows or depths of water could endanger...the public. During floods, discharges from Inniscarra Dam are increased by increments of 25m^3/s as the level in the reservoir increases. Tests...indicate that increases in discharge of this magnitude should not cause dangerously rapid increases in water level downstream of Inniscarra Dam.*" (O'Mahony Affidavit, p.29).

98. Flood operations: Inniscarra. During a flood, in-flow to Inniscarra Reservoir must be calculated hourly. (Lee Regs, para. 1.4.2.1). Critically, "*The peak discharge shall not be allowed to exceed the peak in-flow during the rising flood*". (Lee Regs, para. 1.4.2.1). Total discharge is effected consistent with a table of discharges contained in the Lee Regulations. (Lee Regs, para. 1.4.2.1). Various tables identify the dam-gate openings needed to produce the required discharge at a specified level.

99. Falling flood. When a flood has peaked, total discharge is effected in accordance with another table which, again, prescribes discharge levels by reference to reservoir-level. (Lee Regs, para. 1.4.2.3). There is an express requirement that "*During the falling flood, peak discharge shall be kept below the peak in-flow that occurred during the rising flood.*" (Lee Regs, para. 1.4.2.3). Provision is also made regarding what to do if a flood is followed by another flood, and if a small flood is followed by the promise of good weather. (Lee Regs, para. 1.4.2.3).

100. Inniscarra tables. Because Inniscarra Dam is the lower dam and hence the one from which releases will singularly affect persons downstream, the Regulations require the issuance of certain warnings. When the flood has peaked, discharges are reduced in accordance with falling in-flows and reservoir-levels. Again, peak discharge during a falling flood must be kept below the peak in-flow that occurred during the rising flood and so may exceed in-flow. ESB justifies the pace of discharge in a falling flood by the need to quickly recover flood-control storage but it seems to represent a less than wholehearted implementation of the 'do not worsen nature' rule that it and its witnesses almost religiously espoused at the hearings of the within matter.

101. Water Management Guidelines. Much, if not most, of the work at the Scheme is concerned with water management. The Lee Regulations therefore contain various water management guidelines. Para. 2 of the Water Management Guidelines makes provision regarding, *inter alia*, flood periods. Much of the detail replicates what is stated elsewhere in the Regulations. A discretionary power to spill is conferred on the Hydro Manager (para. 2.2). This power has been considered. Under the heading "*Drawdown Restrictions*", in a section concerned with routine operations, the Lee Regulations provide (para. 2.6.3) for the sounding of an alarm to warn local water users of pending changes in reservoir levels. The Guidelines (para. 2.6.6) make detailed provision regarding pitching total discharges at Inniscarra in such a manner as to maintain a reasonably high oxygen level in the waters so as to safeguard fish downstream.

102. The Gearagh Wetlands. Carrigadrohid Reservoir is relatively shallow. When it descends to levels below 63.40m, an apparently unsightly area of mud-flats and tree stumps is exposed at the 'Gearagh Wetlands', now a special area of conservation. Over the years, objections to these low levels were made to ESB by Macroom County Council and others. So it was agreed by ESB in 1969 that summer levels at Carrigadrohid Reservoir would not drop below 63.40m. Around 1979, ESB decided to continue this water-level restriction. Detailed provision is made in this regard in the Regulations (para. 2.6.5).

103. Water abstraction. Appendix 4 of the Lee Regulations details water abstraction arrangements that have been entered into between ESB and Cork County Council to meet certain fresh-water needs. Other private abstraction arrangements have also been agreed.

CHAPTER 11: HYDROELECTRIC OPERATION.

104. A natural tension. There is a tension between operating a dam/reservoir for hydroelectric generation versus flood alleviation. However, some flood alleviation is a consequence of normal hydro-electric generation. In this regard, ESB maintains that (i) some flood alleviation is incidental to a hydro-electric function, (ii) other flood alleviation is incidental to that function because it is compatible therewith, but (iii) further flood alleviation, as an objective to be prioritised, directly conflicts with hydro-power as a primary purpose.

105. Electricity generation versus flood alleviation. Flood alleviation and hydro-electric generation are sometimes compatible, sometimes in conflict. Mr Stevenson, an expert witness called by UCC, agreed when counsel for ESB suggested that "*there is necessarily a tension between the object of generating hydroelectricity and the object of optimum flood* *management*". (Transcript, Day 52, p.56). This tension arises because "*hydro depends on stored water and flood alleviation depends on empty space*". (Transcript, Day 52, p.56). Mr Stevenson also accepted the suggestion of counsel for ESB that whenever a flood is apprehended the "*theoretical tension between flood management...and hydrogeneration ...becomes a practical conflict*". (Transcript, Day 52, p.57). Mr Faulkner, an expert witness called by UCC, perhaps put matters best during cross-examination: "*I wouldn't say that, you know, the two are always opposed or acting in opposite directions, but there's obviously a tension there.*" (Transcript, Day 13, p.49).

106. TTOL. Usually, on ESB's own account of events, it is preferable to have a reservoir near to full, rather than actually full, so that rainfall which generates in-flows greater than turbine discharge capacity can be captured for future generation. If a reservoir were actually full when such in-flows occurred, the proportion above turbine discharge capacity would have to be spilled, representing a wasted resource. Hence the development of TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35).

107. Consequences of preferring hydro-electric generation. It is likely that a preference for hydro-electric generation will result in a different practical decision being taken by a dam operator as to dam operation. *E.g.* if a reservoir level were well below mandatory spilling level and a large in-flow were to arrive, but not large enough for the reservoir to exceed mandatory spilling level, a preference for flood alleviation would tend towards a decision to reduce reservoir level; a preference for hydro-electric generation would tend towards storing and using the water for generation. There are also, of course, consequences when ESB identifies TTOL and then, for reasons unclear but likely driven by excessive greed for ever greater profit, consistently exceeds that level of optimal efficiency, operating instead to higher water-levels that yielded flooding such as that which occurred in November 2009 but would have been obviated or reduced had ESB but confined itself to "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*".

108. Dam safety. One objective that trumps hydro-electric generation and flood alleviation, is the maintenance of dam integrity. For reasons of dam integrity, almost all gated dams have a mandatory spilling point and rules that must be followed at levels above that point. This regime inevitably involves a level of flood alleviation because there is a temporary storage of in-flow, followed by discharge of less water than is flowing in. General hydroelectric generation practice requires that dam integrity be ensured by following a mandatory discharge regime at specified levels. Additionally, when a reservoir level is at or close to the mandatory spilling-point, and the dam operator has reliable information that large in-flows are imminent, spilling is inevitable. From the perspective of hydro-electric generation, it is irrelevant whether this water is spilled immediately or later. If advance spilling is carried out, the exercise is neutral from a hydro-electric perspective, though likely positive from a flood alleviation perspective. At all times, one is less likely to reach the mandatory spill level if one treats the level at which one reaches optimal efficiency in the operation of a dam (TTOL) as the highest level which it is consistently sought to attain.

109. Acceptance that Lee Dams operate with objective of flood alleviation. ESB tries, where possible, to reduce downstream flooding in a manner that does not detract from its hydro-electric purpose. However, one will search in vain in the evidence to find any convincing explanation as to why ESB does not operate to TTOL – "*the top operating level* *which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35). ESB would perhaps contend that this is to confuse TTOL (a commercial level) with MaxNOL. The court does not accept this contention. By operating to TTOL, ESB combines optimal usage with substantial flood alleviation. MaxNOL still sits separate and apart as the level which can never be exceeded without the necessary design-flood discharge being affected.

CHAPTER 12: WEATHER, RAINFALL, LEVEL AND DISCHARGE MEASUREMENTS.

110. Private weather forecasts. ESB receives daily weather forecasts from the Irish Meteorological Service (Met Éireann). In 2009, these forecasts took the form of daily five-day forecasts, broken into four or six-hour periods. In addition, Met Éireann issued rain warnings for the Lee Catchment once rain above a particular threshold was forecast.

111. Rain-gauges. Recording rain-gauges were installed at Inniscarra and Carrigadrohid Dams from the time of the Dams' initial commencement in 1957. Rainfall telemetry from upstream was added in the 1990s to provide more timely and accurate warning to station-operators "*for the purpose of dam safety* [integrity] *and hydropower operation*". (Bree Affidavit, para. 71). Rainfall amounts at six locations in the Lee Catchment are measured. Rainfall totals are measured and recorded at half-hour intervals and transmitted to Inniscarra. Two of the rain-gauges are located at the Lee Dams. There are also back-up rain-gauges below each dam. These gauges are used to measure rainfall levels.

112. Level and discharge measurements. Reservoir and tail-water level, gate openings and megawatts produced at Carrigadrohid and Inniscarra are measured. These are shown on-screen at the station control-room and logged by hand into 'spill-sheets' during floods. They are also logged automatically to an IT system. At Carrigadrohid, water level in the head-race is measured by means of transducers and a 'Rittmeyer gauge'. Each of the three deep gates has three transducers. At Inniscarra, water-level in the head-race is measured by means of transducers and a Rittmeyer gauge. A staff-gauge (a ruler affixed to a wall and partly immersed in water) is used daily to cross-check water levels. Levels are read in centimetres and typically fluctuate by one to two centimetres. Staff-gauge readings always take precedence, presumably because station-workers can see with their own eyes the water-level. Each of the three crest-gates at Inniscarra has three transducers. They log independently each change in gate opening. Each gate also has a staff-gauge to allow for visual checking of measurements.

113. Cross-checking and averaging. Where three devices are independently recording a parameter, the average of two devices is used to generate the saved value. Checking is done to see if values are within a prescribed tolerance. Averaging is then done by reference to two devices, the choice depending on the results of the tolerance check. A device outside the level of the tolerance check is not used in the averaging process. Hourly discharge/storage is then calculated automatically from the measurements and in-flow is then calculated by a process known as 'back-routing' or 'reverse routing' (described below). The calculations are run hourly on an IT system but can be made locally at any time or read off from diagrams in the Lee Regulations.

114. Calculation of in-flow. As mentioned, in-flow is calculated through a process known as 'back-routing' or 'reverse routing'. This involves taking various end-criteria to determine what the start-value (or in-flow) was. Calculations based on catchment rainfall/tributary flows (a 'distribution method') were trialled by ESB but found to offer little or no benefit over back-routing. In a back-routing calculation, "*significant relative errors*" (Bree Affidavit, para. 81) occur from fluctuations in water-level attributable to wind/waves. As a result, three measurements are made. The arithmetical calculations of in-flow done by reference to such data are always correct. However, individual readings may have relative errors and these appear as oscillations. When plotted on a graph, the effect is obvious and in-flows may need to be 'smoothed' by eye or by an appropriate procedure. During flood events, ESB calculates the 'raw' in-flows with such oscillations as occur, taking the view that such raw in-flow oscillations as occur can be smoothed afterwards. Dr Bree's sense is that "*Local use of raw in-flows is appropriate for the safe passage of floods.*" (Bree Affidavit, para. 81).

115. River-gauging. Three river-gauging stations were installed by ESB on tributaries and three on the main channel of the river Lee during the planning/construction of the Lee Dams. An additional four tributary river-gauging stations were installed during the 1980s. At that time, staff remained on-site for so-called 'wet periods' to provide direct measurements. The resulting flows were of value for ESB's design and dam-safety studies Nowadays such measurements are not necessary and the gauges work as water-level gauges only. Latterly, ESB has had contact with the OPW and local authorities with a view to transferring those stations across to them. Telemetry from river-gauging stations upstream provides, at best, about one to two hours' advance information at the Lee Dams about present in-flows and reservoir rise; this data is considered by ESB to be "*less reliable*" (Bree Affidavit, para. 83) than 'back-routing' calculations.

CHAPTER 13: A RAINY NOVEMBER.

116. Rainfall data. ESB's rain-gauges give a good coverage of the reservoir Catchment, particularly the upland areas to the west and north. The gauges at Carrigadrohid and Inniscarra are on the crests of the Lee Dams and, per Mr Faulkner "*do not conform to best practice for accurate measurement of rainfall*". (Faulkner Report, para. A.1). Real-time rainfall data for each of ESB's gauges is displayed in the control-room at Inniscarra. There is no real-time calculation of catchment-average rainfall. As part of the pre-trial discovery process in the within proceedings, ESB was required to provide rainfall data, at an hourly interval or finer, for the period 2000 to 2009, from all rain-gauges maintained by ESB, or to which ESB has access, in the Lee catchment and adjacent catchments. In the end, data from ESB's rain-gauges was made available for the period, October 2002 to December 2009. Within that data there were gaps from all six gauges. On average, data was available for 90% of the period, availability varying from 87% at Inchigeelagh to 93% at Inniscarra. In 2009, data was missing at Carrigadrohid from 4th July to 24th November and at Inchigeelagh from 18th to 26th November. The reliability of ESB's rainfall data-collection system was criticised 'in-house' by Mr Jack O'Keeffe, a former ESB Chief Civil Engineer, back in 2006 when he stated: "*With the present level of reliability I think they* [the ESB rain-gauges] *may be more of a liability than an asset…they may give a false sense of security…we need to be very careful about depending on them.*" (Quoted in Faulkner Report, para. A.1).

117. Recorded rainfall. In November 2009, there was rain almost every day, up to and beyond the 19th/20th. The main rainfall occurred from 15th to 20th November, the highest daily details being recorded on the 18th. In the days up to the flood event of 19th/20th November, there were two main periods of rainfall, one overnight from 15th to 16th November, the other starting on the night of the 17th and continuing, with only a short break during the 18th, all through 18th and 19th November until midnight at the start of the 20th. The most prolonged peak was from midnight until early-afternoon on the 19th. The flood in Cork City peaked during the night of 19th/20th November. The total rainfall that was recorded during November 2009 depends on the duration over which a particular burst of rainfall is aggregated. What happened was not an isolated storm event, but a succession of wet days. As a result, it seems sensible to examine rainfall totals over a range of durations, including quite long durations – important because the flood of 19th/20th November is likely to have been influenced by antecedent wetness of the Lee catchment. Mr Faulkner, using data from ESB, Met Éireann and OPW rain-gauges, has calculated that 64.9mm of rain fell in the reservoir catchment from 00:00 on 19th November to 00:00 on the 20th. Using only ESB's rain-gauges he has calculated a similar 24-hour rainfall total of 67.9mm. In short, there was heavy rain in November but not as heavy, less alone as exceptional as the 90mm that ESB suggested in the immediate aftermath of the flood to have fallen (*e.g.* in a briefing of 24th November, 2009, for the then Minister for the Environment). There are such significant difficulties with the rainfall calculations done historically by ESB, *e.g.* as regards gauge-failures, failure to account for orographic (mountain/hill) rainfall, a possible failure to upscale rainfall forecasts received (which were themselves based on a catchment area that does not mirror the Scheme catchment), that the court has a preference for the scientifically robust and, as it happens, more conservative calculations done by Mr Faulkner, a distinguished hydrologist and impressive witness.

CHAPTER 14: THE FLOOD EVENTS OF NOVEMBER 2009.

118. Introduction. The court chronicles below the details of the flood-event that led to the within proceedings. Key dates in this account are 19th and 20th November, 2009. Those were the dates of the overnight flooding at UCC's properties. To set the events of the 19th/20th in their proper context, the chronology commences on 16th November and ends on the 20th. The clearest way to describe various events that occurred at various times and affected different people is to describe all of those events on a rolling basis by reference to the time of day they occurred. Within the chronology, the bracketed text "*(Dams)*" or "*(UCC)*" indicates whether what is being described concerns the position at the Lee Dams or on UCC campus. There is also a third category "*(Others)*" that refers to certain witnesses who gave (affidavit) evidence of facts for UCC and whose evidence is useful as offering a window on events as they unfolded; this category also includes the evidence of ESB's Chief Civil Engineer, who played a significant part in the events of 19th/20th November but was not present at the Lee Dams. The references to TTOL throughout show the summer and winter TTOLs, with the winter TTOL being relevant.

Monday, 16th November, 2009

119. 01:00. (Dams). Mr Jerry Browne, Hydrometric Officer at the Lee Dams, was awake at home. Outside it was raining heavily. He rang ESB's Hydro Control Centre to find out what the water levels were at the dams. He was told that at Carrigadrohid Dam the water level was 64.16m OD (MaxNOL: 64.50m; TTOL: 62.00–64.20m), with a water-in-flow of 166m^3/s. At Inniscarra Dam, water-level was 49.00m (MaxNOL: 49.50m; TTOL: 47.50m–49.50m). Around this time, Mr Browne was contacted by Mr James Hegarty, Plant Controller. Mr Hegarty lives outside the boundary of the western catchment of the Lee. Mr Hegarty advised that it was raining very heavily where he was. Mr. Browne contacted another Plant Controller, Mr Michael Shine, to discuss rising dam-water levels. Mr Browne decided it would be appropriate to 'man up' the dams.

120. 02:45 – 03:15 (Dams). Mr Browne arrived at Inniscarra Dam, followed fifteen minutes later by Mr Shine. Water levels were continuing to rise at both Dams. Water-level at Carrigadrohid Dam was 64.26m (MaxNOL: 64.50m; TTOL: 62.00–64.20m); the in-flow rate had increased slightly to 167m^3/s. By 03:15, the level at Inniscarra Dam had risen to 49.10m (MaxNOL: 49.50m; TTOL: 47.50m–49.50m). Mr Browne formally determined that a 'flood event' was presenting. He decided to commence 'spilling' water at Inniscarra Dam at 40m^3/s. Together with waters being used to generate electricity, this had the effect that there was a total discharge of 120m^3/s from the Dam. It will be recalled that under the Lee Regulations (para. 1.2), staff are required to "*notify*" downstream residents and interested parties prior to effecting such spilling. Because the decision to spill on the 16th was taken in the early hours of the morning it was decided, as a matter of courtesy, not to give this notification. Dr Hughes has indicated that the decision taken by station staff in this regard was "*acceptable, particularly as the discharges were at the level that largely remains within the banks of the river downstream of Inniscarra.*" (Hughes Report, para. 7.30). Nothing untoward is known to have occurred as a result of this deviation from the Lee Regulations, though it is notable that such a 'heresy' could have occurred given the near-religious adherence to the Regulations that was espoused as the ideal by ESB at the hearing of these proceedings.

121. 06:00 (Dams). A private rain forecast was received from Met Éireann. It included prediction of a significant rain event for the 19th.

122. 07:15 (Dams). Matters were not improving. Water-level at Carrigadrohid Reservoir had risen to 64.55m (MaxNOL: 64.50m; TTOL: 62.00–64.20m). Mr Browne continued to implement the discharge regime in the Lee Regulations. He instructed Mr. Shine to commence spilling from Carrigadrohid at $30m^3/s$. Together with waters being used to generate electricity, this had the effect that there was a total discharge of $110m^3/s$ from Carrigadrohid Dam, as required by the Regulations.

123. 07:30 (Dams). Mr Browne increased discharge at Inniscarra Dam to $150m^3/s$. Water-level at Inniscarra was now 49.13m (MaxNOL: 49.50m; TTOL: 47.50m–49.50m). This merited a lower discharge under the Lee Regulations. So Mr Browne was ahead of the Regulations in bringing water-levels down.

124. 07:50 (Dams). Mr Browne indicates that "*we issued a flood warning to our list of contacts*". This was pursuant to the requirement in the Lee Regulations (para. 1.2) "[to] *notify downstream residents and interested parties*". Persons who received this notification would have included UCC.

125. 08:30 – 09:15 (Dams). At half-past eight and again an hour later, Mr Browne increased spilling at Carrigadrohid. Generation also continued. At 09:15, Mr Browne ran the 'Lee Flood Model'. This confirmed his professional instinct that in-flows would be such that generation alone would not keep water levels below MaxNOL. He therefore considered that continued spilling was necessary.

126. 12:00 (Dams). Water-level at Carrigadrohid peaked at 64.71m (MaxNOL: 64.50m; TTOL: 62.00–64.20m). The level at Inniscarra was 49.30m (MaxNOL: 49.50m; TTOL: 47.50m–49.50m); discharge there remained at $150m^3/s$.

127. 14:15 – 19:00 (Dams). At 14:15, station staff reduced spilling from Carrigadrohid in accordance with the Lee Regulations. Water-level at Carrigadrohid Reservoir was now reducing at 2cm/hr. By 15:00, water-level was at 64.60mD (MaxNOL: 64.50m; TTOL: 62.00–64.20m), reducing by 2cm/hr. By 18:50, water-level at Carrigadrohid was 64.54m. Mr Browne instructed the Plant Controller to reduce spilling further. Throughout this period, discharges from Inniscarra remained at 150m^3/s. This kept water-level at Inniscarra below MaxNOL. Water-level at Inniscarra crested at 19:00 and thereafter reduced.

128. 21:30 (Dams). A further weather forecast was received from Met Éireann. A significant if reduced rain event was still predicted for Thursday the 19th.

Tuesday, 17th November, 2009

129. 09:00 (Dams). Water levels at Carrigadrohid were sufficiently reduced that Mr Browne was able to reduce spilling at Carrigadrohid. Spilling continued at a constant rate at Inniscarra. Generation continued at both stations.

130. Morning of 17th November (Others). Mrs Gibney lives at Inniscarra Bridge, below Inniscarra Dam. She indicates in her affidavit evidence (para. 4) that she received a warning call from ESB on the morning of the 17th. The affidavit evidence of Mr Shine (p.4) contradicts this averment; he states that no calls were made to anyone on the 17th or 18th "*as our discharges did not change*". (They went down but this was not a fact that needed to be broadcast).

131. 15.30 (Dams). Water-level at Carrigadrohid Reservoir was now down to 64.15m (MaxNOL: 64.50m; TTOL: 62.00–64.20m), sufficient for Mr Browne to cease spilling. Discharge continued to be effected via generation. Water-level at Inniscarra was now 49.24m (MaxNOL: 49.50m; TTOL: 47.50m–49.50m). Having regard to water levels, prevailing weather conditions and forecast rainfall, Mr Browne elected to continue generation at Carrigadrohid, and spilling and generation at Inniscarra, to reduce/maintain the level at Inniscarra/Carrigadrohid.

132. Evening of the 17th (Others). Mr Brian O'Mahony, ESB's Chief Civil Engineer, had spoken with Mr Browne earlier and been advised that spilling at Inniscarra was proceeding at $150m^3/s$, with the water-level falling slowly. In the evening he called Mr Tom Hayes, Supervising Engineer for the Shannon and Lee Dams; this call was largely focused on the position on the river Shannon.

133. 23:00 (Dams). A private weather forecast was received from Met Éireann. A significant, if reduced, rain event continued to be predicted for Thursday the 19th.

Wednesday, 18th November, 2009

134. 08:20 (Others). Mrs Gibney indicates in her affidavit evidence (para. 5) that she received another call from ESB indicating that they might be releasing more water from the Lee Dams. The affidavit evidence of Mr Shine (p.4) directly contradicts this: he states that no warning calls were made to anyone on the 17th or 18th.

135. 09:00 (Dams). Matters do not appear to have been very much different from the previous afternoon. At Inniscarra, discharges continued to be at 150m^3/s, the maximum level of discharges at which ESB considers that roads downstream of Inniscarra Dam are unlikely to be flooded.

136. 10:38 (Dams). ESB received a further private forecast from Met Éireann. A significant rain event continued to be predicted for the 19th.

137. Morning of 18th November (Others). Mr O'Mahony spoke to Mr Browne and was advised that spilling had ceased at Carrigadrohid on the 17th but that there had been a further 20mm of rain overnight, with the result that the water-level at Carrigadrohid was rising again. He was also advised that spilling of 150m^3/s was continuing at Inniscarra, that the water-level there was continuing to fall, and that there was a weather alert forecasting up to 60mm of rain.

138. 17.00 (Dams). Water-level in Inniscarra was reducing by about 3cm/hour. Troublingly, water-level at Carrigadrohid was now 64.31m (MaxNOL: 64.50m; TTOL: 62.00–64.20m) and rising by 1-2cm/hour.

139. 17.00 onwards (Dams). Throughout the evening of the 18th, Mr Browne contacted the control room at Inniscarra on a number of occasions to monitor ongoing hydrological conditions.

Thursday, 19th November, 2009.

140. 00:00 (Dams). There was a still-worsening position at Carrigadrohid Reservoir. Water level was now 64.47m (MaxNOL: 64.50m; TTOL: 62.00–64.20m) and the level was rising at 5cm/hour. At Inniscarra, the level was 48.34m (MaxNOL: 49.50m; TTOL: 47.50m–49.50m); there the water level was reducing by 3cm/hour. Generation continued through the night at Carrigadrohid. Spilling continued at Inniscarra at 150m^3/s.

141. 02:00 (Dams). Mr Browne was contacted by the Plant Controller at Inniscarra and advised that the water level at Carrigadrohid was now 64.55m (MaxNOL: 64.50m; TTOL: 62.00–64.20m). Mr Browne determined that a rising flood presented at Carrigadrohid and directed the Plant Controller to commence spilling from Carrigadrohid in accordance with the Regulations.

142. 05:00 (Dams). A further rainfall forecast was received from Met Éireann. Consistent with all the forecasts received since the 16th, this indicated that a significant rain event was predicted for the coming hours.

143. 06:36 (Dams). Mr Browne was contacted by the Plant Controller. Mr Browne does not indicate the substance of the conversation in his affidavit evidence. Even so, one can guess at what might have been said from what he does say: "[A]*fter a brief discussion, I reported to Inniscarra.*" (Browne Affidavit, p.9).

144. 08:00 (Dams). Mr Browne increased total discharge from Inniscarra from 150m^3/s to 160m^3/s. The significance of this was twofold. First, roads downstream of Inniscarra were "*likely to be flooded*". (Lee Regs, para. 1.2). Second, under the Lee Regulations, when the total discharge is greater than $150m^3/s$, a "*more general public warning shall be through the relevant authorities and the media*". The Lee Regulations do not expressly state that this more general warning should issue before total discharge exceeds $150m^3/s$; logic would suggest it should. It is not clear when the general warning issued. It must have been sometime around 08:00. Mr Liam Buckley, then Plant Manager at the Lee Stations, indicates (p.6):

> "*We made contact with the normal emergency services of Cork City Council and County Council. We decided that we also needed to alert all local radio stations, ESB Public Relations Department and RTÉ national radio. We discussed the warning to be issued and I agreed the following text:'ESB Lee Stations at Inniscarra Dam has issued a severe weather alert, the areas at risk of flooding are the Inniscarra and Carrigrohane/Lee road and areas down river of Inniscarra Dam.'*"

145. It does not appear appropriate that a form of warning should fall to be devised by station staff in the heat of the moment or whether a template warning, perhaps even gradated templates, ought to have been contained within the Lee Regulations.

146. 08:10 (Dams). Mr Browne made the first of three attempts to run the 'Lee Flood Model'. It failed to work. Sometime thereafter, he attempted a second run. An output appeared briefly on-screen but the Model failed or was inadvertently closed.

147. 08:15 – 08.30 (Others). Mrs Gibney took the back-Lee Road to work in order to examine the extent of any flooding in the 'Lee Fields', a piece of land outside Cork City. It is her decades-long experience that this tends to be the first area affected by any flooding that occurs between Inniscarra Dam and the City. At 08:30 there was no sign of over-flow and/or flooding on the Fields. She would have expected the Lee Fields to have been very flooded for two full days before there would be even a fraction of the flooding in her garden that she was to experience later that day.

148. 10.30 (Dams). There was a meeting between Mr Browne, Mr Buckley and Mr Shine in the control room at Inniscarra. Spilling had now been ongoing at Inniscarra since the 16th and a notification had issued on that date. At this meeting on the morning of the 19th, per Mr Browne, "[W]*e decided to make another round of calls to these people. We also issued a warning to the public*". (Browne affidavit, p.9) Mr Browne contacted Mr O'Mahony to inform him of the then current situation.

149. 10:50 (Dams). Station staff began issuing notification calls at 10:50. Mr Browne placed 18 of these calls. He states in his affidavit evidence that the warning he gave to each person called was along the lines of: "*This is Jerry Browne from ESB at Inniscarra Dam. We are issuing a flood warning, due to heavy rainfall in the Catchment we will be increasing discharge from Inniscarra dam during the day.*" (Browne Affidavit, p.9). The other member of staff who placed calls remembers delivering a slightly different message. Thus Mr Shine, who also placed 18 calls, states: "*The warning that issued was approximately the following: 'Due to heavy rainfall we will be increasing discharge from Inniscarra dam during the day. Areas at risk are Inniscarra Bar, Lee Road and Carrigrohane.*" (Shine Affidavit, para. 3). If discharge levels were sought, Mr Shine confined himself to detailing discharge levels at the time of the call. At no time did he state what the maximum discharge might be. The court does not consider that this form of warning was of sufficient specificity to convey the enormity of the situation known by ESB to be presenting.

150. 10:57 (Dams). Mr Browne rang Cork County Council as part of the 'ring-around' process.

151. 11:09 (Dams). One of the persons called by Mr Browne asked that the now-flooding or flooded road between Inniscarra and Ballincollig be closed as her previous experience had been that traffic passing her house during flood periods pushed some of the water on the road into her house. Mr Browne called Cork County Council to relay this request.

152. Morning of 19th November (Others). Mr O'Mahony spoke on a couple of occasions throughout the morning with Mr Browne who advised that there had been heavy overnight rainfall in the catchment, reservoir-levels were rising, spilling at Inniscarra would be increasing above $150m^3/s$, and warnings were being given to the authorities and residents downstream. Mr O'Mahony recalls that he also spoke to Mr Buckley.

153. 11:30 (UCC). Mr Paul Prendergast, a Buildings Officer at UCC, apparently now cognisant of the notification received from ESB, rang various members of the Buildings and Estates team, including Mr Kevin O'Regan, UCC's Superintendent of Engineering Services, to apprise them of the notification "*in case we had any activities in train on or near the banks of the river*". (Prendergast Affidavit, p.14). Mr Prendergast was concerned about staff working on or near the river-banks. He had not divined from the warning received that there might be a more wide-ranging threat to the UCC campus.

154. circa.11:30 (Dams). Ms Anne Hennessy of Cork City Council called looking for discharge levels and in-flows at Carrigadrohid and Inniscarra. Mr Shine gave her the requested details as they were at the time. He did not give an indication of what the maximum discharge might be.

155. circa.11:30 (UCC). Mr Eamonn Connaughton is the Western Campus Facilities Manager. The buildings for which he is responsible include the Western Gateway. He was among the people phoned by Mr Prendergast. This was the first time he had experienced a flood warning.

156. 11:49 (Dams). Mr Buckley was Plant Manager at the Lee Stations. Coming up to mid-day, he informed Mr Glenn Pope, ESB Hydro Manager, of the developing flood situation. He also apprised ESB's PR Department and all local radio stations. He e-mailed the agreed warning text to AA Roadwatch. He phoned various local radio stations and asked that they broadcast the agreed general warning. No suggestion of final/maximum discharges was provided as part of the warnings.

157. 11:51 (UCC). Mr Connaughton e-mailed Mr Prendergast some photographs he had taken of the water-levels at a bridge outside the Western Gateway. He noted that there was approximately 1m of capacity in the river before the car-park flooded. He also had concerns as to the integrity of the bridge.

158. 12:00 (UCC). Mr Connaughton could see that there was minor condensation on the basement walls of the Western Gateway. He could also see the high water-level outside. Concerned to protect two electrical transformers in the basement, he procured 50 sand-bags from a local supplier and purchased a sump-pump as a back-up to the sump-pumps already in the building.

159. 12:09 (UCC). Ms Liz Kennedy, executive assistant to Mr O'Regan circulated an e-mail on his behalf to the appropriate intra-university contact list with the subject-heading "*Inniscarra Dam Water Release – Increased Risk of Flooding*". It stated:

> "[W]*e have just been informed by the Buildings Officer, that the Inniscarra Dam will be releasing significantly more water than usual today. As a result there is an increased risk of flooding in low lying areas adjacent to the River Lee. All responsible persons are asked to carefully consider the implications of this for their own areas and take any necessary appropriate action. If you require assistance, please contact the Buildings and Estates Office Helpdesk on ext.* [----]. *If your call is urgent, it is important not just to leave a voicemail but to ensure that you pass it on to a responsible person".*

160. There was some discussion during proceedings as to who took the call from UCC that prompted this e-mail. It is clear that a warning was received from ESB before the e-mail was sent. What is not clear is how Mr O'Regan learned all of the information that featured in the e-mail of 12:09. Was it he who embellished the succinct message which Mr Browne delivered by adding "*[T]here is an increased risk of flooding in low lying areas adjacent to the River Lee*"? Or was this insight imparted to Mr. O'Regan by someone else? The quoted wording echoes Mr Prendergast's concern for persons engaged in activities "*on or near the banks of the river*".

161. 12:30 (Dams). Mr Browne had been monitoring rainfall. ESB was now experiencing more rain in the catchment than forecasted. Mr Browne spoke by phone with Mr O'Mahony. He discussed the then current position, giving an update on water-levels at both reservoirs and on *e.g.* water in-flows, discharges and rainfall. He confirmed that warnings had issued.

162. 12:40 (Dams). Mr Browne made another attempt to run the 'Lee Flood Model'. The Model failed to work.

163. circa.12:45 (Others). Mr Gibney lives at Inniscarra Bridge. Prior to the flood events of $19^{th}/20^{th}$, he had been a patient at a hospital in Cork City. He was released on the 19^{th}; his daughter collected him at about 12:45 and drove him home. Given the proximity of the Gibneys' house to Inniscarra Dam, all of the family are aware of potential flood-risk. As a result, they tend to observe water-levels in the river and Lee Fields. In Mr Gibney's experience, the Lee Fields usually flood before there is any flooding on the adjacent road; the water normally rises so gradually that it could take an hour or more to rise an inch. Mr Gibney and his wife own the field next door to the family house. It is their experience that this field will look as if has been pumped with water before the river Lee breaks its banks, and that it completely fills before their garden starts to flood. The field has a low spot which they use as a flood indicator; even when that spot contains water it typically takes six hours before water reaches their garden. As Mr Gibney journeyed home from hospital with his daughter, he checked the regular spots for flooding: the low-spot in the field contained some water but there was no water elsewhere; he was not concerned.

164. 13:20 (UCC). Mr Connaughton took more photographs of the river-level at the Western Gateway. It did not appear to him that the water-level had changed significantly.

165. 13:24 (Dams). Mr Browne phoned Met Éireann and spoke to a forecaster. The forecaster advised that rain would ease off in the evening.

166. 14:00 (Dams). Mr Browne went downstream to the nearby 'Inniscarra Bar' to determine the effect discharges were having. As far as he could see, there was no flooding of property.

167. 14:00 (UCC). Mr Prendergast cycled the full perimeter of UCC and through flood-waters on the Lee Road (west of the ERI Building) on the north-side of the river. He returned to UCC via Carrigrohane Road which was flooded to a depth of about 50mm. There was no flood-water threatening any UCC building. "*I was not expecting any flooding to impact the UCC building stock*". (Prendergast Affidavit, para. 2.3).

168. 14:10 (Dams). Mr Gerard Keeley is an ESB employee. In 2009, he was a safety officer at Inniscarra. He was also a trained plant controller and acted as relief plant controller. Having spoken with colleagues at Inniscarra, he decided to turn up early for his 16:00 shift. He left his home at 14:10 and travelled to Inniscarra by car. As he approached the junction at Cloghroe to turn right for the Dam, he noticed that the road was completely flooded. As he was assessing the situation, a truck came from the left-hand side of the road heading in the direction he was about to take. Mr Keeley decided to follow the truck as he felt that it might push away a lot of the water. After travelling some distance, Mr Keeley noticed water-splashes bouncing on the bonnet. He thought his car might cut out and was frightened, not least as he did not know if the water would get deeper. He could see water gushing from adjacent fields onto the road. He contacted his wife on his 'hands-free' kit, told her of the situation and that he was unsure he would make it home that night as the situation was bad. Just before Cloghroe he had to take a turn; the road onto which he turned was flooded. He arrived at Inniscarra at about 15:00.

169. circa.15:00 (Dams). Ms Anne Hennessy of Cork City Council again called looking for discharge levels and in-flows at Carrigadrohid and Inniscarra. Mr Shine gave her the requested details as they were at that time. He did not give an indication of what maximum discharge might be. Around the same time, it was decided that, given the severity of the escalating flood, Mr Keeley and Mr Shine should remain at Inniscarra. (The just-arrived Mr Keeley would normally have taken over from Mr Shine. Instead Mr Shine remained until 23:30 when Mr Hegarty arrived). Around this time, Mr Buckley apprised senior ESB management and ESB's PR Department of the escalating nature of the flood.

170. 15:02 (UCC). Mr Connaughton took more photographs of the river-level at the Western Gateway Building. It did not appear to him that the water-level had changed significantly.

171. 16:00 (Dams). ESB was discharging approximately 225m^3/s of water from Innsicarra Dam. Notwithstanding this, reservoir-levels were rising quickly. Given the severity of the flood, Mr Browne had further discussions with Mr. Buckley and Mr Shine. They decided to issue a further 'serious flood warning' to people on the warning-list. They also decided to issue a serious flood warning through ESB's PR Department to RTÉ.

172. circa.16:00. (Others). Mr O'Mahony spoke with Mr Browne and, he recalls, with Mr Buckley also. They indicated that the flood was now very large and that they were about to issue further warnings. He was informed that discharge from Inniscarra Dam was approaching 250m^3/s at this time.

173. 16:15 (Dams). Following discussions between Mr Buckley and Mr Browne, both Mr Browne and Mr Keeley started making further calls to people on ESB's warning-list. "*We agreed the form of the warning and the wording we used described this as a large, bad flood. We warned that we would be continually increasing the discharge through the dams.*" (Browne Affidavit, p.10). It does not seem prudent that it should fall to ESB station staff to decide 'on the hoof', in the course of a serious weather event, whether and when to give any additional warning and to formulate the text of that warning on an impromptu basis.

174. Mr Keeley made a total of 32 calls to downstream residents and interested parties. Upon reaching the various parties he said: "*Hello my name is Gerard Keeley and I am calling from ESB Inniscarra Dam to inform you that ESB will be increasing discharge from the dam on numerous occasions throughout the evening and this is a large, bad flood*". (Keeley Affidavit, p.2). If the person to whom Mr Keeley was speaking requested the discharge levels, he stated the discharge level at the time of the call. At no time did he give a final discharge estimate. He apparently stated to a number of callers that this was the worst flood he had seen during his then 17 years of working at Inniscarra. At the end of most calls, Mr Keeley reiterated: "*We will be increasing discharge from the dam on numerous occasions throughout the evening.*" (Keeley Affidavit, p.2). If a specific person was named on the ESB list, Mr Keeley looked to speak with that person and noted that he had spoken with same. Persons who could not be reached were left the same message as was given personally to those with whom contact was made. If leaving a message, Mr Keeley also left a phone number for the Control Room and indicated that the person being left the message should contact the Control Room if s/he required further information. Mr Keeley also noted on his contact list if a message had been left. He reached a person by the name of 'Marina' at UCC and left the standard message with her. He did not personally contact the Gibney Family but was informed by Mr Browne that a Mr Moynihan (non-ESB staff) would contact them. At the time that Mr Keeley was making these calls, Mr Browne was on the phone advising persons resident near Inniscarra Dam that they should vacate their homes. They proved generally reluctant to do so. Having failed to make contact with the Gibney Family earlier that day, Mr Browne made enquiry about them with a neighbour. The neighbour indicated that he would contact the Gibneys personally or leave a message on their answering-machine. Mr Browne also contacted the fire brigade and informed the duty officer that there were people in the 'Inniscarra Bar' area who were in danger and who would not leave their homes. The duty officer advised Mr Browne that the brigade could not call out unless they got a call directly from affected parties.

175. 16:30 (Dams). Mr Buckley attempted to drive to the 'Inniscarra Bar' to establish what conditions were like. He could not get as far as the Bar: the road was flooded and water was coming across the fields onto the main Inniscarra Road.

176. 16:51 (Dams). As part of keeping senior staff briefed of the on-going situation, Mr Buckley spoke with Mr Pope (Hydro Manager) at this time.

177. 17:00 (UCC). Mr Prendergast walked the river-banks by the Glucksman. Water-levels seemed unchanged from his lunchtime inspection and the situation did not appear to be worsening. He considered the water-levels by the Glucksman to be a helpful, reassuring indicator of water-levels elsewhere given its low-lying riverside location.

178. 17:00 (Others). Up at Inniscarra Bridge, Mr Gibney was preparing dinner. He did not see any sign of potential flooding. Nor, he avers in his affidavit evidence, did he receive any phone calls from ESB from the time he arrived home from hospital. In her affidavit evidence, Mrs Gibney indicates that she did not receive any calls from ESB on the 19th.

179. 17:02 (UCC). A second e-mail was circulated by Ms Kennedy to the appropriate intra-university contact list. This had the same subject as the e-mail sent at 12:09, save that the word "*update*" was added. This e-mail stated that "*we have just been informed by ESB in Inniscarra that they are going to release more water shortly. Please also see the notice below.*" The "*notice below*" was the original e-mail of 12:09. The 'Riddle of the University E-mails' which started with the mystery of who received the first warning from ESB has since been compounded by a further mystery as to who received this second warning. Despite herculean efforts by UCC witnesses to unravel the riddle in the witness box, it goes unsolved.

180. 17:16 (Dams). Having failed to make contact with Cork City Council on their designated phone numbers, Mr Keeley managed to contact a Mr Walsh of Cork City Council just after the quarter-hour and stated "*ESB will be increasing discharge from the dam on numerous occasions throughout the evening and this is a large, bad flood.*" (Keeley Affidavit, pp.2–3).

181. 17:30 (UCC). Mr Prendergast spoke to UCC's General Services team and requested that they do regular patrols of the river-bank by the Glucksman to monitor the effect of the high-tide (believed by UCC staff to be a particularly worrisome time) and to keep an eye for bank-collapses or fallen trees.

182. 17:30 (Others). Mrs Gibney drove home from work. There was still no water to be seen in or around the family home, adjoining field, or neighbours' houses. There was an inch of water on the driveway but her view is this was from rain-water. She had to tiptoe up the drive, trousers slightly lifted, but she was not especially concerned.

183. 17:35 (Dams). Mr Browne contacted a couple of hostelries a short distance downstream of Inniscarra Dam, and apprised them of the serious flood situation now presenting at the dams.

184. 17:42 (Dams). As part of keeping senior staff briefed, Mr Buckley spoke with Mr O'Mahony.

185. 18:00 (UCC). Water started to drip into the basement of the Western Gateway at this time. It was coming in at a rate of "*approximately one bucket full a minute*". (Connaughton Affidavit, para. 2.5). He estimated that this was a rate of about 1.2m^3/hour. The basement at the Western Gateway is drained through a network of trench drains into an underground sump in the car-park. This sump is then pumped to the foul sewage system via two sump-pumps. Each of these sump-pumps has a capacity of 10m^3/hour. As a result, there did not appear, to Mr Connaughton, to be a perceivable threat of flooding at this time.

186. 18:20 (Others). Mr Gibney and his family sat down for dinner. Mrs Gibney was home from work and their two adult daughters were visiting. During dinner, the family Alsatian dog started banging at a door to the house. Mr Gibney opened the door to find there was at least half a foot of water outside. The smaller of the two family dogs, a 'Westie', was floating in the water. Mr Gibney brought the dogs into the house and his two daughters ran to move the family cars from the sloped garden driveway. They managed to move three of the four family cars up to higher ground. The fourth car was already affected by flood-water and could not be started. By the time Mr Gibney's daughters returned to the house, the water had risen another half-foot. Mrs Gibney and her daughters ran upstairs to get towels and tried to block water coming in under the front door. They had vents in their wooden floors and water was coming up through these. They went into the downstairs bathroom and saw water coming up through the shower-hole.

187. 18:30 (Dams). The local resident who had earlier asked that the Inniscarra to Ballincollig road be closed rang Mr Browne to indicate that she was leaving her home and that there was a traffic jam at Inniscarra Bridge. Mr Browne also took a call from a person in the Bon Secours Hospital in Cork City asking whether she should move her car from the car park. He informed her that ESB had increased its discharge from Inniscarra and that it would be a few hours before that would reach the city.

188. circa.18:45 (Dams). Around this time an incident of some note occurred. Per Mr Browne:

> "*At approximately 18.45 Liam Buckley suggested that we were approaching the peak of the flood as in-flow to Carrigadrohid had receded from 675m^3/s to 533m^3/s and the rainfall had lessened. We contacted the Chief Civil Engineer…for consent to allow the levels in Carrigadrohid to rise beyond that outlined in the Lee Regulations. Brian O'Mahony agreed that we had reached the peak of the flood and that he would consent to a deviation from the Lee Regulations. This allowed the levels in Carrigadrohid to rise and make use of the overhead spillway in order to avoid greater in-flow into, and consequently greater spilling discharges out of, Inniscarra.*" (Browne Affidavit, p.11).

189. Mr Buckley indicates in his affidavit evidence that this episode transpired half an hour earlier, at 18:15. Mr O'Mahony puts the call earlier still, at about 18:00. It is useful to recount Mr O'Mahony's account of the idea proposed and decision made:

> "*...I received a further call from Inniscarra Control Room around 18.00. From what I can recall, I again spoke to both Liam Buckley and Jerry Browne. The discharge from Inniscarra was approaching 300m^3/s at this time and levels and in-flows were continuing to rise. However, they considered that they were approaching the peak of the flood. They were concerned that the level in Inniscarra Reservoir was continuing to rise quickly and that they would be approaching the level (50.85m) above which they would have to discharge the in-flow to Inniscarra Reservoir. This could lead to a further significant increase in discharges from Inniscarra. They requested my permission to allow them to hold back discharges from Carrigadrohid for a few hours and to let the level rise in Carrigadrohid Reservoir. The safety of Carrigadrohid Dam would not be immediately compromised by allowing this to happen as water would start to flow over the auxiliary spillway as levels rose. As I considered that there were no immediate dam safety risks and maximum discharges from Inniscarra were likely to be less, I gave my approval of their proposed course of action. They also indicated that further warnings had been issued and that they were also keeping in contact with Glenn Pope, the Hydro Stations Manager, who was keeping senior management informed about what was happening. I indicated that I would contact them again when I returned to Dublin to assess the situation regarding the delayed discharges from Carrigadrohid.*" (O'Mahony Affidavit, p.46).

190. Whatever about the timing of the call between the three men, all three are agreed that, as a ploy, this breach of the Lee Regulations worked in holding back some of the water that would otherwise have been released into the Lee, and ultimately journeyed down to Cork City, on the evening of the 19th. So why is the episode of note? Simply put, because ESB contested throughout the hearings that the discharge tables prescribed in the Lee Regulations are all but set in stone: they are there to preserve dam integrity and prevent catastrophe; deviation from their diktats is not to be tolerated. Yet here was ESB's Chief Civil Engineer departing from those discharge tables in the midst of a flood event, applying his undoubted professional skill and knowledge to all the facts at hand so as to take a discretionary decision that worked to the benefit of everyone downstream. It is just such a responsive and, it would claim, responsible approach to flood management that UCC has contended throughout the proceedings is a more reasonable approach to flood management than the near-religious adherence to the Lee Regulations that ESB has consistently propounded.

191. 18:45 (Others). Mr Gibney, having just returned from hospital, was despatched upstairs by his daughters to rest while they commenced moving family furniture and belongings upstairs. Some of the furniture was too heavy for them to move. One of Mr Gibney's daughters suggested that maybe they should evacuate the house.

192. 19:00 (UCC). Mr Mark Poland, Director of Buildings and Estates at UCC, returned to his office, having attended a number of meetings during the day. He had been copied on the e-mails of 12:09 and 17:02 but by this time he had not yet read the second e-mail. He was also generally aware that flood waters were raised in the Lee Fields area outside Cork City and that there was concern about possible flooding in Cork City. He called Mr Prendergast for an update. Mr Prendergast told him that security staff were monitoring campus riverbanks. High tide was at about 19:00 and there had been a concern among the Buildings and Estates team that if there was going to be on-campus flooding, it would likely coincide with high tide. However, high tide passed without problem. Mr Prendergast indicated that he would return to the campus around 21:00 to double-check everything was fine and would call Mr Poland if anything changed. Call completed, Mr Poland went home.

193. circa.19:30 (Others). One of Mrs Gibney's daughters turned off the electricity around this time, presumably as a safety precaution. The family now had to use candlelight to see their way around the house.

194. circa.19:33 (Others). Just after half-past seven, Mrs Gibney went upstairs to her husband while her daughters continued trying to salvage as much as they could downstairs. Mr Gibney was "*frantic*" at this stage because his recent hospital operation meant he was physically unable to help his daughters with the salvage-work downstairs. (Mrs Gibney Affidavit, para. 15).

195. 19:34 (Dams). As part of keeping senior staff briefed, Mr Buckley again spoke with Mr O'Mahony.

196. circa.20:00 (Dams). The in-flow into Carrigadrohid Reservoir peaked.

197. circa.20:00 (Others). When he got home, Mr O'Mahony again called Mr Buckley and Mr Browne. They indicated that the level in Inniscarra had risen to 50.79m and that, in accordance with the Regulations, the discharge from Inniscarra Dam was approximately 475m^3/s. As agreed in the earlier call between the three, discharges had been held back at Carrigadrohid and water was discharging over the auxiliary spillway. The decision to hold back water had reduced the rate of rise in Inniscarra, as planned.

198. 20:45. (UCC). Having gone home for a time, Mr Prendergast returned to UCC and walked the footpath at the Glucksman. The river was not breaching its banks and, to him, there was no sign of a flood. The water appeared to him to be at much the same level as at 14:00 and 17:00. Driving from the campus to collect his son from school, he decided to go by George's Quay in the city centre. He deliberately took this route because he was familiar with the level of water there at high tide. In his affidavit evidence, Mr Prendergast indicates that at high-tide the water on George's Quay is usually close to the road and, when combined with high wind, can be on the road. Coming up to 9pm the water-level was at least two metres down from the roadside, with ample capacity in the river. "*I said to myself 'grand we're over it now'*". (Prendergast Affidavit, para. 2.9). If only.

199. circa.20:00/21:00 (Others). Ms Virovska, then a second-year science student and resident of University Hall, went outside with a friend to rescue a flatmate's car from the now-flooding underground car-park at University Hall. There were a lot of other students trying to rescue cars at the time. Per Ms Virovska:

> "*There was a general feeling of chaos around. The area outside my apartment ultimately looked like a big lake...People were panicked and everybody was calling friends to try to locate where they were and ensure that they were safe. The situation began to feel more and more like an emergency. I returned to the apartment and did not know what to do....I was only nineteen...and did not know what to expect or how I should react....Ultimately I stayed in my apartment....It*

was quite a restless night however as I was anxious and nervous about what was happening and how the situation might develop. In addition, we had electric doors and because the electricity was down these were open all through the night which made me nervous in circumstances where we were two girls in an apartment on our own." (Virovska Affidavit, paras. 5 and 6).

200. circa.21:00 (Dams). Water-level in Carrigadrohid Reservoir peaked at 65.34m (MaxNOL: 64.50m).

201. 21:00 (UCC). Mr Connaughton remained at the Western Gateway to see that high-tide passed safely. By 21:00 it was apparent that the trench drains at the Western Gateway were unable to cope with the volume of water presenting. Because of this, he and another member of staff opened the sewage manhole in the basement of the building and diverted flood-water through this manhole. They also operated the second sump-pump manually, increasing pumping capacity to $20m^3$/hour.

202. 21:00 (Others). The Gibney daughters were now wading around in about two to three feet of water downstairs, still trying to save what they could of the family possessions. All of the family were by now very upset as they watched the flood-waters engulf the downstairs rooms.

203. 21:30 (UCC). Mr Poland was at home watching the evening news on television. In his evidence he recalled that there was flood damage reported in the towns of Skibbereen and Bandon, both in County Cork, but no report of flooding in Cork City. Unaware, it seems, of the ongoing position at the Western Gateway or University Hall at this time, he presumed that Cork City was unaffected by flooding. He recalled that the news presenter was standing at a location in the City that would normally experience tidal flooding and there was no flooding there.

204. 21:30 (Others). The Gibney daughters came upstairs as the water-level downstairs was still rising and they were concerned that the water might be contaminated. All of the family were freezing cold. The two daughters were covered in dirty water. The two family dogs were locked in an upstairs room for their own safety but were becoming more and more agitated at the sound of water gushing throughout the house. For a time, the family remained upstairs in the hope that the water would begin retreating.

205. circa.21:30 (UCC). Mr Prendergast received a telephone call from UCC's General Services Supervisor to say that there was water in the Glucksman. Apparently the water had come in from the South Channel.

206. 21:45 -22:00 (UCC). Mr Prendergast arrived at UCC. He could see muddy water outside the windows of the Glucksman at ground-floor level. Water was also starting to fill up the basement. He called Mr Poland and told him he needed to come to UCC immediately. He then walked down into the basement with a member of the Glucksman Gallery staff with a view to salvaging artworks stored, with some element of hubris, in a basement-level secure-room. However, the water-level was already to their chests. (Mr Poland, who witnessed this episode, puts it a quarter-hour later and recalls the water-level being up to Mr Prendergast's chin). Realising it was too dangerous to continue with rescuing the art-works, Mr Prendergast and colleague retreated. The water-level ultimately rose to about 800mm above ground-floor level, with the basement completely flooded. Conscious that the electricity main-switch for the Glucksman is situated in the basement, Mr Prendergast deemed it prudent to switch off all power to the Glucksman. In his affidavit evidence, Mr Prendergast states himself to have been "*totally taken aback by the speed at which the flooding occurred.*" He continues:

> "*It had occurred to me that if there was any real threat of flooding I would have ample time to go to the gallery and put all the artwork into the lift and move it up in the lift away from any threat of water damage. This proved to be an incorrect assumption on my part, due to the speed at which events unfolded*". (Prendergast Affidavit, para. 2.12).

207. 21:45 (UCC). Mr Connaughton phoned Mr Prendergast looking for help but learned that Mr Prendergast was in the Glucksman trying to save the artwork. He recalled that it was Mr Prendergast's view that "*if we could hold out for another half an hour we should be safe as high tide had passed.*" (Connaughton Affidavit, para. 2.7). Mr Connaughton recalls that river-water was lapping over the bridge outside the Western Gateway by now.

208. 22:00 (Dams). Water-level at Inniscarra Reservoir peaked at 50.85m (MaxNOL: 49.50m; TTOL: 47.50m–49.50m). Spilling discharges also peaked at this time at approximately $460m^3/s$.

209. 22:00 (UCC). It was clear to Mr Connaughton that they were struggling to maintain control at the Western Gateway, notwithstanding the sump-pumps. The basement water-level was now about four inches high and rising. The sandbags he acquired earlier in the day were still managing to maintain a water-tight barrier to the electrical switch-room.

210. 22:00 (Others). Trapped upstairs in their house, the Gibney Family could see jeeps and JCBs with reporters on the road outside their house. They were shining floodlights on the family home and taking photographs for the newspapers. "*This was extremely heart breaking for us*". (Mrs Gibney Affidavit, para. 18).

211. 22:05 (Others). The Gibney Family contacted their local Garda Station. The Gardaí advised the Gibneys to call the fire brigade who could assist them in leaving the house. The Gibneys elected to wait for a time to see if the waters flooding the house would recede.

212. circa.22:30 (UCC). Mr Poland arrived at the Glucksman. He recalls in his affidavit evidence that the river had broken its banks, spilled onto the grounds, into the Glucksman, and was continuing to rise:

> "*When I arrived at approximately 10.30pm, the river was running through the building. Paul Prendergast was trying to get into the basement in an effort to rescue the art stored there; however the water was up to his chin and he could not get access. The situation was extremely dangerous, and in my opinion posed a significant risk to anyone in the building.*" (Poland Affidavit, para. 3.8).

213. circa.22:30 (Others). Mr O'Mahony contacted Mr Browne for an update. Mr Browne indicated that the water-level at Inniscarra Reservoir had risen to 50.86m (MaxNOL: 49.50m; TTOL: 47.50m–49.50m); discharge from the dam was now 535m^3/s. Discharges were approximately matching in-flows. While there had been reports of further rainfall in west Cork, in-flows to and discharges from Carrigadrohid Reservoir had started to reduce.

214. 22:30 – 23:30 (UCC). By 22:30, "*the Glucksman Gallery had gone beyond saving*". (Connaughton Affidavit, para. 2.9). Mr Poland puts matters a little later, stating that from 23:00/23:30 the basement of the Glucksman was "*completely inundated*". (Poland Affidavit, para. 3.8). Because of the position at the Glucksman, Mr Prendergast allocated to the Western Gateway the services of Cork Drains, a local drainage provider that had been assisting at the Glucksman. Cork Drains attended with Mr Connaughton from 22:30, using a 20,000 litre tanker to suck water from the basement of the Western Gateway and pump it into the Lee. This sufficed to regain control of the situation until about 23:30, at which time water started to flow down from the car-park into the basement. Sometime after this, the outer basement door buckled under water-pressure, allowing a torrent of water into the wet-plant room.

215. 22:36 – 23.15 (Dams). As part of keeping senior staff briefed, Mr Buckley again spoke with Mr O'Mahony. Mr Buckley then spoke with Mr Pope, the Hydro Manager.

216. Throughout the night (UCC). Mr Poland stayed on UCC campus for the rest of the night managing the emergency response to the flooding now occurring across-campus. He set up an emergency response team and got 'all hands on deck'. He also liaised with senior UCC management. In all, there were between ten and twenty people on the team. He managed matters from the Buildings and Estates Office and stayed in contact with staff at various locations by telephone. His main concern was student safety. He coordinated with Campus Accommodation and the Student Union to ensure students were evacuated from student accommodation. He also set up an emergency shelter for students in the Electrical Engineering Building. He mobilised a tractor and trailer to evacuate students from student accommodation. The Army also assisted. In all, over 2,000 students had to be evacuated. University staff offered assistance to university neighbours affected by the flood. Mr Poland was also concerned, albeit that it was a secondary concern, to establish the extent of the damage to UCC's buildings and equipment, so that the Buildings and Estates team was in a position to deal effectively with matters from day-break.

217. Throughout the night (Dams). Mr Hegarty is a plant controller at the Lee Stations. Much of his evidence overlapped with that of other ESB witnesses. Perhaps the only point to note about his actions is that throughout the night of the 19th, in addition to his other duties, he fielded numerous calls from residents downstream and in the city. In response to such queries as were received, he outlined the current situation at the dams at the time of call regarding the amount of rainfall and the discharges being made.

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218. circa.00:00 (UCC). At about midnight, Mr Connaughton went down a back-stairs in the Western Gateway to check if the incoming waters had breached the sand-bag defences at the electrical switch-room. He found that there was approximately one foot of water on the electrical room-side of the sand-bags. He immediately headed for the electrical sub-station to pull the fireman switches as he was fearful that the transformers in the switch-room would explode. *En route*, he went into the main auditorium to alert a colleague who was in there moving audio-visual equipment to higher levels. By now, there was a foot of water in the auditorium and water levels were rising fast. This colleague went with Mr Connaughton to the electrical sub-station. On their way, one of the transformers tripped and a loud explosion could be heard.

219. 00:06 (UCC). Mr Connaughton pulled the power to the second transformer. He also 'stood down' Cork Drains at this point and vacated the Western Gateway.

220. 00:30 (UCC). Mr Connaughton went to retrieve his car and found that the water-level was up to the bottom of the car door-sills. He drove west along Western Road but had to turn around as Victoria Cross was impassable. Western Road was flooded to approximately one foot in front of the Medical Clinic; Mr Connaughton was able to make his way slowly through this, before turning onto Gaol Walk and higher ground.

221. 01:15 (Dams). Consistent with the Lee Regulations, the spilling discharge at Carrigadrohid was reduced.

222. 01:45 (Others). The Gibney Family telephoned the fire brigade and asked to be evacuated from their house. Because they have electrically operated gates, the fire officers had to physically break them to gain access to the family property. They also had to force open the front door. Inside the family home, the water had now reached the third step of the stairs. It was moving very rapidly and there was a strong current. Mr Gibney and his wife were stretchered out. The water was up to the fire officers' knees in the house. Mr Gibney's daughters carried the family dogs to safety. After the family had been evacuated, one of the fire officers collapsed, it seems from a heart attack. The fire officers called an ambulance. The Gibneys waited with them for it to come.

223. 02:00 (Dams). Having worked late, Mr Keeley finally went home, taking the same route by which he travelled to work earlier that day. The water on the flooded roads had subsided and he was able to travel home without much difficulty.

224. 02:30 (Others). The Gibneys drove to Minane Bridge where their daughters have houses next to a river unaffected by the flooding. None of the family slept that night; they spent most of the night crying. They were in disbelief as to the events which had occurred "*without any warning*". (Mrs Gibney Affidavit, para. 24). The entire event had been very upsetting. Mr and Mrs Gibney did not even have a clean set of their own clothes with them.

225. circa.03:00 (UCC). During the night, the roads on UCC campus became impassable. Mr Poland went out at around 03:00 to get a sense of the damage. He got into his car and drove as far as Victoria Cross. He could not get his car through the water and continued on foot. He could not pass along the Western Road, even on foot. He knew then that UCC's buildings on the Western Road must be in trouble too. He had been in contact with the team at the Western Gateway and knew that they had been trying to hold back the surface water and pump it out of the building. While he had been receiving updates from the various locations, it had been difficult to obtain information about all of UCC's buildings in real time. He knew, however, that the Enterprise Centre in North Mall had also flooded and that security staff could not gain access to the building.

226. 03:00 (Dams). Mr Browne drove down to Inniscarra Graveyard to survey what had happened. There he saw the fire brigade in the direction of 'Inniscarra Bar'.

227. 03:40 (Dams). Consistent with the Lee Regulations, the spilling discharge at Carrigadrohid was reduced. Further reductions in discharges take place throughout the night.

228. 03:00 – 04:00 (Others). Ms Hazel Smyth, then a final year law student at UCC, returned with friends to Victoria Mills Student Accommodation from a Law Society dinner in Rochestown. Ms Smyth had been unaware of the flooding which occurred that night until the taxi-driver informed her he could not drive to Victoria Mills as the area was too flooded. He could only drive them as far as Brookfield Student Accommodation. Ms Smyth and her friends then walked to Victoria Mills. In her affidavit evidence, Ms Smyth recalls that at the Mills "*there was a palpable sense of chaos, confusion and panic. I recall that a large number of Gardaí, fire services and emergency services were all present in the area.*" (Smyth Affidavit, para. 4). Unable to access her apartment, Ms Smyth spent the night with a friend at Brookfield Student Accommodation.

229. circa.06:30 (Others). Mr O'Mahony contacted Mr Browne at Inniscarra Station to get an update. Mr Browne indicated that water-levels in the Lee Reservoirs were 65.09m at Carigadrohid (MaxNOL: 64.50m; TTOL: 62.00–64.20m) and 50.74m at Inniscarra (MaxNOL: 49.50m; TTOL: 47.50m–49.50m). Mr Browne also advised that there had not been much overnight rain in the catchment and in-flows had reduced substantially to about 314m^3/s. Discharges were also reducing from both dams, being approximately 470m^3/s at Inniscarra and 350m^3/s at Carrigadrohid. Mr Browne advised Mr O'Mahony that there had been significant flooding locally and in Cork City. Locally, 'Inniscarra Bar' and about five houses had been flooded. As further rain was forecast, both Inniscarra and Carrigadrohid Dams would continue to be 'manned up' over the weekend. Mr O'Mahony 'touched base' again with Mr Browne on a couple of occasions later in the morning.

230. 06:30 (Others). Ms Sheila Crowley, a resident since 1958 at Dyke Parade in Cork City, came downstairs to find her house had flooded overnight. All of her downstairs furniture was up-ended and floating. She particularly noticed her hall table and some flowers floating in the water. There was a current in the water. The door to an extension had come off its hinges and was floating in the water. She went with her adult son to a window at the top of the house and observed that the area outside was like a river. In a scene reminiscent of 19th century paintings of skaters on the frozen Thames, she describes having "*observed people water skiing outside the house*". (Crowley Affidavit, para. 5). She and her son were unable to leave the house. The water did not recede until the afternoon; it took at least a year for the house to dry out. Ms Crowley's experience as a long-term resident of the Mardyke was that there had been many storms and high tides over the years; yet her property had never flooded.

231. 09:00 (Dams). The level at Inniscarra Reservoir was 50.50m (MaxNOL: 49.50m; TTOL: 47.50m–49.50m); spilling discharge was $345m^3/s$. The level at Carrigadrohid was approximately 65.05m (MaxNOL: 64.50m; TTOL: 62.00–64.20m); spilling discharge was $210m^3/s$.

232. Morning of 20th November (UCC). Mr Poland indicates in his affidavit evidence that by the morning of the 20th (it seems after daylight), the flood waters had receded and the extent of the damage that occurred was now apparent. A meeting of UCC's emergency response team was convened. This included faculty members, student representatives and others. It was decided to close UCC for a week, cancelling all lectures.

233. Morning of 20th November (UCC). Mr Connaughton indicates that he could not get into the Western Gateway on the morning of the 20th; "*it was like an island in the middle of a lake*". (Connaughton Affidavit, para. 4.1). He had to organise a lift in a four-wheel drive to gain entry from Western Road. In the building, the water had risen to 50mm above ground-floor level; the basement and auditorium were completely flooded. The electrical switch-room, boilers and associated equipment were completely submerged and un-recoverable. It took around twelve hours to pump the water out.

234. Sometime after 9am (Others). Ms Smyth returned to Victoria Mills to try to access her apartment. There were a lot of students, Gardaí and fire service staff milling around. She noticed local residents, some of them openly distressed, trying to sweep flood-water from their homes. A "*tractor like vehicle*" was transporting tenants of Victoria Mills through the floodwater outside the property in order that they might retrieve belongings from the apartments. (Smyth Affidavit, para. 7). Ground-floor apartments were badly flooded. A number of cars parked underground were also flooded and damaged. As Ms Smyth entered the building, an Accommodation manager informed all tenants that they could not stay in the building in its present condition. There was a sense of confusion among students as to when they could return to their apartments.

235. Afternoon of 20th November (Others). The Gibney Family drove to their house at Inniscarra to survey the damage. "*Everything downstairs was destroyed. Our furniture was ruined.*" (Mrs Gibney affidavit, para. 25). The house had to be dried out before repair works could begin; it was not back to normal until February 2010.

236. 14:20 (Dams). A further rain-warning issued to ESB from Met Éireann. The forecast stated that the rainfall could be of concern in the present situation.

237. 16:00 (Dams). Water-level at Inniscarra was 50.41m (MaxNOL: 49.50m; TTOL: 47.50m–49.50m); spilling discharge was $257m^3/s$.

238. 16:30 (Dams). Water level at Carrigadrohid was 64.95m (MaxNOL: 64.50m; TTOL: 62.00–64.20m); the spilling discharge was $120m^3/s$.

239. circa.20:00 (Others). Mr O'Mahony contacted Mr Browne shortly before 20:00. Mr Browne indicated that water-levels in the reservoirs had reduced to 64.70m at Carrigadrohid (MaxNOL: 64.50m; TTOL: 62.00–64.20m) and 50.23m at Inniscarra (MaxNOL: 49.50m; TTOL: 47.50m–49.50m). The gates at Carrigadrohid were being closed to reduce discharges. It was expected that spilling would be re-commenced, if necessary, when drawdown conditions allowed. Discharge at Inniscarra was approximately $290m^3/s$. Mr Browne hoped to have Inniscarra Reservoir down to 49.50m (MaxNOL: 49.50m; TTOL: 47.50m–49.50m) by the next morning when there was further rain forecast.

CHAPTER 15: DAMAGE DONE TO UCC'S PROPERTY.

240. Overview. Loss caused to UCC by the flood of 19th/20th November was in the region of €19 million. Thirty of UCC's 80 acres in Cork City Centre were submerged. Thirty per cent of its building stock was affected. The extent of the damage is described below.

241. Castlewhite Apartments. The Castlewhite Apartments building is a three-storey complex. Within this complex, water-levels rose to 280mm above ground-floor level. In November 2009, the Castlewhite Apartments had just been refurbished. Once power was restored, students were able to return to the upper floors. Students resident in ground-floor units had to be housed elsewhere until January 2010. Damage occurred to flooring, skirtings, doors, decoration tiling, built-in units and electrical/mechanical installations. In terms of contents, the loss included audio-visual and data-equipment, furniture, office furniture, kitchen utensils, mattresses, washing machines, 'white goods', televisions, fire extinguishers, computers, stationery, a cash-register, a water dispenser and safe.

242. **Connolly Building.** This building is located on Mardyke Walk beside the Granary Theatre. These buildings flooded to a depth of 800-900mm above ground-floor level. There was damage to flooring, built-in units, electrical and mechanical installations, the air-conditioning system and alarms. Re-decoration work was required. In the theatre, there was damage to audio-visual and data equipment, floor coverings, office furniture, archaeological artefacts, fire extinguishers, a safe and stationery.

243. **Enterprise and Butler Buildings.** These buildings are located at the North Mall. Here water rose to 660mm above ground-floor level. Work required here included cleaning, general building repairs, flooring, decoration, replacement of built-in units, electrical installation, mechanical installation, air conditioning, and the fixing of an alarm. In terms of contents, damage was done to audio-visual and data equipment, floor coverings, office furniture, the phone system, canteen equipment, fire extinguishers, fridges, safes and a time-lock.

244. **Glucksman Building.** At the Glucksman Gallery, where the water-level reached a depth of 840mm above ground-floor level, the basement was entirely flooded. As a result, all building elements, plants and services in the basement had to be replaced. A scale model of the UCC complex, belonging to the Geography Department had been in the basement and had to be replaced. Artworks located in the basement were also damaged; while the majority of the works were capable of conservation and restoration, some were destroyed. Equipment was also

destroyed, including spotlights, projectors, televisions, monitors and speakers. Remedial works were also necessary on the ground-floor level.

245. Sports facilities. UCC's sports facilities are mainly located at Mardyke Walk. The entire complex was submerged in water following the flood, rising to 1.39m above ground-floor level. Extensive damage was caused to equipment, sports-gear and machinery. There was also extensive damage to the all-weather pitch and running track. General building repairs and decoration had to be undertaken to the Mardyke Pavilion. Other expenses included the cost of emergency works, general repairs, electrical work to flood lights, alarms/CCTV, siteworks, cleaning and skips. There was significant damage done also to the Mardyke Arena Sports Hall: the swimming pool, fitness suite, reception area and other facilities all experienced extensive damage.

246. Tyndall Buildings. Here the flood-depth reached 380mm above ground-floor level. Corrosion caused by the flood-waters destroyed electrical panels in the chiller-yard. The consequent re-cabling of electrical services to equipment escalated the extent of building-work and disruption arising. Decoration and electrical-work and work to alarms, the lift and the Quay Wall were also required. In terms of damage to contents, there was damage to floor-coverings, general furniture, office furniture and computers, as well as storage and blinds. Most significantly, a variety of electron microscopy equipment and semi-conductor/fabrication equipment in the ground floor of Phase 1 and 2, required repair, a complicated task that required some care. Overall, the flooding in November 2009 caused circa. €4.6m damage to building infrastructure and equipment.

247. University Hall Apartments. These are located at Victoria Cross. Here, water rose to 50mm above ground-floor level. There was significant damage to the basement and ground floor. Damage to the basement was of particular significance as the UCC Campus Accommodation web-server and a laundry/store were located there. Damage also occurred to flooring, doors and built-in units. Costs were incurred relating to electrical installations, CCTV, audio-visual and data equipment, a damp test, alarms, phone system, air-conditioning, sealant, let units, signage, skips and siteworks. In addition to replacing computers, it was also necessary to replace 'white goods'.

248. Victoria Lodge Apartments. The Victoria Lodge Apartments are located directly opposite University Hall. Here, flood-water rose to 300mm above ground-floor level with resulting damage to floor finishes, doors, and built-in units. Work was also required on electrical installations, lifts, CCTV, phone systems and signage; decoration was also required. In terms of damage to contents, there was damage to audio-visual and data equipment, furniture, office furniture, computers, 'white goods', kitchen utensils, kitchen appliances, small appliances, televisions, stationery, blinds, cleaning, a fire extinguisher, a water dispenser and safes.

249. Western Gateway. There was over €7m-worth of damage to the Western Gateway. It had to be closed for ten days. A team of 65 people undertook the clean-up and reinstatement. Notwithstanding that it opened for work-purposes after ten days, it took another twelve months to repair the flood-damage. The damage done was so extensive, it had to be managed over three phases. Phase 1 involved all the work necessary to re-open the building within 10 days. Phase 2 involved replacing all the plant-room equipment affected by the flood. Phase 3 involved a refurbishment done over summer 2010.

250. Western Road houses and Ferry Lodge. Here there was damage to the flooring, decoration, built-in units, electrical installations, mechanical installations and alarms. In terms of content, damage was done to audio-visual and data equipment, floor coverings, office furniture, blinds, fridges and a safe.

CHAPTER 16: ESB'S APPROACH TO DAM SAFETY.

251. ESB's hydro-electric portfolio. ESB owns and operates hydro-electric plants on five rivers in Ireland. There are nine power stations on the five rivers, with a combined capacity of approximately 220MW. Dams and embankments form a major part of the associated infrastructure. The dams and embankments were constructed between 1929 and 1973 to then contemporary standards. But by the late-1970s, there were significant developments in dam integrity and reservoir-engineering standards. In Ireland and the United Kingdom, the publication by the Institution of Civil Engineers of its guidelines on "*Floods and Reservoir Safety*" (1978) was a landmark in this area of engineering knowledge. ESB kept abreast of these developments and by 1979 had determined it would be necessary to re-examine the design and physical conditions of its various dams, their ability to pass extreme floods, and such other improvements as might be needed to bring the dams into line with improving standards. Preliminary studies commenced in 1979. In 1984, ESB's Chief Civil Engineer recommended that more detailed studies be undertaken. Around the same time, ESB's Chief Executive requested ESB directors with relevant responsibilities to report to ESB's Board on significant hazards to the public associated with ESB activities. In April 1985, the Director of Generation/Transmission/Operations submitted a report that included a section on dams. This recommended a ten-year inspection period for all of ESB's dams and led to the appointment of

Mr. G. Innerhofer as a consultant to ESB Board. Mr Innerhofer later became the first chairman of ESB's External Dam Safety Committee, a type of independent audit committee that ESB has established in the realm of dam safety; its work is considered below.

252. Flood Control and Dam Safety Study. A possibly complicating factor in ESB's determination of the appropriate level of safety standards to apply at its dams is the fact that there is no specific legislation in Ireland covering the operation, inspection or maintenance of dams and reservoirs. Nor are there statutory requirements regarding dam design standards. So as part of the flood control and dam safety studies carried out by ESB in the 1980s, there was a need to determine the appropriate design-flood standard to apply to ESB's dams. In consequence, a review of international flood protection standards was included as part of the ongoing flood control and dam safety studies being conducted by ESB. This review found that the approach of different countries to the issue of design floods varies substantially. *E.g.* in Austria, Germany and Switzerland, a flood with a return period of 1,000 years was the basis for design. Other countries such as Finland and France used return periods of 5,000 to 10,000 years. Other countries, *e.g.* Brazil, Canada, South Africa, the United Kingdom and the United States, used a more conservative approach, basing design on a factor known as the 'Probable Maximum Flood'. So, for 'Category A' dams in the United Kingdom (and ESB treats the Lee Dams as such), the general standard for design-flood in-flow was the Probable Maximum Flood; the minimum standard (assuming occasional overtopping is tolerable) was the larger of 0.5 x Probable Maximum Flood or the 10,000-year flood.

253. 'Overtopping'. As part of the Flood Control and Dam Safety Study, the Probable Maximum Flood and a range of return period floods were estimated for Carrigadrohid and Innsicarra. This work confirmed that neither dam could pass their respective Probable

Maximum Flood without serious overtopping. It was also confirmed that under the then operating regime, Carrigadrohid Dam could not pass the 10,000-year flood without overtopping. Prevention of overtopping during floods is an important dam safety consideration. During overtopping, the foundation and abutments of a concrete dam can be eroded, leading to possible failure from sliding or overturning. In addition, when a concrete dam is overtopped, the loads on it can be greater than its design-loads and dam components can become overstressed and damaged. Moreover, water control equipment and its operating gear can be damaged and rendered inoperable. So while a concrete dam could survive some overtopping, it would likely be damaged. None of ESB's dams was specifically designed to cater for overtopping. However, it was considered that some limited overtopping would be acceptable. Therefore, having regard to the studies done and the advice of its international experts, ESB decided that in the case of the Lee Dams the objective should be that they at least comply with Austrian, German and Swiss standards and, without overtopping, pass (i) the 10,000-year flood with all gates operable, and (ii) the 1,000-year flood with one gate unavailable and with a freeboard allowance for wave run-up. This standard allows water-level in the Lee Reservoirs to rise to dam crest level, but only during design flood events, when all spillway gates are available. This design flood standard compares favourably with, or exceeds, design flood standards applied in many European countries.

254. Results of Flood Control and Dam Safety Studies. The results of the Flood Control and Dam Safety Studies conducted by and for ESB, insofar as applicable to the Lee Dams, can be summarised as follows. First, at Inniscarra Dam, flood-handling capacity was adequate to meet safety standards. At Carrigadrohid, flood-handling capacity did not meet desired standards. Accordingly, it was necessary to revise the operating regime and provide additional spillway capacity. Second, Inniscarra Dam was basically stable under desired flood and seismic loading conditions and required only minor remedial works. Third, Carrigadrohoid Dam had an inadequate margin of safety to meet new flood/seismic design conditions; an anchorage system was therefore required. Fourth, prevailing practice required that the Lee Dams be provided with 'movement monitoring' systems to enable tracking of possible dam movements. Improvement works to correct such deficiencies as were identified by the Flood Control and Dam Safety Studies were undertaken. The largest element of the required works was the construction of an auxiliary spillway at Carrigadrohid Dam.

255. Dam safety as operated today. Dam safety activity in ESB is governed by the 'ESB Dam Safety Organisational Structure' (the "Structure") approved by ESB's Board of Directors in 1988. The document sets out the roles and responsibilities for ESB's dam safety personnel. Following a recommendation in 2008 by ESB's External Dam Safety Committee, of which more below, this document was redrafted, agreed with the Committee, and approved by ESB's Board in September 2009.

256. Chief Civil Engineer. Under the Structure, the Chief Civil Engineer is the responsible engineer for dam safety. He (it is presently Mr O'Mahony, so the court uses the masculine form) carries the main dam safety responsibility within ESB and must ensure that required surveillance and checks are carried out. He has the authority and responsibility to make final decisions concerning all deviations from normal dam performance.

257. The External Dam Safety Committee. ESB dam safety is independently evaluated by the EDSC. This audit-style committee recommends additional dam safety requirements when necessary. The EDSC normally comprises four members. The chairman must be a civil engineer with extensive experience of hydro-electric dams. There is also a requirement as to expertise among the other members. The EDSC chairman is appointed by ESB's Board; the other members are appointed by ESB's Chief Executive. The Structure requires the EDSC to (i) discuss and agree with the Chief Civil Engineer various matters pertaining to dam operation, surveillance and maintenance, (ii) assess dam safety, (iii) inspect ESB's dams at defined frequencies, (iv) recommend implementation and/or modification of *e.g.* regulations, standards, policies, *etc.*, (v) recommend necessary studies/investigations on ESB's dams, (vi) recommend necessary dam-improvement works, (vii) provide requested advice to the Chief Civil Engineer, and (viii) comment on structural and organizational changes that may affect the dam safety surveillance system. Each year the EDSC chairman carries out a review based on the annual reports and presentation of the Chief Civil Engineer and others. Thereafter, the chairman issues a covering letter/certificate concerning safe operation of the dams. The Chief Civil Engineer also prepares an annual dam safety report for ESB's Board. A copy of the EDSC chairman's letter/certificate is included in this report. At least every five years, the EDSC does a review of dam safety. Following this review, the EDSC issues a report. A summary report is issued, *inter alia*, to ESB's Chief Executive. At least every ten years, the EDSC carries out a detailed dam-safety inspection; this is more detailed than the five-year review but enjoys a like circulation within ESB.

258. Hydro Stations Manager and Supervising Engineer. The Lee Dams operate under the direction of the Hydro Stations Manager. The Supervising Engineer reports to the Chief Civil Engineer on matters relating to dam safety and ensures that the regulations and guidelines are properly interpreted and applied. The Supervising Engineer personally carries out surveillance on the dams, manages a monitoring system, and certifies the safety of the dams each month.

259. The Lee Regulations. To ensure dam integrity, generation of electricity at the Lee Dams must be carried out within the framework of the Lee Regulations. These have been considered above. The EDSC has never criticised the Lee Regulations as inappropriate or inadequate for dam management.

CHAPTER 17: GENERAL PROVISION OF INFORMATION BY ESB.

260. Overview. Any reasonable observer would have to conclude that over the years ESB has given a lot of flood-relevant information to local authorities and Lee Valley residents.

261. Commencement of Dams–2009. Staff/students of UCC were regularly given tours of the Lee Dams and associated presentations on their operation. Information has been freely provided over the years to various UCC Department of Engineering staff/students seeking information relating to their studies. Meetings have been held with downstream residents. 'Open Days' have been held at the Dams.

262. 22nd June, 1987. ESB indicated in writing to local authorities that they should conduct a study of the implications of large natural floods on the Lee catchment.

263. 22nd February, 1988. ESB made a presentation to Cork County Council explaining a flood-event of the previous December, noting that significant floods are occasionally to be expected and that the Dams can rapidly reach the point where they have to release substantial amounts of water.

264. 21st March, 1988. A follow-up meeting to that of June 1987 took place. The 1988 Inundation Study was presented and discussed. Risk of fluvial flooding at Cork was discussed. ESB suggested that planning permissions in the Lee Valley below Inniscarra be endorsed with a notification that the site to which a permission attached was prone to flooding.

265. 11th November, 1993. The Inundation Studies were presented and explained by Mr Mangan to a meeting attended by local authorities. Mr Mangan explained the effect of the Dams, and that they cannot provide flood alleviation for large events. He reiterated that there remains a risk of flooding downstream of the Dams. This meeting resulted ESB's preparation of the 1994 Sensitivity Study, an exercise undertaken by ESB for the benefit of Cork's local authorities and which shows the demarcation between fluvial/tidal flooding.

266. Circa. April 2002. ESB engaged with the Joint Emergency Planning Group (which included representatives of Cork City/County Council, Southern Health Board and An Garda Síochána), furnishing it with the 1988 and 1992 Inundation Studies, the September 1994 Sensitivity Study, and aerial photographs of the December 2000 flood and details of peak discharges during same.

267. Information provided to local authorities on 19th November, 2009. In addition to abundant flood-related information provided to Cork City/County Council over the years, information was also provided to those authorities during 19th November 2009.

CHAPTER 18: FLOOD WARNINGS.

268. Duty to warn? The law of negligence recognises a duty to provide warnings that warn of harm that is, *e.g.,* possible or contingent, never mind harm of the imminent, certain and foreseen variety at issue in these proceedings. The learned authors of *Clerk and Lindsell on Torts* (21st ed., 2014) observe, at para. 4–11:

> "*Whether or not producing a dangerous product is negligent, failing to label it adequately or to provide sufficient warnings about it may well be....Whether a duty to warn arises will depend on the circumstances, including the level of the danger and its obviousness to the reasonable user, although the necessity of avoiding undue alarm will also be taken into account.*"

269. Certain of the common law principles pertaining to the duty to warn are considered in Chapter 50. Suffice it to note here that there are three features in this case that cast on ESB a heightened duty to warn. First, ESB assumed the responsibility of giving warnings to those on its warning-list; the corollary of such an assumed responsibility is a heightened obligation towards those to whom that obligation is assumed. Second, ESB was the only entity capable of providing information on discharges. Third, ESB stood possessed of its knowledge of various flood studies.

270. Usefulness and need for warnings. Dr Hughes indicated that flood warnings can considerably reduce fatalities/costs attributable to flooding. He advised that flood damage to individual properties can be reduced by about 30% if warnings are received three hours in advance of a flood, more if the lead time is increased to six hours or more. Per Dr Hughes, flood-warning dissemination is essential for successful flood-warning systems. "*There is little value in investing in the technology of flood warning if those at risk do not receive warnings with sufficient time to act and those responsible for providing assistance...are not given sufficient time to mobilise*". (Hughes Report, p.28). Flood warning dissemination can be active or passive. Active dissemination involves transmission of a warning directly by one or more of telephone, internet and press. Passive dissemination relies on an individual actively ascertaining the current warning status. Some controversy has arisen as to what constitutes a proper flood warning and, in particular, Dr Hughes' assertion that:

> "*The type of message provided is crucial. The ideal flood warning message should provide:*
>
> - *A brief description of the hazard*
> - *Location of likely impacts*
> - *Severity of impacts – what are the likely consequences*
> - *Action to be taken and time window in which to act*
> - *When and how will the next warning and other information be disseminated*".
>
> (Hughes Report, p.28).

271. Dr Hughes meant in this regard to refer to the type of flood-warning that would be given by a flood-management agency to the public. However, it does offer a template by which to gauge the adequacy of a flood-warning that might be given by a private body such as ESB.

272. Flood prediction. Flood prediction is essential to effective flood warning. Per Dr Hughes:

"Flood prediction for the Lee catchment for the city of Cork, should ideally involve prediction of the conditions in the upstream catchment, conditions at the dams including their likely levels and discharges during the flood even, conditions on all downstream tributaries including the likely timing of all in-flows to the City of Cork (from the Inniscarra releases as well as all downstream in-flow catchments) as well as the timing of the tide. In this way, the whole system can be assessed ahead of predicted flood events and appropriate action taken by all...concerned. Flood forecasting models are used to predict likely flooding for given forecasted rainfall events, and are often linked to early warning systems and emergency response. It is vitally important that such models cover the whole system likely to contribute to, or be affected by flooding, and provide accurate and timely predictions to enable mobilisation of...emergency responders." (Hughes Report, p.29).

273. Dr Hughes made clear in his oral testimony that he considers flood warnings to be an element of emergency planning for which local authorities are responsible; ESB has a part to play as stakeholder but the local authority 'owns' the process. Dr Hughes pointed to relevant international practice. In Austria, emergency planning and flood warning is a well-developed part of local authority responsibilities. In Canada, Dr Hughes' personal experience of one hydro-operator is that it undertakes joint exercises with local authority and emergency services to practice their response. In England and Wales, local authorities are responsible for off-site emergency planning-response; reservoir owners are responsible for on-site safety. In France, Italy and Sweden, hydro-electric operators must provide limited information to a local/public authority; that information's interpretation or significance is a matter for the flood or emergency response authority. In Scotland, the Scottish Environmental Protection Agency

(SEPA) provides a flood-warning service in conjunction with local authorities and emergency services. The Scottish Hydro-Electric Company provides warnings to SEPA and immediate downstream-owners at certain discharge levels. SEPA then acts as flood-warning authority. "*A characteristic evident in all of the international examples is the distinction of onsite and offsite obligations. The hydro-electric operator has, it appears universally, a functional boundary within its own sphere of activities and expertise. The content of warnings is minimal and almost always limited to response agencies.*" (Hughes Report p.29ff.). Dr Hughes offers the expert opinion that when the normal activities/expertise of a hydro-electric operator are seen in the context of a competent flood-warning and response system and emergency management policy "*it is evident that ESB is not best placed to initiate a flood response*". (Hughes Report, p.30). UCC contends that as the up-stream party which has taken control of the Lee-waters, ESB is the party that knows better than anyone how the river Lee is behaving above the dams, and likely downstream consequences. Who better to initiate a flood response by means of warnings than the party situate at the dams?

274. Assumption of responsibility. That ESB has assumed some level of responsibility to provide warnings is incontestable. Mr O'Mahony indicated that the responsibility of giving warnings is a responsibility assumed by ESB:

"*Counsel* [UCC] – [W]*hy do you bother giving any warnings at all?*

Mr O'Mahony – *It's a good question. It appears that warnings were given to UCC which people didn't heed....But the warnings I think, like they grew up from people near the dam initially getting a warning that there was discharges occurring....And in other instances then – it was initially when discharges went above* *the turbine discharge and then when they would go above the bankful discharge and it was to provide, I suppose, time for people to react to it....The list then grew by various people coming to them, coming to the station, saying 'Can I be added to the list?' There were, I think, meetings with the residents' group and meetings with farmers' groups and eventually I suppose over time – and in some instances businesses that their yards might have got flooded looked to be added to the list as well.*

– *But as I understand it, ESB doesn't worsen nature, is that correct?*

– *That's correct.*

– *...Why bother then or why do you feel under any obligation to give any warnings..?*

– *Well, I suppose it's a good neighbour approach to –*

– *A good neighbour approach?*

– *-- the people who were...near to the dam....*

– [B]*ecause you can see that people can be affected by the dam operations?*

– *Well, obviously if water is going to come through the dam, if a flood passes through the reservoirs there are going to be discharges downstream....*

– *But is that because you see that people will be affected by the dam operations and decisions made?*

– *Well, I suppose it goes back initially to people coming to the dam, to the station…*

– *Well, does ESB think it has any responsibility to issue warnings, as opposed to obliging people who call to the dam?*

– *Well, I think the main warnings that we need to give are to the local authorities, because they're the flood response agency…*

– *So…you have no responsibility to give warnings to the people on the list, but you do that out of a sense of good neighbourliness, is that correct?*

– *Well, it's a responsibility that we've taken on to provide it to people who've requested it.*

– *Well, do you accept now you've a responsibility to do that?*

– *Well, it's what we do….*

– [B]*ut do you accept that you have a responsibility to do it?*

– *I'm saying it's a responsibility that we've taken on –*

– *You've taken on.*

– *- in agreement with these people. They have come to us and said 'Can you give us a warning?' And we've said yes.*" (Transcript, Day 55, pp.67–69).

275. A chronology of the flood warnings of November 2009. The court has set out in Chapter 14 a detailed chronology of the events of 16th to 20th November, 2009, including such notifications/warnings as were given on or between those dates. The court does not consider it necessary to repeat that chronology here, whether wholly or partly. It simply notes, by reference to that chronology, the following as dates/times of particular relevance regarding warnings: Monday, 16th November, 2009 (02:45 – 03:15 (Dams); 07:50 (Dams)); Tuesday, 17th November, 2009 (Morning of 17th November (Others)); Wednesday, 18th November, 2009 (08:20 (Others)); Thursday, 19th November, 2009 (08:00 (Dams); 10.30 (Dams); 10:50 (Dams); 10:57 (Dams); circa.11:30 (Dams); 11:49 (Dams); 12:09 (UCC); circa.15:00 (Dams); 16:00 (Dams); 16:15 (Dams); 17:02 (UCC); 17:16 (Dams); and 17:35 (Dams)).

276. Deficiencies in warnings. There are at least fourteen failings in the warnings that ESB gave in November 2009. (1). There was no indication that buildings were in danger, no calibration of discharge volume, and no differentiation with regard to volume. (2) Even dam operatives observed that for "[m]*ost of the people discharges wouldn't mean anything to them*" (Transcript, Day 92, p.116 (Mr Shine)); "*I don't think discharges mean a lot to a lot of people....150 CUMECS doesn't mean anything to most people*". (Transcript, Day 91, p.41 (Mr Brophy)). (3). There was nothing to differentiate the notifications on 19th November, 2009, from those given on previous lesser-flood occasions. (4). The notifications gave no indication of impact of discharges or likely levels they might reach. (5) The warning that issued directly to UCC did not indicate that UCC buildings might be flooded or that special precautions were merited. (6) There was no indication the warnings were other than routine. (7) That there were two warnings in one day was not sufficient to raise alarm: the second did not convey anything different from the first. (8) The text of the warnings was not sufficiently clear to convey the flood-risk arising. (9) The warning that there was going to be a large, bad flood was not specific, though in fairness it is clear that, belatedly, it was trying to indicate that something different was occurring. (10) On 19th November, individuals who enquired were given a discharge figure that did not suggest there would be flooding of buildings, and no guidance where discharges would end up. (11) The warnings went no further than to alert UCC of increased river-flows. (12) The warnings gave no indication of level of inundation. (13) The warnings gave no notice that unprecedented flooding was to occur. (14) There was no warning that the flood would be the worst since the Lee Scheme was constructed. Additionally, it would have been relatively easy for ESB to provide more effective warnings. ESB could have conveyed the full risk arising, *e.g.* by indicating this was going to be a storm of great severity. At least four other improvements seem possible: (i) the provision of information on the spilling or the extent to which they exceeded normal spillages; (ii) the issuance of gradated warnings in a manner similar to those deployed by the United Kingdom's Environment Protection Agency (a body whose best practices can be drawn upon, albeit that its duties are not comparable); (iii) a formalised process whereby warning-recipients knew what particular warnings meant; and (iv) a rolling system whereby ESB reviewed the substance of its warnings.

277. UCC's Response to Warnings Received. What did UCC make of the warnings issued by ESB in November 2009 and before? Per Mr Poland:

"**[1]** [W]*arnings received from ESB were not a major concern....* **[2]** *I note from* [one of the witness statements proffered by ESB that]*...UCC was first added to ESB's warning list after we purchased the Western Gateway Building site from Bord na gCon. I do not know if this is correct....* **[3]** *ESB was aware from its own inundation studies that the discharge of large quantities of water from the dams, which occurred on the night of 19/20 November 2009, would result in the flooding of multiple UCC buildings.* **[4]** *I am surprised...that we were not on a warning list at all times.* **[5]** *I am also disappointed that ESB could have, but did not, inform us about the risk posed to our buildings.* **[6]** *The quality of the warnings was wholly insufficient given the level of knowledge that ESB had.* **[7]** *No information was ever provided to* *me or to my knowledge to any member of the Building & Estates team as to the impact of discharges above 150m³.* **[8]** *If ESB had provided information to us on the likely/possible result of discharges above 150m³ that would have put us on alert of the necessity to invest in flood protection measures for the existing building stock and flood prevention measures in new developments.* **[9]** *Instead, we only ever understood the warnings to mean that we should desist from doing maintenance work at the river bank.* **[10]** *I was not aware of the inundation studies prior to these proceedings.*"

278. Re. **[1]**. The immediate response this assertion prompts is 'Why not?' No satisfactory response to this question has been forthcoming in these proceedings. Re. **[2]**. If so, UCC was on the warning-list from at least 2004. (Poland Affidavit No.2, para. 3.10). One might have expected that in the years following UCC's taking occupation of the Bord na gCon site, it would have made effort to explore with ESB the purport of its being so included. There is no evidence that it did. Re. **[3]**. Implicit in this is an assertion that what ESB knew it should have broadcast. Absent from this statement is any sense that UCC should look to itself first when it comes to protecting itself from river-damage. Re. **[4]**. The court fails to see the relevance of this in proceedings that occurred when UCC was on the list. Re. **[5]**. If Mr Poland means that building-specific warnings should have been given, *i.e.* that there was a risk to 'X' building or 'Y' building, the court does not accept that so detailed a risk warning was required to be given by ESB. Again, there seems absent from this statement any sense that UCC should look to itself first when it comes to protecting itself from river-damage. Re. **[6]**. This important issue is considered later below. Re. **[7]**. Again, there seems to be absent from this statement any sense that UCC should look to itself first when it comes to protecting itself from river-damage. Re. **[8]**. When UCC elected to further develop its campus on a floodplain, it was first and foremost for UCC to ensure that it took such protective measures as were necessitated, not for third parties to do so. Re. **[9]**. See comment at [2]. Re. **[10]**. The court would expect that a university which elected to develop a riverside campus on a floodplain that was repeatedly inundated by the river Lee would have sought to consider flood-risk more thoroughly.

279. ESB's 25 contentions. ESB made about 25 contentions regarding the duty to warn. The court lists these hereafter and makes certain observations. **[1]**. *'The flow of water in the River Lee is a natural phenomenon'*. The court does not accept that when a dam operator impounds a river behind a dam and takes control of the release of water downstream, that the downstream flow can thereafter be described as 'natural'. **[2]**. *'The hazard to Cork City of flooding from the river Lee is ancient and notorious'*. The court considers this more of relevance to the issue of contributory negligence by UCC than to the issue of negligence on the part of ESB. **[3]**. *'The flow of water in the river Lee does not originate on or in ESB's lands but passes through those lands, subject to such impoundment as is effected by the Lee Dams'*. See comment re. [1]. **[4]**. *'As a riparian owner, ESB is entitled not to detain the flow of the river and is entitled as against all other downstream owners to have that flow leave its land unimpeded'*. See comment re. [1]. **[5]**. *'Where the flow in the river downstream of the dams is not greater than the in-flow to the reservoirs, that flow represents no more than natural conditions, with the result that any hazard arising thereby has not been created or caused by ESB, but by nature'*. The court considers the 'do not worsen nature' rule and its deficiencies later below. The notion that a dam operator that impounds water and releases it is not to be treated as the author of such hazard as the water poses seems absurd; see further in this last regard Chapter 54. **[6]**. *'A riparian owner is under no obligation to warn other riparian owners, or anyone else, of circumstances that represent no more than the natural flow of the river, provided he has not increased or worsened that flow'*. Riparian law is considered in Chapter 53. As to the 'do not worsen nature' dimension, see comment re. [5]. **[7]**. *'All persons against threat from the* *natural flow of the river must look to their own defences against that flow, subject to any relevant duties that may constrain such action'.* See comment re. [1]. **[8].** '*ESB is not under a general duty to warn anyone about discharges from its dams on the river Lee, provided these discharges are not in excess of the natural flow of the river'.* The difficulty arising in this case is that ESB agreed to have UCC on its warnings list and thus assumed a responsibility to give warnings to UCC and other persons on that list. As to the reference to the 'natural flow of the river', the court has addressed this point repeatedly above. **[9].** '*A general duty to warn would be grossly burdensome'.* The court struggles to see why a duty which embraced the taking of reasonable steps such as publishing a meaningful warning on one's website and releasing an associated press release would be grossly burdensome, especially when the form of warning can be suitably caveated. **[10].** '*The recognition of a general duty to warn would be inconsistent with the statutory and regulatory framework for emergency planning, which identifies An Garda Síochána and the local authorities as the lead agencies for emergency response management'.* The court considers that a common law duty to warn, especially a duty to warn those on a warning-list, is complementary to other statutory responsibilities. **[11].** '*ESB has voluntarily undertaken to provide certain warnings to certain people, who have asked to receive such warnings'.* This does not have as its corollary that ESB can feed any old nonsense to those people and be treated as having discharged its undertaking; the warning issued must be meaningful. **[12].** '*To the extent that persons are accustomed to receiving warnings from ESB and rely on those warnings, ESB may be under a duty to continue to provide such warnings, or not to discontinue the provision of such warnings without adequate advance notice'.* The court accepts this is so. **[13].** '*The scope of any duty assumed by ESB with regard to the provision of warnings is circumscribed by the nature of the warnings that ESB has undertaken to give'.* See comment re. [11]. **[14].** '*The warnings that ESB has undertaken to give concern when spilling of certain levels is due to take place at Inniscarra'.* ESB appears to intimate that the warnings it gives are determinative of the warnings it is required to give. The court does not accept this: to discharge meaningfully a duty/undertaking to warn, it must be that the warning issued has to be meaningful. **[15].** '*ESB has not assumed responsibility to warn about the possible consequences of its actions*'. See comment re. [14]. **[16].** '*ESB's assumption of responsibility to provide such warnings cannot be construed as assumption of responsibility to provide different, more detailed warnings*'. It can. See comment re. [14]. **[17].** '*Even if there is a wider duty to warn, that duty was adequately discharged by ESB*'. See comment re. [14]. **[18].** '*UCC was or should have been well aware of the long-standing risk posed by the river Lee to areas occupied by certain of UCC's buildings*'. The court accepts this is so. **[19].** '*ESB discharged any duty it might have owed with regard to the dissemination of information concerning its inundation studies by disclosing those studies to the relevant local authorites and the OPW*'. Dissemination of inundation studies to others neither allays ESB's assumed responsibility to give UCC meaningful warning nor discharges the duty of care that the court considers to arise. **[20].** '*UCC, as an institution, was aware of the inundation studies, as were certain of its academic staff*'. The court does not consider that, to the extent that this is contended, ESB could therefore issue any manner of warning in discharging its duty/undertaking to warn. **[21].** '*The warnings given by ESB on 19th November were adequate*'. The warnings ESB issued on 19th November suffered from the multiple deficiencies described above. **[22].** '*Any deficiency in warnings given by ESB must be causatively related to steps that UCC could and would have taken, had the deficiency not been present, to avoid or reduce the damage it suffered*'. The reason little was done in response to the warnings given by ESB was because they suffered from the many deficiencies outlined above and came in the context of ESB having repeatedly and widely touted to the world the flood alleviation merits of its dams. The court considers that a timely and meaningful warning on the 19th would have made difference to the subsequent actions taken by UCC. **[23].** '*Informing UCC of the actual or expected rate of discharge from* *the dam would have had no effect as the relevant staff did not understand the significance of discharge rates and would not have altered their behaviour*'. See comment re. [22]. **[24].** '*Even if the full effects of the flood on UCC could have been predicted, and UCC warned, UCC was so unprepared to respond to a flood that it would have made no difference, or any difference would have been inconsequential*'.There is a touch of the extreme to this. No-one has suggested that every least detail of what happened on 19th November, 2009, ought to have been apprised to UCC by ESB. Such a duty would be impossible to achieve, and if law is the fruit of politics, it too seeks ever the possible. All that has been sought is that such warnings as issued ought to have been sufficiently meaningful as be useful, and this they were not. **[25]** '*Unreasonable conduct on the part of UCC breaks any chain of causation*'. In this regard, ESB relies on the decision in *McKew* v. *Holland & Hannen & Cubitts (Scotland) Ltd.* [1969] All E.R. 1621, 1623, as approved by the Supreme Court in *Fletcher* v. *Commissioner of Public Works* [2003] 1 I.R. 465. In *McKew*, the plaintiff's conduct, jumping down a flight of stairs to avoid injury, amounted to a *nova causa interveniens* because, even if foreseeable, it was unreasonable in the circumstances. Likewise, ESB contends, given the extreme weather conditions that Cork experienced in the run-up to 19th November, and the warnings ESB issued to *e.g.* the local authorities/radio, it was unreasonable for UCC to ignore such warnings as it received from ESB. To this the court responds as follows: ESB undertook to provide warnings directly to UCC; to discharge meaningfully a undertaking to warn, any warnings despatched to UCC ought to have been meaningful; instead the warnings were possessed of the multiple deficiencies identified above; a timely and meaningful warning on the 19th would have made difference to UCC's actions that day. One final, general comment: ESB contends that the problem on 19th November was not the warnings, but that UCC did not take adequate action upon receiving them; ESB refers in this regard to the decision of the House of Lords in *Caparo plc* v. *Dickman* [1990] 2 A.C. 605, in particular the observation of Lord Oliver, at 635, that "*In* *general…when any serious statement, whether it takes the form of a statement of fact or of advice, is published or communicated, it is foreseeable that the person who reads or receives it is likely to accept it as accurate and to act accordingly.*" The difficulty ESB encounters in this regard is that when such warnings as it issues are possessed of the multiple deficiencies identified above, one has moved beyond the general instance identified by Lord Oliver into a separate realm where his truism no longer applies.

280. Some conclusions. The principal problem for ESB when it comes to the issue of warnings is not that it failed to provide a warning of a natural phenomenon; it is that it failed to provide adequate warning of the discharges it intended to make, and their likely impact, in circumstances where ESB (a) controlled the Lee Dams and (b) was the only entity with knowledge of (i) water-levels at any particular time, and (ii) the Dams' capacity to accommodate in-flows. If ESB were only subject to a duty 'not to worsen nature' (and, as will be seen, the court considers it is subject to a more expansive duty of care), the duty to provide warnings would be even more exacting because persons downstream have no way of knowing what the 'natural' run of the river is (or would have been before 1957). It is just and reasonable that anyone positioned as ESB was and which can see that a hazard is on its way should let people in harm's way know. As to causation, the court notes and accepts the consistent thrust of the evidence from UCC's staff that if they had known early on the 19th what was coming later, there was more they could and would have done. The reason little was done was because ESB's warnings suffered from the many deficiencies outlined above. In light of the admitted fact that the damage occasioned to, *inter alia*, UCC on 19th/20th November, 2009, was foreseeable and foreseen, the failure to provide adequate warning to UCC, a person on ESB's warning-list, of the hazard that was on its way down from the Lee Dams was and is inexcusable. All of the evidence supports the conclusion that that there was a duty on ESB to provide timely and adequate warnings to a person to whom it had assumed a responsibility to so warn, and that it failed to discharge this duty.

CHAPTER 19: ESB'S FLOOD INUNDATION STUDIES.

281. Various inundation studies. ESB has undertaken a number of inundation studies to assess the likely effects of a dam-breach or design-flood event were it to occur at Carrigadrohid or Inniscarra. These are summarised below. Further details of the modelling employed appear in the account of Mr Mangan's expert evidence in Chapter 36.

282. [1] River Lee Inundation Study (March 1988). As part of the Southern Health Board's ongoing emergency planning, the Board requested ESB to examine the downstream consequences of breaches at Inniscarra Dam. The Study considered four different flood events and their effects as far as Cork City Waterworks Weir. This included a 1,000-year, 10,000-year flood and dam breach. A significant rainstorm of August 1986 was used to calibrate the model.

283. [2] Carrigadrohid Inundation Study (August 1992). This Study estimated inundation levels on the river Lee between Carrigadrohid and Inniscarra based on a 1,000-year flood, 10,000-year flood, and a dam breach at Carrigadrohid. The Study was produced to input into the Local Authority Emergency Plan.

284. [3] Cork City Inundation Study (September 1994). This Study estimated inundation levels in Cork City for a number of flood events. It considered the same flood events as the 1988 Study, this time with the emphasis downstream of Waterworks Weir. The Study was produced to input into the Local Authority Emergency Plan.

285. [4] River Lee Levels – Cork City (September 1994). The purpose of the Study was to estimate the effects of discharges from Inniscarra Dam on river flood-levels. Estimates of river-levels at key City locations were made for river flows of 100 to $500m^3/s$ at highest astronomical tides.

286. Interaction with local authorities and others. Correspondence occurred in the 1980s between ESB and the Southern Health Board concerning risks associated with the Lee Dams. Following an inadvertent operation of the Inniscarra spillway-gates in late-1987, there were meetings in 1988 with local authorities and the first inundation studies were handed over. In November 1993, there was a meeting between ESB and Cork City/County Council at which previous inundation studies were handed over. Thereafter, ESB was requested to do further work on the impact of various discharges on Cork City. In consequence, the 1994 report was produced. Copies of the 'River Lee Levels – Cork City' study was presented to Cork City Council in January 1995. In February 2002, a meeting was held with Cork Joint Emergency Planning Group; inundation studies done to that time were handed over. The Emergency Planning Group included representatives of Cork City/County Council and An Garda Síochána. Copies of the first three inundation studies were issued to the OPW in September 2009.

287. Significance of inundation studies. The significance of these studies in the within proceedings is they show that ESB had a detailed knowledge of the downstream effects of discharges from/floods at the Lee Reservoirs, and was uniquely well-placed to undertake the flood alleviation role UCC contends to arise for ESB by law.

CHAPTER 20: FLOOD ALLEVIATION EFFECTS OF LEE RESERVOIRS.

288. The Lee Dams have a natural flood alleviation effect. This is because the peak-rate of water-in-flow into the reservoirs from the surrounding catchment during a significant rainfall event may not be seen in its entirety downstream of the dams. This natural flood alleviation effect is limited. The Lee Reservoirs "*were not originally designed to provide full flood protection to downstream areas*". (O'Mahony Affidavit, p.40). That said, if the Lee Dams did not exist, heavy rainfall in the catchment area feeding the dams could produce a volume and intensity of flow at Inniscarra in excess of what occurs with the operation of the dams and reservoirs. That does not mean that the Lee Dams can protect against all floods. Large floods will have severe effects downstream and the larger the flood, the greater the downstream effects will be.

CHAPTER 21: CFRAMS AND FLOOD RELIEF.

289. CFRAMS and Lower Lee Flood Relief Scheme. In early-2006, the OPW, in conjunction with Cork City/County Council, initiated the Catchment Flood Risk Assessment and Management Study (CFRAMS) for the river Lee catchment. Halcrow were appointed as lead consultants. Over the following years, ESB engaged with the OPW and Halcrow and provided such data as was requested of it. The development and publication of a Flood Risk Management Plan was intended to be completed by winter 2007. The draft plan was published in February 2010. There are various options presented in the draft plan, including revised operating procedures for the Carrigadrohid and Inniscarra Reservoirs, and localised works downstream to allow greater dam-discharges without flooding of properties, thus creating further storage in the reservoirs in advance of a flood peak. A steering-group was established in

March 2010 to drive forward the process for implementation of flood risk management measures for the lower Lee as envisioned in the draft plan. This steering group comprises the OPW, Cork City/County Council and ESB. It was decided to commission consultants to undertake the design, planning and construction supervision of proposed measures, and to look at environmental issues. In 2012, the project moved to the next stage, the 'Lower Lee Flood Relief Scheme'. In 2013, the consultant firms Arup and JBA were appointed by the OPW to develop a flood relief scheme.

290. Interim flood relief measures. In September 2010, the OPW requested ESB to examine interim measures that might be established on a pilot basis at the Lee Reservoirs for the winter period, so as to increase downstream flood protection. The measures ESB proposed were to reduce the winter spill-level in both Reservoirs by 0.5m. This means that water now falls to be spilled from the Lee Reservoirs at a lower level than previously. ESB considers that the effect of this reduction is marginal for larger floods but more significant for smaller, more frequent floods. Pending final implementation of the Lower Lee Flood Relief Scheme, ESB has continued to operate these interim measures.

291. Significance of CFRAMS, *etc.* ESB contends that the foregoing demonstrates that flood management and flood response requires a multi-agency approach to be effective. What the court draws from the foregoing is that it is, and always has been, within ESB's exclusive power to do what the court finds in this judgment that ESB ought to have done in November 2009, namely operated to TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35).

CHAPTER 22: THE BUSINESS AND BENEFITS OF HYDRO-ELECTRICITY.

292. Commercial purpose of Lee Dams. When the Lee Scheme was approved in 1949, the total installed power station capacity in the State was approximately 300MW. The Lee Scheme provided an additional 27MW and so represented a significant increase in capacity. However, the percentage of total system installed capacity represented by hydro-electric generation steadily decreased as new, non-hydro power stations came into operation. By 1970, total installed capacity in the Republic was 1,409MW; by 1980 it was 3,117MW. ESB's total installed hydro-electric capacity is now 220MW in an island-wide single electricity market with a total installed capacity of 12,429MW. The maximum electricity system demand is approximately 6,500MW for the single electricity market ("SEM"). So ESB's hydro-power stations provide approximately 1.8% of the installed capacity of the SEM and are capable of supplying 3.4% of peak demand on the day of the highest peak system demand, assuming all hydro units are running.

293. Hydro-electricity and electricity prices. Since November 2007, there has been a single electricity market on the island of Ireland. Power stations produce electricity and offer their electricity for sale in a wholesale market. Market participants offer electricity for sale based on bid prices submitted on a day-ahead basis. Bid prices must reflect the marginal cost of generating electricity using the specified fuel and type of power plant. The market operator takes in all bids by different generators and accepts increasingly expensive bids until generated quantity matches expected demand. The highest-price electricity required to meet demand sets the market price for that time period. ESB's hydro-electric stations aid in reducing prices. They always offer full output quantity at a bid price of €0 due to nil fuel cost. (Water, at least when it falls from the sky, is still free). As a result, hydro-electric stations reduce the need for more expensive generation. This lowers wholesale market price. As hydro-electric stations can only deliver energy to a limit set by stored water, the impact in lowering wholesale price is most advantageous at peak demand periods. In summertime, when water resource is typically low, hydro-electric stations typically run over the evening load peak to reduce market-price. In winter, hydro-electric stations typically run at full capacity throughout the day, reducing price in all time periods.

294. Scale of revenue earned. The Commission for Energy Regulation and the Northern Ireland Utility Regulator published a report in May 2013 entitled "*Generator Financial Performance in the Single Electricity Market*". This report contains financial information for 2011 for electricity generators on the SEM. The total income earned by all market-generators in that year was €2.7bn. ESB's hydro-electric stations earned total revenue of €55m, based on generating 629 gigawatt–hours of electricity and selling this wholesale.

295. Hydro-electricity and grid system support. The percentage contribution from hydro-electric stations to meeting electricity demand has decreased since the 1950s. However, hydro-generation still provides a valuable role in enabling the secure, economic operation of the electricity grid. This role includes grid system-support through frequency-response, flexible minimum loads, and 'black-start' capability. The all-island transmission system consists of over 6,500km of high voltage lines and over 100 transmission and generation sub-stations. Providing power of a suitable quality to the remotest sub-stations on the island of Ireland is the task of EirGrid, the transmission system operator. To achieve this, EirGrid uses services provided by electricity generating stations, located around the island. Because locally provided generation support is more effective than remote-supplied support, it is of benefit to EirGrid that it can call on generation stations located in weak parts of the transmission system. Many areas of the north-west, west and south-west are relatively weak parts of the system. The location of ESB's hydro-electric stations allows them play a valuable grid support-role. At Carrigadrohid and Inniscarra, hydro-electricity generators provide support for power transmission to and from Macroom, West Cork and South Kerry. Recent and planned upgrades to ESB's hydro-electric stations have allowed voltage support-capability to be expanded to support integration of wind generation into the transmission system. ESB's hydro-electric stations provide excellent response to frequency needs. This is due, firstly, to their quick start-up time. The stations can start up and synchronise to the electricity grid within five minutes of instruction-receipt, and be at full output five minutes later. Secondly, the ability of hydro-electric stations to change generated power output at approximately 25% of their output per minute allows EirGrid to counter shortfalls/excesses in generation due to intermittency of wind generation.

296. 'Black-start' support. ESB's hydro-electric stations are central to EirGrid's plans for system recovery after an electricity black-out. 'Black-start' service requires a generator to be capable of (i) starting without external electricity supply, (ii) taking on small amounts of higher electricity demand in a stable fashion, and (iii) starting a larger generator in a distant power station. Each ESB hydro-electricity stations has a small generator which is capable of meeting local electrical needs of the station, allowing them to start up without an outside power supply. Hydro-electric stations are also stable while running at a very low generated power output. Their wide operating range allows them pick up small amounts of customer load and power the large auxiliary motors needed to start up the next generating station. Lastly, they have high starting reliability and no delays in starting. This makes them well-suited to the requirements of getting system restoration in minimum time.

297. Hydro-electricity generation and CO_2 emissions. Since publication of the Renewable Energy Directive (Directive 2009/28 of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (OJ L140, 5.6.2009, p.16)), there has been an European Union-wide target that 20% of all energy should, by 2020, come from renewable sources. Different targets have been given to each European Union member-state. Ireland's target is that 16% of gross final consumption come from renewable energy sources. This target comprises contributions from renewable energy in electricity, transport, and for heat and cooling. In the case of electricity, the target is that the renewable contribution to gross electricity consumption be 40% by 2020. Hydro-electricity generation contributes to this target. ESB's hydro-electric stations produce between 600 and 900 gigawatt-hours of electricity annually, depending on the water available.

298. Water-supply. One, perhaps curious, attribute of ESB's portfolio of hydro-electric stations is that the reservoirs serving those stations are used to supply water to local authorities in Dublin (from the river Liffey) and Cork (from the river Lee). For both river-systems, a certain amount of water is provided free. After this quantity is reached, an electricity market-based charge is applied to allow ESB to recover income it would otherwise have realised, had the water travelled through power station turbines. Mr Nicholas Tarrant, a former Group Production Manager at ESB, avers in his affidavit evidence that "*This is consistent with a power generation mandate*". (Tarrant Affidavit, para. 8). The court accepts this and does not consider that such ancillary water-supply arrangements transform the Lee Dams from single-purpose to multi-purpose dams.

CHAPTER 23: KEY DOCUMENTARY EVIDENCE.

299. Limited number of key documents. A limited number of key documents are critical to the court's consideration and determination of the issues arising between the parties. These are identified below, with brief extracts reproduced and/or comment made.

300. Interim Electricity Generation Licence granted to ESB. See further Chapter 49.

301. Lee Dams Publicity Brochure. Among the documents provided to the court was an undated small coloured information pamphlet published by ESB and entitled "*the river lee hydro-electric scheme*". It briefly outlines the principal features of the Lee Scheme, stating, *inter alia*:

> "*Occasional flooding of the valley downstream of Inniscarra has always been and will continue to be inevitable....due to the topography and...climatic conditions in the area. However, flooding downstream...has been minimised by the presence of the dam. The discharge from Inniscarra has always been less than the peak natural in-flow...since the dam was built. ESB issues flood warnings to those known to be at risk downstream of the dam during periods of floods.*
>
> *The River Lee is not a major factor in city flooding...*"

302. This text is consistent with the general thrust of ESB's public communications over the years that it aids, *inter alia*, in minimising flooding downstream of Inniscarra.

303. The Contribution to Irish Society of Irish Hydro-Electric Dams. An undated, published article by Mr J O'Keeffe of ESB on "*The Contribution to Society of Irish Hydro-Electric Dams*" looks at the socio-political impact of Ireland's hydro-electric schemes on the national economy. Among the stated attributes of the dams, at 13, are their contribution to flood alleviation:

> "*The contribution of the dams to the reduction in flooding on the River Lee is...significant....Inniscarra Dam attenuates flooding due to most short duration flood events on the Lee and it is possible to prevent the peak discharge reaching...peak in-flow in all but the most severe events....Careful management of flood situations helps to reduce the frequency and magnitude of flooding downstream of Inniscarra, but because of the limited storage available, the flashy nature of the river and the downstream topography, flooding can never be eliminated....The dams have reduced the risk of flooding but the risk has not been eliminated...occasional severe events result in flooding to...new settlements. Because of the control provided by the dams it is generally possible to provide warnings for people at risk...*".

304. "River Lee: Assessment of dam safety" (1987). This study was commissioned by ESB of external experts (*Vorlaberger Jllwerke Aktiengesellschaft*). It identifies, almost a quarter-century before the flood events of 2009, the need to investigate the possibilities for downstream flood reduction through modification of existing operational rules, stating, at 7:

"Inniscarra discharges the tailwater into the River Lee which flows through the city of Cork. Therefore much attention has to be paid to the control regulations. The natural runoff shall by no means be increased by the plants.

If...the dams and reservoirs provide a reduction of flood peaks, the plants can be considered to be multipurpose plants. In many countries the government follows the principal sharing the benefits gained or losses incurred and pays contributions to the hydro power plant in such situations.

Obviously...existing regulations result in the fact that minor peaks up to a certain flood volume are cut off totally. This led to a wrong assessment of safety by the population....

We recommend to investigate the possibilities for flood reduction by modifying...existing control regulation. As we understand emphasis should be given that spilling does not coincide with spring tide.

The results, the reduction of peaks which can be guaranteed as well as the limitatiuons, should be discussed with the relevant authorities...".

305. Internal Paper on "Hydro Generating Plant: Limits on Use of Storage" (1979). ESB has emphasised that, pursuant to the Act of 1945, it has been authorised to erect hydro-electricity dams on the river Lee and generate electricity. This document suggests that ESB can modify the use of its hydro-electric dams and is not barred by law from so doing. In Part 1, ESB notes: (i) a portion of its hydro-electric reservoirs has been surrendered to meeting water-supply needs and there will likely be further such demands, (ii) it has received numerous representations that it modify use of dammed rivers to satisfy tourism needs, (iii) changed storage-patterns have emerged on dammed rivers to meet changed generation practices/demands, and (iv) increased value of farming-land has led to increased complaints from farming interests regarding flooding and waterlogging. The paper concludes in this regard (at 2): "*In view of all these factors...E.S.B. should voluntarily modify...use of its hydro resources in the national interest. It is believed that if it does not...it will eventually be forced to do so by government action.*" The paper considers, *inter alia*, changes to be made at the Lee Dams, including (at 7): changes to summer water-levels at Carrigadrohid Reservor to avoid baring "*unsightly*" mud-flats and tree stumps at the Gearagh Wetlands; and the commission of a study into how best to combine optimal generation with Cork County Council's water-supply needs.

306. "River Lee Levels – Cork City (Sensitivity to Inniscarra Discharges)" (September 1994). This is one of the Inundation Studies referred to in Chapter 19. It demonstrates that ESB had a detailed knowledge of the downstream effects of discharges from the Lee Dams and the significance of inflows from downstream tributaries, stating (at 5):

> "[T]*he regulation of flood flows through Carrigadrohid and Inniscarra Reservoirs causes...considerable reduction in...peak flows into Cork City. By temporarily storing...flood flows in both reservoirs and discharging evenly over the following hours a reduction and a delay in the peak flow downstream of Inniscarra is brought about....*[I]*t is estimated that a peak discharge greater than 500m^3/s would have occurred downstream of Inniscarra during August 1986 if there were no* [Lee] *dams....Also...peak discharge occurred some hours later than it would have, if there were no dams, and therefore did not coincide with peak discharge from the downstream catchment. The peak discharge from the Shournagh* [a downstream Lee tributary], *estimated at 160m^3/s during August 1986, occurred 8 hours before...peak discharge from Inniscarra Dam.*"

307. Report on Management of Lee Floods of February 1997. ESB contends that rigorous adherence to the discharge levels prescribed in the Lee Regulations is necessary to maintain dam integrity, and deviation therefrom is not to be countenanced. UCC has pointed to the successful deviation sanctioned by ESB's Chief Civil Engineer on 19th November 2009 (considered above). It points to a similarly successful deviation done during the flood-events of February 1997. ESB's "*Report on Management of Flood on River Lee during the Period 16th February – 20th February 1997*", notes: "*At Inniscarra spilling commenced earlier than necessary for dam safety. This was done with the intention of reducing the flooding downstream of Inniscarra...*[A] *computer study* [has]...*indicated that the water discharge at Inniscarra was 33 cumecs* [m^3/s] *(13%) less than would have occurred had the spilling not commenced until it was compulsory*". A separate report, "*River Lee Flood of February 1997*", prepared by ESBI likewise notes (at 20): "*Due to...local knowledge applied to the flood, water levels and discharges were less than would have occurred had one waited for the Regulations to come into force.*"

308. Presentation to National Hydrological Conference (2001). The presentation at a National Hydrological Conference on "*Flood Risk Management through Reservoir Storage and Flow Control*" by Mr Jim Fitzpatrick and Dr Thomas Bree of ESB in 2001 is one of many examples of ESB touting the flood risk-management merits of its hydro-electric dams. A slide on reservoir uses appears to rank flooding alleviation and water-supply uses of reservoirs above their providing electricity. An accompanying paper by Mr Fitzpatrick and Dr Bree entitled "*Flood Risk Management through Reservoir Storage and Flow Control*" makes play of ESB dams' flood management functions, stating (at 1, *et seq*):

"There are fifteen large dams located throughout the Republic....The dams are owned [inter alia] by the Electricity Supply Board (ESB)....Dams and reservoirs play a significant role in Ireland in flood risk management....Almost all...were constructed more than fifty years ago. Although they have more than recovered their initial investment, there are significant costs involved in operation and maintenance for flood control.

The objective of this paper is to illustrate the major benefits and the inherent risk of reservoir storage.

The ESB controls catchments in Ireland namely, the Shannon...Erne...Liffey...Lee...and Clady....Within these catchments, ESB is the owner and operator of thirteen dam structures, most with reservoirs, which are associated with nine hydro-electric generating stations

These dams and reservoirs are multipurpose:

- *They reduce significantly flooding impacts downstream and in the cities,*
- *They provide a major source of water supply to the cities of Dublin, Cork and Limerick,*
- *They provide a renewable source of electricity, and*
- *They are important for recreation and amenity.*"

309. Cork Joint Emergency Group Presentation (2002). This document comprises a slide presentation done for representatives of various public bodies in 2002. It points to a comprehensive knowledge on the part of ESB as to the effect of various discharge-levels from Inniscarra Dam for various locations downstream, including Cork City.

310. Submission to Review of Government Policy on Flood Relief (2003). In March 2003, ESB made a written submission to a task-force established by Government and focused on flood-relief policy. This submission emphasises the flood alleviation benefits of ESB's hydro-electric dams, *e.g*:

> "*1. Introduction*
>
> *Electricity Supply Board welcomes the Government review of policy on Flood Relief. It makes this submission to the Government Task Force to highlight the contribution of reservoir management to flood protection in Ireland and to confirm its continued cooperation with other stakeholders in river management....*
>
> *Dams and reservoirs play a significant role in Ireland in flood risk management through the provision of storage and controlled discharge of floods in-flows. Almost all...were constructed more than fifty years ago. Although they have more than recovered their initial investment, there are significant costs involved in operation and maintenance of the facilities in the provision of their selected service including flood control....*
>
> *ESB owns and operates thirteen large dam structures, most with reservoirs, which are associated with nine hydro-electric generating stations. In addition a number of smaller dams and embankments form part of these facilities.*
>
> *Most of these dams and rivers are multipurpose:*
>
> - *they significantly reduce flooding impacts in agricultural lands and urban areas downstream, particularly on the Liffey and the Lee,*
> - *they provide a major source of water supply...*
> - *they provide a renewable source of electricity, and*
> - *they are important for recreational and amenity reasons.*

ESB's primary interest and responsibility is the generation of electricity. As a company attention to safety is a feature of ESB business and will continue to be a priority issue. We work with a wide range of government agencies, NGOs and community organisations in coordinating the control of water levels and flows, and in the management of water quality and ecology."

311. Report of AXA Insurance (2004). In 2004, AXA conducted a special on-site visit, in its capacity as an ESB insurer, to evaluate the exposure of ESB regarding, *inter alia*, dam liability risk. Given the duty of absolute good faith between insured and insurer, the court had particular regard to this report. It was written by someone for whom English appears not to be his first language, so the English used is not flawless; its purport, however, is entirely clear. The Report states (at para. 2):

"*The dams safety management is good*....[B]*est international practices are used. We noticed...that there is no regular cooperation between ESB and the Authorities*....[T]*here is a lack of involvement from the Authorities in flood control which may increase the responsibility of ESB in case of claims. In the other hand, ESB provides risk assessment in case of dam breach but is not involved in the local emergency plan.*"

312. Para.3 states:

"Flood Control

ESB should request more implication of the local or national Authorities in the flood control...to avoid any claims and/or court action from people who consider...ESB did a bad management of a flood

ESB should present to the Authorities its policy concerning flood control...ESB should request the agreement of the Authorities concerning this flood control policy.

Comments:

The flood control is a task which is strategic for the country and is achieved in the common interest of the population. The dams allow...flood control with some limitations and floods may occur in case of high rain level.

Presently ESB manages...flood control alone; this might induce a 100% responsibility in case of claims."

313. Under the heading "*Proposed Improvements*", the Report states:

"Emergency plan

ESB should be more involved in the emergency plan in case of dams breach....

Comments:

ESB does not know accurately the emergency plan defined by the local authorities. The involvement of the dams owner in the emergency plan allows usually it to be more efficient. For example, it could be useful that the most *experienced population are informed directly by the dam owner in order to avoid any lack of time.*"

314. In para. 6, the Report notes:

> "*The ESB dams are very important for flood control....*[F]*lood control of dam use is more strategic for Ireland than the electricity production.*
> *ESB has a very good knowledge of the water flow of the river which is permanently measured. ESB has succeeded to avoid any major flood for a long time...*
> *ESB has no specification from the authorities for the flood control management. They apply the best practices according to their knowledge and the dams capacity.*"

315. The court has also seen an ESB document entitled "*Response to Issues Arising from Insurance Surveyors Report on ESB Dams*". The ESB document notes, *inter alia*:

> "*ESB are satisfied that if the* [Lee] *Regulations are properly implemented...flooding will not be worse than if there were no dams on the rivers and in many cases the floods are significantly attenuated by the presence of the dams. ESB have successfully defended a number of claims for damages, where we were able to prove that the Regulations were implemented correctly.....*[I]*f the Regulations are not properly implemented...ESB will have a liability for any damages resulting....Any new arrangement with the LAs* [local authorities] *is unlikely to change that.*

The relevant Local Authorities are aware of the existence of the Regulations and of the general limitations provided by the Regulations in controlling flooding. However, I think it would be very difficult to get the LAs involved in a process that could have liability implications for them."

316.ESB further in its "*Response to Issues Arising from Insurance Surveyors Report on ESB Dams*":

"*ESB has prepared documents covering crisis management issues for a number of Dam Incident Scenarios including Dam Breach. These documents give outlines of the inundated areas and the estimated time lapse of the flood wave.*
These documents have been provided to the relevant Local Authorities and Emergency Planning Group for their use in the development of Emergency Plans. It would be the responsibility of the police and the LA to arrange for evacuation of areas at risk in the event of an incident....[I]*t is likely that ESB would provide the inundation information and…would also assist the relevant authorities in any evacuation effort…*".

317. Report on Lee Flood of December 2006. ESB contends that rigorous adherence to the discharge-levels prescribed in the Lee Regulations is necessary if dam integrity is to be maintained, that deviation therefrom is not to be countenanced. UCC points to a successful application of the discretionary spilling clauses during a flood event of December 2006. The ESBI's final report on that event states:

"Executive Summary...

During the Lee Flood December 2006 the discretionary clauses of the 'Regulations for the Control of the River Lee' were applied. Discharge from the reservoirs was effected prior to the water level in the reservoirs reaching...a level at which obligatory discharge is required under the Regulations. This was based on all available information, such as current reservoir levels, downstream water levels...and Meteorological Forecasts...

8. Conclusions

The decision taken to invoke the discretionary clauses...increased the storage capacity of the reservoirs prior to the large flood in-flows to the catchment. Therefore, a greater volume of water could be stored in the reservoirs and the peak discharges were reduced. It is clear on this occasion the operational methodology employed mitigated the flooding downstream of Inniscarra...

9. Recommendations...

It is clear on this occasion that invoking the discretionary clauses outlined in the Regulations for the Control of the River Lee mitigated the flooding downstream of Inniscarra. These clauses should be maintained as part of the current Regulations."

318. The last line reads almost as a clarion call for the type of dam management contended for by UCC throughout these proceedings.

319. CIBSE Presentation (2007). On 24th October 2007, Mr Liam Buckley, then Plant Manager at the Lee Scheme, and Mr Jack O'Keeffe, a former ESB Chief Civil Engineer delivered a lecture to the Chartered Institution of Building Services Engineers (CIBSE). Slide 9 of the presentation, headed "*Our Operations*" appears to rank safety above the generation of electricity and, under the heading "*Safety*" appears to rank safety of the dam and of people as the two highest-ranking issues. Among the remarks made at the presentation by Mr Buckley were the following: "[S]*afety is always number one with ESB, safety of the dam itself is always paramount, the safety of people, the environment, the property, plant and generation of electricity, even though it was what we were put there for, but it's not first on our priority list. That's the way it has to be.*"

320. Lee Stations Presentation to UCC BSc Environmental Studies Group (2007). As with the CIBSE presentation, Slide 3 of this presentation, headed "*Our Operations*" appears to rank safety above the generation of electricity and, under the heading "*Safety*" appears to rank safety of the dam and of people as the two highest-ranking issues.

321. Note during Hydrometric Review done by OPW (2007). In early-January 2007, Mr J Benn of JBA Consulting was assisting the OPW in undertaking a hydrometric review. In this capacity he met with ESB and, following this meeting, sent a comprehensive note of same to ESB. At the outset of this note, in a summary review of hydrometric monitoring done by ESB, Mr Benn noted that ESB's "*priorities for dam operation are (1) flood control, (2) water supply and (3) power generation*". In ESB's reply e-mail there was a small number of minor changes to Mr Benn's note; no comment was made on, or amendment effected to, the just-quoted text.

322. Dam Safety Presentation to the OPW (2009). In January 2009, Mr Brian O'Mahony, delivered a presentation on dam safety to the OPW. Yet again, one of the slides in this presentation highlights the flood management benefits of the dams.

323. ESBI Reports on Lee Flood Events of November 2009. It will be recalled that ESB's intra-group reports on the flood events of 1996 and 2006 pointed to the successful use of discretionary spilling as a means of flood management. UCC has pointed to an unexplained gradually more nuanced approach in the reports on the flood-events of 2009. The draft ESBI report, "*Lee Flood of November 2009 – Preliminary Report*" (January 2010), states, at para. 7.2:

> "*The Inniscarra reservoir level at the start of the major in-flow on the 19th was 48.30m. This level is higher than the target top operating level at Inniscarra for November, as given in the current Lee Guidelines, which is 47.50m. The months of October and November were particularly wet with rainfall exceeding the normal monthly average across the Lee Catchment. Additional spilling earlier in the month would have been required to achieve the target operating level at the start of the 19th.*"

324. Throughout the proceedings ESB has consistently sought to steer the focus on MaxNOL. So why the above focus on TTOL? Whatever the reason, the text was gone by June 2010, replaced by pessimism as to the utility of discretionary spilling:

> "*The potential for further reduction of the Inniscarra peak discharge is examined, by operation of reservoirs at low levels and/or increased discharge in advance of*

heavy rainfall. Additional attenuation of flood flows is possible in this way for smaller floods but not for high return period floods, due to the limited amount of storage in the reservoirs."

325. A longer version of the above-quoted text, also in a draft report of June 2010, evinces similar, if not greater, pessimism as to the utility of discretionary spilling:

> "*The potential for reduction of the Inniscarra peak discharge, by operation of the reservoirs at low levels and/or increased discharge in advance of heavy rainfall, is examined. Additional attenuation of flood flows is possible in this way for smaller floods, but the significance of initial reservoir level is reduced for floods of a higher return period, due to the limited amount of storage in the reservoirs. In November 2009 the 3-day in-flow to the reservoirs was approximately two and a half times the combined normal operating storage capacity of the reservoirs.*"

CHAPTER 24: EXPERT EVIDENCE.

326. The court has been provided with an abundance of expert and other evidence which has been of considerable use in resolving the various issues arising in these proceedings. Pertinent elements of the expert evidence received, and not referred to elsewhere, are considered in Chapters 25 to 46.

CHAPTER 25: MR SHIBATANI'S EVIDENCE.

327. Description of expert and overview of evidence. Mr Robert Shibatani is a distinguished hydrologist, based in California. Mr Shibatani's evidence, key elements of which are considered hereafter, might be summarised thus: (1) the river Lee is a 'flashy' catchment; (2) the Lee Regulations unduly focus on dam integrity; (3) the Lee Regulations focus unduly on reservoir water-levels; (4) the Lee Regulations are reactionary in terms of flood reduction; (5) the Lee Dams are not truly operated independently of each other; (6) the Lee Regulations are flawed in not definitively defining when flood periods commence; (7) the 'rule curves' in the Lee Regulations focus unduly on water-levels without due regard to 'empty space'; (8) the yield-to-storage ratio at Carrigadrohid Reservoir is about 9:1, a rapidity of refill which justifies greater advance discharges before significant storms; (9) operational levels are not low enough during flood-season to accommodate anticipated run-off; (10) the Lee Regulations unduly favour maintaining high reservoir water-levels; (11) by preferring to use storage space, rather than creating additional space, the Regulations choose the riskier method of attenuating/avoiding flood-flows; (13) the 'do not worsen nature' dimension of the Lee Regulations is over-rigid; (14) the Lee Regulations too readily accept that dam operations result in flooding of downstream dwellings; (15) the Lee Regulations lack necessary specificity; (16) there is a lack of documented transparency in decision-making under the Regulations; (17) the forecast precipitation for 19th November, 2009, clearly indicated there was not sufficient space in the Lee Reservoirs to contain anticipated run-off; (18) water levels at both reservoirs during 15th to 20th November, 2009, exceeded TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – and, in several instances, MaxNOL; (19) there is little real-time hydrometric data available to the Lee Dam operators; (20) gaps exist in the spatial coverage of the river-gauging network; (21) there is no documented evidence that 'un-channelised' flow is factored into river-flow estimates and dam discharges; (22) there is no documented evidence river accretions downstream of Inniscarra Dam were factored into operational decisions on 19th November, 2009; (23) there is no documented evidence tide-cycles were factored into decisions made during the 19th; (24) the discharge rates from Inniscarra Dam were very high leading up to the peak flows and, when combined with downstream tributary in-flows, resulted in the flood-damage suffered by UCC.

328. Multi-purpose or single purpose? Mr Shibatani notes that the Lee Regulations "*identify a number of functions*" for the Lee Reservoirs. (Shibatani Report, para. 5.6). These include hydropower generation, fresh-water supply, instream flow maintenance, fish passage, hatchery water supply, and flood control. "*Each of these can be considered operational functions for the reservoir system*". (Shibatani Report, para. 5.6).

329. Water-levels (rule curves). Central to the prescriptions in the Lee Regulations are operating water-levels or 'rule curves' for the Lee Reservoirs. Such water levels, Mr Shibatani observes, "*dictate the amount of empty space that can be used to store the additional in-flow generated by flood events*". (Shibatani Report, para. 5.8). He is critical of an over-reliance by ESB on water-levels as an operative metric:

> "*Water levels determine all of the operational prescriptions (e.g. discharges) during flood periods. However, water levels measured at the reservoir (or dam face) only provide a static indication of reservoir conditions. They do not provide an indication of how reservoir conditions may, or will likely change in the future.*

Moreover, they say nothing of the conditions in other parts of the catchment that are generating runoff that will soon reach the dam....

Having access to this broader suite of hydrometric information...is critical in flood management...By relying exclusively on water levels...to set discharges...ESB reservoir operations become completely reactionary in responding to flood threats." (Shibatani Report, paras. 5.10 and 5.11).

330. Flood-damage reduction. Mr Shibatani considers that the Lee Regulations pay insufficient attention to flood-damage reduction. Under the Regulations, (a) a flood period begins when, "*in the judgment of the Hydrometric Officer...spilling may be necessary*" (Lee Regs, para. 1.2), and (b) the priority during the flood period is "*the proper management of the flood to avoid any risk to dam safety* [integrity]" (Lee Regulations, para. 1.2). As to (a), Mr Shibatani considers the approach to defining a flood period is arbitrary. (Shibatani Report, para. 5.21). As to (b), Mr Shibatani considers the Lee Regulations over-emphasise dam integrity to the detriment of other considerations, *e.g.* downstream flood-safety. "[B]*oth dam safety and downstream flood damage reduction are compatible; they can and should be fully integrated in a co-equal manner.*" (Shibatani Report, para. 5.22).

331. Management of the flood events of November 2009. Mr Shibatani considers perceived shortcomings of the manner in which ESB managed the flood events of November 2009 under some thirteen headings, *viz.* (1) undue reliance on static water-levels, (2) failures in creating/maintaining empty space, (3) undue reliance on fixed prescribed actions, (4) lack of specificity in the Regulations, (5) lack of transparency in decision-making, (6) failure to comply with ESB's operating levels, (7) an unyielding tie between prescribed water— and discharge–levels, (8) a reactive approach to operational decision-making, (9) failure to take due account of the Reservoirs' high refill potential, (10) failure to reduce water storage as quickly as possible, (11) failure to avoid rapid 'ramping-up' of flooding, (12) certain operational and institutional failures, and (13) inadequate regard to tide/storm surges.

332. [1]. Static water levels. Mr Shibatani considers that by waiting for water-levels to rise at the Lee Dams, ESB has removed "*all preemptive capabilities to proactively attenuate the flood response*". (Shibatani Report, para. 6.1). ESB's ability to react to run-off is further limited by the size of the Lee Reservoirs to the catchment area. These factors "*significantly and unnecessarily raise the risk that flood damage will occur*". (Shibatani Report, para. 6.3).

333. [2]. 'Empty space' failures. 'Empty space' is the shorthand for creating and having space within a reservoir that can accommodate a surge in water volume during flood-periods. Mr Shibatani considers that empty space during flood-season should be as important as maintaining active storage. "*Without an empty space requirement, reservoir operators have no volumetric standard to meet flood threats.*" (Shibatani Report, para. 6.5).

334. [3]. Reliance on prescribed actions. Mr Shibatani believes Lee Dam operators should be afforded greater discretion under the Lee Regulations as to discharges. As to allowed discretionary action, he is critical of the basis on which it is applied. Per para. 2.2 of the Regulations: "*The Hydro Manager, on the advice of the Hydrometric Officer, has the option of spilling below... levels prescribed in the Regulations...in order to increase storage and/or to reduce flooding at a later stage....However...peak discharge from either reservoir shall not be allowed to exceed...peak in-flow to the catchment during the rising flood.*" Mr Shibatani makes a number of criticisms in this regard: (1) any spilling intended to reduce flooding later must be conditioned on predicted weather and water-levels. (Shibatani Report, para. 6.14); (2) Mr

Shibatani is critical of the requirement that peak discharge not exceed peak in-flow during the rising flood:

> "*Where operators have to 'gain' empty space; they cannot do that if they are bound by the equivalency provision of...largely theoretical restrictions....A rule for rule's sake that does not consider the pragmatic realities of human practice, especially for something as vital as flood management, is short-sighted and elevates flooding risks unnecessarily...*
> *Fixing such a hard and inflexible rule as this, takes away much needed flexibility of the dam operators during a time when they require it most....I disagree with the notion that reservoir releases should not exceed peak reservoir in-flow.*" (Shibatani Report, paras. 6.17 – 6.18).

335. And (3): the Lee Regulations accept too readily that operation of the Lee Dams will result in flooding. "*A reservoir system that embraced a more proactive approach to advance discharges might not have to make such a concession*". (Shibatani Report, para. 6.19).

336. [4]. Specificity in the Regulations. Insofar as the Lee Regulations make provision for discretionary action, Mr Shibatani considers that they are lacking in specificity.

337. [5]. Transparency in decision-making. Mr Shibitani is a keen advocate for transparency of action in flood management. He offers two reasons for such transparency: (1) it provides an incentive for detailed and consistent documentation of what actions were performed, when and why; (2) it provides a meaningful basis for 'adaptive management', *i.e.* learning from experience. What he perceives to be ESB's lack of appropriate documentation has the effect, he claims, that the gradual improvement facilitated by optimal transparency is inhibited. The court sees no evidence that ESB has failed historically to seek to learn from its past operational experiences.

338. [6]. Non-compliance with ESB's operating levels. Mr Shibatani notes that operational levels at both of the Lee Reservoirs were often significantly higher than applicable TTOLs up to November 2009: "*The Lee Regulations, as evidenced by...consistent TTOL exceedances in both reservoirs during the winter seasons in years up to and including 2009, appear to promote a preferred practice of....keeping them as full as possible, as much of the time as possible.*" (Shibatani Report, para. 6.31). This, of course, is especially surprising when one recalls that TTOL is (a) defined in the Lee Regulations as "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), (b) aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35), and (c) is a level the consistent and deliberate exceedance of which can reasonably be construed as springing from nothing more than an excessive desire for ever-greater enrichment of ESB.

339. [7]. Tie between prescribed water/discharge levels. Para.1.4.2.3 of the Lee Regulations provides that "*During the falling flood, peak discharge shall be kept below the peak in-flow that occurred during the rising flood.*" Mr Shibatani is critical of this provision which he considers is consistent with an undue focus on water-levels, and overlooks the hydro-climatic reality that storm events are variable. He suggests a more considered operational approach would be to look closely at the overall dynamics of a specific storm/storm series and act accordingly.

340. [8]. Reactive decision-making. Mr Shibatani is critical of what he considers is ESB's reactive approach to flood management. In this regard, he notes certain features of the 2009 flood-event: (i) reservoir-levels were consistently above applicable TTOLs but there was little effort to reduce to applicable TTOLs; (ii) discharges from Carrigadrohid Reservoir were only increased after precipitation commenced and reservoir in-flows started rising; (iii) discharges from Carrigadrohid Reservoir were immediately reduced following a storm of $15^{th}/16^{th}$ November despite high-water levels and warnings of another storm; (iv) the stated reason was to avoid increased in-flows into Innsicarra Reservoir. These features, Mr Shibatani contends, evince strong adherence by ESB to a 'fill first, spill later' policy. He concludes: "*By unremittingly trying to maintain water levels as high as possible, as evidenced by...significant exceedances beyond...TTOLs even after several storm warnings...the options left for effective flood damage reduction become significantly reduced. This manner of reservoir operations...significantly increases...risks of flood damage.*" (Shibatani Report, para. 6.37).

341. [9]. High refill potential. On average, Carrigadrohid Reservoir can refill (from empty) nine times a year. Mr Shibatani suggests that, properly managed, refill can occur from in-flow generated by the last storm in a storm-series. "*For reservoirs with a high refill potential, forfeiting head loss for a short duration is a small price to pay for significant flood damage reduction benefits from large storms.*" (Shibatani Report, para. 6.41).

342. [10]. Quick reduction of water storage. Mr Shibatani is critical that on 17^{th} and 18^{th} November, discharges from Inniscarra were kept at $150m^3/s$. However, as it is ESB's experience that roads not in ESB's ownership are likely to be flooded when total discharge from Inniscarra exceeds $150m^3/s$, the court does not accept that discharges in excess of that level are permissible unless in-flows match or exceed same: ESB has no legal authority to flood other people's property at will. Two related points might, however, be made. First, such flooding as occurred on 19th/20th November, 2009, would have been obviated or reduced had ESB consistently operated to TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35). Second, as mentioned previously, the court accepts as valid the criticism concerning ESB's failure to spill above $250m^3/s$ for a few hours early on the 19th when in-flow levels were above that level and spilling could have occurred without breaching ESB's 'do not worsen nature' rule. (See further Chapter 51). Had ESB done so, the later flooding would have been alleviated.

343. [11]. 'Ramping-up'. "*One always strives to attenuate the effects of the flood peak.*" (Shibatani Report, para. 6.46). This can be accomplished by 'flattening' the flood hydrograph through judicious use of available reservoir storage and well-administered releases. Again, Mr Shibatani is critical of ESB for maintaining water-levels above TTOL during the weeks prior to the November 2009 flood event.

344. [12]. Operational/institutional failings. More an amalgam of his other criticisms, Mr Shibatani considers that two primary causal failings resulted in the flooding of November 2009: (i) (an operational failing) reservoir-levels were too high for the time of year; (ii) (an institutional failing) discharges at the Lee Dams are tied directly to reservoir water-levels, there is ineffective use of hydrometric data, and rule curves are based on targeted water-levels, not empty space priorities. (Shibatani Report, para. 7.4).

345. [13]. Tide and storm surges. There was no tidal influence on the flood that affected UCC on 19th/20th November, 2009. However, ESB was not to know this at the time and Mr Shibatani is critical that there is no documented evidence that, *inter alia*, tides were factored into the decision-making process regarding dam discharges. (Shibatani Report, para. 7.7).

346. Warnings. Mr Shibatani is critical that the warnings referred to discharge levels at Inniscarra Reservoir when downstream accretions had the effect that flow in Cork City could be higher. He considers that warnings could and should have issued earlier. The issue of warnings is considered at some length in Chapter 18.

347. Alternative management actions. Mr Shibatani suggests eight alternative management actions that ought to have been taken by ESB during the flood event of 2009. (1) ESB should have strived to maintain water-levels at or below TTOL as far as possible. (2) At the first sign that storms were developing over the Atlantic Ocean, dam staff should have recommended to higher management that water-levels be reduced below TTOL. (3) ESB should have used the first rainfall forecasts/warnings to compute projected catchment run-off and compared same with reservoir storage. (4) ESB should have assumed that basic run-off ratios across all sub-catchments were high and that catchments would be fully primed by the first storm in the anticipated storm-series. (5) ESB should have issued high river-flow warnings when the first rainfall forecast/warning was received. (6) ESB should have assumed all tributaries to be running full and factored their additional in-flow into downstream flow calculations. (7) ESB should have added an out-of-channel flow component to its flow calculations, with a view to increasing advance discharges if necessary. (8) ESB should have used Carrigadrohid Reservoir as the peak-holding reservoir, (he admits this would require advanced hydro-meteorological information).

348. Hydrometric information. Mr Shibatani considers that a consequence of ESB's reliance on water-levels to make operational decisions is it necessarily assumes a higher degree of risk that its decisions will be incorrect or come too late to have a meaningful impact in reducing flood risk. As to flood damage reduction, according to Mr Shibatani: "*[H]aving information beforehand is considerably more valuable than having information after the fact...the success of flood damage reduction is based on proactive...informed intervention.*" (Shibatani Report, para. 10.3).

349. River-gauge failings. Per Mr Shibatani, ESB's river-gauge network in the Lee catchment is subject to various shortfalls, including lack of coverage, lack of real-time connection, improper usage, and loss of key hydrometric variables. Mr Shibatani concludes that ESB's hydrometric gauging network in November 2009 was not suitable for effective flood damage reduction. "*An unsuitable river gauging network omits vital hydrological information.... Without that knowledge...flood management is compromised.*" (Shibatani Report, para. 10.4).

350. Reverse routing. Per Mr Shibatani, operation of the Lee Scheme largely ignores information that can be provided from upstream hydrometric stations. In this context, he criticises the reverse-routing method of calculating in-flow: "*ESB's reverse routing of reservoir water levels to generate upstream tributary in-flow (i.e. discharges) is counter to typical flood management where, the whole objective is to use upstream in-flow data to manage...downstream water levels, not vice versa.*" (Shibatani Report, para. 10.8).

351. Hydrometric data that should have been used. Mr Shibatani suggests various forms of hydrometric information could have been used or better used by ESB during the flood event of 2009, *e.g*: (1) better upstream gauges; (2) using downstream gauges to avoid ESB releasing discharges in the blind ("*This is a significant shortcoming...*". (Shibatani Report, para. 11.2)); (3) greater regard to *e.g.* hill-slope surface water/soil interaction and antecedent catchment moisture conditions.

CHAPTER 26: MR BENN'S EVIDENCE.

352. Description of Expert and summary of evidence. Mr Benn is a distinguished engineer and executive chairman of JBA, a firm of consulting engineers and scientists based in the United Kingdom. The principal part of Mr Benn's evidence was concerned with addressing the question 'What impact would there have been on the degree of flood damage at UCC if the Lee Reservoirs had been operated differently in November 2009?' To this end, extensive computer modelling was undertaken. In essence, Mr Benn concluded that (i) it would have been possible to avoid flooding above floor-level in all of UCC's buildings if water-level in the reservoirs had been maintained at TTOL in the period before flood-onset, (ii) until the night of 17th/18th November 2009, the operators of Inniscarra Dam had an opportunity to increase discharges and avert the vast majority of flood damage to UCC's buildings, (iii) until late-morning on 18th November, there was still an opportunity to avert much of the damage, and (iv) by early-morning on 19th November, it was no longer possible to reduce the damage that would be effected by discharging at 250m^3/s.

CHAPTER 27: MR COWIE'S EVIDENCE.

353. Description of Expert and summary of evidence. Mr Cowie is a distinguished civil engineer, specialising in dams. The key elements of his evidence might be summarised thus: (1) the Lee Regulations are concerned with managing the design flood, a rare event; given the rarity of same, the Regulations should allow ESB discretion to manage lesser floods to minimise downstream flooding; (2) additional storage capacity was available at Carrigadrohid Reservoir during the storm-event of November 2009; this was not used to prevent or mitigate flooding downstream; no physical impediment to using this additional capacity has been identified; (3) at no time during the November 2009 flood events were either of the Lee Dams in danger of exceeding structural limits; (4) operating rules at the Lee Dams see each of the dams operated independently of each other; conjunctive operation is good practice internationally; (5) there should be options in the Lee Regulations empowering experienced staff to utilise storage-capacity to store more water in the upper reservoir during rising floods; (6) since November 2009, ESB has worked with, in effect, a lower MaxNOL and has not, despite some equally wet weather, been required to adopt the sequence of discharges effected in November 2009.

354. 'Design flood'-focus of Lee Regulations. Mr Cowie indicates that safety from dam-failure is but "*the most important of...many objectives to be addressed by the engineering team responsible for...design of the dam and the reservoir formed by it*". (Cowie Report, para. 4.8). Mr Cowie considers there is no reason why design flood-style calculations cannot be done in respect of lesser floods. This is clear from the following exchange:

"*Counsel* [UCC] – [J]*ust as a matter of general principle, when you're formulating your operating rules in a vacuum or in advance, you have described how you go through an iterative process and do various desktop calculations to calculate how you would deal with the design flood. Is there any reason why, in advance of the operation of dams or in preparing rules and regulations, you can't do a similar exercise to consider how you might deal with lesser floods.*

Mr Cowie – *I believe it is possible to consider how lesser floods are handled...*". (Transcript, Day 31, p.56).

355. Practical application of abstract design. Discharge arrangements are a compromise based on topography, economics, reliability and safety. Mr Cowie notes the abstract and somewhat unreal status of such operating rules: "*Fundamentally, the operating rule is an academic exercise created...for...the design flood....It is based solely on...water level....No inputs from weather forecasts are required or telemetry from rainfall and river level gauges or even interventions by operations staff (except in the event of failures of equipment). Moreover, outputs from turbines, scours or fish passes are not included in the computations. All...are immaterial.*" (Cowie Report, para. 4.18). Operational rules such as the Lee Regulations represent, per Mr Cowie, a best effort to pass a design flood safely, based on a best effort at defining a design flood. But real life is unlikely to mirror a best effort based on a best effort. So, Mr Cowie suggests, the practical implementation of rules based on such efforts require a degree of discretion to allow for real-life: "*Few flood events...fit the model of the operating rules....Information in the form of meteorological forecasts, knowledge of catchment wetness conditions, reservoir water levels and their rate of change, available storage volumes below* *maximum permissible levels and telemetry (if working) allow future flood events to be analysed and their management planned and controlled by experienced operations staff at the site of events.*" (Cowie Report, 4.19). Mr Cowie opined as to the virtues of occasional departures from the 'one size fits all' approach of the Lee Regulations:

"*Mr Cowie* – *I say that there should be options in the regulations. In other words, you really can't justify one size fits all. Skilled operators – and there's evidence from previous flood events in the Lee valley that operators have used their judgment....*[T]*here are some very good memos from a Mr JJ Green who was the Hydrometric Officer...*

Counsel [UCC] – *...dealing with an event in 1964.*

– *Yes. He has a good turn of phrase....*[T]*he essence of this one is that he used his discretion to hold the water back from being discharged from Inniscarra because the...Shournagh and the Bride were in full flood and high tide was due down at Cork...that, to me, is significant....*[I]*t shows that someone who has concentrated his mind on operation and utilising his grey matter has not been prepared to stand back and say 'Well, the regulations say this, I will do that.*" (Transcript, Day 31, pp.48–50).

356. Choice of spillway over reduced water-levels. Mr Cowie notes that when improving engineering standards led to a revision of the Lee design standards in the 1970s, ESB could have elected to go with lower water levels at Carrigadrohid Reservoir but elected instead to erect a spillway. "*ESB thus had the option of permanently lowering the level of water in the dam or building an additional spillway. Having carried out further investigations ESB opted to construct the auxiliary spillway.*" (Cowie Report, para. 5.22). There seem to have been two principal drivers to ESB's decision. First, a concern with depending on dam sluice-gates unfailingly to provide the necessary discharges; a spillway did not present this risk of malfunction. Second, environmental concern that lower water levels would expose the mud-flats and tree stumps at the Gearagh wetlands; a possibly unusual factor to bring to bear on water/flood management.

357. Alternative flood-gate operation. Much of the cross-examination of Mr Cowie focused on his assertion that an alteration of discharge sequences at Carrigadrohid in November 2009 would have provided a benefit in that flood. Even with the benefit of hindsight, Mr Cowie was 'put to the pin of his collar' by counsel for ESB in terms of identifying an alternative opening sequence that would see no overtopping of the dam. What all of this suggested to the court is that it is difficult even with hindsight to settle on what would have been a better sequence of gate-openings. However, none of this did anything to diminish the potency of the contention that had ESB generally sought to operate to the lower water-level represented by TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*)), TTOLs, being "*basically economic targets, whose main purposes are to provide for optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs.*" (O'Mahony Affidavit, 35) – the combination of events that presented at the Lee Dams in November 2009 would not have arisen. This is not just a theoretical proposition: "*Since…November 2009…ESB appear to be working with a lower…*[MaxNOL] *and thus have not, despite equally wet periods of weather, required to adopt a sequence of discharges as it did in November 2009.*" (Cowie Report, para. 3.14).

358. Conjunctive use of dams. Mr Cowie pointed to the apparent non-conjunctive use of the Lee Reservoirs, pointing to the statement in the Lee Regulations (para 1.1), that "*In general, the two reservoirs...are treated as...independent of each other.*" Mr Cowie's view is conjunctive operation of cascading dams typically allows for better management of flood periods as it allows the aggregate volume available for water-storage at two reservoirs to be used by the reservoir-operator. In Mr Cowie's view, there is no evidence the Lee Reservoirs were managed conjunctively until Inniscarra Reservoir was in danger of exceeding MaxNOL. "*This resulted in a lost opportunity to reduce the level of discharge...required from Inniscarra and caused...an unnecessarily high in-flow of water to Inniscarra from Carrigadrohid.*" (Cowie Report, para. 6.14). The court returns to this issue later below.

359. Greater discretionary powers for staff. Mr Cowie suggests that ostensibly unyielding discharge rules ought to be tempered, through the human agency of experienced dam-staff, in their practical application. Per Mr Cowie:

> "*There should be options in the...operational guidelines open to...experienced trained operating staff, to utilise available storage capacity...to store more water in the upper reservoir during rising floods, to reduce maximum outflows into the river downstream and prolong the duration when water in the reservoir could be utilised for extended power generation....If...operational guidelines are required to be operated prescriptively, with no room for discretion to take account of the real time information...it inevitably follows that opportunities to properly manage a flood event will be lost.*" (Cowie Report, para. 4.20).

360. More particularly, Mr Cowie suggests that regulations and operational guidelines should allow discretion to operational staff in the management of lesser floods than the design flood. This would allow operational staff with necessary experience and actual data to operate the appropriate sequence of discharges in line with actual flood events "*when it is patently obvious that the design…flood will not occur*". (Cowie Report, para. 4.21). Lest his emphasis on human discretion be perceived as unwise, Mr Cowie points to the beneficial decision of the Chief Civil Engineer, with input from expert station staff, to hold back water at Carrigadrohid on the evening of 19th November, as testament to the benefits of operator discretion. "*The consequence of this action was a direct reduction in…outflows…into the River Lee. It is unfortunate that this initiative was not taken earlier during the rising flood as might have been the case if discretionary action had been explicitly built into the reservoir rules*". (Cowie Report, para. 6.26).

CHAPTER 28: MR FAULKNER'S EVIDENCE.

361. Description of Expert and summary of evidence. Mr Duncan Faulkner is a distinguished hydrologist. His expert report covers various issues: the general characteristics of the November 2009 flood; its foreseeability, ESB's management of same; and alternative actions that could have reduced its impact. Mr Faulkner's key conclusions are synopsised below.

362. [1] General characteristics of November 2009 flood. (1) Rainfall over the Lee catchment in the days prior to the flood was "*moderately extreme*" (Faulkner Report, para. 2.2). (2) At flood-start and in the preceding weeks, water-level on both Lee Reservoirs was "*considerably higher*" than TTOL – "*the top operating level which the station shall endeavour* *to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) (Faulkner Report, para. 2.2). (3) A tendency to maintain high winter water-levels was typical of the years prior to 2009. (4) During the three days prior to the flood of November 2009, water-level at Inniscarra was reduced by discharging water at $150m^3/s$ through sluices and turbines. (5) Both Lee Reservoirs provided some reduction in peak-flows and delayed peak-flows by about four hours. (6) Rate of rise of discharge from Inniscarra was faster than the in-flow rate rise; per Mr Faulkner, management of the Lee Dams resulted in a more rapid inundation of Cork than if the Lee Dams had not been present. (7) The flood was the highest intentional discharge from Inniscarra since the Lee Reservoirs were constructed. In-flow volume was higher, *e.g.* in a flood of 1978 but, per Mr Faulkner, initial water-level was lower in 1978 than 2008, and water-level at Carrigadrohid was allowed to rise half a metre higher in 1978 than 2009.

363. [2] Foreseeability of November 2009 flood. (1) The return period of the flood was well within the design flood-range. (2) November is the month in which most flood events have occurred. (3) The flood occurred after several weeks of higher-than-average rainfall which resulted in high soil moisture, with particularly high rainfall on 15th to 16th November. (4) From the morning of 16th November, Met Éireann was issuing forecasts of heavy rainfall on the 19th. "*The forecasts applied to an area that covered lower-lying parts of the Lee catchment…thus the forecast rain-depths should have been scaled up to ensure they were representative of rain over the entire catchment*". (Faulkner Report, para. 2.3). (5) ESB has a flood forecast model which, despite "*several shortcomings*" (Faulkner Report, para. 2.3) could have been operated to better enable ESB to test alternative operating strategies. (6) ESB has no record of results from model runs done in November 2009. (7) The Lee Regulations call for in-flow to each reservoir to be calculated hourly during floods; using ESB's calculation method, it is difficult for dam operators to know flow-rate until a few hours after it occurs. (8) ESB's ability to predict a flood and make reasonable decisions about required levels of discharge from the Lee Dams was hampered by: (a) two of its six rain-gauges in the Lee Catchment being out of action on 18th/19th November 2009, (b) the forecast model tending to under-estimate reservoir in-flow, (c) the model not applying discharge rates at Inniscarra that matched those specified in the Regulations, and (d) flows on main downstream tributaries of the Lee not being monitored or forecast. (9) ESB's flood-management would have improved if (a) performance of ESB's forecasting model had been improved after previous floods, (b) data from ESB's upstream river-level gauges were available in real-time, and (c) observed river-levels were converted into flow-data. (10) It should have been clear to ESB staff that peak discharge released from Inniscarra in 2009 was going to result in substantial flooding. (11) ESB ignores the impact of downstream tributaries when making decisions on discharges.

364. [3] **Management of November 2009 flood.** (1) ESB did not always follow the discharge sequence in the Lee Regulations. (2) At Carrigadrohid, discharge during the 2009 flood event was generally lower than specified in the Lee Regulations and was reduced to around 20% below what the Regulations specified by the time peak level was reached. "*This highlights...a lost opportunity...open to ESB if it had taken this action earlier.*" (Faulkner Report, para. 2.4). (3) At Inniscarra, discharge was increased above $150m^3/s$ several hours before the Lee Regulations required it. (4) That dam operatives deviated from the Lee Regulations indicates "*they considered they had some discretion to do so*". (Faulkner Report, para. 2.4).

365. [4] **Alternative actions available.** (1) Mr Faulkner considers that autumn/winter reservoir-levels were too high in the years up to and including 2009:

"*If…water levels in Carrigadrohid and Inniscarra Dams had been at TTOL at the start of the flood, the peak discharge from Inniscarra would have been reduced by around 40% and delayed by around 13 hours. The discharge would have been similar to that…in previous large floods, and…the damaging effects of the flood would have been substantially reduced. Achieving TTOL at the start of the flood would have been possible without needing to discharge over 150m³/s in the days leading up to the flood, as long as the reservoirs had been generally managed at a lower level in the preceding weeks. There is little sign of endeavours being made to keep water levels close to TTOL throughout the years…up to 2009. Both reservoirs were operated with water levels in excess of TTOL through most of the autumn and winter periods in those years. As can be seen from the water levels recorded since November 2009, it is…possible to maintain lower water levels in the reservoirs.*" (Faulkner Report, para. 2.5).

366. Again, the court cannot but note that this is all the more surprising given that TTOL is, per the Lee Regulations (at *iv*) "*the top operating level which the station shall endeavour to maintain during non-flood conditions*", TTOLs, being "*basically economic targets, whose main purposes are to provide for optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs.*" (O'Mahony Affidavit, 35).

367. (2) Mr Faulkner considers the advance discharge from Inniscarra of $150m^3/s$ should have been increased earlier, that in the days up to the flood ESB could have increased discharge to $250m^3/s$. "*There are several times when such an increase could have been considered, including when rainfall forecasts were received or when the total Catchment in-flow exceeded*

150m^3/s." (Faulkner Report, para. 2.5). (3) Mr Faulkner considers there was an opportunity to store "*considerably more*" water in Carrigadrohid, thus reducing peak discharges from Inniscarra. (Faulkner Report, para. 2.5). (4) Mr Faulkner considers that if the Lee Regulations had set discharge rates by reference to current in-flows, rather than water-levels, "*it is likely*" peak discharges would have been lower. (Faulkner Report, para. 2.5). (5) Mr Faulkner considers that if ESB provided more accurate, clearer flood warnings with a longer lead-time, people downstream could have prepared better for the flood. "[I]*t should have been possible for ESB to forecast the peak discharge from Inniscarra with a reasonable degree of accuracy several hours in advance*". (Faulkner Report, para. 2.5).

368. Available data. ESB's management of the Lee Reservoirs depends in part on the availability of reliable rainfall/water-level data.

369. [1] Rainfall data. ESB's rain-gauges give a good coverage of the Lee Catchment, particularly upland areas to the west and north. Gauges at Carrigadrohid and Innsicarra are on the crests of the Lee Dams: "*These exposed locations do not conform to best practice for accurate measurement of rainfall.*" (Faulkner Report, para. 4.1). ESB has provided UCC with rainfall data from its rainfall gauges for October 2002 to December 2009. During this timeframe, there are periods of missing data at all six gauges; on average data is available for 90% of the period. In 2009, two of ESB's six rain-gauges had no rainfall data for the main period of the flood. "*This shortage of data would inevitably have hampered ESB's ability to calculate catchment-average rainfall...and hence to forecast in-flows.*" (Faulkner Report, para. 4.1).

370. [2] River data. Water-levels on all major rivers that flow into the Lee Reservoirs, and those joining the Lee downstream, are measured at gauging stations. However, Lee Dam operators do not have access to realtime river-flow data. Consequently, live river-flow data cannot be used operationally for control of discharges through the Lee Dams. Per Mr Faulkner, "*In 2009, if ESB had calculated flows at their river gauges...an opportunity would have been created for improved advance warnings of in-flows...*". (Faulkner Report, para. 4.2).

371. [3] Tide-level data. Tide-level data is available from the Port of Cork and predictions of future tide-levels are made by the Marine Institute. Mr Faulkner has seen "*little information*" from ESB about how tide-level data or forecasts are used operationally. (Faulkner Report, para. 4.3).

372. [4] Reservoir-level data. Mr Faulkner considers the difficulties ESB encountered in accessing digital records of water-levels and discharges before 2006. His sense is ESB has not prioritised the recording, archiving, and analysis of Lee catchment hydrometric data. This, Mr Faulkner asserts, "*would have restricted ESB's ability to review and learn from past flood events and to develop and test any revised operating procedures or hydrological models.*" Although most hydrometric systems suffer from limitations, "*ESB's data recording and archiving does appear unusually incomplete.*" (Faulkner Report, para. 4.4).

373. [5] Reservoir discharge data. ESB calculates discharges from the Lee Reservoirs from data on water levels, sluice openings and turbine output. Though he voices some criticisms of ESB, Mr Faulkner's end-conclusion is that "*discharges calculated using ESB's current approach are acceptable*". (Faulkner Report, para. 4.5).

374. [6] Reservoir in-flow data. As mentioned, in-flows to each of the Lee Reservoirs are calculated by 'reverse routing'. The resulting in-flow series is vulnerable to rapid fluctuations; to reduce this, ESB recommends smoothing the resulting hourly series using a three-hour moving average. This smoothing was not applied to in-flow data calculated by ESB during the November 2009 flood. Thus, Mr Faulkner concludes "*the in-flow data provided by ESB is not realistic.*" (Faulkner Report, para. 4.6). He notes that the Lee Regulations call for in-flow to be calculated hourly during a flood, but reverse routing makes it difficult for dam operators to know actual flow-rate until a few hours later. This "*may introduce*" a delay in the increasing dam-discharges. (Faulkner Report, para. 4.6).

375. [7] Inundation studies. The detail of ESB's various inundation studies is considered in Chapter 19. Mr Faulkner concludes from a review of same that "*It appears...ESB had some prior knowledge of the likely effect of discharges of water on properties downstream of the* [Lee] *dams. Additional knowledge was available from ESB's analysis of previous floods*". (Faulkner Report, para. 4.7).

376. [8] Forecast model. As mentioned previously, ESB has a flood forecast (computer) model that can be used to plot data from historical flood events or to simulate future in-flows, water-levels and discharges. Mr Faulkner considers the model has notable deficiencies. For example, it takes no account of the prior state of catchment saturation when calculating in-flows. "*This is not in accordance with usual practice.*" (Faulkner Report, para. 4.8). Likewise, the model can substantially under-estimate reservoir in-flows, even when run using observed rainfall depths. Moreover, the discharges for Inniscarra specified in the model are not in line with those in the Lee Regulations (2003). There are deficiencies in the maintenance of model records. The model predicts flow at Carrigadrohid and Inniscarra only. (Faulkner Report, para. 4.8).

377. [9] Lee CFRAMS. The CFRAMS has yielded a flood management plan that includes suggestions relating to operation of the Lee Reservoirs. Though he does not recommend unilateral implementation by ESB of the flood management plan, Mr Faulkner notes that: "*The flood management plan states that…levels in the reservoirs at the onset of a flood event have a significant impact on downstream flows and flood levels. In Cork City, with 'medium' starting levels, about 1,400 properties are estimated to be potentially at risk of damage from flooding for the 100-year…event….*[T]*his reduces to less than 100 properties with 'low' starting levels in the reservoirs…*". (Faulkner Report, para. 4.9). The obvious lower level at which to operate at the Lee Dams is ESB's own target top operating level, *i.e.* TTOL ("*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*)), TTOLs, being "*basically economic targets*" aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs.*" (O'Mahony Affidavit, 35).

378. Control of flow through dams. Mr Faulkner considers the structures used to control the flow at the Lee Dams and ESB's related operational procedures. The relevant detail has already been considered. The court merely notes Mr Faulkner's views on the 'do not worsen nature' rule, as expressed in the requirement in para. 1.1 of the Lee Regulations that "*The peak in-flow shall not be allowed to exceed the peak in-flow during the rising flood*":

> "*The meaning of this* [requirement] *is not entirely clear since the flood is no longer rising at the time…the peak occurs….The Regulations do not state a*

reason for the above prohibition. I consider it likely that the reason is to ensure that the operation of the [Lee] *dams does not result in a peak discharge that exceeds the peak that would have occurred if the dams had not been built. This aspiration is understandable although it sets a low bar given that even on uncontrolled reservoirs or lakes, peak discharges are lower than peak in-flows. It is also worth noting that the focus of the* [Lee] *Regulations is on restricting peak discharges from Inniscarra rather than on…impact of discharges downstream in Cork City. The Regulations do not require…dam operators to take any account of the timings of discharges in relation to in-flows from tributaries that join the Lee downstream of Inniscarra. It would be possible to envisage a situation where...peak discharge from Inniscarra was lower than in the natural situation, but…peak flow through Cork was higher due to the way...the discharge hydograph combined with flows from tributaries.*" (Faulkner Report, para. 5.5).

379. Reservoir levels and flows in November 2009. Mr Faulkner has undertaken an analysis of water-levels and flows at the Lee Reservoirs in November 2009. His account of the events of the 19th is summarised here. (1) Despite the release of water at 150m^3/s from 16th November, the minimum water-level achieved in advance of the flood of 19th November was 0.8m above TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35). (2) In response to the rapidly rising water-level, the discharge from Inniscarra was increased through 19th November. Around 09:00, the discharge exceeded 150m^3/s. By 16:00, the discharge was 240m^3/s. The following six hours saw rapid discharge-increase. By 22:00, discharge was 2.25 times higher than six hours earlier. The rate of rise of discharge was faster than that of in-flow to the catchment. "*One consequence will have been that...water levels in Cork rose more rapidly than...if the dams were not present.*" (Faulkner Report, para. 7.2). (3) Throughout the 19th, discharge from Inniscarra was below the rate of in-flow, so the reservoir level rose. The reported peak discharge was sustained from 23:00 on the 19th to 03:00 on the 20th. (4) There is evidence suggestive of brief malfunctions of water-level measuring equipment at Inniscarra.

380. Water-levels/-flows elsewhere. Mr Faulkner emphasised that when it comes to investigating the 2009 flood, it is important to consider the "*wider context*" of the Lee Reservoirs, *viz.* (a) the rivers that flowed into them and (b) water-courses that join the river Lee between Inniscarra Dam and Cork City. (Faulkner Report, para. 7.3). Of interest in this regard is the Leemount gauge, 8.7 kilometres downstream of Inniscarra Dam. It appears that on 19th November there was a lag-time of approximately one to two hours between rise in discharge from Inniscarra and rise in water-level at Leemount, water-level there peaking between 02:30 and 03:30 on the 20th. Peak discharge from Inniscarra seems to have occurred when the flow was still at its peak on the river Bride; hence both peaks "*presumably almost coincided*" at the Bride-Lee confluence. (Faulkner Report, para. 7.3). On this presumption, Mr Faulkner contends that "*If the peak from Inniscarra could have been delayed, it would have occurred at a time when there was less water entering the Lee from the Bride, and hence the combined flow downstream would have been reduced. This highlights the value of real-time information...*". (Faulkner Report, para. 7.3). Mr Faulkner also mentions that although ESB regards its river-gauges as level-only stations, there are rating equations available which enable conversion of river-level to flow-data. "*River flow data is considerably more useful than level data for...hydrological analysis*". (Faulkner Report, para. 7.3).

381. Comparison with previous floods. November 2009 saw the highest discharge from Innsicarra since the Lee Dams were constructed. Not all aspects of the November 2009 flood were record-breaking. Peak water-level at Carrigadrohid was 65.36m. But this level has been exceeded many times previously. Looking, *e.g.* to a flood-event of 1978: initial water-level was lower in 1978 than in 2009; water-level at Carrigadrohid was allowed to rise half a metre higher in 1978 than in 2009. These points, per Mr Faulkner "*indicate the importance of the availability of flood storage*". (Faulkner Report, para. 7.4). As to peak flows, comparison with various flood events from 1964 through to 2009 shows that the November 2009 flood was not record-breaking at most gauging-stations on the rivers that flow into the Lee Reservoirs. By contrast, peak discharge from Inniscarra was exceptional in 2009. The 2009 peak downstream discharge was considerably higher than any other recorded.

382. Flood attenuation and management. The presence of water-bodies in a catchment tends to result in attenuation of floods, and hence a reduction in downstream peak flows. Per Mr Faulkner: "*Some residents and property owners downstream of the Lee reservoirs may have the perception that floods are caused entirely by the operation of the dams....However, there is little doubt that the November 2009 flood would have been worse in terms of peak flow through Cork if the dams had not been present.*" (Faulkner Report, para. 7.6). This does not alter the fact that had ESB but operated to TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – the flooding of November 2008 would have been reduced or obviated. One interesting point that arose in the re-examination of Mr Faulkner was that the rule in the Lee Regulations that peak discharge should not exceed peak in-flow does not guarantee that one would not worsen nature:

"*Counsel* [UCC] – [W]*ould a rule that peak discharge not exceed peak in-flow, would that…guarantee that you wouldn't worsen nature?*

Mr Faulkner – …[I]*t wouldn't necessarily guarantee that because it doesn't take into account the attenuation that would happen in the valley without the reservoirs present. So the rule, if you really wanted to avoid increasing...pre-dam discharge, the rule would have to be that the peak discharge doesn't exceed the peak that would have happened without the dams and that peak would have been somewhat lower than the peak in-flow so that's what I refer to as setting a low bar in my report in commenting on this rule.*" (Transcript, Day 18, p.121).

383. Flood management. As regards flood management in November 2009, Mr Faulkner's conclusions might be summarised thus:

384. [1] Timeline. In the three days up to 19th November, 2009, water was released from Inniscarra through the turbines and spillway gates at a total of 150m^3/s. During this period, several forecasts and warnings of rainfall on 18th/19th November issued. The rate of release from Inniscarra was increased above 150m^3/s at 09:00 on 19th November, and further increased during the evening. There was a delay between timing of in-flows and discharges from the Reservoirs.

385. [2] Foreseeability of flood. The rainfall on 18th/19th November was forecast as far back as 15th November. The forecast issued on the morning of 16th November predicted a total rainfall for the 19th that was within 10% of actuality. "[I]*f the forecast was scaled up to be representative of the whole catchment it turns out to have been a slight overestimate.*" (Faulkner Report, para. 8.5). "*ESB's forecast model should have been correctly set up...and its results should have been a key ingredient to the process of decision-making about...timing and magnitude of advance discharges.*" (Faulkner Report, para. 8.5).

386. [3] **Adherence to Lee Regulations.** Notably, during the 2009 flood, ESB did not always follow the sequence of discharges set out in the Lee Regulations. That this should be so is all the more surprising when one considers the emphasis consistently placed by ESB on the need for rigorous compliance in this regard. Yet at Carrigadrohid, the discharge was slightly below those specified in the Regulations during the rising flood; it was reduced to around 20% below by the time peak was reached. "*This latter deviation*", sanctioned by ESB's Chief Civil Engineer, "*was a deliberate decision aimed at reducing in-flows to Inniscarra.*" (Faulkner Report, para. 8.5). At Inniscarra, discharge was increased above 150m^3/s several hours before this was required under the Regulations. Once this level was increased, ESB did not thereafter deviate from the discharges specified in the Regulations up to the peak level. After water-level started falling, discharge was reduced quicker than specified by the Lee Regulations. Mr Faulkner indicates that "*It is not thought that this deviation would have had any adverse impact on downstream.*" (Faulkner Report, para. 8.5). Mr Faulkner's overall conclusion is that the actions of ESB, in terms of non-adherence to the Lee Regulations, points to the Lee Dam operators having "*some flexibility to depart from the Regulations*", again notwithstanding the general contention of ESB that the Regulations ought rigorously to be observed at all times.

387. [4] **Different operation of Lee Reservoirs.** Mr Faulkner considers that flood damage to UCC properties might have been reduced/avoided if discharges from the Lee Reservoirs had been different. His prescription for better flood management includes (1) different initial water-levels, (2) the flexibility to make discharges in advance of predicted floods, and (3) amending the Lee Regulations in light of historic experience. As to (1), Mr Faulkner notes:

> "*ESB define the target top operating level (TTOL) as the top operating level which the station shall endeavour to maintain during non-flood conditions. There is little sign of such endeavours being made in the years leading up to 2009. Both reservoirs were operated with water levels in excess of TTOL through most of the autumn and winter periods in those years. In the weeks leading up to the flood, the water levels were of the order of 2m above TTOL....If the reservoirs had...been at TTOL at the start of the 19 November flood, the peak discharge from Inniscarra would have been reduced by around 40% and delayed by around 13 hours. The discharge would have been similar to that seen in previous large floods, and hence the damaging effects of the flood would have been substantially reduced...*
>
> *A final opportunity to reduce...peak discharge existed during the flood itself. There are several ways in which the sequences of flood releases specified by the Regulations could have been improved, such as storing more water in Carrigadrohid...*" (Faulkner Report, para. 9.4).

388. [5] Flood warnings. Mr Faulkner considers that ESB might usefully have issued more accurate and earlier information on the expected magnitude of the November 2009 flood. This would not have reduced water-flows; however, "*it might have given residents and property managers more time...to prepare for the flood*". (Faulkner Report, para. 10.1). He recognises that ESB has no statutory role to play in the provision of flood warnings but notes that ESB has procedures for informing downstream residents when flood releases will be made. "*It is important that flood warnings that are issued to members of the public, directly or via the media, are meaningful. They need to give clear information on what is expected to happen (where is going to flood, when, how badly) and what recipients should do in response.*" (Faulkner Report, para. 10.1). Given the information available to Lee Dam operators on 19th November, 2009, Mr Faulkner considers it should have been possible to accurately predict eventual peak discharge from Inniscarra, and warn of widespread flooding in Cork, with a lead-time of several hours:

> "*In light of…lag times and travel times, it should have been possible to predict, with reasonable accuracy, the contribution made by releases from Inniscarra to river flow through Cork with a lead time of at least 6–7 hours. The lead time could have been extended, albeit with some loss of accuracy, by incorporating results from ESB's forecast model. After the reasonably accurate rainfall forecast issued at 05:00 on 19 November, it should have been possible for ESB to forecast…eventual discharge with reasonable accuracy (assuming…their model had been set up correctly). It is likely…the forecast model, even with its…limitations, would have predicted peak discharges at least 350m^3/s from Inniscarra. Yet ESB's communications to Cork City Council did not mention the possibility of…discharge higher than 350m^3/s until after 17:00. It appears…ESB were not making full use of the model's outputs, or did not trust it. A consequence was a lost opportunity to give a much improved advance warning of the seriousness of the flood.*"
>
> *Prediction of the resulting flows and levels within Cork City would have been more difficult given the lack of monitoring of in-flows from downstream*

tributaries...and the need to account for tide levels, particularly in the eastern part of the city. However, it would have been expected that if an extreme flow was released from Inniscarra, an extreme flood would result in Cork....

In reality the information issued by ESB to Cork City Council on the afternoon and evening of 19 November did not accurately predict...discharge, even in the phone call at 22:10 when the actual flow was already 20% higher [than] *the predicted flow supplied by ESB at that time. At 17:00, 5–6 hours before the peak discharge, ESB were predicting that the discharge would reach 300m^3/s...even an hour later...discharge was above this (324m^3/s)... the eventual peak was 83% higher.*

By 20:00 the discharge from Inniscarra had exceeded the previous record discharge (set in 1964). I have seen no record of ESB issuing warnings around this time...that unprecedented flooding was on its way." (Faulkner Report, para. 10.3).

389. The issues as regards the giving of warnings are more thoroughly considered in Chapter 18.

390. What is 'nature'? UCC contends that a duty 'not to worsen nature' is 'conceptually perverse' in circumstances where 'nature' no longer exists and the Lee Dams represent the new *status quo*. In this regard, the following exchange was of interest:

"*Mr Faulkner* – *... I have got some argument with using the word 'nature', but if we can say that nature is a shorthand for no dams present and everything else the same then yes.*

Counsel [ESB] – [W]*hat is your argument with nature, isn't that just the simplest concept we have altogether?*

– *Well, I don't think so....I think I said earlier on that the Lee Catchment and the rest of Ireland isn't natural*

– *...I remember that...I am wondering what in the Lee Catchment other than the dams is not natural.*

– *Well, there is lots of farmland and that will have field drainage for instance.*

– *Well, sorry, just a minute. That's all downstream of the dam. What in the state of God-given affairs in the region of the dam is not natural other than the dam?*

– *Upstream of the dam...I haven't explored all parts of the catchment. But if you look at most upland areas of Ireland, there has been...drainage of land, there has been forestry that has been cut down. Naturally a lot of Ireland would have been forested. You have got to go a very, very long way back before you can really say natural and that's why I have some quibbling with using the word 'natural' just to mean without the dams present. There is climate change as well...which is not an entirely natural process. So our landscape has come a very long way from when it was natural and I suppose I see the dams, as a hydrologist, as part of that non-natural landscape...and that's why I am hesitant to agree with the idea that we just sort of compare nature with present day."* (Transcript, Day 16, pp.12 –13).

391. Instinctively, conceptually, logically, however the court views Mr Faulkner's testimony in this regard, it considers it to make eminent good sense.

CHAPTER 29: MR BROWN'S EVIDENCE.

392. Description of expert and overview of evidence. Mr Matt Brown is a distinguished energy consultant, called by UCC as a witness. He was asked to provide an expert report, from an economic/operational perspective, on various matters: (1) possible reasons ESB might have for storing water above TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35); (2) the minimum volume of water ESB would be required to store in the Lee Reservoirs so that (i) a dam could be declared available, (ii) ESB could attain the minimum dam-operation level, and (iii) a dam could operate at maximum export capacity, (3) how and if availability/dispatch data for winter 2013/14 for the Lee Dams differs from November 2009, (4) whether hydro-generators such as the Lee Dams have priority dispatch under European and Irish law and ensuing implications, and (5) the revenue that the Lee Dams earned during November 2009 and what revenue would have been if the dams operated consistently at TTOL. Mr Brown's principal conclusions might be summarised as follows: (i) the main reason for ESB to hold water above TTOL was to maximise the value of water and revenues that ESB receives for electricity production, *i.e.* to maximise its monetary return; (ii) the minimum level of output at the Lee Dams over a 24-hour period requires a level of 61.7m at Carrigadrohid. For production to be at the installed capacity level over a 24-hour period requires a reservoir level of 62.9m at Carrigadrohid; (iii) availability/dispatch data for winter 2013/14 suggests operation of Inniscarra Dam to be more conservative than in November 2009; (iv) in practice, the Lee Dams have priority dispatch as they bid at zero cost and are highly likely to be dispatched when available. However, priority dispatch is not really an issue in the November 2009 context as, absent dispatch, dam levels could be reduced by spilling; (v) Mr Brown's estimate of revenue earned by ESB from the Lee Dams in November 2009 is €1.1m. Had ESB endeavoured consistently to maintain the Lee Reservoirs at TTOL, it would have earned between €100-130k less than it did.

393. Making money from water. When a hydro-electric station is constructed on a river, river-water takes on an additional value beyond, *e.g.* agricultural use. To maximise water-value, a reservoir must be operated with due regard to uncertainties about future in-flows so that the most valuable periods of electricity generation can be targeted. Often a series of reservoirs is constructed along one river. As a result, possible generation of electricity at each reservoir is linked to generation at reservoirs higher up. The dams at Carrigadrohid and Inniscarra are reservoir hydro-stations in a two-reservoir series. They have a declared electrical capacity of 27MW. Thus, as mentioned previously, Carrigadrohid has 8MW of capacity; Inniscarra has 19MW (split between two units of 15MW and 4MW). The Lee Dams represent a small part of ESB's total generating capacity of around 3,000MW of available capacity in November 2009. A review of market data by Mr Brown indicates that, in November 2009, the Lee Dams produced electrical output in excess of their declared capacity to a maximum level of 10MW, 17MW and 5MW respectively. The dams also bid a zero short-run marginal cost, *i.e.* on a day-to-day basis production from the dams had no cost. Due to their inherent flexibility, the Lee hydro-units provide additional value to the system by minimising system costs; however, high availability of water during November 2009 meant the dams were operating on a near-to-continuous basis, so this additional value did not exist and is not relevant.

394. The Single Electricity Market. The SEM is an organised market-place where electricity is bought and sold. In 'layman's' terms, it functions as follows. Trade occurs via a 'pool'. Ahead of time, all available electricity is offered by generating companies into the pool. Supplier companies state what their demand will be and 'buy' electricity from the pool. Generators are obliged to offer generation at prices reflecting their day-to-day cost levels; a supply curve is created from the volume offered by each generator and the prices they have submitted. All demand for each trading-period (half-hour) is added together and the intersection of supply and demand dictates how market-price is set. Regardless of offer data, all generators are paid the same 'clearing' price. In each trading period, this 'clearing' price is the cost of the most expensive generator required to meet demand. Not all available output is required to meet demand. The market operator selects the generation required, on a basis that minimises the overall cost of meeting system demand. Other things being equal, the lower the prices offered by a generator, the higher the probability its output will be scheduled by the market operator. In addition to the 'clearing' price, additional payments are made to generators for capacity to generate, as opposed to actual generation. These additional payments are necessary because the 'clearing' price is based on day-to-day costs, and is not intended to cover all of the annual costs incurred by generators. Day-to-day costs cover *e.g.* fuel and other consumables. Annual costs cover maintenance and capital recovery. These 'capacity' payments are generally calculated by reference to available capacity. Due to their special characteristics, market rules provide that for dams these capacity payments align closely to their production of electricity, rather than installed generating capacity; this is because it is availability of water, not installed capacity, which determines how much capacity dams can contribute. In advance of the trading day (which runs from 06:00 to 06:00), generators tell the market operator what their commercial/technical characteristics are. The market operator uses this data to run sophisticated software to organise the required trade and minimise the total system costs of meeting demand.

395. Storing water above TTOL. Mr Brown considers that ESB's commercial aim of maximising water-value, *i.e.* the revenue that may be earned from water-use, is the reason for holding reservoir levels above TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35). "*This would have the effect of maximising…revenue from the dams for ESB due to…higher production of electricity from the dams, than if the dams were at TTOL.*" (Brown Report, 13). Mr Brown notes that ESB's total available generating capacity across the entire market was slightly lower during the week up to the floods; he considers this would not have a bearing on ESB's wish to maximise dam water-value: that incentive would remain even if ESB had higher plant availability.

396. Minimum values of water required to operate. It is possible to declare each hydro-electric dam available for the day but to offer only an hour of output. In practice, dams tend to be scheduled for around four hours. The plant should, per Mr Brown, be declared available as long as reservoir level is above MinNOL, after taking into account size and probability of that day's in-flows. If there are no in-flows, availability should be zero.

397. Comparison of 2013/14 with November 2009. Mr Brown has fairly limited evidence to offer under this heading, thanks to the general lack of data available to him. He merely observes that, in general, operation at Inniscarra was lower in winter 2013/14 than November 2009; this is not true of Carrigadrohid which had levels of operation that were similar. Operation levels at Unit 1 (Inniscarra) in winter 2013/14 were lower than November 2009, though there were short periods in which they reached the same level. Operation levels at Unit 2 (Inniscarra) did not, in any period, achieve levels of operation as high in 2013/14 as in November 2009.

398. Priority dispatch Priority dispatch is the practice, required by European Union law, whereby renewable or other generators such as peat are dispatched in preference to other generators. It has the result that renewable and certain other generators can be scheduled ahead of other generators. This facility has the effect that hydro-electric dams are scheduled in the market according to the price they bid and the relativity of those prices to those bid by other generators. However, as hydro-dams bid at zero price, they are likely to be scheduled, if available, as they are likely to be the lowest price-offering. If there is a high level of renewable electricity available, a choice needs to be made as to which generator that has been afforded priority is re-dispatched down. In the current re-dispatch hierarchy, re-dispatch of hydro-power in flooding situations is the last option. The Lee Dams are not formally afforded priority dispatch under electricity market rules. However, by bidding zero prices they are, in effect, guaranteed dispatch when available. In practice, re-dispatch of the Lee Dams would not necessarily impact on the amount of water released downstream as the Lee Dams could still spill. As discharges associated with hydro-electric generation do not generally create flood risk, maintaining high levels of generation would seem a "*prudent action*" for a generator. (Brown, para. 2.5).

399. How much did ESB earn in November 2009? Mr Brown has sought to calculate the amount of money ESB earned from the Lee Dams in November 2009, and what it would have earned (or lost) had it maintained the Lee Reservoirs at TTOL. To calculate the amount earned, Mr Brown replicated the calculations set out in the then market rules. He stresses that the calculations should be regarded as estimates. By his reckoning, the total earned across the month of November 2009 by ESB from its three units at the Lee Dams was €1.1m. ESB's filed accounts state that revenue earned by its power generation business was €1.22bn in year-ending December 2009. Mr Brown then considered what the output would be had ESB maintained the Lee Reservoirs at TTOL throughout November. He took two approaches: (1) a basic approach which assumed output was limited to rated capacity at each unit in all periods; (2) using full modelling at the reservoirs (Pöyry models) up to and including 18th November, 2009; after this date he assumed the same revenue was earned based on actual output. In both cases, assumptions were made as to the constancy of the price at which electricity would have been sold or as to the capacity payments receivable. In the first scenario, total reduction in revenue for November 2009 by virtue of operating at TTOL was €130,000. In the second, assuming strict adherence to TTOL in both reservoirs, revenues were lower by €100,000 over November 2009.

CHAPTER 30: MR STEVENSON'S EVIDENCE.

400. Description of expert and overview of evidence. Mr Toby Stevenson is a distinguished economist and energy consultant. He was instructed by UCC to consider (a) the distinction drawn between the management of a hydro-electric reservoir and a flood-management reservoir, (b) the nature of TTOL, and (c) ESB's stated position that ultimately its responsibility in flood management is 'not to worsen nature'.

401. Commercial management versus flood management. Mr Stevenson does not accept that reservoir management involves a choice between commercial/flood management. He considers it to be a meld of both. "[A]*t times a hydro operator will be more conscious of the potential impact of floods…at other times the operator will emphasise commercial outcomes.*" (Stevenson Affidavit, para. 23). In Mr Stevenson's view, a hydro-electricity operator can exercise reservoir management to account for the possibility of floods and commercial objectives. The ranking of these factors is fluid and changeable. But, per Mr Stevenson, a reasonable hydro-electricity operator with a long-term profit maximisation goal will account for more than commercial objectives in the way it operates hydro-electric reservoirs. Mr Stevenson considers that pre-emptive action, such as spilling, forms part of a hydro-electric operator's responsibility, and notes that the Lee Regulations specifically accommodate the possibility of pre-emptive spill if flooding is a possibility. This is "*consistent with including…a commercial focus or… flood focus on the Lee system as circumstances warrant*". (Stevenson Affidavit, para. 42).

402. General reservoir management. Mr Stevenson considers there are certain general principles which are reasonable and appropriate to apply when operating a hydro-electric dam. First, hydro-operators are granted a right to dam rivers and manage resulting structures, ultimately for commercial benefit. (Stevenson Affidavit, para. 46.1). Second, potential outcomes from the force of nature are altered by containing/managing the river system. The court understands Mr Stevenson to mean by this that, when it comes to 'do not worsen nature' rule, nature is what it is, not what it was. Third, the most extreme outcome of nature is dam failure. Fourth, risk of dam failure is not the sole impact of hydro operation that would have an impact on the neighbouring environment/community. Fifth, it is impossible to forecast accurately every eventuality that will impact on generation output of a hydro-electric unit. Sixth, multiple responsibilities of hydro-electric operators and risk of forecasting uncertainty always have to be taken into account. Seventh, when the possibility of a flood occurs, strict commercial guidelines should be relaxed in favour of flood-attenuation actions. Eighth, absence of statutory rules and regulations does not obviate the hydro-electric operator's "*responsibility to operate to acceptable standards of behaviour in recognition of...the opportunity presented to them and the consequence of their actions as custodians of the assets on the river...they control*". (Stevenson Affidavit, para. 46.8). The notion of societal expectations which Mr Stevenson implicitly captures when he refers to "*acceptable standards of behaviour*" is, of course, the evolutionary impulse that has informed the greatest advances in tort law in the last century or so, including Lord Atkin's inspired judgment in *Donoghue* v *Stevenson* and, of particular relevance in the context of the within proceedings, the decisions of the Privy Council and of the courts of our neighbouring jurisdiction in the *Leakey* line of authorities (considered later below). Ninth, a hydro-electric operator's approach to managing a hydro-catchment must be transparent to the relevant community.

403. TTOL. ESB insists that TTOL is a commercial guideline, not a flood-related level. Mr Stevenson appears to consider it a bit of both. He notes that "*TTOL*" is defined in the Lee Regulations (at *iv*) as "*...the top operating level which the station shall endeavour to maintain during non-flood conditions...*". This being so, he would expect ESB to offer more generation availability into the market when reservoirs are above TTOL and *vice versa*. He considers that TTOL's seasonal variability is an acknowledgement that situations could arise from November that may require more capacity to address high in-flows. (Stevenson Affidavit, para. 54). Mr Stevenson considers that the fact that the Lee Regulations refer to TTOL as the top operating level that ESB shall "*endeavour*" to maintain reflects the need for an established level on which ESB will base market offers.

404. 'Do not worsen nature'. It would be fair to say that Mr Stevenson is not a believer in the 'do not worsen nature' maxim of which ESB is such an assiduous devotee. Mr Stevenson's view is that hydro-electricity operators are granted a right to dam and control reservoirs for commercial gain. With that right comes responsibility. Mr Stevenson considers that the outcome of every decision should be the best outcome possible after all competing priorities have been taken into account. "*That is...different to ESB's position which is effectively that their obligation is solely to ensure that the culmination of their decisions evades an outcome which is worse than would have been the case if the structure were not in the river.*" (Stevenson Affidavit, para. 44).

CHAPTER 31: MR DALE'S EVIDENCE.

405. Description of Expert and overview of evidence. Mr Noel Roger Dale is a distinguished meterological observer with British Weather Services, a company that offers private meteorological services. His evidence was concerned with rainfall events in the Cork region in and before November 2009; he considered general principles of rain/weather forecasting, rainfall events and weather forecasts, and ESB's awareness of weather warnings.

406. Weather forecasting not exact. Mr Dale stressed the uncertainty of weather forecasting and the fact that a weather forecast should always be treated by a recipient of same as a guide or an interpretation of what is expected, not a confirmation of what will happen.

407. Rainfall forecasts. Mr Dale places rainfall forecasts into three categories. In the very short term, rainfall is predicted using rainfall radar and observational reports. Medium-term forecasts rely more on computer modelling. For longer term forecasts, appreciation of global cycles comes into play. Common to all three is that any estimate of future rainfall is an estimate: a recipient should never treat millimetre forecasts as certain.

408. Data available to Met Éireann. In determining the data available to Met Éireann when it produces weather forecasts, Mr Dale has had regard to its website and to a presentation by Met Éireann after the flood of November 2009 to the Joint Committee of the Oireachtas on the Environment, Heritage and Local Government. In his expert report, Mr Dale concludes that "[T]*he information given to ESB by Met Éireann is quite area specific....Met Éireann certainly appear to have very localised data available...at both Carrigadrohid and Inniscarra and would presumably provide the most localised available data to ESB*". (Dale Report, para. 4).

409. Data available to ESB from Met Éireann. Met Éireann issues regular rainfall forecasts to ESB, as a commercial client, for ESB Inniscarra, and ESB Advance/Rain Warnings for the Lee Catchment. It also issues wind/thunderstorm warnings to ESB. And it is available to provide more up-to-date information by e-mail/telephone, if requested. Mr Dale emphasises that an experienced forecast-user like ESB is likely attuned to local variations that may differ from forecasts received. "[T]*he long term end user is always likely to be aware of microclimate differentials....and...is in a better position to judge whether any given forecast should be upgraded, kept the same or downgraded.*" (Dale Report, para. 5).

410. Rainfall between June and November 2009. Mr Dale has engaged in an analysis of rainfall in County Cork between June and November 2009:

411. [1] June to October. Based on his analysis of rainfall over this period, Mr Dale concludes the rainfall was "*somewhat exceptional*". (Dale Report, para. 6). This does not mean that every day was exceptional, a point on which he lays some emphasis when it comes to analysis of rainfall from 18th to 19th November.

412. [2] 15th November. Met Éireann issued a rain warning for the Lee Catchment at 10:51 on 15th November. This predicted rainfall of 25 to 40 mm. This warning was valid between 22:00 on 15th November and 15:00 on 16th November.

413. [3] 16th November. Met Éireann issued an ESB Advance Warning at 07:13, forecasting persistent rain in many areas with continued flood-risk. It predicted that the morning of 18th November would see outbreaks of rain with heavy rain spreading from the west later. It predicted that 19th November would see heavy spells of heavy rain or showers and strong, gusty winds. A slight risk of rain exceeding 25 millimetres was identified.

414. [4] 17th November. Met Éireann issued an ESB Advance Warning at 06:44, indicating that showery rain would spread from the west that morning, continuing:

> "[R]*ain will become widespread across the country and will be heavy in places with the risk of flooding... Very windy and wet tomorrow with spells of rain, heavy at times...very windy on Wednesday night* [the 18th] *with spells of rain and fog over hills...Thursday* [the 19th] *will be mild and very windy with further spells of heavy rain or showers and strong, gusty south to southwest winds.*"

415. A risk of overnight rain exceeding 25 millimetres was identified.

416. [5] **18th November.** The following rainfall was forecast for 18th November on the days prior:

00:00, 15th November: 12.7mm (midnight to midnight).

06:30, 16th November: 26.3mm (midnight to midnight).

21:30, 16th November: 8.9mm (midnight to midnight).

06:35, 18th November: ESB Advance Warning from Met Éireann: "…[R]*ain will be widespread later in the night with some very heavy falls in places and a risk of flooding by morning…Cloudy again tomorrow with spells of heavy rain in all areas with a continuing risk of flooding*". [A severe weather risk of greater than 25mm of rain was identified].

10:38, 18th November: Rain Warning for Lee Catchment issues to ESB from Met Éireann: "*Further wet and windy weather expected this evening, tonight and tomorrow. Falls of 40 to 60mm possible with further flooding. Southerly winds gusting 80 to 110km/h at times also*". [This warning was valid from 18:00 on 18th November to 00:00 on 20th November].

417. [6] 19th November. The following rainfall was forecast for 19th November on the days immediately prior:

06:30, 16th November: 58.9mm (midnight to midnight).

21:30, 16th November: 48mm (midnight to midnight).

23:00, 17th November: 52.2mm (midnight to midnight).

05:00, 19th November: 53mm (to 06:00 on 20th November).

06:37, 19th November: ESB Advance warning from Met Éireann: "*The weather remains very unsettled with further rain and strong winds at times.*" (A severe weather risk (high risk) of rainfall exceeding 25mm was identified).

418. Availability and accuracy of prior forecasts. Mr Dale is emphatic as to the accuracy of these prior forecasts:

> "*It is clear from these warnings and forecasts for 15 to 19 November 2009 that a degree of heavy or very heavy rain was forecast...and that a number of references to flooding risk were made...*
> *It is quite clear...that from 16 November 2009 Met Éireann was predicting heavy rainfall for the Inniscarra and Lee Catchment areas for a number of days up to and including 18 and 19 November 2009. The main period of rainfall started at 5pm on 18 November and continued until around 3-4pm on 19 November. This particular period of rain therefore started very close to the time it was predicted, and continued for a shorter time than predicted....ESB was specifically alerted to these forecasts, seemingly had the option of contacting Met Éireann for more detailed information if required, but in any event would have in my view been in a position to tailor this information to its situation given its first hand knowledge of the catchment area...*". (Dale Report, para. 7).

419. Mr Dale's view is that while the very specific period around 18th to 20th November had substantial volumes of rain, the levels were not highly unusual within typical two-day periods during November. In addition, he considers that while the rainfall of 18th/19th November was substantial, it was not extremely rare. What was unique was the level of precipitation in the month before 18th/19th November and throughout the summer of 2009. "*Given the above analysis and the known difficulties of estimating likely rainfall totals during intense developing situations, I would suggest that the rainfall forecasts issued by Met Éireann to ESB were reflective of what occurred.*" (Dale Report, para. 7).

420. Orographic rainfall. Mr Dale suggests that when predicting rainfall into the Lee Catchment, consideration should possibly have been given to enhanced 'orographic' rainfall in the mountainous areas to the west. Such orographic (mountain/hill) rainfall usually enhances total rainfall amounts. Mr Dale observes that it would be unusual if ESB was not aware that adjustments might have to be made to the forecasts to predict expected catchment peaks. Moreover, as a sophisticated consumer, and given its experience of relating forecasts to the amount of rainfall that actually fell, Mr Dale considers that ESB should have been in a position to apply an appropriate adjustment to the Met Éireann forecast. "*I would have expected it to do so.*" (Dale Report, para. 7).

421. Adequacy of forecasts. The forecasts reviewed by Mr Dale comprise, in his view, detailed assessments of anticipated rainfall/flooding. But in his view they were "*the very minimum*" required by ESB. (Dale Report, para. 8). Other information such as ESB's site-specific rain-gauges would, in Mr Dale's view, have been invaluable in assessing accuracy of forecasts and assessment of potential developments. Mr Dale is also an advocate of on-going contact with the duty forecaster at Met Éireann as a means of gaining greater appreciation of a developing situation. He concludes his report by re-emphasising the importance of attention to orographic rainfall. "*ESB should have taken this into account...by requesting that this be reflected in the forecasts provided...or by adjusting those forecasts themselves to suit their needs.*" (Dale Report, para. 8).

CHAPTER 32: DR HUGHES' EVIDENCE.

422. Description of Expert. Dr Andrew Hughes is a distinguished civil engineer, specialising in dams. He was recently described by Lang J. in *R. (Heath and Hampstead Society)* v. *Mayor (et al) of London & Anor.* [2014] EWHC 3868, para. 10, as "*a highly qualified and experienced specialist in dam engineering*".

423. Dam purpose. Dr Hughes indicated that a dam's purpose can evolve over time. "*In some cases...purposes can be combined or amended over time...the combination will produce a different scheme.*" (Hughes Report, para. 5.1). Dr Hughes further indicated that there are significant differences between dams designed for hydro-electric purposes and dams designed for flood alleviation, reflecting catchment, reservoir size, downstream channel size and flood frequency. "*Typically, the flood alleviation dam is located in a region of intermittent extreme flows...and only stores water when there is a flood event. The hydro-electric dam, if it is not a run-of-the-river kind...typically operates by the storage of regular flow to accumulate generating potential*". (Hughes Report, para. 5.5). He pointed to the fundamental engineering feature of dams as determinative of what the dams are: "*It is a fundamental engineering feature of the flood alleviation category that it is designed to improve...natural flooding hazard....In the hydro-electric category, a dam...must generate electricity...the criterion of its direct effect on a flood is...to avoid exacerbating nature.*" All of this suggests that the Lee Dams are single-purpose, hydro-electric dams. Where the court struggles with Dr Hughes' logic is with his consequent observation that when it comes to floods, the duty of the Lee Dams, is to avoid exacerbating nature. There is a trend in Dr Hughes' evidence that because something is done so, it ought to be done so.

424. Dam mandate. The so-called 'mandate' that a dam enjoys was presented by ESB as the touchstone of operational practice at the Lee Dams. In this regard, Dr Hughes indicates as follows:

> "*The purpose of a dam, whilst partly evident from…structure and natural setting is normally formalised in a specific mandate, provided by legislation or other…Government authorisation. The hydro-electric operator has an explicit interest in a river and the impounded water with the purpose of exploiting this to his benefit without causing damage downstream. This is frequently illustrated by payments made to the operator for abstraction from his reservoir by other parties….Adapting a hydro-electric scheme for flood alleviation has to be 'intrusive'. While…existence of a dam and reservoir always provides some scope for alleviation, the only restriction for water management in a hydro scheme is the need to control levels for safety purposes…Where adaptation of a hydro-electric function occurs, it usually occurs on the initiative of an external agency….Often it will involve more parties than just the dam operator to provide an integrated flood alleviation facility.*" (Hughes Affidavit, pp.16ff.).

425. The court rather paused when it first read this element of Dr Hughes' report. It seemed to it then, and it seems to it now, having heard all of the oral testimony in this matter, that under the careful and honest analysis of ESB's expert witness, the rather black-and-white world for which ESB generally contended throughout the proceedings, in which single-purpose dams ever operate to a single end, instead descends into shades of grey. It is worth looking closer at the quoted text. First, the purpose of a dam is "*partly*" evident from structure. This suggests that public perception and reliance may be partly determinative of purpose. Second, the purpose of a dam is "*normally*" formalised in a specific mandate. This does not rule out the possibility that a mandate can evolve. Third, adaptation of a purely hydro-electric scheme to serve an additional purpose "*usually*" occurs on an external agency's initiative. Notably, it is not contended that it could not spring from the initiative of a hydro-electric operator acting, *e.g.*, on its interpretation of applicable law. Fourth, adaptation of a hydro-electric scheme will "[o]*ften*" involve more than the dam operator...but not always.

426. Dam integrity. Dr Hughes conducted a comprehensive analysis of ESB's approach to dam-safety, flood protection, dam-management, maintenance and surveillance. He considers that: (1) ESB has an appropriate structure of individuals and specialists, supplemented by the EDSC, to make strong efforts to ensure the safe and efficient operation of their plants, and ensure safety of their structures; (2) the organizational structure within ESB is such that there are clear roles/responsibilities and short lines of communication; (3) there are adequate training plans but there is a need for succession/knowledge transfer planning; (4) ESB is "*generally operating*" its facilities in line with best international practice (Hughes Report, para. 6.41); (5) "*they have taken a proactive role in applying and monitoring international standards*" (Hughes Report, para. 6.42); (6) in the absence of Irish dam safety legislation, ESB operates a dam-safety programme which "*compare*[s] *favourably with best practice around the world*".

427. Flood warnings. Dr Hughes gives a mixed review of ESB's approach to warnings. His conclusions are identified here, with some additional comment. **[1]** "[T]*imely and appropriate warnings were issued by ESB to all people within their system*". (Hughes Report, p. 33). This is contrary *e.g.* to the evidence of Mr Faulkner. The court considers that Mr Faulkner's evidence is, on the balance of probabilities, a better reflection of the truth of matters. **[2]** "*Throughout* *the event, ESB fully discharged all of its responsibilities in relation to flood warnings, in line with its Regulations.*" (Hughes Report, p.33). The issue is whether in so doing, ESB fully discharged any obligations arising at law. As indicated in Chapter 18, the court considers that ESB has not. **[3]** "*In providing flood warnings to...downstream populations, ESB provide information on the escalating nature of the flood risk, but...not...the levels of discharge involved. This is in keeping with the Regulations.*" (Hughes Report, p.33). See comment re. [2]. **[4]** "*The flood warning operated by ESB does not necessarily make the best use of the latest warning technologies available, but it does ensure that as many people as possible, on the warning list, are actually contacted.*" (Hughes Report, p.33). In truth, the procedure seems almost amateur; it is suprising that *e.g.* texts and e-mail messaging are not relied upon. **[5]** "*[T]he procedure of phoning 60 recipients as the flood develops is clearly not ideal as it takes up to two hours to get through the list.*" (Hughes Report, p.33). See comment re. [4]. **[6]** "*[T]he response of the public indicated that there was some hesitation to take seriously, the warnings and advice given by ESB....The reasons for the reluctance to heed the warnings should be further examined ...*" (Hughes Report, p.33). There is no suggestion of any such hesitancy on the part of UCC. **[7]** "*The refusal of the fire brigade to act on ESB's request to evacuate people, suggests that there was a lack of coordination of efforts and a lack of clear lines of communication and definition of responsibility during the event....*" (Hughes Report, p.33). This observation seems of no relevance to ESB's behaviours *vis-à-vis* UCC of the matters in dispute in the within proceedings. **[8]** "*ESB over the years have provided Cork City Council with information on the extent of flood inundation from flood release and dam breach which is useful information for use in the management of flood risk and response for the downstream catchment...*" (Hughes Report, p.33). See comment re. [7]. **[9]** "*More dialogue would be expected between Cork City Council and and ESB during any flood event and particularly the 2009 event.*" (Hughes Report, p.34). See comment re. [7]. **[10]** "*There is no integrated flood* *emergency plan for the catchment involving the various government departments, local authorities and key stakeholders...so flood warning is provided on an 'ad hoc' basis.*" (Hughes Report, p.34). See comment re. [7].

428. Flood alleviation response/responsibility. Dr Hughes indicates that the typical hydro-electric power operating system is characterised by two overall rules, *viz.* (1) store as much water as possible, and (2) identify a below-crest level that allows time for (i) reaction to exceptional in-flow and (ii) safe discharge of design storms without overtopping. "*That is not to say that the hydro-electric operator can do nothing to alleviate a storm, but it does mean that he is limited to what is normal for a hydro-electric scheme*". (Hughes Report, p.35). Limited, it might be noted, not by any legal requirement or by science, but by Dr Hughes' preferred engineering practice. Dr Hughes cautions that mandatory discharge in excess of channel size may require legislative change. It is not something that a hydro-power operator can simply elect to do. "[B]*ased on fundamental engineering, understanding and convention, as reflected by international practice, a hydro-electric scheme is free to store water for electricity generation, and not to analyse how best to alleviate natural flooding. When a hydro-electric reservoir reaches its maximum level* [MaxNOL], *then and only then does it consider avoiding flood risk presented by dam breach or overtopping.*" (Hughes Affidavit, p.35). Notable in this, and consistent with ESB's general approach is the premium placed on MaxNOL. Notably, operating consistently to TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – is not something that requires legislative change.

429. Possible difference between ESB and other hydro-power operators. One aspect of Dr Hughes's oral testimony that attracted the court's particular attention was the below-exchange:

"*Counsel* [UCC] – *Are you aware of any dams in England similar to ESB that do provide flood alleviation, any hydroelectric dams?*

Dr Hughes – *Not through my involvement with them, no.*

– *So there is no comparator in the United Kingdom?*

– *....There are lots of comparators with ESB dams.*

– *Are there...hydroelectric dams in the UK that provide flood alleviation?*

– *There might be some which are mandated to provide flood alleviation....*

– *Are you aware of any that provide flood alleviation?*

– *I am aware of water supply dams that are mandated to provide flood alleviation, I am not aware of any hydro dams but I am sure there are some.*

– *So...ESB does provide flood alleviation and you are not aware of any comparator in the UK?*

– *No. I said that ESB provide flood alleviation almost as a by-product of operating, it is not their mandate to provide flood alleviation. It happens naturally by the process that they do plus the good neighbourly bit. They don't have a mandate to provide flood alleviation....*[A]*ll the hydro dams in the UK that I work with have the same facility. There might be hydro dams which have a mandate specifically to provide flood* *alleviation. I don't know what those are if they are. I know of water supply dams that have a mandate to provide flood alleviation as part of an integrated system and they get compensated accordingly.*

- *You say you know of other hydro dams in the UK that have similar facilities, are you saying there are other hydro dams that draw down in advance of floods?*
- *The ones that I work with don't tend to, they just automatically deal with the floods. So I would say, no, they don't. The ones that I deal with don't have that discretionary facility.*
- *So any of the dams that you deal in the UK don't compare with ESB which does draw down in advance of floods?*
- *Well, they compare on a hydro situation. They don't do the good neighbourly bit that ESB do.*
- *And, therefore, you have no experience of any dam in the UK that combines hydro generation and flood alleviation; is that correct?*
- *Well, as I say it's a natural process...*
- *If you wouldn't mind for the purpose of this question, Dr Hughes....*[t]*here are no dams that you are aware of, that you have experience of in the UK that actually combine hydro generation and flood alleviation in the manner in which ESB does?*

– .... *I can't think of any at the moment.*" (Transcript, Day 68, pp.14–16).

430. Dr Hughes has a distinguished professional pedigree and the court was considerably struck by this exchange which suggests most strongly that there is a significant distinction to be drawn between the position of ESB and that of other hydro-electric dam operators when it comes to flood alleviation. The court notes in passing the reference to "*the good neighbourly bit*" that ESB does, wording that has a rather 'Atkin-esque' resonance to the legal ear.

431. Responsibilities of public authorities. The development of integrated flood emergency planning and flood warning systems is a relatively new concept that, globally, has only started to be applied in a structured manner in the last decade. Nonetheless it is becoming an international norm. Dr Hughes has pointed to the need for an integrated approach to flood management that involves all stakeholders and in which ESB has a role, but not the lead role. He has referred to the role that public bodies play under the European Union's Floods Directive (Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks) (O.J. L288, 6.11.2007, p.27), and the role of local authorities under the Government-approved framework for major emergency management (2006), observing that "*The ESB Lee Hydro Scheme was a matter to be considered in the formulation of any emergency planning by the Local Authority, as the hydro scheme is part of the overall flood risk, and not vice versa.*" (Hughes Report, p.36). The court does not accept the suggestion, if such there is, that because a legal duty arises for public bodies, this has the effect of obviating the separate legal duties that the court considers to arise for ESB by law.

CHAPTER 33: DR BREE'S EVIDENCE.

432. Description of expert and summary of evidence. Dr Thomas Bree is a distinguished civil engineer specialising in hydrology and hydropower. Since 1978, he was worked within ESB Group. Dr Bree's evidence might be summarised thus: (1) the Lee Scheme was designed as a hydro-power scheme and has been operated on that basis to the present day; (2) floods occurring at the Scheme are managed for safe passage through the Reservoirs in line with international practice; (3) at each of the Dams, there is a dedicated band of reservoir level for hydro-power operation and a higher band for safe passage of floods; (4) the flood of November 2009 was the highest combined volume/peak in-flow at the Lee Dams since their construction but fits reasonably well with ESB's experience of similar flood-flows; (5) advance discharge commenced four days ahead of the flood events, up to the maximum possible under the Lee Regulations without causing downstream flooding; attenuation-levels were similar to previous events; (6) although storage capacity is limited, the Lee Reservoirs have an attenuating effect on natural floods; (7) low-lying areas of Cork City span a narrow valley, on land reclaimed from an estuarine flood-plain by raising ground-levels and filling in river channels. This reclamation and city development has, to some extent, protected the city from fluvial floods and attenuates flood-flows. The attenuation provided by the Lee Reservoirs is additional to this.

433. Single-purpose scheme with particular mandate. Dr Bree opines that "*The* [Lee] *reservoirs were designed and are operated as a hydroelectric scheme. ESB's mandate to manage the dams is set out in* [the River Lee Hydro-Electric Scheme Approval Order, 1949]...". (Bree Affidavit, para. 27). Dr Bree confirms the world-view of ESB, at least as propounded in these proceedings, *viz.* that the Lee Scheme is a single-purpose, hydro-electric scheme. He intimates that the proper locus for someone seeking the detail whereby that

Scheme must be run is the Order of 1949. He appears to overlook that the common law may also have ramifications for ESB.

434. Dam Safety Flood Management. As to the Lee Regulations, Dr Bree asserts that "*Due to the scale of the hazard of dam failure on the Lee, this simple system* [of pre-ordained discharges at pre-determined water-levels]*...is appropriate to avoid misinterpretation and...allows for breakdown in communication during floods.*" (Bree Affidavit, para. 39). Offhand, this seems reasonable; in practice it has the, almost bizarre, consequence that rules defined in the abstract, fall to be applied rigorously in the real, notwithstanding that on the Lee, as in life, the real does not invariably, if ever, conform entirely to the expected.

435. Independent/conjunctive operation. Because spillway capacity at Carrigadrohid is limited, it is not possible to pass extreme floods by discharging peak in-flow. Hence some in-flow must be stored now and released later. Part of the top storage at Carrigadrohid is needed to safeguard Inniscarra, as its storage is smaller. "*Thus flood management and storage at the two reservoirs are linked.*" (Bree Affidavit, para. 41). As an assertion, this appears to sit uneasily with the statement in the Lee Regulations, at para 1.1 that "*In general, the two reservoirs...are treated as being independent of each other.*" (Bree Affidavit, para. 41).

436. Downstream flood protection. Dr Bree opines succinctly on whether ESB, as Lee Scheme operator, has any responsibility for downstream flood alleviation:

> "*Flood control for downstream protection is not a function of ESB Hydroelectric Scheme...*

If a reservoir has a downstream flood control function, this would be agreed with the authorities responsible for flood management....In this situation...flood operating rules would have procedures that are clearly defined for floods in addition to the dam safety extreme flood requirements. If flood control for downstream had been an objective on the Lee...additional operating rules would apply, all agreed with flood management authorities, such as:

a. Statement of downstream flood standard.

b. An empty flood control storage band for floods up to this design flood....

c. Clear boundaries defining movement from hydropower operation to flood control operation from downstream protection, and from there to flood control for dam safety extreme floods.

d. *Support systems and mandatory requirements for advanced discharge and discharge rate.....*" (Bree Affidavit, paras. 52 and 53).

437. The court pauses to make a few general comments. If downstream protection is not a function of the Lee Scheme, it might be considered curious that (i) ESB deems it necessary to issue warnings and notifications, (ii) ESB staff, including Dr Bree, have for so long gone about about touting to the world the flood alleviation effects of the Scheme, and (iii) the downstream impacts of the 2009 floods were of such clear concern to ESB staff that its own Chief Civil Engineer authorised a deviation from the Lee Regulations so as to hold back water at Carrigadrohid Reservoir. Moreover, it is not clear whether, when Dr Bree opines that downstream protection is not a Lee Scheme function, he makes this assertion from an engineering or legal perspective, or, alternatively, considers that engineering purpose determines legal responsibility. It is obviously for the court to decide where matters lie from a legal perspective but could it be, as might reasonably be inferred from Dr Bree's evidence, that if ESB has a downstream flood control function it must go through various 'hoops' with the local authorities and, if it does not go through those hoops, this does not point to any breach of legal obligation but means instead that there is no such obligation arising? The court's unequivocal answer to this question is 'no'.

438. Flood alleviation impossible? Dr Bree states that "*Combining downstream flood control with other uses is possible only if total reservoir capacity is large and/or channel capacity downstream is large. In the case of the Lee, there is a relatively small reservoir storage volume and also a limited channel capacity, so this is not possible.*" (Bree affidavit, para. 57). This assertion appears to sit uneasily with the broad thrust of the case argued by ESB, and with evidence provided by experts called by ESB, not least Dr Pürer, the present chairman of the EDSC, whose evidence is considered later below. The thrust of ESB's case, and that evidence, is not that the Lee Dams cannot serve a flood alleviation need but that they were not designed to serve that purpose and are not required by law to do so. The below exchange between counsel and Dr Bree seems to indicate, contrary to the just-quoted text that not only is it possible for ESB to engage in flood alleviation; it actively does so:

"*Counsel* [UCC] – ...[W]*e can agree that the dams and reservoirs have an automatic flood alleviation effect. But this paragraph in the document is not confined to the automatic flood alleviation effect of the dams and reservoirs, is it?*

Dr Bree – [I]*t's referring to the discretionary clause.*

– *Yeah. Because you're talking about managing floods carefully. That's ESB managing, doing something, intervening, trying to make the outcome better, isn't that so?*

- **[1]** *It uses its discretion to do that, yes.*
- *Yes.*
- **[2]** *As a good neighbour to the landowners downstream.*
- *And that's something that ESB wants to try and do – it wants to be a good neighbour?*
- *Oh, definitely, yeah. That's my understanding.*
- *Yes. So that's part of the operational philosophy of the dams, is to try and operate them to be a good neighbour?*
- *Yes, within obvious limitations. It depends what that means.* **[3]** *It might mean doing very little, it might mean doing a lot. So you'd have to define – it's not – you know, it cannot change its operating system and so on to extremes.*
- *But what is said here is ESB manages floods carefully. So I think it's accepted that there are limits to what ESB can do?*
- *Yes.*
- *But within those limits ESB manages floods carefully, does what it can?*
- **[4]** *Yeah....definitely the 'careful', I mean the top priority is dam safety. And then after that, with the discretionary clause, it does what it can. Which is quite limited really...*" (Transcript, Day 74, pp.153–154).

439. The court understands the following from the above. Re. **[1]**, that ESB exercises a discretion as regards flood management. Re. **[2]**, that ESB seeks to be a 'good neighbour', a form of wording volunteered by Dr Bree but which segways neatly into the classic definition of negligence. Re. **[3]** and **[4]**, that there are limits to what ESB can do but that it can change its flood management system.

440. Additional upstream information. Mr Cowie suggested that the increased discretion he commends to the court could be better effected if ESB's knowledge was enhanced by real-time data on rate of rise of river levels, rainfall and other parameters. Dr Bree takes a divergent view. Starting with the premise that advance spilling in excess of $150m^3/s$ would cause downstream flooding of roads, mindful that on 16^{th}, 17^{th} and 18^{th} of November 2009, ESB engaged in this level of advance spilling, he concludes:

> "*There is no potential for additional upstream telemetered or forecast information that would improve this advance discharge....There is limited flood storage capacity in the reservoirs in comparison to the volumes of flood in-flows from upstream....Realtime access to more observations transmitted from upstream or downstream whether rainfall or hydrometric gauges could not have changed or improved any aspect of the way the flood was managed, since...earlier small storms were stored in accordance with hydropower practice and...advanced discharge could not have been increased once the* [weather forecast on the 16^{th} for the 19^{th}]...*was received* [because discharge level was already at 150m3/s]." (Bree Affidavit, para. 65).

441. This logic seems flawless, if one ignores the fact that reservoir levels could and, the court concludes later below, ought to have been operated to TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary* *spilling of water from the reservoirs*" (O'Mahony Affidavit, 35). Dr Bree notes, *inter alia*, in this regard that dam-staff possess considerable local knowledge of the catchment and flood control. "*When rainfall is observed or forecast, they are aware of likely in-flow...including those from a saturated catchment. This local knowledge is important in...management of...reservoirs and...contributes to...safe management of floods through the dams.*" (Bree Affidavit, para. 70). The court is surprised at the reliance placed by Dr Bree on local staff knowledge when it comes to rising floods. These are the same staff who (per Dr Bree) require simple rules when it comes to effecting discharges, but (per Dr Bree) are to be relied upon when it comes to their knowledge of in-flows (a key determinant of spilling). How can it be that the same staff are trusted to understand in-flows but need simplicity when it comes to outflows? The truth is simple: they can be trusted with both. Indeed, as the beneficial and prudent decision of ESB staff to hold back water at Carrigadrohid on the evening of 19th November, 2009, shows, such trust in experienced and professional staff, with a good sense of what they are about and what confronts them, is amply deserved.

442. Time lag. One last aspect of Dr Bree's oral evidence that was of interest were his comments on the lag-effect that arises from existence of the Lee Scheme, and the result that flow-timing will vary from the 'no-dams' scenario, resulting in effective impingements of ESB's 'do not worsen nature' rule:

"*Counsel* [UCC] –	[O]*ther ways...the dams can potentially worsen nature is...if they delay discharges from Inniscarra coincides with the peak flows on downstream tributaries when that otherwise wouldn't have occurred, isn't that so?*
Dr Bree –	*If they delay differently from a pre scheme delay...*

- *Yes....*[I]*n fact that's something that you...had occasion to comment on. In your 2006 flood report you...noted that it's beneficial to avoid compounding...peak discharge from the Shournagh and Inniscarra at Leemount Bridge. So that's an issue that you are conscious of?*
- *It's an issue I am conscious of, yes.*
- *....*[B]*ecause of the potential to worsen nature...?*
- *If the departure from the pre scheme timing was significant. But every reservoir disrupts timing. So again you are back to the complex nature of the pre scheme....*[O]*nce you decide I am building a reservoir here, you upset the timings to some extent. So what I would have been thinking about...in that statement would have been ...significant timing changes.*" (Transcript, Day 75, p.25).

443. The above-quoted text is but one example of how the ESB's 'do not worsen nature' rule was shown consistently and repeatedly throughout the proceedings to be rather porous when it comes to its application, entailing, as it does, the core proposition that, when considering on a day-to-day basis the issue of downstream flooding, ESB and its staff may turn the clock back to the late-1950s and assess the position as if there were no dams in place at Carrigadrohid and/or Inniscarra. As will be seen later below, the court concludes that the inherent unreality of this proposition assists in its refutation.

CHAPTER 34: DR PÜRER'S EVIDENCE.

444. Description of expert and overview of evidence. Dr Ernst Pürer is a distinguished civil engineer. Since 2000, he has been the chairman of the EDSC.

445. Water discharge and reduced flood-risk. Dr Pürer indicates:

> "*It is possible to create water discharge Regulations with a view to further reducing flood risk…but these would reduce power generating capacity. It is not…acceptable to use…flood control level above…*[MaxNOL]*…or to risk overtopping…as a general flood control mechanism. It is not good engineering practice to assume the right to flood property on the basis that it would be an acceptable price for preventing flooding elsewhere.*" (Pürer Affidavit, para. 6).

446. Notwithstanding the constraints that follow, the opening sentence of the above-quoted text appears to acknowledge the thrust of UCC's contentions, namely that, albeit at a loss of generating capacity, the Lee Regulations can be altered to further reduce downstream flooding on the river Lee. It is difficult to reconcile this assertion with Dr Bree's observation that: "*Combining downstream flood control with other uses is possible only if total reservoir capacity is large and/or channel capacity downstream is large. In the case of the Lee, there is a relatively small reservoir storage volume and…a limited channel capacity, so this is not possible.*" (Bree affidavit, para. 57). Lest there be doubt as to Dr Pürer's evidence in this regard, the following exchange is of interest:

"*Counsel* [UCC] – [I]*n applying that advance discharge rule, ESB is trying to reduce as far as possible the flooding that might later occur, is that correct?*

Dr Pürer – *...Yes, this as far as possible....*[A]*s I mentioned...that's not easy.*

– *Not easy?*

– *....*[N]*ot easy. Because the forecasting, the accuracy of the forecasting models increase the closer you come to the flood event itself. If it is in a...very early stage then it is 'it could be'...*

– *Yes?*

– *So that's* [why]*...I said earlier that it is very useful to have an experienced staff – they know the respond of the catchment area to precipitation and things like that.*

– *And they can make judgments as to what can be done to reduce the flooding?*

– *Yes.*

– *And the purpose is to avoid unnecessary flooding...?*

– *....Yes, by advance discharge.*" (Transcript, Day 64, p.113).

447. Moreover, Dr Pürer previously accepted in his oral evidence that reduction of MaxNOL at Inniscarra Dam in December 2007 was for the purpose of downstream dam alleviation:

"*Counsel* [UCC] – *And recommendation four was: 'A review of...current regulations should be undertaken to examine the potential to* *increase discharge earlier in Inniscarra during a rising flood. A number of historical floods should be used to test proposed changes and the design flood should be examined from a dam safety perspective....And what was being recommended here was to see how the regulations should be reviewed to see if it was going to be possible to increase discharges earlier during a rising flood; is that correct?*

Dr Pürer – *Yeah, it's here.*

– *And that's clearly for the purposes of flood alleviation?*

– *Yes. This is for the – yes, okay.*" (Transcript, Day 65, pp.24–25).

448. Having regard to the totality of the evidence before it, the court cannot but conclude that the assertion made by Dr Pürer is correct, *i.e.* that it is possible to create water discharge regulations with a view to further reducing flood risk, and that this has been done.

449. Evidence of Mr Faulkner, Mr Cowie and Mr Shibatani. Dr Pürer does not agree with the opinions expressed in the statements of the aforementioned gentlemen. "*These opinions are not based on any recognised engineering standard for hydroelectric purposes*". (Pürer Affidavit, para. 7). As to Mr Shibatani's suggestion that the Lee Regulations should be more detailed, Dr Pürer considers ESB is an experienced operator of its hydro-power plants and no more detail is needed. As to Mr Faulkner's evidence, Dr Pürer considers it: generally "*an 'intellectual exercise'...with the benefit of hindsight*" (Pürer Affidavit, para. 7); and to pay insufficient attention to the fact that ESB is not authorised by law to flood other people's lands. Although the court considered Dr Pürer to be an impressive witness, it considered him in effect to be 'on the wrong side of history': most of the various contentions made by UCC throughout the proceedings seemed to the court to accord better with a proper analysis of the facts presenting and law arising. Specifically, the court does not consider that the evidence of Mr Faulkner was an exercise in hindsight, save to the extent that it identified with striking clarity a variety of failings that would have been obvious, with reasonable foresight, to ESB well in advance of November 2009, had it, *e.g.*, conducted a proper risk-assessment exercise (of which more below).

450. Fundamental misunderstanding of Lee Scheme. Dr Pürer considers that UCC's witnesses are guilty of a "*fundamental misunderstanding*" of the Lee Scheme which was "*constructed and officially approved to generate electricity...not for the purpose of flood control*". (Pürer Affidavit, para. 7). From this, and a later segment of his affidavit evidence, it is clear Dr Pürer does not accept that the Lee Dams are dual- or multi-purpose dams, and that he considers ESB's 'mandate' is to generate electricity in accordance with prevailing engineering standards. Per Dr Pürer: "*The Lee reservoirs are constructed and officially approved to generate electricity...not for...flood control.* [T]*he proposed 'Alternative Strategies' would require...conversion of the approved purpose of the reservoirs into a 'Multipurpose Scheme' for electricity production and flood control.*" (Pürer Affidavit, para. 7). Ultimately, of course, ESB's 'mandate' is the same mandate to which all private enterprise is subject: to comply with the law on pain of sanction in the event of breach. That includes the common law, yet to this Dr Pürer seems oblivious, He refers to the "*officially approved*" purpose of the Lee Scheme. He seems to forget that the Act of 1949 and the Order of 1945 do not exist alone; they sit bobbing in a swelling sea of legal obligations which align differently depending on the conditions and circumstances presenting. As to any suggestion, if suggestion there be, that electricity generation and flood control are irreconcilable, the overwhelming thrust of the evidence in this case is that this is simply not true. Were matters otherwise, how could ESB staff bring to their jobs that attentiveness to flood alleviation which, by their own accounts (see further Chapter 48), they so clearly bring?

451. Carrigadrohid Reservoir not a flood control reservoir. Dr Pürer indicates that the design of Carrigadrohid Reservoir is such that it cannot primarily be a flood control reservoir. Per Dr Pürer: "*The design of Carrigadrohid with deep sluices would be completely inadequate if flood control were the main purpose of the scheme because deep sluices are prone to driftwood jam in case of low reservoir levels.*" This seems rather caveated evidence. It indicates only that Carrigadrohid Reservoir is not designed with a "*main purpose*" of flood control; it does not state that the Reservoir cannot assist with flood alleviation as an ancillary function. As to the reference to "*low reservoir levels*", the levels Dr Pürer contemplates in this regard would be some way below TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35).

452. Lee Dams not built for limited overtopping. Dr Pürer indicates that the Lee Dams are not designed to be overtopped even in a design flood event: "*A reservoir level higher than the crest level during a flood may be tolerated in Carrigadrohid by a few 'cm' because of the parapet walls...because overtopping then is restricted to small areas. An overtopping of Inniscarra, even in small sections, is inadmissible since erosion of foundation material around the buttresses cannot be excluded.*" (Pürer Affidavit, para. 7).

453. No additional storage at Carrigadrohid in November 2009. UCC's witnesses contend that additional storage was available at Carrigadrohid during the event of November 2009 and could have been used to prevent/mitigate downstream flooding. Dr Pürer disputes this, pointing out that discretionary spilling was advanced and reservoir levels thereby "*repeatedly reduced to provide storage volume within the bounds of possibility and in respect of updated forecasts.*" (Pürer Affidavit, para. 7). He also considers, presumably by reference to the discretionary spilling clauses, that the Lee Regulations enable protective/pre-emptive tactics to be adopted by station staff "*within the context of operating a Hydroelectric Plant and considering the likelihood of an incorrect prognosis.*" (Pürer Affidavit, para. 7). The court accepts the evidence of UCC's witnesses in this regard. To take but one example, the holding back of water at Carrigadrohid on the evening of the 19th would not have been possible was there not additional storage available there. But even if the court is wrong in this, it is instructive to ask why there was not still-greater storage available at the reservoirs in the run-up to the flood event. The answer is simple: ESB completely and utterly failed in the days, weeks, months and years prior to the flood-event of November 2009 to keep reservoir-levels at TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35).

454. Independent/conjunctive operation of Lee Dams. Dr Pürer gives the clearest explanation of the independent/conjunctive operational dichotomy considered previously:

> "*The Plaintiff's witnesses recommend the conjunctive operation of Carrigadrohid and Inniscarra reservoirs during floods. The intention of the 'Regulations' is that the reservoirs may be treated as independent (first of all for energy production)*

but of course they also may and in November 2009 they were operated in conjunction. Each of the dams will be operated locally but coordinated by the Hydrometric Officer in consultation with the Chief Civil Engineer and the Hydro Manager. The reservoirs were operated in a coordinated fashion". (Pürer Affidavit, para. 7).

455. This explanation, that the "*independent*" operation to which the Lee Regulations refer at para. 1.1 concerns power generational purposes, appears to tally with the explanation offered by Dr Bree that during flood operations part of the top storage at Carrigadrohid is needed to safeguard Inniscarra; thus "*flood management and storage at the two reservoirs are linked.*" (Bree Affidavit, para. 41). It is odd, however, if Dr Pürer and Dr Bree are correct, that the Lee Regulations should continue to state, at para. 1.1, that "*In general, the two reservoirs, Carrigadrohid and Inniscarra, are treated as being independent of each other*" when in fact they are, at least when it comes to flood management and storage, intrinsically linked.

456. Downstream tributaries. When it comes to whether downstream in-flows should be factored into warnings given by ESB, Dr Pürer indicates that "*the consideration of occurrences...downstream of Inniscarra for warning purposes is outside the responsibility of ESB*". (Pürer Affidavit, para. 7). What is within the responsibility of ESB is a matter for the court. However, when it comes to releasing discharges into the blind in the manner with which Dr Pürer is so clearly comfortable, the evidence and, as will be seen, the law propel the court to the conclusion that, to echo Mr Shibatani, when it comes to ESB's operations "[t]*his is a significant shortcoming*" (Shibatani Report, para. 11.2). Indeed the court cannot but express some degree of censure that sitting upstream of Ireland's second-largest city, ESB would consider that in terms of its self-professed desire to be a 'good neighbour', and in the context of its having widely touted the flood alleviation benefits of the Lee Scheme, it is appropriate, never mind lawful, to discharge vast volumes of water from Inniscarra Dam whilst unaware of the circumstances prevailing further downstream, and hence the consequences of its actions in terms of potential loss of life and damage to property in the City of Cork.

457. 'Do not worsen nature'. ESB posits that its legal duty extends to 'not worsening nature'. The court has already considered what constitutes 'nature' in this context. Dr Pürer's oral evidence is of interest in this regard. First, because he freely admitted that building a hydro-dam will result in a worsening of nature. Second, because he reformulated the 'do not worsen nature' maxim, impressed on the court as a dam-engineering constant, into a new rule 'do not aggravate a hazard'. This new rule was not pressed by ESB, perhaps because it somewhat shifts attention from 'Mother Nature' to the role of the dams. But what struck home with the court was that the iron maxim, presented by ESB as a universal linchpin of dam engineering, would be reformulated at all. The relevant exchange between counsel and Dr Pürer went as follows:

> "*Counsel* [UCC] – [T]*he timing of...discharges could also worsen nature depending on...flow levels in rivers downstream; isn't that correct?*
>
> *Dr Pürer* – ...[B]*ecause a decision is made to open the gates at that particular time?*
>
> – *Yeah.*
>
> – *That is a discharge that may have the effect of worsening nature..?*
>
> – *For the period of the advance discharge, yes.*
>
> – *Yes.*

– *Yes…But, Judge, I am not happy with this….*[A]*fter all this discussion I see it is not a real good expression, not worsening nature. Because if you build a hydro power plant you worsen nature of course….You have to spend compensation water, you have fish passes, a lot of things…but you are allowed to do that by the permission. I would prefer to say 'not to aggravate a hazard'….I would prefer this expression.*" (Transcript, Day 64, p.81).

458. Risk management. Dr Pürer was cross-examined for some time about risk management. It is worth quoting some extracts from the relevant segment of his oral evidence. This is because one of the grounds on which UCC contends that ESB fell below the standard of reasonable competence in the run-up to the flood of November 2009 is that, despite extensive knowledge and awareness of flood risk at and below the Lee Scheme, it failed to undertake any risk assessment to identify steps that could have been taken to minimise downstream flooding. A significant exchange between counsel and Dr Pürer went as follows:

"*Counsel* [UCC] – *…I just want to explore what risk management did ESB have?*

Dr Pürer – *Yes, they identified several risks….*

– *And that involves also looking at the costs of avoiding the risks..?*

– *Yes. Costs, that's again, I believe that's again a point for the risk management authority…*

- *But leaving aside whose responsibility it is, that is how the question of risk management is approached, isn't that correct?*
- *Yes....*
- *And not just civic authorities, but businesses that operate facilities that have safety consequences, they have to engage in that?*
- *Yes....But flood, of course...flood is not something that arose or arises from the operation of a dam, flood is a natural hazard, a natural phenomenon....*
- [W]*hat causes a flood are a number of things: you firstly have to get the rain, isn't that correct?*
- *...Yeah.*
- *You can't control the rain.*
- *Yeah.*
- *But you do have an influence over the discharges from the dam?*
- *Yes....*
- *Therefore, you have an element of control...?*
- *To a certain amount, yes.*
- *Therefore, you look at....how you can exercise that control to best protect safety, that's what you do if you're doing a risk analysis, isn't that correct?*

> – ....*Yes, yes. I am not so happy with the expression 'risk analysis' in that concern. But anyhow, it's wording."* (Transcript, Day 65, pp.122–126).

459. The long and the short of Dr Pürer's evidence in this regard seemed to be that a risk assessment of the type contended for by UCC was something that ought to have been done by Cork's local authorities. The court must admit that by the end of the proceedings it had rather wearied of ESB's efforts to 'pass the buck' in this regard. The court considers that it is no answer at common law for a reservoir-owner releasing vast quantities of water from its reservoirs to 'cross its fingers' and hope for the sake of the life and property of those downstream that others have done what the reservoir-owner expects them to have done. The court is conscious in this regard that the inaction of the heedless should not inexorably heighten the liabilities of the prudent. But here, as will be seen hereafter, the court concludes that ESB was imprudent; and it is from that imprudence that its common law liabilities flow.

CHAPTER 35: MR RAMSBOTTOM'S EVIDENCE.

460. Description of expert and overview of evidence. Mr David Ramsbottom is a distinguished civil engineer, involved since 1975 in water engineering. The purpose of his evidence was to review the detail of the 2009 flood and to consider UCC's claims regarding the way in which the Lee Dams were operated during that event. In this chapter, the court focuses on aspects of his evidence not touched upon elsewhere.

461. Impact of reservoirs on 2009 flood. Mr Ramsbottom suggested that peak outflow from Inniscarra Reservoir ranges from 53% to 79% of peak total catchment in-flow. "*It is therefore* *apparent that the reservoirs attenuate flood flows.*" (Ramsbottom Report, para. 4.45). Part of this attenuation is likely to occur even if the reservoirs were not present because of natural river-valley attenuation. Consequently, Mr Ramsbottom undertook an analysis to determine the question of whether the reservoirs increase or reduce such attenuation as would otherwise occur. The results are of interest. Mr Ramsbottom has produced a series of flood hydrographs that show the effect of flows with and without reservoirs. These show that throughout 19th November 2009, the water-levels at Waterworks Weir (the point of reference used by Mr Ramsbottom) were significantly lower than if the Lee Dams were not there. To put a figure on matters, peak flow at the Weir is about $100m^3/s$ lower and the duration of the peak approximately two hours shorter than without the reservoirs. The effect of the reservoirs is therefore to reduce peak flow by about 10% and also total flood volume in Cork.

462. Warnings. When it comes to warnings, Mr Ramsbottom is at one with, *inter alia*, Dr Hughes in positing flood response as a multi-agency activity in which a hydroelectric dam operator has a limited role. "[T]*he overall management of floods within a river catchment will be outside the role and expertise of the dam operator*". (Ramsbottom Report, para. 5.60). Mr Ramsbottom acknowledges that a hydroelectric dam operator "*may*" be able to issue warnings of discharges to those in the downstream floodplain but considers this should not be viewed as the primary source of flood information. As to flood forecasting and warning systems generally, Mr Ramsbottom opines that these would "*normally*" be the responsibility of an organisation with overview of the river catchment and/or responsibility for flood management. (Ramsbottom, para. 5.61). As to the substance of flood warnings, Mr Ramsbottom considers "*these should be linked to the requirements of the recipients*"; this sits within his overall view as to the need for integrated flood management. "*The preparation and issue of warnings is...part of the overall flood response system.*" (Ramsbottom, para. 5.62). The issue of warnings is considered in greater detail in Chapter 18. It will be apparent from the court's closing comments in the context of Dr Pürer's evidence above that the court does not consider the statutory or other flood management obligations arising for local authorities yield a 'Get Out of Jail Free' card for ESB in terms of its own separate civil responsibilities and liabilities at common law.

463. Using Lee Dams for flood alleviation? By 'flood alleviation' Mr Ramsbottom means taking physical measures to reduce flood magnitude/consequences. He considers that the Lee Dams are hydroelectric dams whose only flood alleviation objective is "*not increasing natural flood-flow*". (Ramsbottom Report, para. 5.68). Mr Ramsbottom points to the fact that flood alleviation requires identification of the flood-size to be controlled because this determines rate/timing of discharges; this, per Mr Ramsbottom, is a "*policy choice*" and private electricity companies do not set policy. (Ramsbottom Report, para. 5.65). One fly in all of this is Mr Ramsbottom's follow-on observation that "*Flood control reservoirs are normally designed to mitigate the effects of a particular size of flood.*" (Ramsbottom Report, para. 5.65). This appears not to preclude the possibility that a reservoir could have as a purpose the mitigation of flooding generally (as opposed to mitigation of a particular flood-size). Regardless, it seems to the court that Mr Ramsbottom's evidence was broadly correct in allowing that a single-purpose dam can be operated in such a manner as to achieve flood alleviation without thereby becoming a multi-purpose dam.

464. Alternative operation of Lee Dams. A critical element of UCC's case is that the Lee Dams should have been operated differently during the 2009 flood, be it through (i) lower reservoir-levels at start-flood, and/or (ii) higher discharge-levels before start-flood, and/or (iii) earlier times of discharge, and/or (iv) greater water retention. Mr Ramsbottom identifies various factors that constrain application of these alternative means of operation: (1) any modification should only be undertaken in the context of integrated flood alleviation with a public body as the driver; (2) the scope for change is limited where power generation is to remain the main dam/reservoir function; (3) the effectiveness of alternatives identified at (i) to (iv) must be considered in context; thus (a) they must fit into a general scheme that is universally applicable to the dams, (b) they must take into account unpredictability of future events, and (c) the consequences of alternatives must be accommodated; (4) if dams are to provide flood alleviation, there must be a flood alleviation objective and associated flood response system that takes account of dam operating rules; and (5) the operating rules must be written for mandatory use and be accepted 'without regrets' under all circumstances. It all seems very complicated. UCC would contend, and the court agrees, that a dam operator is simply required to comply with the law, be it statute-law and/or common law. And the court would note in passing that the State does not typically wade in to assist private enterprises in deciding how their statutory and/or common law duties fall to be applied in a particular context. That is for those private enterprises to decide, informed perhaps by professional advice, and subject to liability under statute law and/or common law in the event that their interpretation or observation of such law is deficient.

465. Scenario testing. Mr Ramsbottom considered four scenarios in particular, (1) reducing operating water-levels (particularly when heavy rainfall warnings were first received), (2) early release of water to create additional storage, (3) ways of operating the reservoirs in tandem, and (4) use of information from other sources. His objective was to see whether the scenarios could significantly reduce outflow from Inniscarra Dam during the 2009 event. The approach used, by Mr Ramsbottom's own account, was "*simple*" (Ramsbottom Report, para. 8.7) and did not, *e.g.*, consider the decision-making process for opening the gates or the time taken for gates to move. Consequently, Mr Ramsbottom cautions that his scenario-testing results might overestimate achievable outflow reduction.

466. **[1] Reducing water-levels.** Reducing water-levels, Mr Ramsbottom found, could contribute to flood-risk reduction. Mr Ramsbottom found that to achieve a level of TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – before a storm-warning is received, it would be necessary to keep the water-levels at TTOL or below and discharge surplus water. An alternative would be to reduce water-levels to TTOL when the storm-warning was received. Mr Ramsbottom found the alternative scenario would have caused flooding downstream if the forecast storm did not occur or predicted rainfall was lower than occurred. Mr Ramsbottom noted that keeping water levels at/below TTOL restricts potential for power generation. "*For this scenario to be implemented it would be necessary to keep water levels low throughout the flood season…*". (Ramsbottom Report, para. 8.27). The alternative solution was not, of course, contended for by UCC. It contended that to comply with its common-law obligations ESB ought to have kept water-levels lower, pointing in this regard to TTOL. Apart from finding that TTOL restricts power generation at levels beyond 'optimised availability for power generation and minimal unnecessary spilling' – and why, apart from excessive greed, should ESB need to go beyond optimal? – Mr Ramsbottom in effect finds that there is no practical issue presenting with the ideal posited by UCC.

467. **[2] Early release.** Early release of water of about 150m^3/s occurred in November 2009. Mr Ramsbottom's results for this scenario show that if outflow had been increased further, peak flood-flow on 19th November would have been reduced. Mr Ramsbottom also found that

this would have led to an independent cause of flooding before the main flood event that would not otherwise have occurred. If the forecast extreme rainfall did not occur or was less than occurred, this flooding would not have been necessary. Neither, of course, would such flooding have occurred, or occurred to the extent that it did had ESB not persistently maintained water-levels at the Lee Reservoirs in excess of TTOL in the days, months and years prior to November 2009.

468. [3] Operating the reservoirs in tandem. Among the scenarios identified by UCC was increasing the water-volume stored in Carrigadrohid Reservoir by keeping the gates closed until water-levels reached a level at or above the fixed spillway level and above MaxNOL. Mr Ramsbottom did not analyse this scenario in detail. His greatest concern was that if the flow did not reduce on 20th November but continued at a high level, this could yield a threat to the safety of Carrigadrohid Dam. "*[T]his scenario may not be compatible with the requirement to safely pass the design flood*". (Ramsbottom Report, para. 8.31).

469. [4]. Use of additional information:

470. a. *Forecasts*. Mr Ramsbottom indicates himself to "*understand from ESB*" – he does not appear to have tested matters further – "*that more than 50% of severe rainfall forecasts are false alarms, which means that the severe rain that was forecast did not actually occur in more than 50% of cases*". (Ramsbottom Report, para. 8.32). When it comes to weather forecasts, Mr Ramsbottom's essential view is that "*they provide an important alert but further information is needed to assess the flood as it develops.*" (Ramsbottom Report, para. 8.34). This conclusion is premised on the logic that "*weather forecasts normally have a high degree of uncertainty*". (Ramsbottom Report, para. 8.34). The court notes that the reality is more nuanced. Though it will return to the issue of forecasts and reliance on same in Chapter 52, it is perhaps worth noting, given Mr Ramsbottom's evidence that while, of course, forecasts may be wrong, they can be wrong either way and the risk of under-prediction is assymmetric to over-prediction. Even if, in November 2009, a weather forecast had a 50% chance of being wrong, that meant it had an equal chance of being right. Such a risk demanded action of a more proactive and effective kind than was undertaken by ESB at that time.

471. b. *Gauges*. Rainfall, river-level and flow-gauges provide an opportunity to improve flood warnings. However, per Mr Ramsbottom, the time between heavy rainfall and the start of the rise of the water-level in Carrigadrohid Reservoir is short, about six hours. Such gauges, Mr Ramsbottom states, "*may provide some additional warning of what is about to happen but would only provide data hour by hour. It would not provide information for the whole event.*" (Ramsbottom Report, para. 8.38). As for river-gauges, he echoes Dr Bree's evidence, stating that these are closer to the reservoirs than the rain-gauges and provide less warning of what is coming. He points also to a fact stressed by Dr Pürer, that from the commencement of discretionary spilling on 16th November, ESB was discharging the maximum possible outflow. (Ramsbottom Report, para. 8.41). A further issue regarding use of rainfall and river gauges is reliability: gauges/telemetry may fail. During the 2009 flood event, a number of gauges failed or were unavailable. This, Mr Ramsbottom notes, is not unusual.

472. What is 'nature'? The importance of this question has been touched on above. In this regard, the following exchange between counsel and Mr Ramsbottom is of interest:

> "*Counsel* [UCC] – [T]*he construction of the dams fundamentally alters nature, isn't that so?*

Mr Ramsbottom – ...Yes, the dams alter nature, yes.

– *Mr Buckley...the plant manager at Inniscarra, has described the effect of the construction of the dams as changing what was a river ecology into a lake ecology?*

– *It sounds reasonable.*

– *So once the dams have been constructed nature has been changed fundamentally and irrevocably?*

– *That sound a – yes, okay, I will go with that.*

– *Okay. To the extent that the, as we can see from the CFRAMS Study, the dams are now considered to be an integral part of the catchment?*

– *Well, yeah, this is a strange argument really. They are certainly an integral part of the catchment. I am not quite sure, you would describe them as nature...I wouldn't. But, yes, they are an integral part of the catchment, that's true.*

– *I mean, you can't analyse the catchment, you can't analyse the flooding risk on the Catchment without looking at the dams?*

– *Hmm, well, that's an interesting question. No, you can't under present day conditions, that is true."* (Transcript, Day 79, pp.129–130).

473. In short, ESB's expert witness accepted that the Lee Scheme is a part of the ever-altering and long-altered landscape of County Cork and that flood-risk on the Lee catchment cannot now be done without having due regard, *inter alia*, to the presence of same.

CHAPTER 36: MR MANGAN'S EVIDENCE.

474. Description of Expert and overview of evidence. Mr Brian Mangan is a distinguished chartered engineer with more than thirty years' experience in hydrology. He is an independent consultant hydrologist, though largely engaged by ESBI. Mr Mangan's evidence primarily comprised a review of the background, development and operation of ESB's hydrological/hydraulic models. The description of ESB's hydrological and hydraulic models that follows draws heavily from his evidence.

475. Lee Flood Control and Dam Safety Report ("Lee FCDS"). ESB undertook a detailed study of its dam portfolio in the 1980s. The results of the studies on the river Lee were included in the Lee FCDS. In its assessment of the impact of extreme floods and dam failures on downstream areas, ESB used up-to-date river modelling packages to carry out inundation studies. ESB has sought to make play throughout these proceedings of the fact that these inundation studies "*were presented to the local authorities for inclusion in their emergency planning*". (Mangan Report, p.3).

476. MODEL. A flood modelling package incorporating the detail of the Flood Studies Report ("FSR") and published by the Institution of Civil Engineers in the 1970s formed a part of the Lee FCDS. This computer package (MODEL) forecast reservoir in-flow, water levels and hourly discharges for any given rainstorm and specified flood control regulations. It facilitated development/testing of procedures to ensure safe passage of design floods through the Lee Dams. MODEL's object was to facilitate accurate prediction of the flow-régime and water levels in the Lee Reservoirs. MODEL has two components: a rainfall run-off module; and the reservoir-routing module: The rainfall run-off module estimates the flow from individual river catchments for a given rainfall. The method is based on procedures recommended in the FSR. It yields hourly in-flows to the reservoirs. The reservoir-routing module routes in-flows through the Carrigadrohid/Inniscarra reservoirs, taking account of specified operating regulations. The outputs from this module are hourly reservoir levels and discharges. MODEL was calibrated using nine historical flood events and verified against a further five.

477. Hydraulic modelling. River modelling requires a dynamic routing technique to account for changes in the flood hydrograph through the downstream valley. Accuracy and reliability of model results depends to a large extent on the availability and quality of data used. During its studies of the 1980s, the most suitable hydraulic models available to ESB were used to assess downstream inundation due to extreme natural flood events and postulated dam-failure scenarios. On the Lee catchment, initial inundation studies covered the area down to Waterworks Weir. Following a request by the then Cork City Engineer in July 1990, these inundation studies were extended into Cork City.

478. Application of ESB Model to river Lee. The Lee Hydrological Model was initially used in estimating updated design floods and optimising the Lee Regulations. Using procedures developed in the FSR, the model was calibrated and used to calculate the flood in-flow profiles for various design events. The model was then used to simulate the passing of these in-flows through the Lee Reservoirs under various operating conditions. Initial reservoir-level at commencement of a flood-event and operation of gates/turbines determined reservoir-level and dam-discharge profiles throughout the event. Gate-openings could be adjusted on an hourly basis or determined by a specific regulation. The model demonstrated that Carrigadrohid Dam and Reservoir was not able to withstand the more rigorous design-flood requirements that emerged in the 1970s. The model was used to facilitate design and construction of the auxiliary spillway at Carrigadrohid, and in developing revised Lee Regulations.

479. Capacity to minimise downstream flooding. An exchange of interest between counsel for UCC and Mr Mangan concerned the amendment of the Lee Regulations over the years with the specific purpose of enhancing ESB's capacity to minimise flooding.

> "*Counsel* [UCC] – *Now, can I ask you to go to the next page....Here you explain...that: 'The objective of the revision is to reduce the peak Inniscarra discharges during flood events such as December 2009'..?*
>
> *Mr Mangan* – *Yeah.*
>
> – *So this exercise was not just about the rate of rise, this exercise was about trying to reduce the peak discharge..?*
>
> – *Well, they are interconnected?* [I]*f the rate of rise is lower the discharge at particular levels is lower...*[I]*t has a combined impact.*
>
> – *Yes. But you do accept...that one of the objectives of this review and of the revision to the regs was to try to reduce...peak discharge?*
>
> – *During flood events such as December 2006.*
>
> – *And therefore the reason for trying to reduce the peak discharge was to try and reduce flooding downstream..?*
>
> – *Well, to reduce the impact on the ramping up of discharges and consequently the size of the peak discharge....And the*

knock-on effect would have been to reduce the discharge coming from Inniscarra, yes.

– *...And that will reduce flooding downstream?*

– *It would be a contributing fact, yes.*" (Transcript, Day 77, pp.166–167).

480. This exchange seems rather to put the lie to the contention that there is a fundamental incompatibility between ESB's performance of a flood alleviation role and its legal mandate, a contention which the court has made clear elsewhere above that it does not in any event accept.

481. Flood assessments. It is current ESB policy to undertake retrospective assessments of significant flood events that occur on its hydroelectric catchments. On the Lee Catchment, post-flood assessment reports have been undertaken on the following flood-events: August 1986, February 1987, November 2000, December 2006 and November 2009. The data collected in these studies was used to assess the validity of the 'rainfall run-off' module in LeeMOD. The 'reservoir routing' module was used to assess the performance of the Lee Reservoirs during the events. A summary of the results of these studies follows.

482. [1] August 1986. Peak in-flow to the Lee Reservoirs during August 1986 was at the time the largest on record. The flood was caused by a severe rainstorm which lasted approximately 22 hours. This event is unusual for the river Lee in that it occurred during the summer. MODEL was used to analyse the event. It showed that regulation of the flood through Carrigadrohid and Inniscarra prevented flooding of a more serious nature downstream to Cork City. Results of modelling on the catchment, assuming there were no dams, indicated that levels downstream of Inniscarra would have been 0.5m to 1.0m higher.

483. [2] **February 1997.** Flooding occurred in a number of areas downstream of Inniscarra following heavy rain throughout the Lee Catchment. Spilling at Inniscarra occured before reservoir level reached MaxNOL. LEEMOD was used to assess the implications of this advance discharge. It demonstrated that peak discharge from Inniscarra would have been greater than $260m^3/s$ (the maximum hourly discharge from Inniscarra during the flood event was $230m^3/s$) had early spilling not taken place.

484. [3] **November 2000.** Heavy rainfall towards end-November and early-December 2000 resulted in flood conditions on the Lee catchment. The rainfall period was characterised by a series of storms that individually would not cause significant flooding, but in series, over consecutive days, resulted in significant, prolonged in-flows to the Lee catchment. During the flood of November 2000, the discretionary clauses of the Lee Regulations were applied. Spilling was effected prior to the water-level in the reservoirs reaching the obligatory spilling level. This operation was designed to increase storage capacity and flood attenuation attributes of the respective reservoirs. LEEMOD was used to assess the impacts of this operation which was found to have reduced flood in-flow impact downstream of Inniscarra. Hourly peak was reduced by about $50m^3/s$.

485. [4] **December 2006.** Heavy rainfall towards end-November and into December 2006 resulted in flood conditions on the Lee catchment. During this event, the discretionary clauses of the Lee Regulations were applied. Spilling was effected prior to water-level in the Lee Reservoirs reaching obligatory spill-levels. This operation was designed to increase storage capacity and flood attenuation attributes of the reservoirs. LEEMOD showed this operation

reduced impact of flood in-flows downstream of Inniscarra; hourly peak discharge was mitigated by about 28m^3/s.

486. [5] November 2009. During the November 2009 flood, the discretionary clauses of the Lee Regulations were applied. Spilling was effected prior to the water-level in the reservoirs reaching a level at which obligatory spilling is required under the Regulations. LEEMOD showed that this operation reduced the impact of the flood-flows downstream of Inniscarra. It is estimated that hourly peak discharge was mitigated by approximately 115m^3/s. The flood return period has been estimated to lie in the range of 50 to 100 years.

487. Real-time flood forecasting. As mentioned previously, the Lee Catchment is very 'flashy', with only a short time between rainfall and flooding. This is particularly true of the catchment upstream of Carrigadrohid. Decision-time for spilling is primarily related to the time of rainfall and then reservoir-level. For this reason, Mr Mangan contends, real-time flood forecasting on the Lee Catchment has to be strongly linked to rainfall monitoring. The use of real-time flood forecasting became popular worldwide in the 1980s/90s with the advent of sophisticated technology and data-processing power. When it came to the Lee it was considered that because of its 'flashy' nature, real-time forecasting would only give a few hours in which to make a decision about spilling.

488. Automatic rain-gauges. In 1986, the provision of automatic rain gauges in the Lee catchment which would transmit real-time rainfall data to ESB staff was identified as a means to improve the ability of Carrigadrohid to pass large floods. Six rainfall stations were selected and data from these transmitted to Inniscarra at regular intervals. This information, in conjunction with Met Éireann rainfall forecasts, assisted ESB staff in their assessment of gauging future in-flows. It was considered by ESB that, "*with the completion of the new spillway at Carrigadrohid in 1991 and the strict control of the Lee Reservoirs in accordance with the* [Lee] *Regulations, a real-time flood forecasting model was no longer absolutely necessary*". (Mangan Report, p.10).

489. Lee Flood Management Model/Lee Flood Forecasting Model. In 1997, following a flood event of that year, ESB's then Chief Civil Engineer commissioned the Lee Flood Management Model (also referred to as the Lee Flood Forecasting Model) in conjunction with a possible adjustment to the Lee Regulations. The objective of the model was to predict in-flow to Carrigadrohid and Inniscarra Reservoirs based on six existing real-time rain-gauges and meteorological forecasts. The Lee Flood Management Model was in effect an upgrade of LEEMOD. No new calibration was carried out and catchment response was based on previous studies. Appropriate percentage run-off figures were based on preceding rainfall. The model's objective was to assist in decision-making during floods, specifically the discretionary aspect of spilling pre-MaxNOL. The 'River Lee Flood Management Package and Users Guide' was supplied to Inniscarra Station in February 1998. A facility for the user to select high/low percentage run-off factors was added in 2001.

490. Inundation Studies. In 1987, inundation studies were commenced for all ESB dams. These studies were based on worst-case scenarios. In addition to providing useful information on risks associated with each dam, they provided valuable inputs to emergency planning procedures. These studies have been referenced in Chapter 19; it is the detail of the modelling that is considered below.

491. [1] Lee Inundation Study. This assessed the impacts of a failure of Innsicarra Dam downstream to Waterworks Weir, assessing the impacts of extreme natural floods and dam-breaks. The most widely-used model to estimate the dam-break effects was 'DAMBRK'. This model represented state-of-the-art technology in the understanding of dam failures, as well as hydrodynamic theory, to predict dam-break wave formation as it proceeds down the Lee Valley. Calibration was carried out using information from the 1986 flood and data recorded following a malfunction of gates at Inniscarra. The calibration was deemed by ESB to be satisfactory. The results of the study were presented as a series of peak flood levels throughout the downstream Lee valley.

492. [2] Carrigadrohid Inundation Study. In 1992, ESB completed a study which assessed the impacts of extreme natural events and a postulated dam failure on the river Lee between Carrigadrohid and Inniscarra. DAMBRK was again used to predict peak levels for 1,000-year, 10,000-year and dam-break scenarios. The study concluded that most flooding due to a dam-break at Carrigadrohid would occur downstream of Inniscarra. The postulated failure at Carrigadrohid resulted in overtopping of the dam at Inniscarra. Even if Inniscarra did not fail as a result of this overtopping, flooding downstream was estimated to be similar to that which would occur during a 10,000-year event; however, flood levels would occur at a faster rate.

493. [3] Cork City Inundation. A further study was carried out in 1992 at the request of Cork Corporation to assess inundations beyond Waterworks Weir. DAMBRK was not readily applicable to complex channel networks such as those in Cork City. So a computer package known as 'HYDRO' was used to model floods. HYDRO is a one-dimensional river-modelling package developed by Mott MacDonald, a prominent UK engineering consultancy. HYDRO was able to incorporate a wide range of structures and to model more complex river networks.

It was useful for modelling the North and South Channels through Cork City. The impacts of tide flooding on Cork were tested.

494. [4] Cork City levels – sensitivity to Inniscarra discharges. A further modelling study was done in 1994 to assess the impacts of less extreme Inniscarra discharges on Cork City water-levels. The North and South channels through Cork City were modelled using HYDRO and estimations of flood points made for various flows at Waterworks Weir. The study concluded that large river-flows would mainly affect areas upstream of North and South Main Street, in particular, along the Mardyke and Carrigrohane Road.

495. [5] Modelling November 2009. ESB has 'modelled' the events of November 2009. Mr Mangan indicates that the modelling suggests the following conclusions. (1) Percentage run-off factors during the November 2009 event were high but within the range previously modelled. (2) LEEMOD was used to estimate reservoir levels/discharges that would have occurred if the Lee Regulations had been rigidly applied. This indicated that peak discharge would have been more than $100m^3/s$ greater than that recorded. (3) LEEMOD was used to determine what the flood at Inniscarra would have been if the Lee Dams had never been constructed. This indicated that the flow would likely have exceeeded $700m^3/s$. (4) Floods are significantly attenuated at the Lee Reservoirs through application of the Lee Regulations. For smaller floods, increased attenuation is possible if reservoir-level is held lower in anticipation of a flood. "*However for larger floods the amount of attenuation may be reduced as the volume and rate of in-flow is more than...available storage can handle.*" (Mangan Report, p.14). (4) In the extreme scenario that the Lee Reservoirs were empty and large discharges made prior to reservoir levels reaching MaxNOL, Mr Mangan indicates the modelling to have shown that peak discharge could likely have been limited to less than $400m^3/s$:

"However, this would have necessitated significant spilling from the start of the month with consequent flooding of roads, land and even property. It is unlikely, even if the sole purpose of the reservoirs was 'flood alleviation', that this action would have been undertaken. Flood in-flows to the Lee reservoirs occur within hours of rainfall. Meteorological forecasting is improving all the time but decisions to cause flooding based solely on what might occur would not be recommended." (Mangan Report, p.14).

496. Public expectations as to warnings. One further element of interest in Mr Mangan's evidence were his observations as to public expectations of warnings. In a paper entitled "*Flood Risk Assessment and Communication, The Irish Experience*", presented by Mr Mangan for ESB/ESBI at an international conference of engineering professionals in 1998, he noted, at 10, that: "*The General Public expect to be adequately warned of the possibility of flooding. In general this is possible in Ireland and sufficient advance warning of flooding is usually available and consequently loss of life due specifically to flooding is very rare.*" During cross-examination, Mr Mangan was questioned about the just-quoted text:

"*Counsel* [UCC] – *I take it that represented your view and also the view of ESB and ESBI at the time, that the general public expect to be adequately warned of the possibility of flooding?*

Mr Mangan – *Yes. But that's why I needed to see the context. This is the Irish experience. I wasn't talking only about ESB*

Catchments. I was talking about the general public throughout Ireland...". (Transcript, Day 77, p.198).

497. Evolving societal standards, represented by such public expectations as are referred to above, are the transformative lifeblood that has excited singular advances in tort-law by way of a coruscating kaleidoscope of judgments over the last century or so, from Scrutton L.J.'s dissent in *Job Edwards Ltd. v. Birmingham Navigations Co. Proprietors* [1924] 1 K.B. 341, to the Privy Council decision delivered by Lord Wilberforce in *Goldman* v. *Hargrave* [1967] 1 A.C. 645, and on to the judgment of Megaw L.J. in *Leakey* v. *National Trust for Places of Historic Interest or Natural Beauty* [1980] Q.B. 485, all of which are considered later below and their implications for ESB assessed.

CHAPTER 37: MR CAWLEY'S EVIDENCE.

498. Description of Expert and overview of evidence. Mr Anthony Cawley is a distinguished hydrologist with over 24 years' professional consulting experience in the water-engineering field. The key elements of Mr Cawley's evidence concerning UCC's claim against ESB might be summarised thus. [1] The Lee Dams are "*self-evidently*" part of a power-generating scheme built, with limited capacity for flood-control (Cawley Report, para. 1.1.1). [2] To impose a flood alleviation function on such a scheme requires complex study and external co-operation which "*is not a reasonable task for a hydroelectric scheme owner*" (Cawley Report, para. 1.1.1). The court, of course, is not concerned *per se* with what is "*reasonable*" for a hydroelectric scheme operator but with what is required of such an operator by law. In this regard, the court would note that if politics is the art of the possible, then law is the fruit of that tree. So it follows that the law never demands the impossible: *lex non cogit ad impossibilia.*

And still it may demand the irksome, the challenging, or what a witness expert in matters hydrological may consider is "*not a reasonable task*" but which our ever-evolving common law, informed by the wisdom of the past and alive to the expectations of the present, may nonetheless impose by way of obligation. [3] The nature of the Lee catchment with its steep valleys and dense tributary network yields a peaky flood hydrograph that rises/falls rapidly. [4] The Lee Valley floodplain cross-section adjacent to UCC and the Mardyke is 400m wide. Developments here yield a "*throttling effect*" below Lee Fields, resulting in increased flood levels and obstruction of natural flood pathways, forcing flood flows down roads and around buildings (Cawley Report, para. 1.1.1). [5] Flooding in Cork City has been common over its history. [6] UCC's flood-affected properties were built on lands subject to previous flooding. [7] All of UCC's flood-affected properties were located in the low-lying flatlands of the Lee Valley on reclaimed swamp-lands, in-filled during previous centuries. [8] Flood risk assessments ("FRAs") and flood-studies for development sites/infrastructure projects close to or within flood-plains have been done in Ireland for decades. "*This was and is considered standard good engineering design practice*". (Cawley Report, para. 1.1.8). [9] The general minimum standard in Ireland, prior to the flood-event of November 2009, in recommending minimum floor-levels in flood-prone areas where detailed analysis was not available was to obtain a reliable maximum flood-level and apply a minimum 1m 'freeboard' (extra height) to allow for uncertainty, extremes and future change. [10] The November 2009 flood-event was caused by a combination of out-flow from Inniscarra Dam, and in-flows from downstream tributaries that amounted to about 23% of peak-flow at Waterworks Weir. The court cannot but note in passing that the effects of the November 2009 flood, as endured by UCC, would have been obviated or reduced had ESB, in the days, weeks and years prior to that flood but operated to TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power* *generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35). [11] Historical flood surveys suggest the 2009 flood-event was the largest flood at Waterworks Weir since 1853 and considerably larger than the 1916 flood-event. [12] The November 2009 flood could be described as "*the near perfect storm*" (Cawley Report, para. 1.1.14); prolonged rainfall throughout November resulted in a saturated system with limited storage producing high run-off rates when rain fell on 19th November. The storm characteristics produced high run-off rates. This resulted in flood peaks for downstream tributaries arriving/overlapping with the upper catchment flood-peak, yielding extensive city-flooding. [13] Taking into account the estimated return period of downstream tributary-flow and the estimated return period for in-flows into the Carrigadrohid/Inniscarra Reservoirs, the return period for the November 2009 flood-event can be estimated with 67% confidence as a 50 to 250-year flood event. [14] Storage volume in the combined reservoirs of Carrigadrohid and Inniscarra is "*relatively small*" (Cawley Report, para. 1.1.17), with a 1m rise in storage level at maximum operating levels representing a combined storage volume of 13.3 million cubic metres, translating to 17mm of effective rainfall over the total contributing catchment area of 792km^2; on 19th November, 2009, total flood run-off volume was 40.3 million cubic metres. [15] The Lee Reservoirs, "*depending on their initial water levels*" (Cawley Report, para. 1.1.18) provide a degree of attenuation/delay to timing of flood peaks; such protection is not the Scheme's objective. (Cawley Report, para. 1.1.18). Again, the court cannot but note, as at [10], the deleterious impact for UCC that ESB's consistent maintenance of water-levels in excess of TTOL had for UCC. [16] FRAs, in defining flood-risk zones, ignore "*the presence of flood protection measures such as flood defences and flood storage reservoirs (such as Hydro Electric Dams) as such defences carry a residual flood risk from overtopping or breach, or accidental release*" (Cawley Report, para. 1.1.19) – the court notes in passing the reference to hydro-electric dams as flood storage reservoirs. [17] The Lee Reservoirs attenuate in-flows, average attenuation being approximately 30%; attenuation achieved during the November 2009 flood-event was about 26%, suggesting attenuation performance was reasonably similar to previous floods. Yet again the court cannot but note that the flood-event of November 2009 would have been obviated or reduced had ESB operated consistently to TTOL, the level that it iself recognises as "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs.*" (O'Mahony Affidavit, 35). Again, it seems to the court that the only reason that ESB would operate beyond such an optimal level and thereby engender an exponential increase in risk to persons downstream is a desire for profit at the price of prudence. [18] Attenuation effects of the Lee Reservoirs on downstream flooding in Cork City is reduced by in-flow from the downstream catchments of the rivers Bride, Shournagh, Curragheen and lower Lee, representing almost 30% of the Catchment and 23% of flood-flow in November 2009; hydraulic modelling suggests the attenuation rate of the Lee Dams during the November 2009 flood was 12%; Mr Cawley estimates that without the Lee Dams the natural flood would have been 100cm^3/s higher. Had ESB but operated to TTOL, the downsteam effect of the flood-event would have been negated or lessened.

499. Summary of Mr Cawley's evidence re. contributory negligence. The key elements of Mr Cawley's evidence concerning ESB's claim of contributory negligence might be summarised thus. [1] FRAs and flood-studies for development sites and infrastructure projects close to or within flood-plains have been done in Ireland for decades. "*This was and is considered standard good engineering design practice to achieve safe and sustainable development.*" (Cawley Report, para. 1.2.1). [2] A FRA or flood study does not appear to have been carried out during the planning/design/construction of any of UCC's flood-affected buildings. "*The only flood risk assessment that appears to have been carried out by UCC was a simple assessment for the ERI building upstream of Waterworks Weir. In November 2009 this* *building came close to, but did not suffer flood damage*". (Cawley Report, para. 1.2.2) [3] In the case of UCC's affected buildings, good engineering practice was not followed, with finished floor-levels for all affected buildings set too low, without any alternate flood-defence provided; if a flood-level screening assessment had been done "*flood damage to UCC would have been considerably lower*". (Cawley Report, para. 1.2.4). [4] Despite the location and low finished floor-levels of affected UCC properties, no flood protection measures were provided. [5] There appears to have been no strategy plan prepared by UCC to deal with flooding and to minimise damage. [6] ESB is not a statutory consultee in the planning process; "[I]*t cannot reasonably be expected that they should have examined, assessed and advised on individual planning applications downstream in Cork City*" (Cawley Report, para. 1.2.7). [7] ESB did all that was reasonable and, in 1992 and 1994, provided Cork City Council and Cork Joint Emergency Group with ESB's flood inundation studies. [8] UCC should have been aware of the flood-risk to their buildings (a) given the depth of historical flood information available, (b) given the in-house hydrological expertise of UCC's academic staff, and (c) through consultation with Cork City Council engineers and planners. [9] UCC built within a known floodplain, with a long history of flooding, without carrying out appropriate flood-risk assessments "*and consequently their buildings flooded in November 2009*". (Cawley Report, para. 1.2.9).

500. General Hydrology of river Lee catchment. In his expert report, Mr Cawley considers a number of matters recounted in some detail elsewhere in this judgment, *e.g.* a general description of the Lee Catchment and a historical account of flooding in Cork both before and after the Lee Dams were constructed. His observations as to tidal and groundwater flooding are of interest.

501. [1] Tidal flooding in Cork. As is clear from the chronology of events on 19th/20th November 2009, the issue of tidal flooding and, more particularly the coincidence of fluvial and tidal flooding, was a matter of some concern to UCC staff. There is reason for this concern. Given the very low ground levels of Cork City Centre, tidal flooding and storm drainage issues are prevalent. In fact they represent the most frequent flood cause for the Patrick Street and Oliver Plunkett Street areas. Because these streets consistently flood, Cork City Council has for some time set a citywide minimum finished floor level of 3.1m for all new buildings. However, Mr Cawley notes that studies by Cork City Council indicate that a potential high-water surge level of 3.75m could present in particular conditions.

502. [2] Groundwater flooding. The Lee flood-plain overlies a buried valley which is a highly permeable gravel aquifer that reacts rapidly to changes in river/tide-levels. Rapid seepage into gravel aquifers makes engineering of flood defence embankments and walls, and protection of basements, difficult in terms of preventing seepage flows. An academic article from 2003 by, *inter alia*, Mr. A. Allen, a member of UCC's Geology Department, describes the drainage problems encountered during the construction works of the Glucksman Gallery, specifically when it came to the necessary basement and elevator shaft excavations into the permeable gravel aquifer. (See Allen A. and D. Milenic, "*Drainage problems during construction operations within a buried valley gravel aquifer*", (2003) 50(1) *Materials and Geo-environment*, 1).

503. Topography of flooded buildings. All of UCC's flood-affected buildings were located in the low-lying Lee Valley flatlands. Historical review of mapping for Cork shows that these valley lands were reclaimed swamp-lands, in-filled during previous centuries. Archival sources show recurring flooding of the Mardyke area (Sports Complex), Fitzgerald Park, Mardyke

Cricket Grounds, Western Road (Castlewhite and other buildings), the Greyhound Track (Western Gateway), Victoria Cross (University Hall) and Carrigrohane Road (Victoria Lodge). Early ordnance survey maps show the Mardyke as 'liable to flood'. The majority of the more recent UCC developments, per Mr Cawley, "*seem to have ignored flood risk in the planning and design stage....In my opinion this is very surprising given the history of flooding and the locations of the development sites in the Lee Valley floodplain*". (Cawley Report, para. 5.4.4). Mr Cawley's expert opinion is that when these planning applications were done, it was standard for flood assessments to be done. But no flood assessment report was included with the planning applications for the Glucksman Gallery, Maltings Complex/Tyndall Institute, University Hall, Enterprise and Butler Building, and the Mardyke and sports arena.

504. Absence of FRAs. A FRA does not just assess potential for flooding of a development. It investigates the impact of such a development and suitable flood mitigation measures. As mentioned above, the only UCC development done in the years immediately prior to the 2009 flood and which was accompanied by a preliminary FRA was the ERI building back in 2002. "*Unsurprisingly this building did not flood in 2009.*" (Cawley Report, pata.5.4.12). The flood risk assessment done for the ERI building involved an investigation of the highest known flood-level previously known at the site and resulted in a recommendation that the proposed building's finished floor level be set 1m higher than this historical high. The building was eventually built to a slightly lower finished height; even so, the additional height added was "*sufficient to protect the main part of the ERI building against the extreme flooding of November 2009*". (Cawley Report, para. 5.4.12). Mr Cawley considers that all recent UCC planning applications in and adjacent to the Lee floodplain, including those flooded in 2009, should have undergone a prior FRA. Such FRAs were "*reasonable and common practice*". (Cawley Report, para. 5.4.16). It is Mr Cawley's expert view that "*had, even a simple flood* *risk assessment study...been carried out and acted on...the flood damage to UCC would have been considerably lower*". (Cawley Report, para. 5.4.17).

505. November 2009 Flood Analysis. Mr Cawley undertook a hydrological analysis of the flood event of November 2009. Much of his analysis overlaps with that of Mr Faulkner and finds echoes more generally in the evidence considered above. Although the court has had regard to the entirety of Mr Cawley's evidence, it confines itself here to an analysis of those elements of his evidence which appear novel and/or of especial interest.

506. [1] Extent of flooding at UCC. In the flood event of November 2009, on-campus flooding at UCC commenced on the evening of the 19th, peak levels occurring between 02:00 and 06:00 on the morning of the 20th. On the campus, circa. 30% of UCC's building stock was affected, with some 13% directly damaged at basement and ground-floor levels. Of especial interest is Mr Cawley's mention of the finished-floor levels at the flooded buildings as "*relatively low-lying*". (Cawley Report, para. 6.2.2). Mr Cawley's continuing point in this regard is that if an ERI building-style flood analysis been done and finished floor-levels set higher, much of the flooding that took place on the 19th/20th could have been avoided.

507. [2] Rarity of rainfall/flood event. Mr Cawley notes that return periods for rainfall on a river catchment do not directly reflect the return period of catchment run-off. Storm duration, storm profile, antecedent rainfall and catchment wetness affect run-off rates and influence flood-return period. Per Mr Cawley, the combined effect of prolonged heavy rainfall in excess of 20 days' duration in November 2009, a still wetter period from 15th November onwards, and intense 24 hour rainfall on 19th November resulted in an unusually wet catchment that produced very high percentage run-off rates (typically 82%), culminating in the extreme flood-event of 19th/20th November which, combined with other in-flows, caused flooding in Cork City not witnessed perhaps since 1853. In-flows to the Lee Dams, he estimates, were of the order of a 100-year return period, with downstream peak-flows in the rivers Shournagh and Bride being in excess of 100 years, as was the peak-flow at Waterworks Weir.

508. [3] **Flood Attenuation.** Mr Cawley has prepared a table showing historical maximum floods since the completion of the Lee Scheme, ranked in order of out-flow magnitude. It is clear from the table that the Lee Reservoirs attenuate in-flows. Average attenuation rate between in-flows into the Lee Reservoirs and out-flow from Inniscarra Dam is approximately 30%. Attenuation achieved during November 2009 was about 26%, indicating that attenuation performance during that event was "*reasonably similar*" to previous flood events. (Cawley Report, para. 7.1.3). The nature of a flood-event significantly affects the degree of attenuation safely achievable by the Lee Reservoirs. The table shows that, without the Lee Dams, larger floods would historically have been visited on the Lee Valley and Cork City, particularly in 1986 and 2009. "*If the function of the dams was for flood protection…then it would have been operated differently, principally by lowering reservoirs in advance based on a forecasted flood and by generally keeping the reservoir operating level lower particularly during the winter flood period (November to March).*" (Cawley Report, para. 7.2.1). Mr Cawley is sceptical that an initial spill-rate of $150cm^3/s$ would be increased by ESB even if the Lee Dams had a flood protection role. This is because flows above this rate can produce out-of-bank flooding downstream, and so flooding of third-party lands. Moreover, Mr Cawley adds, a higher spill-rate would compromise public road access and a number of downstream properties, particularly if it coincided with downstream tributary flows. Plus dam integrity (*i.e.* design flood) requirements would still apply. And ultimately, even as flood attenuation dams, they are of limited storage and consequently cannot provide full protection to all properties downstream under design flood conditions – not, the court notes, that UCC has contended for such a standard of protection.

CHAPTER 38: MR FLEMING'S EVIDENCE.

509. Description of Expert and overview of evidence. Mr Gerald Fleming is the Head of Forecasting with Met Éireann. Called by ESB, his evidence focused on whether the present state of meteorological science is such that one could use weather/rainfall forecasting to a greater extent than ESB has historically done in determining whether and when to release/store waters at the Lee Scheme, and whether a design storm has arrived or is *en route*. The key issues Mr Fleming considers are (i) the degree of uncertainty in weather forecasting, (ii) the provision/usefulness of weather warnings, (iii) catchment versus point forecasts, (iv) Met Éireann's role in major emergency planning, and (v) the evidence of Mr Dale.

510. Uncertainty in weather forecasting. Mr Fleming indicates that uncertainty in weather forecasting is related to various factors. [1] *Size of the area to which forecast relates.* In general, the larger/smaller the area to which a forecast relates, the greater/lesser the forecast certainty. This also holds true of larger weather systems. [2] *Short-range, medium-range and long-range forecasts.* Uncertainty increases with the length of time that one looks ahead. Usually around eight to ten days, uncertainties associated with providing detail are such as to render detailed weather forecasts "*essentially useless*". (Fleming Statement, p.2). In particular, Mr Fleming refers to forecasts of heavy rain as being among the most difficult to get right. If the forecast is for one or two days hence, uncertainty of the forecast is about 30% (so a 70% chance of occurrence). With a forecast of four to five days ahead, uncertainty is about 50 to 55 percent (so a roughly 'evens' chance of occurrence). For a rainfall forecast eight to nine days ahead, uncertainty is 80% (so a 20% chance of occurrence). [3] *Duration of forecasted time-period.* The weather at a given place and time is made up from large- and small-scale features. The latter have shorter lifespans and are less easy to predict accurately. So, while a forecast might predict accurately rainfall accumulation over a day, the predicted accumulation over a 20-minute period during that day will carry higher uncertainty. [4] *Season.* In the mid-latitudes, *i.e.* where Ireland is situated, there is seasonal variation in uncertainty. Forecasts for winter months are much more certain than summer forecasts. This is because the vigour of winter weather systems makes them more vulnerable to prediction. [5] *Character of geographic area.* Weather is influenced by topography. A forecast for a mountainous region carries greater uncertainty. Proximity to the coast is another source of uncertainty. [6] *The particular weather parameter.* A forecast service must deal with a range of different parameters, *e.g.* wind-speed and direction, pressure, temperature, humidity, cloud, rainfall. Not all of these can be forecast with the same certainty. Wind and pressure can be forecast with the highest certainty. Next comes temperature and humidity. Least certain are forecasts of cloud amount and rainfall. [7] *Weather forecasting improvements.* Over the past decades, uncertainties around weather forecasts have decreased significantly, thanks to a number of factors. First, more powerful computer facilities allow mathematical models of weather systems to be run at finer resolution. Second, improvements in weather satellites have resulted in far more observed information. Third, ongoing improvements in scientific understanding of atmospheric processes have been worked into applicable mathematical models.

511. Provision and usefulness of weather warnings. A weather forecast is a statement/opinion on likely weather at a specified location at some future time. A weather warning is a more formal statement that a specific weather parameter or group of parameters is likely to exceed one or more pre-set defined thresholds. Met Éireann issues public service weather warnings and customer weather warnings (tailored to thresholds defined by particular clients). Met Éireann makes mention of spot-flooding on roads and coastal flooding; these forecasts are general in nature. Met Éireann does not issue more general flood warnings. Per Mr Fleming:

> "*The generation and issue of Flood Warnings would require...hydrological and meteorological expertise; Met Éireann does not have hydrological expertise. There is no national flood-forecast service available in Ireland, although some individual rivers and coastal locations benefit from localised flood-forecast systems. These are mostly the work of the Local Authority concerned and the Office of Public Works.*" (Fleming Statement, p.4).

512. Met Éireann and emergency planning. "*Met Éireann have been involved in assisting Local Authorities and others in preparing for and responding to major emergencies for many decades.*" (Fleming Statement, p.5). This involvement, Mr Fleming indicates, took on a more formal aspect in 2008 with the publication of the 'Framework for Major Emergency Management'. Met Éireann's role in this framework is (a) timely communication of weather warnings to local authorities, (b) to provide advice, interpretation and ancillary information to the 'emergency management community', (c) to provide a forecaster to the National Emergency Response Coordination Committee, (d) to provide expert advice to Government, and (e) to participate in media briefings.

513. Upscaling rainfall. There have been a number of suggestions that the forecast rainfall values provided by Met Éireann to ESB in November 2009 ought to have been up-scaled by dam operators. Mr Fleming is dismissive of this suggestion for three reasons. First, all forecast values have an uncertainty. "*Attempting to apply a precise upscaling factor to a figure with such an inherent uncertainty is meaningless.*" (Fleming Supplementary Report, p.3). Second, forecast values received by ESB were frequently modified by the duty forecaster by reference to other information. This, Mr Fleming suggests, would render invalid any statistical analysis that would underlie upscaling. Third, there may be merit in upscaling rainfall when calculating long-term averages/extremes; for day-to-day operations, other factors would come into play, the most obvious being wind. The complexity of the relationship between forecast rainfall and total rainfall, never mind factors such as antecedent rainfall and temporal distribution, "*is simply too great to be adequately represented by one single upscaling figure*". (Fleming Supplementary Report, p.3). Mr Fleming indicates that in the context of longer-term rainfall, the upscaling factor would be about 10%. It is not clear how he derives this estimated figure. Implicit in Mr Fleming's comments about up-scaling appears to be an acknowledgement that in all forecasts provided by Met Éireann to ESB around 2009 there is an under-estimation of forecast rainfall. Knowledge of the fact of this under-estimation, whether quantifiable or not, is likely something that would have been of use to ESB had it been aware of same. It is not clear to the court that ESB was so aware; it was the view of Mr Dale that it ought to have been.

CHAPTER 39: MR STOKES' EVIDENCE.

514. Description of expert and overview of evidence. Mr David Stokes is a distinguished economist who has worked in energy and financial markets since 1996. He was called by ESB to give expert evidence on the "*commercial operation of reservoir hydroelectric systems*". (Stokes Report, para. 1). His evidence might be summarised as outlined hereafter.

515. [1] Principles of commercial operation. Operators of hydro-electric reservoir systems typically work within a set of regulatory guidelines. Managing such systems, given uncertainty around in-flows and electricity prices, is complex. "*In response...hydro system operators typically define a commercial and operational framework to support decisions on how much water to store...and when to discharge water to generate electricity.*" (Stokes Report, para. 1).

516. [2] Commercial operation of Lee Scheme. Mr Stokes states: "*It is our understanding that...*[TTOL] *represents an internal benchmark...developed as part of ESB's commercial and operational framework for managing the Lee hydro system.*" (Stokes Report, para. 1.) He continues: "*Analysis of historical operational data shows that dam head levels have regularly risen above TTOL. This is consistent with...use of TTOL for commercial guidance rather than...a hard constraint.*" (Stokes Report, para. 1). It is also consistent, of course, with squeezing more profit from the Lee Reservoirs than would be attained if there was rigorous striving for TTOL.

517. [3] Water levels. Mr Stokes indicates that ESB focuses on water management, subject to MaxNOL and MinNOL levels. (Stokes Report, para. 1). It is not clear whether his understanding in this regard is based on instructions received, or follows an investigation by Mr Stokes. "*Within these constraints...ESB has adopted a commercial and operational framework that aims to add value from (i) seasonal regulation of reservoir levels...and (ii) use of available water...to shape generation output into periods of higher wholesale electricity prices.*" (Stokes Report, para. 1).The court understands Mr Stokes to mean in this regard that TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony

Affidavit, 35) – is a commercial tool, not a flood-level tool. Even if this were so, adherence to TTOL carries substantial flood-alleviation benefits.

518. [4] Cost-benefit analysis of TTOL. Mr Stokes' analysis suggests that long-term average incremental monthly value from operating above TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – is €55,000. If one takes the flood of 2009 as a 100-year flood, then operational flexibility that allowed levels to rise above TTOL over a 100-year flood incidence period would yield €21m net present value.

519. Commercial operation of hydro-reservoirs. Technology limitations have the result that it is difficult to store large volumes of electricity. As a result, energy needs to be stored in other forms to support security of supply. Hydro-storage is valuable in supporting effective operation/balancing of power systems. Because the amount of water (stored energy) in a reservoir is constrained by reservoir size, commercial optimisation of the hydro-system is focused on when to flow water through turbines.

520. Impact of uncertainty. As hydro-electricity operators make decisions on when to use/store water, they are confronted by uncertainty, *e.g.* as to hydro-in-flows and market prices. The operator does not know (i) when reservoir levels will be replenished, (ii) how valuable future electricity generation will be. Per Mr Stokes: "*Uncertainty around these two factors means…hydro system optimisation is not a mathematical problem with a discrete formulaic solution. Instead hydro system operators typically define a commercial and operational framework to support decision making on how much water to store…and when to…generate.*"

(Stokes Report, para. 3.3.3). This suggests that TTOL is a decision-making support tool, not an operating-level. But how is one to reconcile this with the statement in the Lee Regulations (at (iv)) that "*The 'target top operating level'* [TTOL] *is the top operating level which the station shall endeavour to maintain during non-flood conditions.*" The truth is that TTOL is a level and despite the very best efforts of ESB in the within proceedings the inconvenient truth remains that it is stated clearly to be such in the Lee Regulations. They define TTOL (at *iv*) as the 'Target Top Operating Level', not the 'target top decision-making support tool' or whatever else ESB or its witnesses might suggest TTOL to be. It may be, as Juliet suggests, that "*A rose by any other name would smell as sweet*", but calling what is patently a water-level by another name reeks of desperation.

521. Management of reservoir-levels. Mr Stokes indicates that a hydro-electric operator is required to choose whether to release/store water based on expectation of (i) reservoir replenishment, (ii) current versus future electricity values, and (iii) operating obligations. But actual in-flows and market outcomes may differ from expectations. "*As a result...defining an approach to determine...optimal reservoir levels at any given...time is ...a key component of the commercial and operational framework used to manage a reservoir hydro system.*" (Stokes Report, para. 3.3.4). This logic suggests TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – is a flawed endeavour to plot what is/should be the optimal level at which to operate. In this regard, the court would but refer to its observations in the preceding paragraph.

522. Regulatory constraints. In Mr Stokes' experience, regulation of commercial operation of hydro-electric schemes varies by country but typically includes legislation and hydro-system regulations. "*Within these constraints the hydro operator can then optimise...commercial value*". (Stokes Report, para. 3.3.5). Un-mentioned by Mr Stokes is the potential application, in common-law jurisdictions, of the common law.

523. MaxNOL, MinNOL, TTOL. Mr Stokes considers that ESB has two "*hard constraints*" on dam head-level, MinNOL and MaxNOL and a "*target reservoir level*" (TTOL). (Stokes Report, para. 4.3). "*It is our understanding that TTOL represents an internal benchmark.*" (Stokes Report, para. 4.3). It is not clear whether this understanding derives from Mr Stokes' own independent assessment or merely repeats what he has been told by ESB. Either way, the court respectfully concludes that it is not wholly correct. TTOL is defined in the Lee Regulations (at *iv*) as "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" and is aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs.*" (O'Mahony Affidavit, 35). If one might borrow from the logic of Gertrude Stein, a level is a level is a level. The only way it falls to be construed as an internal benchmark is that clearly the level at which any one dam will yield 'optimal availability for power generation and minimise unnecessary spilling of water' will likely be different from other dams. Because that level attaches to that dam and because, in this case, the relevant dams are owned by ESB, TTOL (the 'target top operating level') represents a benchmark internal to ESB – but it is a benchmark level. Mr Stokes goes on to note that at the Lee Scheme the relatively large size of potential in-flows versus reservoir volumes creates a natural tendency for levels to exceed TTOL "*even if...generation turbines are run at high output*" (Stokes Report, para. 4.3). Mr Stokes makes it sound so hard to operate to TTOL that one might wonder whether it is an attainable level. And yet always there is that provision in the Lee Regulations, quoted above, which suggests that ESB thought it a generally attainable level, at least until these proceedings commenced.

524. Operation of the Lee Scheme in 2009. Mr Stokes undertakes a brief analysis of operation of the Lee Scheme in 2009. Though of interest, his evidence adds little to the hydrological evidence provided by other witnesses. Of greater interest are his insights into the commercial imperatives driving ESB around that time:

> "*A flood of the scale of November 2009 was a very low probability event....Reducing dam head levels over a prolonged period in anticipation of such a low probability flood event, has a substantial cost attached....Once the period of high in-flows in November 2009 commenced, the Lee system operator also had little commercial flexibility around reservoir levels given the scale of in-flows compared to reservoir storage volume and the overriding...operating regulations.*" (Stokes Report, para. 4.4).

525. It is hard to avoid the impression that Mr Stokes does not see TTOL ("*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*)) as much of a level at all. Rather, it seems something that is generally to be exceeded, rarely to be attained, observed at the cost of profit, and of no relevance in the flood context. But, for the reasons stated above, it appears to the court that, with respect, his version of TTOL cannot be reconciled with the simple, straightforward, plain-English text of the Lee Regulations.

526. Lee Scheme and Ireland's power market. Once the water above MinNOL is used, the Lee Scheme ceases to generate electricity or provide capacity until there are further in–flows.

Per Mr Stokes: "*Maintaining low reservoir levels increases the risk that a period of low in-flow will result in…dam head level approaching MinNOL*". (Stokes Report, para5.2). One might be forgiven for thinking that UCC has contended for operation of the Lee Dams at or about MinNOL. It has not, and when it comes to dams that, per Mr Shibatani, have a 9:1 refill rate in any one year, the risk for which Mr Stokes contends seems, with respect, to be exaggerated when one has regard to this last reality.

527. Creating value through flexibility. Mr Stokes indicates that a flexible approach to reservoir use maximises profit. His observations are beguilingly specific and surprisingly vague. In a nutshell, he seems to consider ESB's approach to reservoir use to be 'get as much as you can from the reservoirs, all things considered' – all things except downstream flooding:

> "*Energy revenue from the Lee hydro system can be enhanced by use of reservoir flexibility to manage seasonal in-flow…via:*
>
> *(i) Avoiding lost revenue from spill*
>
> *(ii) Ensuring adequate water is stored to support generation*
>
> *(iii) Increasing turbine efficiency….*
>
> *Reservoir flexibility can…be used to define Energy Limit parameters such that output is shaped into periods of higher electricity value…*
>
> *Our understanding of ESB's operation of the Lee hydro system is…it is focused on water management through the system subject to maximum and minimum reservoir level operating constraints (MaxNOL, MinNOL). Within these constraints…ESB has adopted a commercial and operational framework that aims to add value from:*
>
> - *Seasonal regulation of reservoir levels….*

- *Usage of available water in reservoirs to shape generation output according to expected...market differentials.*" (Stokes Report, para. 5.3).

528. Where does TTOL come into this, *i.e.* "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regulations, *iv*)? Like the dog that did not bark, the absence of reference to same seems telling.

529. Quantifying the benefits of flexibility. Mr Matt Brown estimated the additional profit to ESB during November 2009 from generating above TTOL was between €100–130k, *i.e.* 9 to 12% of the roughly €1.1m earned by the Lee Scheme in November 2009. Putting matters conversely, Mr Stokes arrives at almost the same result, *i.e.* that the loss to ESB had it not generated above TTOL would have been about 10% of the roughly €1.1m earned by the Lee Scheme.

CHAPTER 40: DR BOWLES' EVIDENCE.

530. Description of Expert and overview of evidence. Dr David S. Bowles is a distinguished civil engineer and hydrologist. He was called by ESB to give expert evidence on the operation of hydro-power dams in relation to flood storage. This was in the context of certain comparisons made by Mr Jeremy Benn concerning the operation of hydro-power reservoirs internationally. In this, his evidence was largely unnecessary. The court does not consider that the Lee Dams ought properly to be considered as multi-purpose dams. The international comparators to which Mr Benn referred were such. So, to this extent only, the court has discounted the evidence of Mr Benn. As a result of the foregoing, the court gives a summary of Dr Bowles' evidence, rather than engaging in extensive consideration of same.

531. Dr Bowles helpfully summarises his expert views thus:

> "*I am not aware of any cases where hydropower reservoirs provide flood alleviation by drawing down the reservoir pool to provide flood storage...unless this is...planned for and required in their operating rules by a governmental...agency. To deviate from established operating rules could endanger the safety of the dam or lead to the need to suddenly increase reservoir releases that would increase downstream flooding. This would not be...prudent practice....*
>
> *The examples cited in...Jeremy Benn's... 'Report on the Hydraulic Modelling of the Lower River Lee and other related issues relating to the November 2009 flood in Cork' are inappropriate comparisons for...operation of a hydropower scheme that does not have a requirement to provide flood alleviation...*" (Bowles Report, p.2).

532. Dr Bowles does not expressly consider the possibility that a common law duty/liability could arise. He also appears concerned solely with the 'empty storage' line of argument, not the TTOL line of argument, *i.e.* that by more consistent compliance with its own rule whereby TTOL is to be the "*top operating level which the station shall endeavour to maintain during non-flood conditions*", ESB would have occasioned less or little flood-damage in November 2009. Dr Bowles does not consider the issue of warnings. It appears that he subscribes to the general view advanced by ESB that the complicated task of running a single-purpose hydro-power dam is guided ultimately by two paramount precepts: 'avoid dam collapse' and 'do not worsen nature'.

533. Hydropower and water-levels. Dr Bowles indicates that single-purpose hydropower reservoirs "*usually operate*" at high water-levels to maximise power generation. (Bowles Report, p.2). He maintains that this "*well accepted*" practice does not provide available reservoir capacity for storing/attenuating flood peaks. (Bowles Report, p.2). He indicates that hydro-electric dams are configured for generation of hydro-power and for passing (not storing) floods. To add a flood alleviation purpose, he contends, would not just require a change in operating rules but a change in design of reservoir discharge facilities. His assertions are sweeping and he does not distinguish between MaxNOL and TTOL – the latter being, of course, "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – as an alternative, level. Dr Bowles' world is one of notable rigour where one simply stores water high and where "*flood alleviation purposes are included in the original project purpose or…imposed on hydropower operators by an external regulatory agency*". (Bowles Report, p.2). Missing from this analysis is any acknowledgement of the common law and such obligations as it may present.

534. Outflow and in-flow. It will be recalled that under para. 1.4.1.1 of the Lee Regulations, "*The peak discharge shall not be allowed to exceed the peak in-flow during the rising flood.*" Dr Bowles subscribes to this rule, noting that it applies only "*until after the peak of the flood has passed, when the rate of…outflow must exceed…concurrent rate of in-flow*". He maintains that this rule precludes making "*higher flood releases than the concurrent rate of in-flow in the early part of a flood to create flood storage space*". (Bowles Report, p.3). It is not clear that Dr Bowles is entirely at one in this regard with ESB. The Lee Regulations, at para. 1.1, endow the

Hydrometric Officer, to the point when MaxNOL is attained, with the option of discretionary spilling "*in order to increase storage and/or to reduce flooding at a later stage*", subject to various constraints.

535. Deviation from established rules. Per Dr Bowles: "*Deviating from established operating rules by surcharging a reservoir to higher levels than it is designed to withstand could result in a dangerous loading condition for the dam and...spillway gates*". (Bowles Report, p.3). By the phrase "*higher levels than it is designed to withstand*", the court assumes that Dr Bowles means to refer to MaxNOL; for him, there seems no place for TTOL. A particular concern mentioned by Dr Bowles is that reservoir operators are not qualified to evaluate dam-safety implications of deviations and so are required to comply strictly with operating rules. His apparent disregard for the expertise of dam operatives sits uneasily with the evidence of other expert witnesses, such as Dr Bree and Mr Cowie whose faith in the experience and expertise of dam operatives seems to enjoy a solid and greater foundation in the facts as presented.

536. Forecast-based dam management. As to forecast-based dam-management, Dr Bowles states that: "*Where forecast-based operation has been considered, it has included a significant margin of safety to accommodate inaccuracies*". (Bowles Report, p.3). It does not appear that such a system of operation has been contemplated/trialled at the Lee Scheme.

CHAPTER 41: MR TOM BROWNE'S EVIDENCE.

537. Description of Witness and overview of evidence. Mr Browne is the Asset Assurance and Engineering Manager for ESB Generation. His evidence overlapped heavily with that of other witnesses. Perhaps the area of most interest in his evidence was his commentary on the history of TTOL. Per Mr Browne:

> "*The intention of defining...TTOL is to ensure where possible that the reservoirs are operated to levels that would allow operation over a range of weather conditions without having to spill....The target is lower in winter than...summer (a) in recognition of the fact that drought conditions are less likely in winter and (b)...to utilise more space in the reservoir without having to spill....When...reservoir level exceeds* [TTOL]...*but does not exceed* [MaxNOL], *the station generator runs the generating units more frequently or at a higher output...to reduce levels towards the target....*[T]*his reduction happens by generating, not by spilling.*" (Browne Affidavit, 9.iv.14, p.13)

538. Mr Browne acknowledges that TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – is a level, and explains it in terms which accord with Mr O'Mahony's description of TTOL as "*basically economic targets, whose main purposes are to provide for optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs.*" (O'Mahony Affidavit, 35). He then somewhat blurs matters by describing how it operates in the context of MaxNOL which is of course a very different level, concerned with design flood management and thus a separate and different matter to TTOL, the optimal operational level identified by ESB for ESB, yet consistently exceeded by ESB in an apparent preference for profit over prudence.

CHAPTER 42: THE EVIDENCE OF MESSRS PRENDERGAST, CONNAUGHTON, MEHIGAN AND MS MAGUIRE

539. Mr Prendergast's evidence. Mr Prendergast indicates that he "*understood the warnings periodically received from ESB to mean…there would be a larger volume of water flowing in the river, and we should avoid activities on or near the river banks.*" (Prendergast Affidavit No.2, para. 1.1). It was never properly explained how this understanding arose. It likely came about because no-one at UCC appears ever to have asked ESB what the intended purport of its warnings were. "*ESB never gave me any hint that UCC's buildings were at risk*". (Prendergast Affidavit No.2, para. 1.1). At a general level, a query arises whether it is not for UCC in the first instance to assess risks to its buildings and to take appropriate mitigation measures. At the particular level, the adequacy of the warnings given by ESB on 19th November, 2009, is a significant issue arising and is considered in Chapter 18. Mr Prendergast expresses himself surprised that ESB did not share the inundation studies more widely; as indicated above, they were in fact widely shared by ESB.

540. Mr Connaughton's evidence. Mr Connaughton is the Western Campus Facilities Manager. He complains that on 19th November "*ESB never warned us that our buildings were at risk of flooding arising from discharges of water from the dams*". (Connaughton, Second Affidavit, para. 3.3). He appears aggrieved that "*ESB did not give us extraneous information such as the inundation studies to understand the impact.*" (Connaughton, Second Affidavit, para. 3.3). Again, the adequacy of the warnings given on the 19th has been considered in Chapter 18, and the inundation studies were widely shared by ESB. Mr Connaughton accepts that audio-visual equipment could have been removed from the auditorium in the Western Gateway Building earlier than it was. "*[I]t was not done because we did not expect the building* *to flood.*" (Connaughton, Second Affidavit, para. 3.4). Mr Connaughton notes that since November 2009, ESB has taken no action to protect its substation at the Western Gateway. The court does not see what the perceived significance of this is. Mr Connaughton describes an array of flood defence measures that have been taken at the Western Gateway since November 2009. All of them could have been taken, with reasonable foresight, before November 2009.

541. The evidence of Mr Mehigan. Mr Mehigan is a marine and mechanical engineer, and Facilities Manager at the Tyndall Institute. He was not working on 19th November, so he has no direct experience of that evening's events. In an affidavit of 7th May, 2014, he repeats the criticisms of ESB as regards its not circulating the inundation studies to UCC. Per Mr Mehigan: "*If we had been aware of the inundation studies, we would have been in a position to take steps to protect the Tyndall complex from the risk of fluvial flooding resulting from the discharge of a large volume of water from ESB's dams...*". The court would find this more convincing if there was any evidence that UCC ever engaged with ESB before 2009 to gauge the risk arising to UCC from the discharges ESB was in the habit of warning about, or from the dams more generally. As with Mr Poland, Mr Mehigan makes an interesting observation as to the timeliness and related usefulness of such warnings that ESB gave on the 19th: "*The equipment housed on the ground floor of the affected buildings in Tyndall is highly specialised equipment that could not be moved in a short timeframe. The manufacturers of the equipment (some of whom are based as far afield as Japan would have had to be involved in decommissioning and moving the equipment so it could be moved safely...*". (Mehigan Affidavit No.2, para. 3.1). Mr Mehigan describes various flood defence measures taken at the Tyndall Institute since November 2009. All of them could have been taken, with reasonable foresight, before November 2009.

542. The evidence of Ms Maguire. Ms Maguire is Vice President for Research & Innovation at UCC. She was called in effect to rebut the notion that features, *e.g.*, in the evidence of Mr de Silva and Mr Cawley that information held by academic staff or arising from academic research projects is readily available to operations staff at UCC. The court accepts Ms Maguire's evidence that the presence of the Professor of Civil Engineering on the Buildings Committee was not to act as a substitute for such professional advice as had been obtained by the university. However, the Buildings Committee featured persons drawn from the academic and operational sides of the university and was clearly so constituted in order to bring a fusion of academic and operational knowledge to decision-making. Moreover, its individual members must have served some purpose, as must the committee. Which makes it all the more surprising that fluvial flood risk as an issue appears to have been ignored (per Mr Poland) or all but ignored (per Mr McAuliffe) by the Buildings Committee.

CHAPTER 43: MR DE SILVA'S EVIDENCE.

543. Description of Expert and summary of evidence. Mr Kishan de Silva is a distinguished chartered engineer practising in the United Kingdom. His report examined various UCC buildings that were flooded in 2009, looking in particular at: appropriateness of design, construction and space allocation of newly-constructed buildings; and requirements for recently-purchased and existing buildings. His evidence can be summarised as follows. [1] It is likely many individual building owners would only become aware of flood-risk following a flood event; however, Mr de Silva would expect multiple-property owners in high flood-risk areas to be aware of flooding issues and take appropriate measures. [2] Mr de Silva would expect UCC and its advisors to identify the risk of flooding, to obtain likely water-levels on-site for different flood frequencies, and then determine the appropriate design-flood level. Per

Mr de Silva, advisors should develop the building-design to prevent flooding up to the design flood level, and incorporate measures to reduce flood-impact. [3] The historical guidance issued by Cork City Council regarding design-flood level was flawed as it was based on historic tidal flooding. Per Mr de Silva, the design flood-level for buildings on a flood-plain should take account of tidal and fluvial flooding. [4] Reasonable practice to mitigate the adverse effects of flooding has long been known, albeit that formal guidance is of more recent vintage. [5] Mr de Silva recommends, using the data from 1916 (for recorded fluvial levels) and 1962 (for recorded tidal floods), and that suitable floor levels for UCC buildings affected by the flooding of November 2009 are 4.0m to 5.8m, depending on location. [6] The design/'as constructed' levels in all of affected UCC buildings (except the New Laboratory Building at the Tyndall) were of concern as of November 2009. [7] The designers of such of UCC's property/facility portfolio as has been constructed post-1991 and were affected by flooding in November 2009, are open to criticism. [8] Mr de Silva considers that UCC, as a knowledgeable client, with experience of flooding in Cork City is open to criticism for failing to consider the appropriateness of its design teams' proposed flood-levels and for failing to assess the risk of flooding at older buildings.

544. Design approach to new buildings. Mr de Silva contends three key choices fall to be made by a developer and its advisors when considering a new building in a flood-plain: location; space utilisation; and protection against flooding. Space utilisation and flood-protection, he states, are inter-linked. Relatively frequent flooding may be accepted, *e.g.* once in ten-years, in uninhabited work-shops. Flooding of laboratories with expensive equipment would be accepted less frequently, *e.g.* once every 100 years. "[E]*levation of a building and its flood protection measures must be designed with these considerations in mind.*" (de Silva Report, para. 5.3).

545. Design approach to existing buildings. Many individual long-term building owners would likely only become aware of flood-risk after a significant flooding event. However, Mr de Silva would expect a multiple property-owner, such as UCC, in an area of high flood-risk, to "*investigate the risk of flooding and take appropriate actions to minimise the consequence of a flood should they proceed with the purchase or...continue in ownership*". (de Silva Report, para. 6.2). As with new buildings, he considers the first tasks to be undertaken by a prudent property owner-developer are to identify flood-risk and assess design flood-level. With an existing building, it seems that all that can be done is to mitigate the adverse effects of flooding. Although measures to mitigate such adverse effects are long-known, formal guidance only appeared in circa. 2004 when the Construction Industry Research and Information Association published relevant guidance. Suitable means of mitigation, per Mr de Silva, include providing temporary barriers, using ground-floors and basements for activities that are less water-sensitive, and modifying building interiors to make them less susceptible to water-damage.

546. University awareness of flooding. UCC has occupied buildings in Cork City since the mid-19th century. Thus, Mr de Silva concludes, UCC's Estates Department would have known that Cork City flooded occasionally. (It cannot but have known). Additionally, he considers that UCC's Geography and Civil Engineering Departments would have been well aware of flood-risks. Where he strays too far is in his suggestion that the Geography and Civil Engineering Departments "*would be on hand to advise the Estates Department on...risks of flooding and...mitigating such risks.*" (de Silva Report, para. 5.4). UCC has countered this suggestion by way of Ms Maguire's evidence (considered above). However, UCC itself strays too far in emphasising the complete divorce between the academic/organisational sides of a university when it is clear that the two were married for particular purposes in the form of the Buildings Committee.

547. Flood potential. Once a site has been identified for development, Mr de Silva would expect the design-team to assess potential flood-risk. The design team, he maintains, should then advise the building-owner/client of resulting implications. If an owner/client considers the risk of flooding too great, it may choose another site. If a developer wishes to build on its chosen site, the design-team would be required to advise on courses of action to manage/mitigate risk. Mr de Silva accepts that there is a cost-benefit analysis to be done and a compromise arrived at between proceeding and protecting: "*There will inevitably be increased cost arising from the necessary measures...there may well remain a residual risk, even after practicable mitigation measures were adopted.*" (deSilva Report, para. 5.6).

548. Assessing/mitigating risk. Mr de Silva considers that the following steps should be taken to assess/mitigate flood-risk: (1) identify the risk of flooding; (2) determine the design flood-level; (3) develop the building-design to prevent flooding as water-levels rise to design flood-level (with an appropriate free-board); (4) incorporate measures into building-design to reduce flood-impact when water-level exceeds design-floor level.

549. Design floor levels. Mr de Silva undertakes an analysis of floor levels and related issues in the context of the various UCC buildings that flooded in November 2009. Ms McKendrick, an expert witness called by UCC, undertook a similar analysis. It is more useful to consider the evidence of both together; this is done later below.

CHAPTER 44: MR MACINTYRE'S EVIDENCE.

550. Description of Expert and overview of evidence. Mr Ciaran MacIntyre is a distinguished chartered engineer. Because Mr de Silva's report comes with a British gloss, given that he lives and works in the United Kingdom, Mr MacIntyre has cast an eye over Mr de Silva's expert report, and offers the more localised expertise of an Ireland-based professional.

551. Flood Risk Assessment Guidance. Although specific UK guidance documents were available from the 1970s, it is Mr MacIntyre's opinion that assessment of flood-risk and estimation of flood design-levels, prior to the early-'noughties' was typically based on collation of data concerning maximum historic flood levels in the vicinity of the building and determination of finished floor level by adding an appropriate additional safety margin (or 'freeboard'). Increasing awareness in the late-1990s and early-2000s of climate change resulted, Mr MacIntyre states, in prudent engineers increasing freeboard to take account of predicted rising sea-levels and river flood-flow increases. This approach was reinforced by publication in 2005 of a major policy document, "*The Greater Dublin Strategic Drainage Study*". That Study's section on climate-change recommends that for long-term planning in the Dublin area, 1.0m should be added to the February 2000 record high sea-water level to give a recommended design-level of 4.0m.

552. Appropriate freeboard. Apart from recommendations in the above-mentioned Study, Mr MacIntyre is not aware of specific, authoritative published guidance on appropriate freeboard. However, his experience is that, prior to the late-1990s/early-2000s, general level of awareness of climate change implications among building designers was lower, with a typical (combined fluvial/tidal) freeboard of between 0.5m and 1.0m. From circa. 2000, 1.0m became "*more the* *norm as a freeboard value, particularly for sites subject to extreme fluvial and tidal events*". (MacIntyre Report, para. 2.2).

553. Design Methodology. Low-lying areas of Cork City have a long history of flooding. Consistent with British Standard 5930, a core reference document for structural engineers in Britain and Ireland, Mr MacIntyre maintains that for all buildings constructed after 1981, at a minimum, detailed information on historic flood-levels should have been sourced and analysed to determine/estimate historic flood-levels at proposed building locations.

554. Usefulness of simple flood model. An approximation of the highest recorded flood-level could, Mr MacIntyre asserts, have been determined by a graph-model of the type relied upon by Mr deSilva when preparing his expert report. Mr MacIntyre considers that even adopting a "*very basic flood assessment model would have ensured that, for all the buildings* [flooded on UCC campus in 2009], *in the absence of other protective measures, designers would have been made fully aware that the ground floor...was at risk of being flooded if...floor level was not raised.*" (MacIntyre Report, para. 3.1).

555. Cost of obtaining details. Mr MacIntyre considers that the cost of obtaining detailed information about flood-levels should be broadly proportional to the capital value of the building and its contents. He accepts that expensive modelling may not have been commercially justifiable for the majority of buildings constructed for UCC. However, he considers that a comprehensive flood-risk assessment should have been done for the Western Gateway at a time when sophisticated hydro-geological modelling software had become more readily available. Had this been done, Mr MacIntyre considers that a finished floor level of 5.80m (including freeboard of 1.0m) would have been settled upon. This mirrors the figure settled upon by Mr de Silva, is significantly in excess of the 4.79m deployed, and would have been high enough to avoid flooding in November 2009.

556. **Buildings not constructed for UCC.** A number of UCC buildings that flooded in November 2009 were not constructed by UCC. These include the Maltings Complex (Lee Mills House and Blocks 1–3), the Connolly Complex (the PBC, Link and Connolly Buildings, Nos. 1 and 2 Muskerry Villas, and 20 Dyke Parade), and the Western Road Houses. Mr MacIntyre acknowledges that some measures were in place in some of these buildings to mitigate severe flood-event consequences; however, they were limited in nature:

> "*No formal flood risk assessments appear to have been carried out by UCC on acquisition of the properties...while it may be argued that protection against...flooding was partially addressed by taking out buildings insurance incorporating flood cover, little planning appears to have been given to protection of valuable equipment and potential consequential losses....Had detailed historical flood data been collated and converted into a simple flood assessment model, the...real threat of severe flooding would have been identified and...should have led to more proactive...more extensive property protection and flood damage mitigation measures...*" (MacIntyre Report, para. 3.2).

557. **UCC and its designers.** Mr MacIntyre considers that the civil and structural engineers who advised UCC are open to criticism for their actions. As regards UCC: "*In relation to the buildings acquired by UCC, UCC's apparent failure to (i) properly assess the flood risk to their extensive property assets located within the River Lee flood plain and (ii) provide an adequate level of protection to high value equipment, exposes the University to criticism for not*

undertaking the necessary actions and measures expected of a prudent owner of multiple properties in a low-lying riverside area prone to flooding." (MacIntyre Report, para. 4).

CHAPTER 45: MS MCKENDRICK'S EVIDENCE.

558. Description of Expert and summary of evidence. Ms Emma McKendrick is the Managing Director of PUNCH Consulting Engineers. She has more than a quarter-century's experience as an engineer. Her evidence can be summarised thus. [1] There was little published guidance available to designers on management of flood-risk in Ireland before 2004. [2] Cork City Council required at the relevant times that the ground-floor level of new developments be at/above 3.1m. [3] At relevant times, it was common practice in Ireland to obtain a reliable historic flood-level and to apply freeboard in flood-prone areas. [4] At relevant times, Ms McKendrick does not agree it was commonplace to apply a freeboard of 1m. [5] She maintains that (a) prior to 1995 it was not feasible for designers of buildings in Ireland to undertake detailed flood-risk assessments, (b) computer programmes required to construct hydraulic models were not commercially viable, and (c) prior to the mid-2000s, it would have been cost-prohibitive and disproportionate to any of the developments to have undertaken the topographical surveys necessary for a hydraulic model. [6] Ms McKendrick takes issue with the simple hydraulic model that Mr de Silva used because *inter alia* (a) the high-levels used date from the 1916 flood and so pre-date construction of the dams; (b) it would have been preferable to use the 1986 level or, taking a conservative approach, an average between the two levels, and (c) his 1m freeboard "*did not represent best, or even common, practice at the time*". (McKendrick Report, *iii*). [7] The ESB inundation studies were and are not generally available to designers. [8] The buildings affected by flooding in November 2009 were in compliance with best practice regarding flood-risk and, with the exception of historical parts of the

Maltings Complex and the old Presentation Brothers' building, were above the level required by Cork City. [9] Although "[m]*uch is made of the approach taken by MCOS to the design of the ERI (Environmental Research Institute) building by Kishan de Silva ....*[i]*n my opinion, MCOS were ahead of their time*". (McKendrick Report, *v*). So, curiously, although MCOS appears to have got matters right when others did not, their actions are, per Ms McKendrick, aberrant. [10] From a review of sample developments in flood-prone lands, in Cork and nationally, Ms McKendrick considers (a) the approach taken by UCC designers was consistent with that taken in Cork and nationwide, (b) the approach to application of freeboard varied enormously, and (c) attitudes to flood-risk assessments changed from the mid-2000s.

559. Review of Guidance and Modelling Tools. Ms McKendrick indicates there was no definitive legislative guidance in relation to development in flood-prone areas in Ireland until the Department of the Environment published "*The Planning System and Flood Risk Management Guidelines*" (November 2009). However, she indicates there was general awareness in relation to flooding, climate change, the need for sustainable damage and so forth, *e.g.* in the "*Report of the Flood Policy Review Group*" (2004) and the "*Greater Dublin Strategic Drainage Study*" (2005).

560. Accessible information. The Internet Age, coupled with wholesale use of desktop computers has, Ms McKendrick indicates, revolutionised the level of technical data now available to designers. However, she maintains that up to the mid-2000s, technical data was typically limited to that available within a designer's library and on certain microfiche systems.

561. ESB Inundation Studies. Ms McKendrick does not consider the ESB inundation studies were or are generally available to designers. Insofar as Mr de Silva refers to usage by MCOS of the 1992 inundation study, Ms Kendrick indicates that she has learned from MCOS that it was only allowed to view the study informally at Inniscarra and take notes therefrom. Nonetheless, it remains the case that MCOS appears, from the evidence, to be the only advisors engaged by UCC who liaised directly with ESB, who were freely afforded information by ESB, and who, presumably pursuant in part to that engagement, pitched floor-levels at the Environmental Research Institute at a level sufficiently high that it was not flooded in November 2009. It is not clear why ESB falls to be criticised in this regard and MCOS's actions treated as deviant.

562. Surveying Equipment. Ms McKendrick indicates that prior to the mid-1990s, topographical surveys would have been time-consuming and expensive. The mid-1990s saw advances in technology but topographical surveys would still have been time-consuming, expensive and generally limited to watercourses that did not contain fast/moving water. In Ms McKendrick's experience, specialist land-survey companies only started undertaking topographic surveys for river modelling as a matter of course in the mid-2000s. The advent of GPS technology in the mid-2000s meant it then became feasible to undertake topographical surveys of river-courses. She has not found any evidence to suggest that topographical surveys were being undertaken by private topographic companies for the purpose of river modelling before circa. 2004. Hydraulic modelling, if undertaken, typically made use of OPW-surveyed river-sections from as far back as the 1950s.

563. Hydrological modelling. Mr de Silva is an advocate of doing hydrological modelling for a proposed building of significance, and a comprehensive review of flood data when approaching design of lesser buildings. Ms McKendrick does "*not agree…that it would have been reasonable in the period from 1991 to 2001 to prepare a hydrological model for a particular building.*" (McKendrick Report, para. 3.4.1). In her view, unavailability of surveyed river sections, and the time/expense involved in undertaking such survey, would have made such modelling cost-prohibitive and disproportionate to the scale of any of the UCC developments affected by flooding in 2009.

564. Flood level (3.1m). Ms McKendrick considers a 3.01m floor level, *i.e.* a floor level 0.09m lower than the standard 3.1m considered appropriate by Cork Corporation, is appropriate as a finished floor-level for city-wide developments:

> "*The level of 3.1m does not appear to relate to any known flood event. It does however relate to the Finished Floor Level advised in a memo from the Cork Corporation Senior Executive Drainage Engineer to an unknown recipient dated 1st March 1995 which...identifies the March 1962 tidal flood level as being the highest on record at 3.01m.*
> *It would therefore have been more accurate...to have adopted a level of 3.01m. The March 1962 flood event was a result of coastal flooding...Given the inland location of the UCC Campus it is not subject to the effects of wave action...*".
> (McKendrick Report, para. 3.4.2).

565. This logic is difficult to follow. Presented with an obvious failure to set finished floor levels at a level that would withstand the flood events of November 2009, Ms McKendrick's contention is that in truth the standard floor-level should have been set even lower.

566. Flood level (4.81m). Reference has been made by expert witnesses for ESB that the historic high-water level of 4.81m at Waterworks Weir would have been a more appropriate base on which to construct a finished floor level. Ms McKendrick states in this regard:

"*The 4.81m flood level taken at Waterworks weir appears to equate to the November 1916 flood level.....The highest flood level at the Waterworks weir post construction of the Dams appears to be 4.14m and was recorded during the August 1986 floods. In my opinion, an engineer in the late 1990s and early 2000s would have discounted the 1916 flood on the basis that the dams were in place and protected Cork City from the scale of fluvial flooding experienced before the dams were constructed.*" (McKendrick Report, para. 3.4.2).

567. This logic appears to be based on a supposition as to the intended function of the dams. But even if one confined oneself to the post-1957 era, it is unclear why would one settle on the 3.01m level advocated by Ms McKendrick and and not the 1986 level plus some precautionary freeboard.

568. British Standard 5930. Mr MacIntyre maintains that, consistent with BS5930, detailed information on historic flood-levels should have been sourced and analysed to determine or estimate historic flood-levels at the proposed building location of any UCC buildings constructed post-1981. Ms McKendrick "[does] *not necessarily concur that engineers in Ireland in the 1990s or...the early 2000s would have been particularly familiar with...BS5930*". (McKendrick Report, para. 4.2). Ms McKendrick has considered the detail of how one would conduct a site assessment/due diligence. It does not appear to the court that her evidence in this regard is of especial relevance to its judgment.

569. Flood mitigation measures. Ms McKendrick considers what she views to be standard flood mitigation measures. These include, *inter alia*:

"*...Raising Floor Levels*

[R]*aising floor levels is a simple but effective way of mitigating flood risk.... This mitigation measure was used by UCC and its designers in respect of the Western Gateway Building, University Hall, Glucksman Gallery and Castlewhite Apartments.*

Land Raising

This involves raising land levels from existing ground levels to a level above...flood defence level....This mitigation measure was used by the designers of the Western Gateway....

Flood Warning

In a campus development such as UCC this could include the use of warning signs highlighting the susceptibility of an area to flood and the evacuation routes to be used in the event of a flood. This mitigation measure was used by UCC in respect of...tidal flooding at Lee Mills House.

Flood Proofing

[T]*his would either be by means of dry proofing...or wet proofing....This mitigation measure was used by UCC and its designers for the basements of all Affected Buildings constructed by UCC.*

Flood Defences

Permanent flood defences usually consist of walls or embankments…temporary flood defences consist of demountable barriers/walls. This mitigation measure was used by UCC in respect of the known risk of tidal flooding at Lee Mills House.

Compensatory Flood Storage

Compensatory flood storage works are required to ensure…the development does not alter the volume of flood storage….Compensatory flood storage was not required by Cork City Council or An Bord Pleanála….

Management of Development Run-Off

[D]*ischarge of surface water run-off from new developments on greenfield sites should be limited to…pre-development run-off volumes by…introduction of surface water attenuation systems….This technique only became prevalent in Ireland after…2005 and in some counties it was several years* [after 2005]*…before Local Authorities insisted on…use of attenuation systems….*[T]*his mitigation measure was not required for any of UCC's buildings.*

Flood Detection

This involves…use of physical measures which raise an alarm should flood water be detected. This mitigation measure was used by UCC and its designers in respect of the Glucksman…". (McKendrick Report, para. 4.3).

570. *Mitigation measures and finished floor levels.* All of these mitigation measures come in the context of a standard finished floor level (3.1m) gauged by reference to tidal flood levels but applied in an area that included a swathe of fluvial flood-areas. Reliance on historic tide-level in an area where the concern is fluvial flooding seems entirely misplaced. Insofar as Ms McKendrick refers to steps taken to alleviate tidal flooding, these appear of little consequence in the context of fluvial flooding.

571. Out-sourcing professional judgment? There is something of a trend in Ms McKendrick's evidence that if action is required or sanctioned by Cork City or County Council, unquestioning compliance with such a standard is the hallmark of professional competence. Of course, professionals must meet standards that are required of them by competent legal authorities; however, professional competence may require that a professional meet and beat such standards.

572. Disagreement as to 1m freeboard. Ms McKendrick does not agree with ESB's expert witnesses when they assert it was commonplace, at relevant times, to add a 1m freeboard to a historical maximum flood level to establish finished floor levels:

> "[T]*he approach to…application of freeboard varied widely until the mid to late-2000s….I do not believe…it was standard practice to adopt a freeboard of 1m above…predicted design flood level. In practice, there was no individual best practice for…freeboard. The level…varied on a site by site basis and was determined on the basis of perceived residual flood risk.*" (McKendrick Report, para. 4.4).

573. The Western Gateway. Ms McKendrick considers that the designers of the Western Gateway Building completed a site assessment/due diligence appraisal in accordance with then best practice. The finished floor level of the buildings as designed was 4.99m OD, "*well in excess of historic flood levels and therefore in accordance with best practice at the time*". (McKendrick Report, para. 4.7.1.3). Mr de Silva suggests that a finished floor level of 4.8m + freeboard (hydrological analysis)/4.4m + freeboard (historical analysis) was preferable; given the development's scale, he considers the higher level was preferable. (De Silva Report, paras. 7.8–7.10).

574. University Hall. Ms McKendrick considers the finished floor-level of University Hall, as designed, at 4.99m, was "*well in excess of historic flood levels and...in accordance with best practice at the time*". (McKendrick Report, para. 4.7.2.2). As to the basement, her opinion is more caveated: it "*was, in all probability designed, detailed and constructed in accordance with best practice at the time.*" (McKendrick Report, para. 4.7.2.2). She notes that the actual finished floor level of the buildings was about 5.09 to 5.17m. Mr de Silva considers a hydrological study/review of historic flood levels plus the addition of a freeboard would have seen ground-floor levels of 6.7m /5.6m settled upon. He does not consider hydrological modelling was appropriate for this building; hence he considers the lower level preferable.

575. The Glucksman Gallery. Ms McKendrick considers the finished floor-level of University Hall, as designed, at 3.34m, "*was above the existing site levels of 2.7m to 3.035m and the finished floor level recommended by Cork City Council.*" (McKendrick Report, para. 4.7.3.1). In her opinion "*the designers evaluated the flood risk based on historic data and determined a finished floor level that they believed would ensure the building was safe against flooding*". (McKendrick Report, para. 4.7.3.4). She concludes that the design of the finished floor level and basement was in compliance with then best practice. By contrast, Mr de Silva maintains a hydrological study/review of historic flood levels plus the addition of a freeboard would have seen ground-floor levels of 4.8m/5.1m settled upon. Given the landmark nature of the Glucksman Gallery, he considers a hydrological study should have been done and the higher 5.1m level settled upon.

576. Castlewhite Apartments. Ms McKendrick considers the finished floor-levels of the buildings as constructed are circa. 840mm above the February 1990 flood-level. It is not clear why Ms McKendrick focuses on the 1990 flood-heights as a benchmark but, by reference to same, she considers that "*finished floor levels adopted were in compliance with best practice at the time. On the basis that the finished floor levels were sufficient to provide adequate protection against flooding* [in November 2009, they were not] *no further flood mitigation measures were necessary.*" (McKendrick Report, para. 4.7.4.3). Mr de Silva considers the selected design ground-floor level at Castlewhite Apartments (4.09m) was insufficient to protect the building against likely flood levels. Hydrological modelling/a review of historic flood data suggest design flood levels of 5.6m/5.89m (with freeboard included) were appropriate.

577. Lee Maltings (including Tyndall Institute). The developments at Lee Maltings are a combination of buildings constructed in the 19th century and those constructed by UCC more recently. Ms McKendrick notes that demountable flood barriers were installed at the Tyndall Institute in 2009 to guard against minor tidal flooding was known to have occurred there in the past. She concludes:

> "*The finished floor level of a number of the 19th Century buildings is below the recommended 3.1m. Lee Mills House suffered occasionally from tidal flooding*

when…prevailing weather conditions resulted in high tide accompanied by a south-easterly wind and low atmospheric pressure.

Raising…ground floor levels of historic buildings in my opinion would be cost prohibitive. Therefore UCC followed best practice by incorporating a range of flood mitigation measures in 2009 to protect Lee Mills House from…known risk of tidal flooding.

It is therefore my opinion that UCC complied with best practice in respect of …flood mitigation."

578. The court notes that the 3.1m standard to which reference is made was set by reference to historic tidal flooding levels. Moreover, the focus of the flood mitigation measures taken in 2009 was on the risk of "*minor tidal flooding*" known to have occurred on-site. This case is concerned with fluvial flooding. Mr de Silva maintains that a hydrological study/review of historic flood levels plus the addition of a freeboard would have seen ground-floor levels of 4.6m/4.3m settled upon. (Instead, ground-floor levels at Lee Mills House were 2.7 to 2.8m, and in Blocks 1, 2 and 3 were pitched slightly higher at 2.8m to 3.0m). Given the importance of the buildings, Mr de Silva contends a hydrological study ought to have been done.

579. North Mall Complex. Ms McKendrick is relatively brief when it comes to the North Mall. She considers the finished floor-levels of the Butler Building and Enterprise Centre comply with the design finished floor-level recommended by Cork City Council, the Enterprise Centre being raised by a further circa. 500mm above the 3.1m level. "*On the basis that…finished floor levels were sufficient to provide adequate protection against flooding* [they were not in November 2009] *no further flood mitigation measures were necessary*". (McKendrick Report, para. 4.8.2.1). Mr de Silva looks to what ground-floor level would have been settled upon had there been hydrological modelling/a thorough review of historic flood-records. He considers that the ground floor would have been 4.5m/4.5m, by reference to these standards, allowing for a freeboard, above design flood-level. He does not consider that hydrological modelling was required at the North Mall complex.

580. Connolly Complex. The Connolly Complex is located on the north bank of the South Channel. The buildings were typically constructed between the 19th century and mid-20th century. The only exception is the Granary Theatre constructed by UCC in the 1990s. Ms McKendrick distinguishes between the buildings acquired by UCC and the Granary Building. She concludes that the finished floor-levels of the various buildings are in compliance with the (3.1m) finished floor level recommended by Cork City Council. The only exception is the old Presentation Brothers' College building; this has a floor-level beneath that recommended by the City Council and Ms McKendrick considers it would have been prudent to have flood defences such as sand-bags available there. Mr de Silva, applying the standards of a hydrological model/thorough review of historical flood data, suggests that, *e.g.*, at the Granary Theatre the design flood level (plus freeboard) yields levels of 4.5m/4.54m, with Mr de Silva noting that the latter (historical data) approach was appropriate here. The actual ground-floor level was about 3.1m.

581. Victoria Lodge. Although Victoria Lodge is a relatively recent construction (finished in 2003), it was not developed by UCC. Ms McKendrick notes that the finished floor level of the buildings as constructed (5.06m) is "*well in excess of historic flood levels....On the basis that the finished floor level was sufficient to provide adequate protection against flooding* [it was not in November 2009] *no further flood mitigation measures were necessary.*" (McKendrick Report, 4.8.4.3). Mr de Silva opines that a hydrological model/review of historical flood-levels would have yielded ground-floor levels of 4.8m/6.8m, allowing for inclusion of a freeboard. His view is that hydrological modelling was not merited; hence he favours the 6.8m ground-floor level.

582. Western Road Houses. All of the Western Road Houses were acquired at various times by UCC from 1967 onwards. All of them have finished floor levels of 3.49m to 4.36m. (Mr de Silva places the last figure at 4.54m), so in excess of the (3.1m) design finished floor level recommended by Cork City Council. "*On the basis that...finished floor levels were sufficient to provide adequate protection against flooding* [they were not in November, 2009] *no further flood mitigation measures were necessary*". (McKendrick Report, para. 4.8.6.3). Mr de Silva considers that the existing ground-floor levels were not pitched at a level sufficient to protect the buildings against likely flood levels. Hydrological modelling/a review of historic flood levels, he indicates, would have suggested design flood levels of 5.89m/5.2m (including a freeboard). Mr de Silva does not consider hydrological modelling was proportionate for such buildings and favours the lower-mentioned level.

583. MCOS. MCOS were the sole designers from the 'noughties' that constructed a UCC building, the Environmental Research Institute, at a level sufficiently high that it escaped flooding in November 2009. Ms McKendrick states that MCOS "[were] *ahead of their time in their approach*", largely doing this work "*on foot of the requests of the Sanitary Services Department of Cork County Council*" and that it was allowed access to, rather than given a copy of, ESB's inundation studies. (McKendrick Report, paras. 5.1.1 and 5.1.2) Notably, however, MCOS got matters right. The court does not accept, to the extent that this may inform or be implicit in the quoted text, that because a party differs from the generality, it is necessarily the generality that have got it right or, if they have got it wrong, are not to be exposed to criticism for their views or practices.

584. The ESB sub-station and other developments. In 2006, ESB got planning permission for a new sub-station at Centre Park Road. In 2007, a revised planning permission issued. The revised permission saw the finished floor level raised from 3.15m to 4.5m. Ms McKendrick points to this sequence of events as "*a demonstration of the changing attitude to flood risk in the late 2000s but it also shows that up to 2007, ESB gave no consideration to the effects of climate change or...necessity for freeboard.*" (McKendrick Report, para. 6.1). All it seems to the court to evidence is that ESB initially pitched the station at a level above that recommended by Cork City Council and then, two years or more in advance of the flooding of November 2009, elected to seek permission to raise it higher still.

585. Some agreement between experts. Ms McKendrick's evidence and that of ESB expert witnesses called by ESB was in agreement on some issues, *viz*: (1) there are three steps to be properly taken by a developer and its advisors to address a possible flood risk, (i) risk-assessment, (ii) advising building-owners as to risk, and (iii) (if the owner decides to proceed) provision of advices in relation to risk-management and mitigation; (2) in relation to any building of consequence, it is appropriate to undertake an assessment of whether the relevant site is subject to flood risk; (3) if a desk study and reconnaissance of a site identify a risk of flooding, the designer would need to collect further information; (4) in conducting that exercise, one would look at any relevant data-source; (5) input from a specialised hydrologist might be required, particularly where large-scale development is contemplated or the hydrology is especially complex; and (6) at relevant times, it was common practice to obtain a reliable historic flood level and apply freeboard in areas prone to flooding.

586. Reasons for preferring evidence of other experts. Insofar as the evidence of ESB's expert witnesses and of Ms McKendrick diverged, it seems to the court that there were at least seven issues in respect of which there was error in the approach adopted by Ms McKendrick, with other expert evidence, most notably that of Mr de Silva, falling therefore to be preferred.

587. [1] Pre-dams history. Ms McKendrick did not believe that the designers of the UCC properties that flooded in November 2009 would have had regard to the history of flooding before the Lee Scheme; she also did not consider that they needed to understand the effect of the Lee Scheme. As a logical proposition, the court does not accept that competent designers could ignore pre-dam history without understanding what alleviation the dams in fact achieved.

588. [2] Computer modelling. It was Ms McKendrick's view that computer models were not availed of in flood-risk assessment prior to the late-1990s and early-2000s, and that topographical surveys for input into such a model were not generally carried out until the mid-2000s. When it was pointed out that UCC's own civil engineering department was carrying out modelling studies in the 1980s and early-1990s, Ms McKendrick had no answer. Nor was she in a position to dispute that firms such as Wallingford and Halcrow were providing hydrological/hydraulic modelling services in Ireland throughout the 1990s and 2000s. When Mr Cawley was asked about Ms McKendrick's evidence in this regard, he said:

> *"I wouldn't agree with it. I would...think that maybe she was...alluding to a detailed one metre by one metre 2D model where you...needed a lot of LIDAR. But for...flood risk assessments...if I was commissioned in the 1990s, and I have done many studies in that era, I would have built a 1D model of the river and*

identify where, what the level is, where it is likely to spill and there where would it go.....You don't need all the fancy mapping to be able to come up with a flood risk....So...she is right in terms of the very detailed mapping models that we see today. She is not right when it comes to using these 1D models. They were available and being used in the 80s." (Transcript, Day 82, p.15).

589. [3] The 3.1m level. Ms McKendrick attached considerable significance to the fact that various buildings were constructed at or just above the minimum 3.1m level recommended by Cork City Council. Ms McKendrick appeared to believe that for certain buildings this was not the appropriate benchmark, *e.g.* the Castlewhite Apartments. When asked what point along the river the 3.1m level ceased to be an appropriate benchmark, Ms McKendrick stated: "[T]*he precise location...is subject to a hydrologist confirming that*". (Transcript, Day 21, p,99). However, she indicated that she thought that the point at which the Glucksman sits was the point where she would have begun to question if it was appropriate. The difficulty with the 3.1m level is it related to tidal flooding. Per Mr Cawley: "[Y]*ou would question the wisdom of that figure in the first place as a tidal level, let alone what it could apply if you were to assume that was applying to an estuarine area where you have river on top of that.*" (Transcript, Day 82, pp.11–12). Similarly, Mr de Silva observed that neither the designers retained by UCC, nor UCC, would have been justified saying that once they bult to the 3.1 level they had completely taken account of flood-risk. That, per Mr de Silva "*is completely ignoring the fact that there was rain-related flooding. Why on earth do you not pay cognizance to that? I just have no explanation for that.*" (Transcript, Day 95, p.37).

590. [4] Freeboard. A fourth issue that presented itself as between the experts was the appropriate freeboard. Ms McKendrick considered it was appropriate to use a different level per site. Her view in relation to freeboard proved to be based on the incorrect view that as late as 2002, best practice would not have included a consideration of climate change, a proposition contrary *e.g.* to the evidence of Mr Cawley (Transcript, Day 82, pp.22–23), Mr MacIntyre (Transcript, Day 96, p.142), and Mr de Silva (Transcript, Day 96, p.100); their collective view is preferred by the court. Mr Cawley's opinion was that a freeboard of approximately 1m was appropriate. (Transcript, Day 83, pp.19–20). Mr de Silva agreed and pointed to a 1m freeboard as according with international practice and the practice of MCOS when it came to the design of the ERI Building (and Arup regarding the Western Gateway). (Transcript, Day 95, p.58).

591. [5]. **Mr de Silva's simple model.** Ms McKendrick criticised Mr de Silva's so-called 'simple' model on the basis that he used the level of the 1916 flood at Waterworks Weir and the tidal level recorded in 1962 at Parliament Bridge. This, she felt, was inappropriate, because those events had not combined previously. (Transcript, Day 19, p.44). Mr de Silva re-drew his model to accommodate Ms McKendrick's criticisms; the result was that each of the buildings flooded in November 2009 would have escaped flooding – had his model been used.

592. [6]. **The wrong question.** There was a fundamental difficulty with the entirety of Ms McKendrick's evidence, namely that the question she addressed did not seem to the court to be the correct one. Ms McKendrick did not place herself in the position of the persons who designed the UCC properties that flooded in November 2009, ascertain what information was reasonably available to them, and then decide what the appropriate level/freeboard should have been. She looked at the decisions made by those designers based on the information they had, not the information that would have been available to them had they undertaken proper assessments. The result, the court finds, was an unhelpful circularity in Ms McKendrick's approach

593. [7]. Something fundamentally wrong with 'best' practice. Pressed by counsel for ESB whether he was correct that later events showed that there was something fundamentally wrong with best practice when it came to the design of the various buildings that were flooded in Cork in November 2009, Ms McKendrick gave an unequivocal "*Yes*". (Transcript, Day 21, pp.10–11). There is, of course, a legal significance to this response; it is as well to touch upon it here. In *O'Donovan* v. *Cork County Council* [1967] I.R. 173, Walsh J. indicated that, usually, if a professional follows the general accepted practices of his discipline, he will be presumed to have acted reasonably. However, per Walsh J., at 193: "*That proposition is not...without qualification. If there is a common practice which has inherent defects, which ought to be obvious to any person giving the matter due consideration, the fact that it is shown to have been widely and generally adopted over...time does not make the practice any the less negligent. Neglect of duty does not cease by repetition to be neglect of duty.*" This approach was re-affirmed by the Supreme Court in *Roche* v. *Peilow* [1985] 1 I.R. 232. More recently, in *ACC Bank plc* v. *Brian Johnston & Co.* [2010] 4 I.R. 605, the High Court applied the principle in order to hold a solicitor negligent in connection with the services supplied to a bank concerning certain loan facilities. Per Clarke J., at 95: "*[T]he mere fact that a practice is universal does not...immunise the professional concerned from potential liability, if it is a practice which, on reasonable consideration, the professional concerned ought to have identified as giving rise to a significant risk.*"

CHAPTER 46: MR BRASSIL'S EVIDENCE.

594. Description of Expert and summary of evidence. Mr Declan Brassil is a distinguished town planner. His evidence might be summarised thus. (1) The approach taken to the preparation of planning applications by UCC and the assessment of those applications by Cork City Council and An Bord Pleanála in the case of decisions was consistent with relevant planning law, guidance and policy. (2) The approach to flood-related issues was likewise consistent with then provisions of planning legislation, and national and local flood-policy. (3) There was little if any formalised/structured flood-risk policy or guidance pre-2004; the *Report of the Flood Policy Review Group* (2004) introduced a major change in public policy on flood-risk identification/management and filled a 'policy vacuum'. (4) Flood risk-management was not considered in detail in the Cork City Development Plan until 2004. (5) Flooding was of no material relevance to consideration of a significant number of the identified applications relating to the UCC buildings affected by flooding in November 2009 and did not require consideration by the applicant, Cork City Council or An Bord Pleanála. (6) Despite the aforementioned 'policy vacuum', Cork City's Development Plans of 1979 and 1985 made provision for finished floor levels in the city-centre of at or above 3.1m; conditions requiring such floor levels were attached to the planning permissions for the Castlewhite Apartments, Tyndall Institute and Butler Building; this was typical of the manner in which flooding was then considered in the planning system. (7) When it comes to the Glucksman, the Western Gateway and Victoria Lodge, the manner in which flood-risk was addressed by the applicant and planning authority was consistent with the manner in which flood risk was addressed in planning applications to that time.

CHAPTER 47. KEY QUESTIONS OF FACT ARISING.

Section A. Overview.

595. There was so much information at play in the within proceedings that there was a danger the key issues of fact would get lost in the ocean of detail with which court and counsel contended. Consequently, the court asked the parties to identify what they considered to be the key questions of fact arising. Unfortunately, it was not possible for the parties to agree what they each considered to be key questions of fact. Even so, the exercise was helpful. In this chapter, the court considers and answers the various questions of fact perceived by each of the parties to arise.

Section B. Issues of fact (UCC).

i. Reasonable foreseeability of physical damage; risk to physical safety.

596. Question 1: Does the accumulation of water in the Lee Reservoirs have the potential to cause damage to downstream properties and injury to persons if the accumulation of water in the reservoirs and its release from the Lee Dams is not properly managed? **Answer 1:** Yes.

597. Question 2: Did ESB know and/or was ESB aware, from the inundation studies, its own previous flood reports, its participation in CFRAMS or otherwise, that discharge of large water-volumes from the Lee Dams would cause physical damage to property of downstream property owners, including UCC and/or a risk to life and/or physical safety of property occupiers? **Answer 2:** Yes.

598. Question 3: If the answer to Question 2 is 'yes', did ESB share its knowledge/awareness of the impact of large discharges with UCC and other owners and occupiers of downstream properties? **Answer 3:** Not with UCC. However, there is no reason to believe it would not have been shared if sought. Information was shared with local and public authorities and, at least to some extent, with MCOS when the latter sought same.

599. Question 4: If the answer to Question 3 is 'yes', to what extent and how did UCC share this knowledge/awareness? **Answer 4:** See answer to Question 3.

600. Question 5: In the days up to 19th November, 2009, did any of the following indicate that ESB would be required or would likely be required to release large water-volumes: (i) Lee Reservoir water-levels; (ii) catchment saturation-level; (iii) forecast rainfall; (iv) time of year; (v) ESB's previous experience? **Answer 5:** Yes to all.

601. Question 6: Were there any other factors that indicated that ESB would be required or would likely be required to release large volumes of water? **Answer 6:** No. There was, however, sufficient indication in the factors referred to in Question 5.

602. Question 7: Did ESB have the hydrological expertise and/or tools available to it to convert weather forecast into flood prediction? **Answer 7:** Yes.

603. Question 8: If the answer to Question 7 is 'yes', was ESB the only entity that had the hydrological expertise and/or tools available to it to convert the weather forecast into flood prediction? **Answer 8:** It appears so.

ii. The Lee Regulations.

604. Question 9: Have the Lee Regulations been amended in response to previous flood events? **Answer 9:** Yes.

605. **Question 10:** If the answer to Question 9 is 'yes', how have the Lee Regulations been amended? **Answer 10:** See Chapter 10.

606. **Question 11:** Over time, have the Lee Regulations been amended to reduce the capacity of dam operators to react to events as they occur? **Answer 11:** Yes.

607. **Question 12:** Are MaxNOL, MinNOL and TTOL levels set by ESB and within its control and responsibility? **Answer 12:** Yes.

608. **Question 13:** Were the Lee Regulations amended to reduce MaxNOL? **Answer 13:** Yes.

609. **Question 14:** Is MaxNOL the level at which mandatory discharges are triggered? **Answer 14:** Yes.

610. **Question 15:** Do the Lee Regulations permit water levels to exceed MaxNOL? **Answer 15:** Once MaxNOL is exceeded it is the trigger for immediate discharges.

611. **Question 16:** Up to MaxNOL, is spilling permitted to increase storage and/or to reduce flooding later? **Answer 16:** Yes.

612. **Question 17:** Is TTOL the top operating level which the Lee Stations must endeavour to maintain during non-flood conditions? **Answer 17:** Yes.

613. **Question 18:** Is TTOL a level ESB was required to endeavour to maintain? **Answer 18:** By the Lee Regulations, yes. (As will be seen hereafter, the court also considers that a legal obligation to do so arises).

614. **Question 19:** Can ESB generate when water-levels are below TTOL? **Answer 19:** Yes.

615. **Question 20:** To what extent, if any, is ESB's ability to generate limited when water levels are below TTOL but above MinNOL? **Answer 20:** There is no limit, except insofar as there may be no system demand for the electricity generated and hence no commercial incentive to generate.

616. **Question 21:** Do the Lee Regulations allow for discretionary spilling? **Answer 21:** Yes.

617. **Question 22:** Is ESB entitled to spill to reach TTOL? **Answer 22:** Yes.

618. **Question 23:** To what level and in what circumstances are advance discharges permitted? **Answer 23:** See Chapter 10.

619. **Question 24:** What factors can be taken into account by ESB, pursuant to the Lee Regulations, or otherwise, when deciding whether to engage in advance discharges? **Answer 24:** See Chapter 10.

620. **Question 25:** Does the rule that peak discharge shall not be allowed exceed peak in-flow during the rising flood mean peak discharge shall not be allowed to exceed peak in-flow during the rising flood or that current discharge shall not exceed current in-flow? **Answer 25:** In

practice, it can only mean the latter as there is no way of telling now where the future peak may be.

621. **Question 26:** How different is the position created by the rule in Question 25, however interpreted, from that which would pertain if the Lee Dams and Reservoirs were not actively managed? **Answer 26:** No different.

622. **Question 27:** Does the requirement that existing discharges be maintained in the falling flood, mean the Lee Regulations permit current discharges to exceed current in-flow in the falling flood? **Answer 27:** Yes.

623. **Question 28:** Are there any other circumstances in which the Lee Regulations permit current discharges to exceed current in-flows? **Answer 28:** Advance spilling may exceed current in-flows (to the limit of $150m^3/s$). Post-flooding discharges may also exceed contemporaneous in-flow.

624. **Question 29:** During the flood event in November 2009, did discharges ever exceed in-flows? **Answer 29:** Yes.

625. **Question 30:** If the answer to Question 29 is 'yes', did discharges ever exceed what would have occurred naturally? **Answer 30:** Yes.

626. **Question 31:** Do the Lee Regulations require in-flow to be calculated hourly? **Answer 31:** Yes.

627. Question 32: Do the Lee Regulations require decisions/judgments to be made by ESB staff in a flood-period? **Answer 32:** Yes.

628. Question 33: Do the Lee Regulations set out rules/guidelines for water management? **Answer 33:** Yes.

629. Question 34: Does water management include flood management? **Answer 34:** Yes.

630. Question 35: Are the Lee Regulations targeted at the design flood? **Answer 35:** Yes.

631. Question 36: Do the Lee Regulations deal adequately with floods other than the design flood? **Answer 36:** No.

632. Question 37: Are there shortcomings in the Lee Regulations from the perspective of flood management? **Answer 37:** Yes.

633. Question 38: If the answer to Question 37 is 'yes', what are these shortcomings? **Answer 38:** *Inter alia*, failure to deal with lesser floods, failure to allow suitable discretion to experienced reservoir staff, over-reliance on water-levels, insufficient attention to position downstream (*e.g.* lower tributary in-flow) before discharges made, and a failure to operate to TTOL.

634. Question 39: Do the Lee Regulations take account of purposes, other than hydro-generation in the operation and management of the Lee Dams and Reservoirs? **Answer 39:** The focus is hydro-generation but there is also attention to flood management in the overriding context of dam integrity.

iii. Deviations from the Lee Regulations:

635. Question 40: Can ESB deviate from the Lee Regulations? **Answer 40:** Yes.

636. Question 41: If so, in what circumstances can ESB deviate from the Lee Regulations? **Answer 41:** This is unclear. Throughout the within proceedings it has touted the Lee Regulations as operational guidelines to which there must be near-religious adherence, yet its Chief Civil Engineer departed from the Regulations to good effect in November 2009 and so clearly considered he had the authority to do so.

637. Question 42: Has ESB deviated from the Lee Regulations during flood events prior to November 2009? **Answer 42:** Yes.

638. Question 43: If the answer to Question 42 is 'yes', how and why did ESB deviate from the Lee Regulations during the November 2009 flood? **Answer 43:** At Carrigadrohid, discharge during the 2009 flood event was generally lower than specified in the Lee Regulations and was reduced to around 20% below what the Regulations specified by the time peak level was reached. At Inniscarra, discharge was increased above $150m^3/s$ several hours before the Lee Regulations required it.

639. Question 44: If the answer to Question 43 is 'yes', what was the impact of the deviation? **Answer 44:** The deviations reduced flooding downstream.

iv. Dam Integrity.

640. **Question 45:** Was dam-intregrity at risk during the November 2009 flood event? **Answer 45:** No.

641. **Question 46:** Was there sufficient information available to indicate dam-safety was not at risk? **Answer 46:** Yes.

642. **Question 47:** Was ESB aware that dam safety was not at risk at any time during the November 2009 flood event? **Answer 47:** It can only have been, given all the relevant information to hand.

643. **Question 48:** Did the November 2009 flood-event have a return period considerably less than the design flood? **Answer 48:** Yes. Mr Cawley, ESB's own witness, concludes that the return period for the November 2009 flood-event can be estimated with 67% confidence as a 50 to 250-year flood event. The design flood is a 10,000-year flood event.

v. Generation.

644. **Question 49:** Is there a financial incentive for ESB to keep reservoir levels above TTOL? **Answer 49:** Yes.

645. **Question 50:** Is TTOL the optimum economic level for power generation? **Answer 50:** Yes.

646. Question 51: Did ESB earn additional revenue from operating above TTOL in November 2009? **Answer 51:** Yes.

647. Question 52: If the answer to Question 51 is 'yes', what was the value of that additional revenue? **Answer 52:** Somewhere between €100k-130k.

648. Question 53: What is the economic cost to ESB if it operates from TTOL? **Answer 54:** The long-term cost is about €55k per month average incremental value.

vi. Flood Protection created by the Dams/Reservoirs.

649. Question 54: Does the presence of the Lee Dams and Reservoirs alter the natural flow of the river Lee? **Answer 54:** Yes.

650. Question 55: Are the Lee Dams and Reservoirs part of the landscape of the Lee Valley? **Answer 55:** The completed Lee Scheme is a part of the landscape of the Lee Valley since 1957.

651. Question 56: Is the in-flow into Inniscarra Reservoir a natural flow? **Answer 56:** No.

652. Question 57: Do the Lee Dams and Reservoirs have a flood attenuation impact? **Answer 57:** Yes.

653. Question 58: How often have buildings flooded between construction of the Lee Dams and Reservoirs and November 2009 as a result of fluvial flooding? **Answer 59:** The court assumes the question refers to buildings in Cork City generally. If so, the answer is many times. See Appendix B.

654. **Question 59:** Has the purpose of the Lee Dams and Reservoirs evolved over time? **Answer 59:** No.

655. **Question 60:** If the answer to Question 59 is 'yes', how has that purpose evolved? **Answer 60:** N/A.

656. **Question 61:** Do the Lee Dams and Reservoirs have multiple purposes? **Answer 61:** No.

657. **Question 62:** If the answer to Question 61 is 'yes', what are these multiple purposes? **Answer 62:** N/A.

658. **Question 63:** Is hydro-generation consistent with operation/management of the Lee Dams and Reservoirs? **Answer 63:** Hydro-generation is what the Lee Scheme is designed and engineered to do. If this question seeks implicitly to suggest that the Lee Dams are multi-purpose dams, the court does not accept that this is so.

659. **Question 64:** Can the Lee Dams and Reservoirs be managed so as to avoid unnecessary downstream flooding? **Answer 64:** If one defines unnecessary flooding as flooding that occurs through operation at levels above TTOL, yes.

660. **Question 65:** Has ESB ever told downstream property owners or residents of Cork City, including UCC, that ESB considers itself entitled to operate as though the Lee Dams and

Reservoirs do not exist? **Answer 65:** ESB has never told UCC this. As to others, the court does not know.

661. **Question 66:** Has ESB ever been involved in flood management in the Lee Valley? **Answer 66:** Yes.

662. **Question 67:** What has been ESB's participation in flood management studies and/or policy-making? **Answer 67:** *Inter alia*, in various flood inundation studies, by inputting into emergency planning by public authorities, and *e.g.* through submissions to the Oireachtas and participation more generally in public debate by way of academic papers and participation at industry conferences.

663. **Question 68:** Has ESB made representations as to the flood attenuation and/or flood protection created by the Lee Dams and Reservoirs? **Answer 68:** Yes.

664. **Question 69:** If the answer to Question 68 is 'yes', to whom were representations made? Government and the world at large. **Answer 69:** See, *inter alia*, Chapter 23.

665. **Question 70:** If the answer to Question 68 is 'yes', what was the content of the representations? **Answer 70:** See, *inter alia*, Chapter 23.

666. **Question 71** Has ESB managed previous flood events in a manner that resulted in flood attenuation and/or flood protection? **Answer 71:** Yes.

667. Question 72: How did in-flow into the Lee Dams and Reservoirs in November 2009 compare with previous floods? **Answer 72:** The court assumes the question means to refer to the flood-event that is the subject of the within proceedings. In-flow during that event exceeded all other recorded events since the Lee Scheme commenced in 1957.

668. Question 73: How did outflow from the Lee Dams and Reservoirs in November 2009 compare with previous floods? **Answer 73:** The court assumes the question means to refer to the flood-event that is the subject of the within proceedings. Out-flow during that event exceeded all other recorded events since the Lee Scheme commenced in 1957

669. Question 74: Insofar as, in previous flood events, greater in-flows to the Lee Dams and Reservoirs than November 2009 did not result in greater outflows from the Lee Dams and Reservoirs than transpired in November 2009, what is the explanation for this difference? **Answer 74:** N/A.

670. Question 75: What representations has ESB made about its management of previous flood events? **Answer 75:** That they have consistently attained flood alleviation/attenuation.

671. Question 76: What was the impact of ESB's representations and/or management of previous floods and/or practices with respect to flood management on (i) the people of Cork City; (ii) UCC; (iii) planning and development in Cork City; and (iv) the practices of residents of Cork City, including UCC, with respect to flood response plans? **Answer 76:** Re. (i), the court does not know. Re. (ii), although UCC staff seem generally to have assumed that the Lee Dams and Reservoirs were the 'be all and end all' of flood relief, there is no evidence to suggest that this view was arrived at by virtue of direct reliance on particular ESB representations as opposed to a more pervasive sense created by ESB generally. Re. (iii), it appears that people may have developed on the assumption that the flood-plain was exposed to a lower level of flood-risk. Re. (iv), the court does not know as regards residents of Cork City. As to UCC, it had no meaningful preparation for fluvial flood response. At the Lee Maltings there was some readiness for tidal flooding.

672. **Question 77:** To what extent did persons, including UCC, rely on ESB's representations and/or on its management of previous floods and/or practices with respect to flood management? **Answer 77:** As regards UCC, to an unjustified extent. As regards other persons, the court does not know.

vii. Data available to ESB.

673. **Question 78:** What data is necessary for proper management of the Lee Dams and Reservoirs during a flood event? **Answer 78:** Rainfall data, river data, tide-level data, reservoir-level data, reservoir-discharge data, reservoir-inflow data, and weather forecasts.

674. **Question 79:** Did ESB have access to all necessary data in November 2009? **Answer 79:** As regards upstream data, the data available was satisfactory. The absence of adequate downstream data (such as lower tributary in-flow data and tide-level data were notable omissions, albeit that the absence of tide-level data proved in the particular event arising to be of no consequence).

675. **Question 80:** If not, what were the gaps in the data available to ESB in November 2009? **Answer 80:** See Answer 79.

676. **Question 81:** Did ESB have sufficient data to calculate the in-flow on an hourly basis in accordance with the Lee Regulations in November 2009? **Answer 81:** Yes.

677. **Question 82:** What is the purpose of the river gauges upstream of the Lee Dams? **Answer 82:** They are used as level-gauges.

678. **Question 83:** What is the purpose of the river gauges downstream of the Lee Dams? **Answer 83:** They are used as level-gauges.

viii. Flood Modelling.

679. **Question 84:** At what times between 16th November 2009 and 19th November 2009, did ESB run the flood forecast model and what were the results of the various model runs? **Answer 84:** See Chapter 14. The attempts to run the model were a failure.

680. **Question 85:** Are there records of the results of running the model? **Answer 86:** No.

681. **Question 86:** Were there shortcomings in ESB's flood forecasting model? **Answer 87:** Yes.

682. **Question 87:** If the answer to Question 86 is 'yes', what were those shortcomings? **Answer 87:** See Chapter 52.

683. Question 88: If the answer to Question 86 is 'yes', did those shortcomings compromise ESB's ability to rely on the flood forecast model outputs? **Answer 88:** Yes.

684. Question 89: If the answer to Question 84 is 'yes', what impact did this have on ESB's decision-making in November 2009? **Answer 89:** To a significant extent it was operating 'in the blind' without an adequate grasp of the purport of what it was facing or doing.

685. Question 90: Notwithstanding any shortcomings in ESB's flood model, could ESB have made better use of same? **Answer 90:** From the 16^{th} onwards, it could have been used as a flood prediction tool.

ix. Calculation of Flows.

686. Question 91: What was the peak in-flow into Carrigadrohid Dam during the November 2009 flood? **Answer 91:** According to Mr Faulkner (called by UCC), about $590m^3/s$; according to Mr Cawley (called by ESB), about $601m^3/s$. Both of these expert witnesses were impressive individuals and their respective figures can be justified. Given that it would serve UCC's case better to arrive at a higher figure and that Mr Faulkner, a witness called by UCC, arrived at the lower figure, the court favours the lower figure as the more accurate of the two, albeit that the difference between the two is comparatively small.

687. Question 92: Is ESB's figure for peak in-flow into Carrigadrohid Dam correct? **Answer 92:** See answer to Question 91.

688. Question 93: What method did ESB use to calculate in-flow during the November 2009 flood? **Answer 93:** 'Reverse routing' or 'back routing'; both terms were used during the proceedings to describe the same method.

689. Question 94: Were there shortcomings in the method used by ESB to calculate in-flow? **Answer 94:** Yes.

690. Question 95: If the answer to Question 94 is 'yes', what were these shortcomings? **Answer 95:** It was time-consuming and required smoothing. Arithmetically, it was fine.

691. Question 96: If the answer to Question 94 is 'yes', what was the impact of the shortcomings on ESB's ability to calculate in-flow and manage discharges during the November 2009 flood? **Answer 96:** There was a lack of accuracy because of lack of smoothing. The court is not persuaded that rough 'optical smoothing' is appropriate in the management of a dam which presents a flood-risk to those downstream.

692. Question 97: Did ESB smooth the in-flow data that it calculated in November 2009? **Answer 97:** Not on the day of the 19^{th}, save perhaps optically.

693. Question 98: If the answer to Question 98 is 'no', what impact did this failure to smooth the in-flow data have on the calculation of flow? **Answer 98:** See answer to Question 96.

694. Question 99: Could ESB have used another method to calculate in-flow in November 2009? **Answer 99:** Yes (a 'distribution method').

695. Question 100: If the answer to Question 100 is 'yes', would that alternative method have been more accurate than the method used by ESB in November 2009? **Answer 100:** Not according to ESB, and the court sees no reason to doubt this conclusion which was reached by ESB other than in the context of the flood of 2009 and before these proceedings commenced.

x. Rainfall forecasting.

696. Question 101: What is the purpose for which ESB receives weather forecasts? **Answer 101:** Water management, in particular discharges.

697. Question 102: What weight, if any, does ESB place on weather forecasts in making decisions and judgments on the management and operation of the Lee Dams? **Answer 102:** ESB is attentive to such forecasts as it receives. However, it exaggerates the potential for forecasts received to be wrong in terms of over-prediction, over-looking the fact that forecasts can be wrong either way and that the risks associated with under-prediction are assymmetric to those associated with over-prediction (in that an over-estimation that proves wrong is less dangerous than an under-estimation which proves wrong).

698. Question 103: Does Met Éireann issue flood warnings to ESB? **Answer 103:** Not river-flood warnings. The reference to flooding in such forecasts appears to be to coastal flooding.

699. Question 104: What forecasts were received by ESB in the days leading up to the November 2009 flood? **Answer 104:** See Chapter 31.

700. Question 105: What weight, if any, did ESB place on the weather forecasts it received in the days leading up to the November 2009 flood? **Answer 105:** ESB was attentive to such forecasts as it received. However, it exaggerated the potential for such forecasts to be wrong in terms of over-prediction, overlooking the fact that forecasts can be wrong either way and that the risks associated with under-prediction are assymmetric to those associated with over-prediction.

701. Question 106: What actions did ESB take in response to those forecasts? **Answer 106:** Having received the forecasts, ESB, consistent with excessive concern for any over-prediction arising, waited to see how events would unfold.

702. Question 107: Should ESB have scaled up the weather forecasts it received from Met Éireann in November 2009? **Answer 107:** It could, and perhaps by reference to its own knowledge of the catchment this would have been appropriate. However, the court does not consider that, on the evidence before it, it can conclude that, on the balance of probabilities, ESB 'should' have done so.

703. Question 108: What is the design flood rainfall? **Answer 108:** This is a slightly odd question: the focus of dam management is the design flood, not 'design flood rainfall'. The question is perhaps best answered by stating that 'design flood rainfall' is rainfall that, combined with other meteorological and catchment factors presenting in a particular event, would yield a design flood.

704. Question 109: Was the rainfall considerably less than the design flood rainfall? **Answer 109:** Again, this is a slightly odd question: the focus of dam management is the design flood, not 'design flood rainfall'. The question is perhaps best answered by stating that the meteorological and catchment factors, including rainfall, in November 2009 did not yield a design flood.

705. **Question 110:** Is ESB's figure for rainfall over the 29-hour period including the 19th correct? **Answer 110:** This seems unlikely given rain-gauge deficiencies, an apparent failure to include orographic rainfall in the forecasts received and a related possibility that up-scaling might have been merited (plus the forecast area did not precisely mirror the upstream catchment).

706. **Question 111:** How accurate were the rainfall forecasts provided to ESB in November 2009? **Answer 111:** The forecasts received by ESB were prospectively (and retrospectively) accurate.

707. **Question 112:** Were the forecasts referred to in Question 111 sufficiently accurate to alert ESB of the likelihood of significant rainfall affecting discharges from the Lee Dams and Reservoirs? **Answer 112:** Yes.

708. **Question 113:** What other information was available to ESB from Met Éireann or otherwise with regard to weather forecasts? **Answer 113:** *E.g.* details of storm series, catchment rainfall levels.

xi. Record-Keeping.

709. Question 114: What records did ESB keep of decisions and judgments made during the flood in November 2009 and of its reasons for such decisions and judgments? **Answer 114:** Spill-sheets, warning-call sheets. The basis for decisions/judgments was not recorded.

710. Question 115: Were there gaps in the records kept by ESB of decisions and judgments made during the flood in November 2009, and of its reasons for same? **Answer 115:** Yes.

711. Question 116: If the answer to Question 115 is 'yes', what were those gaps? **Answer 116:** The basis for decisions/judgments was not recorded.

712. Question 117: What impact did any such gaps as have been identified above have on ESB's decision-making in November 2009? **Answer 117:** None to the knowledge of the court.

xii. Staff Expertise.

713. Question 118: Did ESB have sufficient staff available with the requisite expertise to operate and manage the Lee Dams and Reservoirs in November 2009? **Answer 118:** Yes.

714. Question 119: Did ESB's key decision-makers have sufficient expertise and experience to make decisions and judgments on the operation of the Lee Dams and Reservoirs in November 2009? **Answer 119:** Yes.

715. Question 120: How did ESB manage handovers between staff in November 2009? **Answer 120:** There are no difficulties in this regard apparent to the court from the evidence.

716. **Question 121:** Were such arrangements as are referred to in Question 120 adequate? **Answer 121:** See Answer 120.

xiii. Warnings.

717. **Question 122:** Why historically has ESB provided warnings? **Answer 122.** To enable those downstream to prepare for pending floods.

718. **Question 123:** What warnings have historically been provided by ESB? **Answer 123.** See Chapter 10.

719. **Question 124:** Did ESB at any time explain the meaning of its warnings? **Answer 124:** Not to UCC. Nor does UCC appear ever to have sought explanation.

720. **Question 125:** Why did ESB provide warnings in November 2009? **Answer 125:** See Answer 122. In the case of UCC, it received individual warning because it was on ESB's opt-in 'warning-list'.

721. **Question 126:** What warnings were provided to UCC in November 2009? **Answer 126.** See Chapter 14.

722. **Question 127:** At what times were the warnings provided? **Answer 127.** See Chapter 14.

723. **Question 128:** What warnings were provided to Cork City Council in November 2009? **Answer 128:** The within proceedings involve UCC and ESB. The court does not know if it has

been provided with a complete account of any warnings given to Cork City Council and thus declines to answer this question.

724. **Question 129:** At what times were these warnings provided? **Answer 129:** See Answer 128.

725. **Question 130:** Did such warnings as were provided to UCC in November 2009 differ from previous such warnings as were provided? **Answer 130:** Not to the court's knowledge, though as warnings do not follow a prescribed form contained in the Lee Regulations, the court does not know. Certainly they do not appear to have been sufficiently different to suggest that a different type of circumstance was presenting.

726. **Question 131:** Did the warnings given by ESB to UCC communicate the fact that there was risk to property and persons? **Answer 131:** No.

727. **Question 132:** If the answer to Question 131 is 'yes', did the warnings adequately communicate the level of the risk? **Answer 132:** N/A (though had the answer to Question 131 been 'yes', the answer to this question would have been 'no').

728. **Question 133:** Did such warnings as were given communicate that there would be unprecedented discharges from the Lee Dams and Reservoirs? **Answer 133:** No.

729. **Question 134:** Did such warnings as were given reflect ESB's own knowledge of the impact of discharges on those downstream, including UCC? **Answer 134:** No.

730. Question 135: Has ESB changed its warning system since November 2009? **Answer 135:** Not to the court's knowledge.

731. Question 136: If the answer to Question 136 is 'yes', how has the warning system changed? **Answer 136:** N/A.

xiv. Alternative Operation of the Lee Dams.

732. Question 137: Could ESB have operated the Lee Dams and Reservoirs differently during the November 2009 flood? **Answer 137:** Yes.

733. Question 138: If the answer to Question 137 is 'yes', how could ESB have so done? **Answer 138:** By consistently operating to TTOL prior to November 19th 2009, it would have alleviated or obviated the need to engage in such spilling as it did on and about the 19th. On the morning of the 19th, there were a few hours when in-flow exceeded 250m^3/s and ESB could have discharged water to the inflow-level without compromising its 'do not worsen nature' rule.

xv. Water Levels.

734. Question 139: Do initial water-levels in the Lee Reservoirs and available storage at the onset of a flood event have an impact on downstream flows and flood levels? **Answer 139:** Yes.

735. Question 140: Were water levels generally maintained above TTOL in the winters prior to 19th November, 2009? **Answer 140:** Yes.

736. Question 141: Did ESB endeavour to maintain water-levels in the Lee Reservoirs at TTOL in the winters prior to 19th November, 2009. **Answer 141:** No.

737. Question 142: Were water levels too high in the period leading up to 19th November, 2009? **Answer 142:** Yes.

738. Question 143: Could water-levels have been maintained at lower levels in the period leading up to 19th November, 2009? **Answer 143:** Yes.

739. Question 144: Is the maintenance of water-levels at TTOL a reasonable step that could have been taken by ESB to protect persons and property from injury and damage? **Answer 144:** Yes.

740. Question 145: Have water levels generally been maintained at TTOL in the winters since 19th November, 2009? **Answer 145:** It is perhaps more correct to state that MaxNOL has been lowered to TTOL.

741. Question 146: If the answer to Question 145 is 'yes', what is the reason for water levels being so maintained? **Answer 146:** The lower MaxNOL is pursuant to a request from the OPW that ESB adopt lower levels for flood protection. Notably, as a flood prevention measure it has worked. Thus ESB has not, despite equally wet periods of weather in the years since, been required to adopt the sequence of discharges it operated on November 19th/20th 2009.

xvi. Advance Discharges.

742. Question 147: Based on all of the information available to ESB on 16th November 2009, was it likely that the peak in-flow into the Lee Reservoirs during the flood event of the 19th would be $250m^3/s$ or less? **Answer 147:** No.

743. Question 148: In the days leading up to the November 2009 flood, could ESB have reduced the water levels in the Lee Reservoirs? **Answer 148:** Yes.

744. Question 149: If the answer to Question 149 is 'yes', what water-levels could have been reduced by engaging in advance discharges? **Answer 149:** Water-levels at both of the Lee Reservoirs.

745. Question 150: If the answer to Question 149 is 'yes', when and/or at what levels could those advance discharges have taken pace? **Answer 150:** A precise sequencing of discharges cannot be determined by the court from the evidence before it. However, it accepts the evidence of Mr Faulkner that earlier in the month, it was possible to reduce levels without exceeding the $150m^3/s$ threshold. And, during the flood-event, on the morning of the 19th, as was accepted by Mr Mangan, there were a few hours when in-flow exceeded $250m^3/s$ and ESB could have discharged water to the inflow-level without compromising its 'do not worsen nature' rule. (On this last point, see further Chapter 52).

746. Question 151: Were advance discharges a reasonable step that could have been taken by ESB to protect persons and property from injury and damage? **Answer 151:** Yes.

747. Question 152: Did ESB engage in advance discharges in the days leading up to 19^{th} November, 2009? **Answer 152:** Yes.

748. Question 153: If the answer to Question 152 is 'yes', when and at what levels did ESB engage in such discharges? **Answer 153:** See Chapter 14.

749. Question 154: Could ESB have engaged in more frequent and/or greater advance discharges in the period leading up to 19^{th} November, 2009? **Answer 154:** That depends on start water-levels. In the context of where it found itself, on the balance of probabilities, and having particular regard to the evidence of Mr Ramsbottom, 'no'. However, ESB should have been operating consistently to TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35). Had it done so, the answer to this question would be 'yes'.

750. Question 155: Has ESB made advance discharges during previous flood events? **Answer 155:** Yes.

751. Question 156: Do the Lee Reservoirs have the capacity to re-fill quickly? **Answer 156:** Yes.

xvii. Storage at Carrigadrohid.

752. Question 157: Does conjunctive operation of cascading dams enable better management of the dams during a flood period? **Answer 157:** Yes.

753. Question 158: If the answer to Question 157 is 'yes', why is this so? **Answer 158:** Through juggling of water levels, creation of 'empty space', and staggering of flows.

754. Question 159: Were the Lee Dams managed conjunctively in November 2009? **Answer 159:** Yes.

755. Question 160: At what time on 19th November, 2009, was a decision made to hold back more water at Carrigadrohid? **Answer 160:** See Chapter 14.

756. Question 161: Why was the decision to hold back water made, and on the basis of what information? **Answer 161:** See Chapter 14.

757. Question 162: Did the decision to hold back water constitute a departure from the Lee Regulations? **Answer 162:** Yes.

758. Question 163: What effect had the holding back of water at Carrigadrohid on the rate of rise at Inniscarra? **Answer 163:** It slowed it.

759. Question 164: Could more water have been held back at Carrigadrohid during the November 2009 flood while maintaining dam safety? **Answer 164:** In retrospect, yes.

760. Question 165: Was holding back more water at Carrigadrohid a reasonable step that could have been taken by ESB to protect persons and property from injury and damage? **Answer 165:** The holding-back that occurred was.

761. Question 166: Was there unused available storage in Carrigadrohid during the November 2009 flood? **Answer 166:** Each time water-levels were below MaxNOL, yes.

xviii. Causation.

762. Question 167: Had water-levels been maintained at lower levels, closer to and/or at TTOL, prior to 19th November 2009, would this have made a difference to the flooding experienced by UCC in November 2009? **Answer 167:** Yes.

763. Question 168: Had ESB made advance discharges above $150m^3/s$ on 16th and/or 17th and/or 18th and/or 19th November 2009, would this have made a difference to the flooding experienced by UCC in November 2009? **Answer 168:** Yes, but for ESB to do so would, it appears, have led to its flooding other people's property, something it cannot lawfully elect to do.

764. Question 169: Had ESB used available storage in Carrigadrohid during 19th November 2009, would this have made a difference to the flooding experienced by UCC in November 2009? **Answer 169:** Yes.

765. Question 170: Had ESB issued meaningful warnings both prior to and/or on 19th November 2009, would it have made a difference to the damages suffered by UCC in November 2009? **Answer 170:** Yes.

766. Question 171: What difference would any and/or all of the measures referred to at Questions 167–170 (inclusive), whether individually or cumulatively, have made to the flooding experienced and/or damage suffered by UCC in November 2009? **Answer 171:** As to Question 167, flooding of UCC's properties on the 19th would have been reduced or obviated. As to Question 168, this is not something that ESB may lawfully elect to do. As to Question 169, it would have reduced flooding downstream. As to Question 170, despite the very significant contributory negligence that the court finds later below to arise on the part of UCC, it would have made a difference.

xix. Damage.

767. Question 172: Was there a continued release of water over a prolonged period of many hours in November 2009? **Answer 172:** Yes.

768. Question 173: If the answer to Question 172 is yes, did the release create a risk to life and safety of persons? **Answer 173:** Yes.

769. Question 174: If the answer to Question 173 is yes, what was the level of that risk? **Answer 174:** Very high.

770. Question 175: Did the release cause damage to property? **Answer 175:** Yes.

771. Question 176: If the answer to Question 175 is yes, what was the damage? **Answer 176:** See Chapter 15.

xx. Contributory negligence.

772. Question 177: What affected buildings were constructed by UCC? **Answer 177:** See Appendix A.

773. Question 178: Of the affected buildings, when were they designed by UCC's consultants? **Answer 178:** See Appendix A.

774. Question 179: What steps could have been taken by an ordinary competent practitioner to assess and mitigate flood risk at the time(s) the affected buildings constructed by UCC were designed? **Answer 179:** See Chapters 43 and 44.

775. Question 180: Did the consultants engaged by UCC take such steps? **Answer 180:** The court assumes the reference is to consultants engaged on the buildings engaged by flooding in November 2009. No consultants took the steps identified as appropriate by the expert witnesses called by ESB, which steps the court considers were appropriate steps to take.

776. Question 181: Did UCC rely on the consultants engaged by it to assess and mitigate flood risk? **Answer 181:** Yes.

777. Question 182: Was flood risk considered by the relevant planning authority(ies) when planning permission was granted for the affected buildings constructed by UCC? **Answer 182:** Not, it appears, in any comprehensive sense.

778. Question 183: What affected buildings were acquired by UCC, and when? **Answer 183:** See Appendix A.

779. Question 184: Did UCC take reasonable steps to assess and mitigate against any known flood risk in respect of the affected buildings it acquired? **Answer 184:** No.

780. Question 185: Were any of the affected buildings previously subject to fluvial flooding? **Answer 185:** Unless the flooding referred to in Chapter 55, Item [47] was fluvial flooding, it appears not.

781. Question 186: If the answer to Question 185 is yes, when? **Answer 186:** See Answer 185 and referenced text.

782. Question 187: Was UCC's reaction to the warnings on 19th November, 2009, reasonable in all the circumstances? **Answer 187:** No.

Section C. Issues of fact (ESB)

i. General.

783. **Question 188:** Did international practice in 2009 permit an authorised hydro-electric operator to optimise power generation, save where there was a legislative limitation? **Answer 188:** Yes. However, if there is a suggestion in the question that ESB merely optimised power generation abilities, this is not so. It consistently exceeded TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35). Moreover, a central issue arising in this case is whether the common law (as opposed to legislation) imposes any limitations on the freedom of industry that the question appears to contemplate.

784. **Question 189:** Did ESB, as a hydro-electric operator, exercise in a *bona fide* manner its discretion to adjust water-levels in the Lee Reservoirs during November 2009? **Answer 189:** Yes, save insofar as it deliberately sought to attain or maintain water-levels in excess of TTOL.

785. **Question 190:** Was prioritisation by ESB of water management safety measures in respect of the design storm contrary to a proven hydro-electric standard of performance? **Answer 190:** Reasonable dam-engineering professionals may reasonably differ and yet the respective standards adopted by them may accord with such obligations as the law, more particularly the common law, requires or imposes. The court cannot therefore answer the question as posed because one is not so much in the realm of 'proven standards' as in the proper exercise of discretion within such parameters as the law, most especially the common

law, allows. So, for example, it is ultimately necessary for UCC to establish nuisance and/or negligence, not the existence of a particular 'proven hydro-electric standard of performance'. However, the court notes that to the extent that ESB considers its own Lee Regulations to be reflective of some 'proven hydroelectric standard', ESB in the years and days prior to the flood events of November 2009 consistently elected to act in breach of same through its choice consistently to maintain water-levels in excess of TTOL. As to whether there has been non-compliance by ESB with any applicable common law obligation, this is considered elsewhere herein.

786. Question 191: Did ESB, as a hydro-electric operator during 2009, act contrary to a proven hydro-electric standard of performance by not reducing its power generation capacity for flood alleviation? **Answer 191:** See Answer 190.

787. Question 192: Did optimisation of power generation require higher water storage levels? **Answer 192:** Yes, though clearly there are limits on this. ESB accepts that it cannot go beyond MaxNOL and its own operational rules require that it operate generally to TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*).

788. Question 193: Do higher water storage levels restrict flood alleviation? **Answer 193:** The higher the level, the less storage ('empty space') available for flood alleviation. As in November 2009, they may also yield flooding that otherwise would not have occurred at all or to the same extent.

789. **Question 194:** Were ESB's operational reservoir levels applicable in November 2009 contrary to a proven hydro-electric standard of performance? **Answer 194:** See Answer 190.

790. **Question 195:** Did ESB act contrary to a proven hydro-electric standard of performance in November 2009 in the control of water levels in the Lee Reservoirs? **Answer 195:** See Answer 190.

791. **Question 196:** Was the management of the Lee Dams by reference primarily to reservoir levels contrary to a proven hydro-electric standard of performance? **Answer 196:** See Answer 190.

792. **Question 197:** Was the use in November 2009 of operational discretion under the Lee Regulations in respect of advance discharges contrary to a proven hydro-electric standard of performance? **Answer 197:** See Answer 190.

793. **Question 198:** Were the conditions imposed on the exercise of operational discretion under the Lee Regulations contrary to a proven hydro-electric standard of performance? **Answer 198:** See Answer 190.

794. **Question 199:** Was the absence of inundation assessment in the Lee Regulations contrary to a proven hydro-electric standard of performance? **Answer 199:** See Answer 190.

795. **Question 200:** Were the Lee Regulations intended for interpretation and use by ESB hydro-electric personnel? **Answer 200:** Yes. However, to the extent that this is suggested, if at all, the court does not accept that this has the result that the Regulations are not now capable of

being interpreted by the court, having regard, *inter alia*, to the abundance of expert evidence with which it has been presented. Moreover, the court considers the Regulations to be a useful pointer to what ESB has historically considered to be good industry/professional practice, *e.g.* the requirement (at *iv*) that it endeavour to maintain TTOL during non-flood conditions, and thus a most useful pointer as to what is not good industry/professional practice.

796. Question 201: Did ESB act in accordance with its interpretation of the Lee Regulations during and in connection with the November 2009 flood? **Answer 201:** No (not least in the belated holding-back of water at Carrigadrohid Reservoir).

797. Question 202: Does the interpretation of the Lee Regulations by persons not engaged in the Lee Hydro-Electric Scheme affect the operation of the Scheme? **Answer 202:** No, unless ESB allows a general impression to arise as to how it will operate the Scheme.

798. Question 203: Was ESB required to make any changes in the Lee Regulations by the EDSC affecting its dam operation in November 2009? **Answer 203:** No.

799. Question 204: Was a hydro-electric operator who did not in 2009 devote a particular amount of reservoir capacity to flood alleviation in addition to storage for the design storm act contrary to a proven hydro-electric standard of performance? **Answer 204:** See Answer 190.

800. Question 205: Was there in 2009 any proven hydro-electric standard of performance applicable to a hydro-electric operator that such hydro-electric operator should not, without legal certainty, aggravate fluvial conditions that would otherwise have arisen in the absence of the hydro-electric scheme? **Answer 205:** See Answer 190.

801. Question 206: Did a hydro-electric operator in 2009 act contrary to a proven hydro-electric standard of performance by preferring not to make pre-emptive discharges likely to cause flooding in advance of a storm? **Answer 206:** See Answer 190.

802. Question 207: Do UCC's alternative advance discharges provide an identifiable standard of performance without explicit choice of alternative? **Answer 207:** No. The court notes in passing that it considers that UCC was unsuccessful in establishing, on the balance of probabilities, an alternative sequence of discharges in which ESB could have engaged on the 19th. This is without prejudice to the court's finding that had ESB but acted in accordance with the Lee Regulations, it would have operated to TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – this would have obviated or reduced the flood-event in November 2009.

803. Question 208: Was ESB, by regarding itself in November 2009 as unable to undertake UCC's alternative advance discharges, acting contrary to a proven hydro-electric standard of performance? **Answer 208:** See Answer 190.

804. Question 209: Did ESB's management of the Lee Dams in November 2009 attenuate flooding both by comparison with the in-flow to the reservoirs, and by comparison with fluvial conditions that would have prevailed in the absence of the Lee Scheme? **Answer 209:** Yes, but greater alleviation or obviation of flooding would have occurred through consistent operation to TTOL.

805. Question 210: Did ESB's discharge in November 2009 cause any material and avoidable worsening of the flood by reference to tide, tributaries or rate of rise? **Answer 210:** No, if one looks to the water-levels that presented but yes if one has regard to the fact that those start-levels were too high because of its persistent failure to operate to TTOL.

806. Question 211: Did the November 2009 flood on the river Lee have a return period of approximately 100 years? **Answer 213:** Mr Cawley, an impressive expert witness called by ESB, estimated that the return period for the November 2009 flood-event can be estimated with 67% confidence as a 50 to 250-year flood event. Thus it is possible that it may have been a 100-year flood.

807. Question 212: Was ESB in breach of any proven hydro-electric standard of performance applicable to a hydro-electric operator by failing to operate the Lee Dams differently during the 2009 flood? **Answer 212:** See Answer 190.

808. Question 213: Was the information available to ESB staff in Inniscarra in 2009 in relation to reservoir levels, in-flows, rainfall and weather forecasts contrary to a proven hydro-electric standard of performance? **Answer 213:** See Answer 190.

809. Question 214: Was the rainfall in November 2009 in the Lee Catchment exceptional rainfall? **Answer 214:** No. (Mr Faulkner (Faulkner Report, 2) describes it as "*moderately extreme*". Mr Cawley (Cawley Report, 2) describes it as "*relatively moderate*").

810. Question 215: Did ESB, by not acting to increase storage at Carrigadrohid as proposed by ESB, act contrary to a proven hydro-electric standard of performance? **Answer 215:** See Answer 190.

811. Question 216: Was a hydro-electric operator who operated a dam in 2009 with a reasonable and bona fide intention of avoiding structural damage arising from the design storm acting contrary to a proven hydro-electric standard of performance? **Answer 216:** See Answer 190.

812. Question 217: Did ESB, in preferring conservative measures for safety over the dangers of the design storm in respect of the Lee Scheme in 2009 act contrary to a proven standard of hydro-electric performance? **Answer 217:** See Answer 190.

813. Question 218: Did international practice or any proven hydro-electric standard of performance in 2009 applicable to a hydro-electric operator require that such hydro-electric operator should devise a flood alleviation standard other than in respect of the design storm? **Answer 218:** No to 'international practice' insofar as known to the court; neither did such practice require that it not be TTOL (by whatever name or acronym known). As to a 'proven hydro-electric standard of performance', see Answer 190.

814. Question 219: Was ESB's application of operating rules for the design storm to general reservoir levels in the Lee Scheme contrary to a proven hydro-electric standard of performance? **Answer 219:** See Answer 190.

815. Question 220: Was TTOL a sufficiently fixed point from which to measure the effect of flood alleviation? **Answer 220:** Yes.

816. Question 221: If the answer to Question 220 is yes, can TTOL be used as a fixed basis of estimating inundation effect? **Answer 221:** If the question means 'can a suitable discharge regime be calculated by using TTOL as, in effect, a new MaxNOL?', yes.

817. Question 222: Was the consideration by ESB of TTOL as being an economic operational level, contrary to a proven hydro-electric standard of performance in 2009? **Answer 222:** See Answer 190.

818. Question 223: What measured level in ESB's reservoirs can be determined as a limit arising from UCC's proposal for the adoption of TTOL as a guide without a fixed position? **Answer 223:** TTOL is a/the measured level. The court notes the somewhat self-serving formulation of this question of fact. UCC has not proposed TTOL as 'a guide without a fixed position'. It has contended for TTOL as an appropriate standard by reference to which ESB could operate the Lee Scheme consistent with such common law obligations as arise, having regard to the fact, *inter alia*, that TTOL is "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35).

819. Question 224: What warnings and/or notifications were issued by ESB to UCC and the public and/or media and/or local authorities in connection with discharges during the month of

November 2009? **Answer 224:** See Chapter 14 for details of 16th to 20th November, the critical period arising.

820. **Question 225:** Was ESB's body of warnings during the 2009 flood contrary to a proven hydro-electric standard of performance? **Answer 225:** See Answer 190.

821. **Question 226:** Could UCC be expected to or did it in fact perceive a flood risk from ESB's body of warnings issued in November 2009? **Answer 226:** No and no.

822. **Question 227:** Was ESB's provision of inundation studies to the local authority in accordance with a proven hydro-electric standard of performance? **Answer 227:** See Answer 190.

823. **Question 228:** Was there in 2009 a proven hydro-electric standard of performance indicated by the concept of 'unnecessary flooding'? **Answer 228:** See Answer 190.

824. **Question 229:** Was ESB's operation of the Lee Dams in November 2009, in prioritising dam safety to protect downstream residents from the effects of a dam failure contrary to a proven hydro-electric strandard of performance? **Answer 229:** See Answer 190.

825. **Question 230:** Was the training and experience of ESB's personnel who managed the Lee Dams in November 2009 contrary to a proven hydro-electric standard of performance? **Answer 230:** See Answer 190.

ii. Contributory Negligence/Causation.

826. **Question 231:** Did UCC make reasonable use of the warnings given by ESB directly to UCC? **Answer 231:** No.

827. **Question 232:** If the rate of discharge from Inniscarra Dam was a relevant consideration for UCC as regards the measures that it might have taken to prepare for the possible arrival of floodwaters, did UCC fail to request any information from ESB with regard to such rates? **Answer 232:** Yes.

828. **Question 233:** Did UCC make reasonable measures to protect its property against water damage, in the light of the warnings aforesaid, whether by erecting temporary barriers or by moving sensitive and valuable equipment and items of property to higher locations within buildings or out of vulnerable buildings entirely? **Answer 233:** No.

829. **Question 234:** Was UCC's response to ESB's warning telephone calls of 11:30 and 17:00 on 19th November, 2009 adequate? **Answer 234:** No.

830. **Question 235:** Did those telephone calls communicate a risk of flooding in low-lying areas? **Answer 235:** No.

831. **Question 236:** Did UCC have a major emergency plan in place in 2009 directed to coping with flooding? **Answer 236:** No.

832. Question 237: Was UCC aware of the vulnerability to flooding of Cork City generally and the locations of the affected buildings in particular? **Answer 237:** Yes.

833. Question 238: If the answer to Question 237 is 'no', ought UCC to have been so aware? **Answer 238:** N/A. Answer 237 is 'yes'. If it had been 'no', the answer to this question would be 'yes'.

834. Question 239: Did UCC take any adequate structural steps to protect its property against flooding? **Answer 239:** No.

835. Question 240: Did UCC erect buildings and structures on lands that are and which UCC knew or ought to have known constituted a natural flood plain? **Answer 240:** Yes.

836. Question 241: Are the lands on which UCC built known to have experienced significant flooding in the past? **Answer 241:** Yes.

837. Question 242: Did UCC take reasonable precautions in respect of its own property. **Answer 242:** No.

838. Question 243: Did UCC place sensitive and/or valuable equipment and artwork, in inappropriate and vulnerable basement locations? **Answer 243:** Yes.

839. Question 244: Should UCC have carried out a comprehensive flood risk assessment in connection with the development of the Western Gateway and Glucksman Gallery Buildings? **Answer 244:** Yes.

840. Question 245: What is the relevance of historical flood information to the design of new buildings? **Answer 245:** Had there been due regard to same in setting the finished floor level of UCC's buildings and taking suitable mitigation measures to counter any such fluvial flooding as occurred, little or none of the damage to UCC's properties that occurred on 19th November, 2009, would have transpired. However, this comes in the context of the court's finding that had ESB but acted in accordance with the Lee Regulations, which ESB clearly sees as according with applicable professional standards, it would have obviated or reduced the flood-event in November 2009 by operating to TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35).

841. Question 246: Were ESB's inundation studies available on enquiry at the time the affected buldings were constructed? **Answer 246:** The experience of MCOS suggests that the answer to this question is 'yes'.

842. Question 247: What guidance for designers was available at the relevant times? **Answer 247:** Specific UK guidance was available from the 1970s. BS5930, extant from the late 1990s, identified a comprehensive code of practice for site investigations. Specific Irish guidance included the "*Report of the Flood Policy Review Group*" (2004) and the "*Greater Dublin Strategic Drainage Study*" (2005). Perhaps too late for useful implementation in advance of the events in issue in these proceedings were the Department of Environment's "*Planning System and Flood Risk Management Guidelines*" (November 2009).

843. Question 248: Would a competent designer have relied upon guidance documents? **Answer 248:** Yes.

844. Question 249: What is the effective limit of tidal influence upon flooding? **Answer 249:** The court understands that what is being sought is a point on the river Lee. If so, the answer is Waterworks Weir.

845. Question 250: Has it been possible to carry out detailed flood risk assessments in Ireland since 1985? **Answer 250:** This has been possible for decades.

846. Question 251: Could specialists have been engaged at the relevant times to carry out such an assessment? **Answer 251:** Yes.

847. Question 252: Would it have been reasonable to conduct a hydrological assessment in respect of any of the affected buildings? **Answer 252:** Yes.

848. Question 253: If the answer to Question 252 is 'no', could a simple model have been derived to establish approximate floor levels? **Answer 253:** N/A.

849. Question 254: If the answer to Question 253 is 'yes', would it have been good or best practice to do so? **Answer 254:** N/A.

850. Question 255: Is a storm surge coinciding with a fluvial model on the river Lee an appropriate basis for the preparation of a simplified model? **Answer 255:** The court assumes that what is being asked is whether the simple de Silva model is acceptable. If so, the answer is 'yes'.

851. Question 256: Was it commonplace in Ireland to take an appropriate historic maximum flood level at the site and to add freeboard to the maximum flood level? **Answer 256:** Yes.

852. Question 257: What level of freeboard was appropriate for each of the affected buildings? **Answer 257:** 1m on top of design floor level.

853. Question 258: On what basis should freeboard be determined? **Answer 258:** Hydrological modelling for a proposed building of significance; a comprehensive review of flood data when approaching design of lesser buildings; and, in each instance, adding the 1m freeboard to the figure thereby settled upon.

854. Question 259: Would an engineer in the late-1990s and early-2000s have discounted the 1916 flood on the basis that the dams were in place and protected Cork City from the scale of fluvial flooding experienced before the Lee Dams were built? **Answer 259:** S/he might, but the court does not consider that this would have been reasonable professional practice.

855. Question 260: What function should UCC's Buildings Committee have had in commenting on designers' proposals in respect of flooding? **Answer 260:** More than it did. There appears to have been no meaningful engagement of any nature at any time by the Buildings Committee as to flood risk, with the possible exception of the Western Gateway Building, a notable failure.

856. Question 261: Was flooding referenced in relation to planning applications for the Glucksman Gallery, the Western Gateway Building and Victoria Lodge? **Answer 261:** The court assumes this to mean 'did flooding arise as an issue for consideration at any stage in the planning preparation/application process?' If so, the answer is 'yes'.

CHAPTER 48: 'MANDATE' VERSUS DUTY OF CARE.

857. Claimed statutory role. ESB maintains that the starting-point for analysis of such duty of care as is applicable to it is the statutory context. The relevant statutory provisions have been considered in Chapter 2. ESB contends that if it were subject to a statutory obligation to use the Lee Scheme for flood alleviation, one would find in the applicable legislation (i) express reference to such purpose; (ii) a means of reconciling hydro-electric and flood alleviation purposes; (iii) a statement of the objective to be achieved; (iv) powers ancillary to flood alleviation; and (v) a conferral of immunity from suit in respect of good faith decisions taken in exercise of the flood alleviation objective. In truth, ESB contends, there is nothing in the Scheme's statutory 'mandate' to suggest ESB has any flood alleviation duty. ESB's sole duty, it maintains, is to operate the Lee Scheme for hydroelectric purposes. ESB's powers to alter reservoir levels are, ESB maintains, conferred for hydro-power purposes. ESB acknowledges that statute does not exclude all flood alleviation: flood alleviation is incidental to prudent hydro-electric operation. But there cannot, ESB contends, be implied into the legislative scheme an obligation inconsistent with stated statutory purpose. And, ESB adds, even if it does provide more flood alleviation benefit than is strictly required, that does not mean it is obliged always to do more. ESB accepts statutory authority is no charter for negligence, but maintains that negligence requires a duty of care which, it contends, has not been established. In summary, ESB contends statute does not require it to do flood alleviation; any flood alleviation it provides does not create a duty of care; and (strangely) it may not act negligently, but no duty of care subsists. Its analysis, with respect, is wrong. A person may have a duty or function in one field and, in so acting, cause or contribute to avoidable damage in another. Such person's statutory or other functions do not prevent a duty of care arising. This is clear from *Dorset Yacht* v. *Home Office* [1970] A.C. 1004, Lord Morris noting, at 1036: "[T]*he fact that something is done in pursuance of statutory authority does not warrant its being done unreasonably so that avoidable damage is negligently caused...*".

858. The reality of ESB's role. ESB's contention of incompatibility between performance of a flood alleviation role and statutory mandate is undermined by ESB's having performed a flood alleviation role for decades. The Lee Regulations incorporate provisions that facilitate flood alleviation. Lee Scheme operatives have sought, when operating the Scheme, to provide flood alleviation. Moreover the evidence in this case points to the compatibility of hydro-generation and flood alleviation. The court offers eight reasons later below why this is so. Suffice it here to highlight the inconsistency of what ESB has contended in court and the contrary *spiel* it has spun to the world since the late-1950s. ESB's touting of the flood alleviation merits of the Lee Scheme, *inter alia*, to Government and the greater public, is considered in detail in Chapter 23, and suggested strongly to all and sundry that in running the Lee Scheme, ESB's priorities are public safety, electricity production and environmental concerns, apparently in that order. Among the most notable assertions in this regard are Mr Buckley's comments at the CIBSE lecture, also considered in Chapter 23. Mr Cawley, an expert witness called by ESB, acknowledged that at that lecture ESB had fairly unequivocally put safety of persons as a top objective, and that lecture was no aberration. If a major commercial concern goes about pronouncing that it places a premium on public safety, it has little to complain about when taken at its word and an impression arises among the world at large as to how that concern will approach and structure its activities.

859. An 'industrial process'. The statutory privilege conferred on ESB enables it to carry out operations and derive a profit from an industrial process conducted in the vicinity of the public. It is a process that is inherently hazardous and poses a risk to downstream residents. So, for example, Mr Buckley, in the public lecture given by him on the Lee Hydro Scheme on 24th October, 2007, and referred to above, asserted: "*[O]nce a dam is built, it poses, it presents a potential hazard to downstream residents. So it's very important to have procedures in place to ensure that the risks associated with the dam are properly managed.*" The hazard posed by the Lee Scheme and its operation to downstream residents is not confined to dam-breaches. Discharges from Inniscarra Dam account for circa. 70% of the flow at Waterworks Weir. So the majority of flood-risk to Cork emanates from the Lee Scheme. Of course, dam-breach would result in serious harm to persons and property; but failure to properly manage the natural resource (water) being harnessed by ESB for commercial gain, also poses a risk. And while, ultimately, flood damage arises from a natural event, a person controlling the water has some level of responsibility as regards the accumulation of that water and any flooding that occurs. There appears to be some agreement between the parties in this regard. Thus ESB has asserted that "[S]*tatutory authority and duty to operate the...Scheme is subject to the implicit requirement that it...carry out its operations without negligence*". (Opening Submissions, para. 324). A bone of contention arising is the supplementary observation that "[W]*hether there has been negligence in the operation of the scheme must be judged by reference to the operation of a hydro-electric scheme*". What ESB appears to contend is it can be as negligent as it wishes in operating the Scheme, provided its hydro-electric operations are done to the standard of a good hydro-electric operator. But there is no principle of law which supports formulation of an undertaking's duty of care by reference to how good it is at its chosen activity. The principle prescribed by law is that of the 'good neighbour', not that of the 'good hydro-operator'. This last person goes un-mentioned by Saint Luke in his eponymous Gospel and by Lord Atkin in his definitive judgment.

860. Operation of Lee Dams. Although ESB considers it does not have a duty to alleviate flooding, its dams do cause natural flood-alleviation and it does engage in flood alleviation, though not to any defined standard. This nuanced approach to flood alleviation has produced a curious meld of views from ESB staff and witnesses as to ESB's role in flood alleviation. Mr O'Mahony indicated that ESB's purpose when doing advance discharges is to "*to reduce flooding*", "*to reduce flooding downstream*", and "*to reduce the effects downstream*". (Transcript, Day 55, pp.101, 104 and Day 56, p.36). Dr Bree indicated that ESB endeavours to be "*a good neighbour to…landowners downstream*". (Transcript, Day 74, p.153). Dr Hughes observed that ESB undertakes flood alleviation "*as a good neighbour*" and does some advance discharges on a "*good neighbourly*" basis, all wording with an 'Atkin-esque' flavour. (Transcript, Day 68, 27th January, 2015, pp.6 and 15). Mr Browne, Hydrometric Officer at the Lee Dams in 2009, accepted it was the practice of him and his predecessor, where possible, to try to reduce discharges to reduce downstream flooding. (Transcript, Day 87, p.90). Mr Buckley indicated under cross-examination that ESB "*within the confines of the regulations…would try and manage every flood event…to cause the minimum amount of disruption down the river*". (Transcript, Day 84, p.72). There is also the previously-mentioned report by ESB's insurers (AXA) that addresses the role of the Lee Dams and ESB's obligations as dam-operator. This report followed a site-visit with ESB, is crafted within the context of the duty of absolute good faith that exists between insurer and insured, and contemplates a wider, deeper role for ESB as regards flood management than ESB has contended for in these proceedings. (See further Chapter 23).

861. The Lee Regulations. Notably, the Regulations facilitate flood alleviation. An EDSC report of 1992 states (at 19) that "[O]*ne of the aims of the…regulations is to minimise flooding downstream*". That aim was facilitated by later incorporation into the Regulations (2000 version) of provision for advance discharges. The express purpose of such discharges is to create more storage for incoming floods, and to reduce peak discharge. This was clear from the testimony of Dr Bree, as evidenced by the following exchange:

"*Counsel* [UCC] – …[T]*he purpose of introducing…advance discharges was in order to reduce…peak discharge and…provide measurable benefits in terms of flood alleviation downstream, isn't that so?*

Dr Bree – *Well, to contribute in a neighbourly way to lopping off an extra bit off the flood. That's the way I would put it and the effect could not be guaranteed. Sometimes it will have major effect, sometimes it will have little effect, sometimes it might have no effect. So it's lopping an extra amount off the flood going downstream.*

– *Dr Bree the making of advance discharges reduces downstream flooding; isn't that correct?*

– *That's correct.*" (Transcript, Day 74, p.113).

862. The provision for advance discharges in the Lee Regulations distinguishes ESB's position from other hydro-electric dam operators who do not perform a flood alleviation role. Dr Hughes indicated that he is not aware of any hydro-dams in the United Kingdom that have a similar facility. This suggests the Lee Dams are qualitatively different from other hydro-dams. Notably, the Lee Regulations have been amended over the years with the purpose of enhancing ESB's capacity to minimise downstream flooding. This emerged during exchanges between counsel and Mr Mangan. Moreover, it was accepted by Dr Pürer that reduction in MaxNOL at Inniscarra in December 2007 was for downstream flood alleviation. Additionally, since 2009 operation of the Lee Dams has been modified by ESB's election to reduce MaxNOL by a further 0.5m. This was done at the behest of the OPW but that it could be done is strongly suggestive that the claimed incompatibility between flood alleviation and statutory 'mandate' does not pertain.

863. Flood reports. ESB commissions flood reports each time a flood occurs to investigate 'learnings' arising. These reports focus on flood-management within the context of maintaining dam integrity and otherwise. *E.g.*, in the executive summary of a flood report of November 2000, Mr Mangan records (at *ii*), that operation of the Lee Scheme during the applicable flood "*was designed to increase... storage capacity of the respective reservoirs and...flood attenuation attributes of the reservoirs*". Implicit in this is a recognition that flood alleviation, and ESB's management of same, goes beyond dam integrity.

864. Flood alleviation versus statutory mandate. The court does not accept the contention that flood alleviation is inconsistent with ESB's statutory 'mandate'. There are at least eight reasons why this contention is wrong.

865. [1] *What happens downstream.* Hydro-generation necessarily carries some consideration of downstream consequences. This is apparent, *inter alia*, from Dr Pürer's evidence. He indicated to counsel for UCC that when a dam operator has an element of control and it is possible to exercise that control to reduce downstream effects, it should do so, subject to its authorisation and commercial considerations:

> "*Counsel –* *I know you say your responsibility is only the safety of the dam, the integrity of the dam...*
>
> *Dr Pürer –* *Yes.*
>
> – *...*[B]*ut I take it you would agree that a dam and reservoir operator, where they have an element of control to reduce the downstream effects, they should do so?*
>
> – *Yes, that depends. I believe that depends on the permission and on the licence, in what amount, how they can contribute or how they must contribute. So there we have a discretionary clause, so they do the best they can. And at the same time to avoid too significant losses in production, in energy production. Yes, so there are many effects to be considered.*" (Transcript, Day 65, p.134).

866. [2] *Combining tasks.* One can combine hydro-generation and flood alleviation. The Lee Scheme, as Dr Bree observed is "*physically and mathematically*" capable of bearing both functions. (Transcript, Day 74, p.94). Dr Hughes concurred with this in the following exchange with counsel for UCC:

"*Counsel* – [I]*t is well recognised that there are methods of optimising the discharge of both of these functions* [hydro-generation and flood alleviation]*; isn't that correct?*

Dr Hughes – *I don't know that it's well recognised. It is not something that is common.*

– *Yes. And that's what you would expect a dam to do if it was performing both of those functions, it would work out how best to integrate them and optimise them; is that correct?*

– *That's what you would expect to happen.*

– *And therefore there is no intrinsic conflict between the two, though you may have to make some compromise between one and the other; isn't that correct?*

– *Well, there is a conflict because the overriding philosophy is dam safety. So you have got to accommodate them all within the boundaries of dam safety.*

– *Yes. Well, you accommodate them within the boundaries of dam safety and you then optimise within that; isn't that correct?*

– *You can do that, yes.*" (Transcript, Day 68, p.86).

867. [3]. *Dual functions in Lee context.* If hydro-generation and flood alleviation functions can be combined, and physically/mathematically they can, this is particularly so in the context of reservoirs that, as mentioned by Mr Shibatani, have a nine-to-one annual refill capacity and where, to quote Dr Bree, "[O]*n the Lee, you are always no more than three or four days away from the next in-flow.*" (Transcript, Day 76, p.8).

868. [4]. *Statute is permissive.* The Act of 1945, and the framework it establishes, facilitate achievement of other objectives. Under that framework, a hydro-electric dam's functions are not crystallised immutably. Additional tasks may be undertaken/imposed. This has occurred in the context of the Lee Dams, *e.g.*, in ESB's entering into water-abstraction agreements, its environmental protection measures regarding the Gearagh wetlands, and its occasional facilitation of amenity usage of the reservoirs. The Lee Dams are not multi-purpose dams; however, the weight of evidence shows that as single-purpose hydro-electric dams they can be operated to optimise electricity generation and flood alleviation through consistently seeking to operate to TTOL ("*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35).

869. [5]. *ESB does flood alleviation.* ESB already to some extent compromises its hydro-electric function to provide flood alleviation. So it is illogical for ESB to claim it cannot compromise its hydro-electric function to prevent some downstream flooding.

870. [6]. *Unreality of ESB's position.* The proposition that appears to sub-tend ESB's position is that it is entitled to pursue its hydro-electric generation mandate without regard for persons and property downstream, provided the flooding that ensues is no worse than would have occurred before 1957. This proposition enjoys no basis in our legal system.

871. [7]. *International position.* Compatibility of hydro-electric generation and flood alleviation is acknowledged, *e.g.*, by the Institution of Civil Engineers. Even dams and reservoirs smaller than the Lee Scheme serve these dual ends; which puts the lie to any suggestion that the Lee Scheme is too small to bear such duality.

872. [8]. *ESB is expert and experienced.* ESB and ESB Group possess the experience to reconcile hydro-power and flood alleviation. This is uncontested.

873. Shift in ESB's position. ESB has actively managed floods to deliver flood alleviation, has adopted operating rules/practices that facilitate flood alleviation, and has publicly touted the merits of the Lee Dams as flood-alleviants. It was only after the 2009 flood that there was a marked change in language and approach, with ESB seeking to re-characterise the role it had assumed historically and to resile from earlier representations as to flood alleviation. The simple reality is that flood alleviation is compatible with ESB's statutory mandate and would have flowed from a proper discharge of the duty of care that the court considers to arise.

CHAPTER 49: THE GENERATION LICENCE.

874. Licence sealed. ESB's interim generation licence was sealed by the Commission for Energy Regulation on 21st April, 2006. In it the Commission grants ESB "*a licence to generate electricity at the generating stations identified in Schedule 1* [including the Lee Stations]", subject to conditions.

875. Legislative basis for licence. The generation licence is granted under s.14(1)(a) of the Electricity Regulation Act, 1999, as amended,which provides: "*The Commission may grant or refuse to grant to any person a licence (a) to generate electricity...and where the Commission* *grants such a licence, that licence shall be subject to such terms and conditions as may be specified in the licence*".

876. Condition(s) relied upon. The generation licence condition principally relied upon by UCC is Condition 19 ("Health and Safety"): "*The Licensee shall take all reasonable steps to protect persons and property from injury and damage that may be caused by the Licensee and shall comply with all applicable enactments when carrying out its Generation Business.*" The term "*Generation Business*" is defined in Condition 1 to mean "*the licensed business of the Licensee in the generation of electricity or...provision of Ancillary Services.*" The term "*Ancillary Services*" has the meaning given to it in the Grid Code; this Code is not relevant for present purposes. Some reliance also appears to have been placed by UCC on Condition 8 which is concerned with the licensee's system planning. This point was not assiduously pursued at the proceedings and appears to have been dropped. In case it has not, the court notes that the point it makes hereafter as to why no private cause of action in relation to Condition 19 arises, applies with equal vigour to Condition 8.

877. Legal basis for reliance on Licence. UCC contends that (1) Condition 19 highlights the inequity of permitting ESB to evade a duty to take reasonable steps to protect persons and property downstream from avoidable flooding, (2) it would be unfair to exempt ESB from a duty of care to which its competitors are subject, if such a condition is a feature of their licences, (3) the unawareness on the part of ESB witnesses of Condition 19 is remarkable, (4) the licence is of general purport because it makes reference to the public. The overriding contention is that Condition 19 posits/recognises the duty of care for which UCC contends. The court does not see how breach by ESB of a condition in the generation licence would confer any private right of action. Even if the licence could be interpreted as giving rise to statutory duties, the proposed action would not lie for at least two reasons. First, basic requirements for such an action, as laid down by authoritative decisions, are not met. Second, the underlying legislation does not admit of the existence of a private cause of action. As Fennelly J. noted, at p.150 of his judgment in *Glencar*, "*A duty imposed by statute on a public body will not be held to create a right to damages for its breach unless it can be shown to have within the scope of its intendment a reasonably identifiable protective purpose and identifiable class intended to benefit*". ESB is not a public body; even so, applying the logic of *Glencar* to this case, here there is no reasonably identifiable protective purpose, nor an identifiable class intended to benefit. The duty imposed by Condition 19 is owed by ESB to the Commission and is intended to ensure the licensee observes good practices regarding health and safety. There is no class identified as intended to benefit from this obligation; for UCC to benefit, the class would be the world at large. Under established principles, there is in such circumstances no private cause of action for breach of statutory obligation.

878. Scheme of legislation against private action. Section 14(1)(a) of the Act of 1999 provides that the Commission may grant to any person a licence to generate electricity on such terms and conditions as may be specified. Sections 23 to 26 prescribe the mechanisms for enforcing the terms and conditions of licences granted. Their effect is that the Act creates its own remedies for breach of a s.14 licence. There is nothing to suggest any intention to confer a private right of action. A generation licence is a matter between licensor and licensee. Breaches of licences should be dealt with in the manner provided for under the Act of 1999. The court notes that there is no evidence before it of any determination by the Commission that ESB is or has been in breach of Condition 19. There is nothing in the Act of 1999 to suggest the Oireachtas intended to confer any power on the Commission to alter rights and obligations of a licensee and third parties under tort law. The very notion is fanciful. Breach of a generation licence is enforceable by the Commission, not by private right of action.

879. 'Jacking up' the common law. In closing submissions, counsel for UCC suggested that Condition 19 fortifies the case that a duty of care at common law exists. It is conceivable that the Commission may consider its inclusion of Condition 19 to be informed by the common law. But even if that is so, that offers no basis for what, to borrow the colourful wording employed by Lord Scott in *Gorringe* v. *Calderdale Metropolitan Borough Council* [2004] 2 All E.R. 326, para. 54, is in truth a misplaced effort to "*jack up*" the common law.

CHAPTER 50: 101 PRINCIPLES OF TORT LAW.

880. The court has been referred to a cornucopia of case-law on nuisance and negligence. In this chapter the court identifies certain key principles arising from that case-law and makes various observations on the application of those principles to the practicalities presenting.

I. The Rule in *Rylands* v. *Fletcher*.

881. **[1] The essential ingredients of liability under *Rylands* v. *Fletcher* are: (1) non-natural use of land by introduction onto it of a dangerous thing, *i.e.* something which in the natural course would, or it is foreseeable would, cause damage if it escapes; (2) escape of that thing; (3) that thing causing foreseeable damage to the plaintiff; and (4) absence of any defence such as act of God.** (*Fletcher* v. *Rylands* (1866) L.R. 1 Exch. 265; *Rylands* v. *Fletcher* (1868) L.R. 3 H.L. 330).

882. **[2] In the United Kingdom, there are limited circumstances in which *Rylands* applies. It is a remedy for damage to land or interests in land. It does not apply to works/enterprises authorised by statute. It is not particularly strict; it excludes liability when the escape is for the most common reasons, *viz.* vandalism or unusual natural events. Cases involving escape not attributable to an unusual natural event or third-party action usually give rise to an inference of negligence. Last, there is a broad, ill-defined exception for 'natural' land uses.** (*Transco plc* v. *Stockport Metropolitan Borough Council* [2004] A.C.1, Lord Hoffman).

883. *Observation #1*: *Rylands* has yielded little reported litigation in Ireland. It was referred to by Henchy J. in *Hanrahan* v. *Merck Sharpe & Dohme (Ireland) Ltd.* [1988] I.L.R.M. 629, 633. His comments were *obiter* as the decision was based on nuisance. So whether Lord Hoffman's observations in *Transco* are entirely correct as regards Irish law is uncertain. The *Rylands* dimension of the within proceedings is no longer being pursued by UCC.

II. Statutory Authority and Strict Liability.

884. **[3] It is generally more appropriate for strict liability in respect of high-risk operations to be imposed by the legislature: relevant activities can be identified; those concerned know where they stand; statute can lay down precise criteria establishing incidence and scope of liability.** (*Cambridge Water* v. *Eastern Counties Leather plc* [1994] 2 A.C. 264, Lord Goff, 305; see also *Transco*).

885. **[4] Where the legislature authorises construction and use of an undertaking/works, that carries an authority to do the authorised with immunity from liability in nuisance. For such immunity to apply, statutory powers must be exercised with all reasonable regard and care for others' interests. Why? Because land-use for a particular activity cannot be characterised as unreasonable if it is authorised/required by statute. Against the fact of statutory authority, the user is natural and ordinary.** (*Allen* v. *Gulf Oil Refining Ltd.* [1981] 1 A.C. 1001, Lord Wilberforce, 1011; see also *Transco*).

886. **[5] No action lies for doing what the legislature has authorised, if it be done without negligence, albeit that it occasions damage to anyone.** (*Geddis* v. *Proprietors of Bann Reservoir* (1878) 3 App. Cas. 430, Lord Blackburn 455–456; see also *Hammersmith and City Railway Co.* v. *Brand* L.R. 4 H.L. 171; *Transco*). The effect of this principle has been to exclude application of *Rylands* to works constructed/conducted under statutory authority. See *Green* v. *Chelsea Waterworks Co.* (1894) 70 L.T. 547; *Dunne* v. *North Western Gas Board* [1964] 2 Q.B. 806.

887. **[6] Liability for nuisance not created by the defendant is not, in modern law, strict or absolute.** (*Sedleigh-Denfield* v. *O'Callaghan* [1940] A.C. 880, Lord Wright, 904).

888. <u>Observation #2:</u> In the present case, the defence of 'statutory authority' is not available to ESB for at least three reasons. (1) ESB's actions in respect of which the claimed nuisance arises are performed pursuant to statutory powers, not in fulfilment of statutory duty. The applicable test is stated in *Charing Cross Electric Supply Co.* v. *Hydraulic Power Co.* [1914] 3 K.B. 722, 781–2. Per Lord Sumner, the undertakers there were:

"*given powers of taking water and laying mains without being under...obligation to keep their mains charged with high pressure, or at all. This serves...to distinguish the class of cases of which* Green...*was an illustration, where the principle is that if the legislature has directed and required the undertaker to do that which caused the damage, his liability must rest upon negligence in his way of doing it...not upon the act itself.*" ESB is under a duty to generate electricity at the Lee Scheme. However, the water-release at issue in these proceedings was not performed pursuant to s.10 of the Act of 1945, but pursuant to an incidental/express power under s.6/10. When spilling, ESB cannot be discharging its duty under s.10 because it is not generating electricity. (2) The defence of 'statutory authority' requires that the nuisance be an inevitable consequence of the statutory power being exercised. Here, ESB could have taken alternative action which would have reduced avoidable flood-damage to UCC. In *Allen* v. *Gulf Oil*, Lord Wilberforce, at 1013, indicated that the applicable test was as stated by Lord Dunedin in *Manchester Corporation* v. *Farnworth* [1930] A.C. 171, 183 *viz.* "[T]here *can be no action for nuisance caused by the making or doing of that thing* [*i.e.* the thing authorised] *if the nuisance is the inevitable result of the making or doing so authorized.*" (3) The damage to UCC was not the "*inevitable result*" of generating hydro-power or managing the Lee Scheme; it could have been avoided by taking reasonable care, through the consistent targeting of TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35). Earlier in *Manchester Corporation*, Lord Wilberforce described other necessary ingredients of the defence of statutory authority, *viz.* "*the statutory powers are exercised without 'negligence' – that word here being used in the special sense so as to require the* *undertaker, as a condition of obtaining immunity from action, to carry out the work and conduct the operation with all reasonable regard and care for the interest of other*[s]". In the present case, the statutory function of hydro-generation was not exercised without negligence. Taking reasonable care, consistent with the duty to generate, would have resulted much less flooding in November 2009.

III. Nature of Private Nuisance.

889. [7] Nuisance is a protean tort *i.e.* tending or able to change frequently or easily. (*Hunter* v. *Canary Wharf* [1997] A.C. 655, Lord Hope, 723; see also *Sedleigh-Denfield*; *Transco*).

890. [8] Private nuisance consists of interference, without lawful justification, with a person's use and enjoyment of his property. (*Royal Dublin Society* v. *Yates* [1997] IEHC 144, Shanley J., para. 73).

891. Observation #3: In the present case, nuisance arose in circumstances where ESB consistently accumulated water in excess of TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35). The result of this consistent and persistent behaviour by ESB was that storage capacity in the Lee Reservoirs was significantly reduced so that, in the event of significant inflows into the Reservoirs, it would (and did consequently) become necessary to release water over a prolonged period at a rate that would cause flooding downstream, thereby interfering with UCC's use and enjoyment of its property.

892. [9] **With nuisance, once damage is identified, absence of negligence on the defendant's part is irrelevant.** (*Hanrahan*, 634).

893. [10] **A party asserting material damage to his property by reason of nuisance must establish the fact of such damage and that it was caused by the nuisance alleged.** (*Halpin* v. *Tara Mines Ltd.* [1976-1977] I.L.R.M. 28, Gannon J., 30; see also *Hanrahan*).

894. [11] **It is no defence to nuisance that activities complained of: were done with the highest standards of care, skill and supervision and equipment; or (b) are of great public importance and cannot conveniently be carried out otherwise.** (*Halpin*, 30; see also *Hanrahan*).

895. [12] **If alleged nuisance involves interference with ordinary comfort and enjoyment of the plaintiff's property, the plaintiff's evidence must show sensible personal discomfort, including injurious affection of the nerves/senses of such nature as would materially diminish the comfort and enjoyment of, or cause annoyance to, a reasonable man accustomed to living in the same locality.** (The reasonable man connotes a person whose notions and standards of behaviour and responsibility correspond with those generally pertaining among ordinary people in our society at the present time, who seldom allows his emotions to overbear his reason, whose habits are

moderate and whose disposition is equable). (*Halpin*, 30; see also *Hanrahan*, and McMahon and Binchy, *Law of Torts* (4^{th} ed., 2013), para. 24–65)).

896. **[13] The maxim *sic utere tuo ut alienum non laedas* ('so use your own as not to injure another's property'), expresses the duty which an owner/occupier of lands or buildings, owes his neighbour, be he (a) an adjoining owner/occupier, (b) a person lawfully upon adjoining premises, (c) a member of the public using the adjoining highway. Extent of the duty varies from (i) absolute obligation to prevent dangerous matter escaping (as in *Rylands*), to (ii) an obligation to take reasonable care to prevent premises from becoming dangerous and a nuisance.** (*Victor Weston (Éire) Limited* v. *Kenny* [1954] I.R. 191, Davitt P., 197).

897. **[14] Making or causing such noise as materially interferes with a neighbour's comfort constitutes an actionable nuisance; it is no answer to say the best-known means have been taken to reduce/prevent that noise or that the cause is exercise of business or trade in a reasonable and proper manner.** (*Vanderpant* v. *Mayfair Hotel Co.* [1930] 1 Ch. 138, Luxmoore J., 166).

898. **[15] Private nuisances are of three kinds: (1) by encroachment on a neighbour's land; (2) by direct physical injury to a neighbour's land; (3) by interference with a neighbour's quiet enjoyment of his land. The unifying factor is that there is 'invasion' of the claimant's land, or his enjoyment of it.** (*Hunter*, Lord Lloyd, 695; see also *Transco*). Encroachment by branches or roots of trees is an example of (1). Category (2) includes but is not limited to emission/escape of dangerous substances. Within this category, nuisance and *Rylands* are "*congeners*". (*Read* v. *J. Lyons & Co.*

Ltd. [1947] A.C. 156, Lord Macmillan, 173). Nuisance by noise/smell is an example of (3); in this category, the principle of 'give and take, live and let live' has most part to play. (*Bamford* v. *Turnley* (1862) 3 B.&S. 62, Bramwell B., 84).

899. **[16] It is no defence in a Category (3) case to show reasonable care was exercised with regard to the activity causing the noise/odour; that is not necessarily so in a Category (2) case.** (*Transco*, Lord Walker., para. 97).

900. *Observation #4:* The court considers a nuisance to arise in the within proceedings. The fact of (flood) damage and that it was caused as a result of maintenance of water-levels in excess of TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – is established. The present case is not one within Category (1) or (3). Properly analysed, it comes within (2), involving direct physical injury to property.

IV. Nuisance where single/isolated escape.

901. **[17] The gist of nuisance is not the isolated act but the continuous/permanent organisation by the defendant of his affairs on his property as to result in injury.** (McMahon and Binchy, *Law of Torts* (4th ed., 2013), para. 24–66).

902. **[18] There can be liability in private nuisance for a single/isolated escape where there is: unreasonable/negligent user of land; and foreseeability of escape.** (*Colour

Quest Ltd. v. *Total Downstream UK* [2009] EWHC 540, Steel J., para. 421; reversed on appeal (see [2010] EWCA Civ.180), though this point seems to survive; see also *Midwood* v. *Manchester Corporation* [1905] 2 K.B. 597, *Charing Cross Electricity Supply Co., British Celanese Ltd.* v. *Hunt* [1969] 1 W.L.R. 959, and *Transco*).

903. Observation #5: In the present case, the continuing previous state of affairs of maintaining water levels in excess of TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – gives rise to liability in nuisance.

V. Nuisance and flooding.

904. **[19] Where a plaintiff is damaged by land-flood, the facts may bring it within the sphere of nuisance.** (*Sedleigh-Denfield*, Lord Wright, 903).

905. Observation #6: Applying the principles identified, *e.g.* in *Sedleigh-Denfield*, ESB's continuous organisation of its affairs by maintaining water-levels in the Lee Reservoirs above TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – created an on-going risk that water would have to be released at rates that flood UCC's property, thus creating a nuisance which caused damage to, and interfered with UCC's use and enjoyment of its property so that actionable nuisance arose. A perhaps separate nuisance arose when over a number of hours, ESB released water at a rate that would inevitably flood UCC's property.

VI. Negligence as element of nuisance.

906. [20] The tort of nuisance, uncertain in boundary, may comprise various situations, in some of which negligence plays no part, in others of which it is decisive. (*Goldman* v. *Hargrave* [1967] 1 A.C. 645, Lord Wilberforce, 657; see also *Rapier* v. *London Tramways Co.* [1893] 2 Ch.588; *Sedleigh-Denfield*; *Overseas Tankship (U.K.) Ltd. v. Miller Steamship Co. Pty. Ltd. (The Wagon Mound No.2)* [1967] A.C. 617).

907. [21] Negligence is not necessary for nuisance. What is done may be done deliberately, in good faith, and in genuine belief it is justified. Negligence is ancillary to the cause of action in nuisance. (*Sedleigh-Denfield*, Lord Wright, 904).

908. [22] Although the boundaries of nuisance are uncertain/shifting, one can sketch salient features. One part of the territory overlaps with negligence, especially where failure to take reasonable care may result in the land-owner/occupier adopting/continuing nuisance for which he was not initially responsible. (*Transco*, Lord Walker, para. 96; see also *Job Edwards Ltd. v. Birmingham Navigations Co. Proprietors* [1924] 1 K.B. 341; *Sedleigh-Denfield*; *Goldman*; *Leakey* v. *National Trust for Places of Historic Interest or Natural Beauty* [1980] Q.B. 485; *Hunter*; *Holbeck Hall Hotel Ltd.* v. *Scarborough Borough Council* [2000] Q.B. 836; *Delaware Mansions Ltd.* v. *Westminster City Council* [2002] 1 A.C. 321).

909. [23] **Where a 'measured duty of care'** (of which more anon) **is imposed in respect of adventitious hazard, there has been an assimilation of the principles of nuisance and negligence.** (*Transco*, Lord Walker, para. 109).

910. Observation #7: Negligence is an essential element of nuisance when the case is one of a land-occupier adopting/continuing a nuisance for which he is not initially responsible. But it is negligence with a modified and reduced duty of care (a 'measured duty'). In this regard, negligence and nuisance collide and converge, like two colossal common law amoebae, each changing the scope of the other, nuisance requiring negligence, negligence arising only according to a measured duty.

VII. Public and private nuisance.

911. [24] **Nuisance contemplates an act/omission amounting to an unreasonable interference with, disturbance of, or annoyance to another person in exercising his rights. If the rights interfered with belong to the person *qua* member of the public, the act/omission is public nuisance. If the rights relate to ownership/occupation of land, or some easement, profit or other right enjoyed in connection with land, the act/omission is private nuisance.** (*Connolly* v. *South of Ireland Asphalt* [1977] I.R. 99, O'Higgins C.J., 103).

912. Observation #8: There is no mention of any limitation here in any authority defining nuisance, to adjoining land. What is relevant is whether there has been interference with ownership/occupation of land simpliciter. In the past, nuisance has afforded protection to various persons, including those suffering from the effects of noise from discotheques

or noxious fumes; these do not respect neat boundaries of 'adjoining'/'non-adjoining' property. In *Hanrahan*, the offending factory was about a mile from the plaintiffs' farm. UCC is manifestly a person affected in its ownership/occupation of land and so comes within the scope of nuisance. *The Wagon Mound (No. 2)* is also worth mentioning in this context. There the defendants were liable in nuisance where oil was discharged into navigable waters in Sydney Harbour, occasioning fire-damage to the claimant's ships. The case contains reference to one's 'neighbour' which in the context does not connote 'next door' or 'adjoining' neighbour: such a concept would have made no sense in the circumstances. Because foreseeability is an essential element of nuisance, it is reasonable to read 'neighbours' as being in the *Donoghue* v. *Stevenson* sense, not a direct geographical sense. In any event, the dynamic nature of rivers militates against limitation of nuisance to immediately adjoining property. There is no fundamental re-orientation in this of riparian law: riparian law is concerned with the right to use water, not water-damage. That UCC's affected properties do not adjoin ESB's property is no impediment to finding nuisance.

913. **[25] A private owner's right to enjoyment of his land is not a right enjoyed in common with others. Yet any illegitimate interference, being one contemporaneously suffered by others of the public, constitutes a common injury satisfying the public nature of public nuisance.** (*Colour Quest*).

914. <u>Observation #9:</u> Here, the damage to UCC as land-owner/occupier means it meets the requirement of having suffered damage sufficient to sue in its own name. However, it was not merely UCC's rights as land-owner/occupier that went affected. UCC and its staff were also affected with regard to their rights as members of the public. An explosion affecting a wide area (as in *Colour Quest*) and a flood that does likewise have parallels. In neither case is it sensible to allow only adjacent landowners recover when a wider range of people are affected. This has the consequence that even if ESB's 'adjoining property' limitation on nuisance had merit it would only be stateable as a proposition with respect to private nuisance. Yet the facts here yield liability in private and public nuisance.

VIII. The *Leakey* authorities.

915. *Note: The court has been asked to decide the within proceedings on the basis that, consistent with the apparent importation of the* Leakey *authorities into Irish law by way of* e.g. Daly *v.* McMullan *[1997] 2 I.L.R.M. 232,* Harrington Confectioners Ltd. *v.* Cork City Council [2005] IEHC 277 *and* Grennan *v.* O'Flaherty *[2010] IEHC 157, the* Leakey *authorities represent good law in Ireland. This is without prejudice to ESB's right to argue the contrary in the event of any appeal. The court notes in passing that even if it had not been requested to treat the* Leakey *line of authorities as good law in Ireland, it would, by reference to the foregoing authorities, have found it to be so.*

916. **[26] If a man finds a dangerous, artificial thing* on his land, which he and those for whom he is responsible did not put there; if he knows that left alone it will damage others; if by reasonable care he can render it harmless; then if he does nothing, he has permitted it to continue and become responsible therefor.** (*Job Edwards*, Scrutton L.J., 354; see also *Sedleigh Denfield*). (*When this proposition was formulated in *Job Edwards*, there was authority that seemed to foreclose liability for naturally occurring dangers. Hence the reference to an 'artificial thing'. This has been changed by *Leakey*. Otherwise, the above remains an authoritative statement of law).

917. **[27] An injured person may abate nuisance by his own action: after notice, if it is necessary to trespass on the land of another to do so, and that other did not cause the nuisance; without notice if he can abate the nuisance.** (*Job Edwards*, Scrutton L.J., 355).

918. Observation #10: The dissenting judgment of Scrutton L.J. in *Job Edwards*, as later approved by the House of Lords in *Sedleigh-Denfield*, marked the commencement of recognition of a measured duty of care by occupiers to remove/reduce hazards to neighbours. The following principles can be extracted from *Job Edwards*: (1) there should be a 'dangerous thing'; (2) it must be capable of being rendered harmless by the landowner without great effort; (3) if the landowner does not act to render harmless the dangerous thing, his neighbour has the right to abate the nuisance; he may do this by entering on the landowner's land after notice to him, if entry is required; or if the nuisance can be abated without leaving his own land, without notice. Transmuting *Job Edwards* into the context of these proceedings, the 'dangerous thing' is water accumulated in excess of TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35).

919. **[28] Exercise of the right to abate should be discouraged; it entails a man taking the law into his own hands.** (*Sedleigh Denfield*, Lord Wright, 911).

920. **[29] The right to abate co-exists with a claim for damages suffered.** (*Sedleigh Denfield*, Lord Wright, 909).

921. **[30] Where a riparian owner, for land-protection, erects a wall along a river-side to prevent flooding and later pulls down part of the wall in connection with building operations, so that a neighbour's property is damaged by flood, the neighbour has no right to protection of the wall and cannot maintain action for damages on the ground of negligence, nuisance or *Rylands*.** (*Thomas & Evans Ltd.* v. *Mid-Rhondda Co-operative Society Ltd* [1941] 1 K.B.381, Greene M.R.). In *Thomas*, the plaintiff sued successfully for damages at first instance. The Court of Appeal reversed because the trial judge, at the outset, considered the conduct of the defendants without considering what is vital in negligence, namely the right, if any, of the plaintiffs to call for exercise of the measure of care found appropriate to the situation. Per Greene M.R, at 393: "[T]*he simple ground for deciding this case is...the respondents had no right to have the wall erected...had no right to insist on its continuance...had no ground of complaint...against anybody who rightfully took it down, and the appellants in this case rightfully took it down.*"

922. **[31] As to the measured duty on occupiers to remove/reduce hazards (natural or man-made) to their neighbours, this duty's existence is based upon (a) knowledge of the hazard, (b) ability to foresee the consequences of not checking/removing it, and (3) ability to abate it. The standard ought to be to require of the occupier what it is reasonable to expect of him in his individual circumstances. The owner of a small property where a hazard arises which threatens a neighbour with substantial**

interests should not have to do as much as one with larger interests at stake and greater resources to protect them. (*Goldman*, Lord Wilberforce, 663).

923. Observation #11: *Goldman* was a decision of the Privy Council. The duty it recognised was affirmed as part of English law in *Leakey*. *Leakey* also extended *Goldman* into the tort of nuisance. *Goldman* has been hailed as a bold step forward, overcoming the reluctance of the common law to impose liability on a defendant who remains passively inactive before a hazard, when a course of affirmative action could save his neighbour from impending harm. *Goldman* has eradicated the immunity whereby older common law exempted occupiers from a duty to remedy conditions natural in origin. ESB has sought to distinguish *Goldman* on the basis that there is nothing in same which disturbs what ESB presents as the starting-point in the present case, *viz.* that ESB did not create/release any hazard. It does not appear from a reading of *Goldman* that the defendant there created a hazard. Nor did it appear so to Megaw L.J. in *Leakey*. In his summary of *Goldman*'s facts, Megaw L.J. stated: "*[T]here could be no complaint that the defendant had done anything which he ought not to have done or left undone anything which he ought to have done, so as...to increase the risk...caused by this act of natural forces setting fire to the tree. Thereafter the defendant...did not do anything...he ought not to have done....But he failed to do something...he could have done without...substantial trouble or expense: which would, if done, have eliminated or rendered unlikely the spreading of the fire*". It is apparent from *Goldman* that a certain latitude is afforded the person owing the duty (by reference to means, *etc.*). Not much latitude need be extended to ESB. It is not a small property-owner with limited resources. It failed to do what it reasonably could and should have done to mitigate the nuisance. And even in respect of small property owners, the latitude allowed is limited.

In *Abbahall* v. *Smee* [2003] 1 All E.R. 465, Munby J. stated, at para. 61, that neither *Goldman* nor *Leakey* "*assert that the defendant's financial resources were determinative.*" Here, ESB's conduct is more serious than failing to abate a nuisance caused by a blazing tree, or by naturally escaping water. ESB deliberately released water and, in so doing, caused damage which could have been avoided or significantly reduced by heeding weather reports and spilling earlier, or indeed by operating consistently to TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35). For ESB to abate the nuisance arising would not have entailed vast expenditure. In truth, ESB merely had to conduct its industrial activity with reasonable prudence and avoid creating dangers which may have enhanced profits but created an unnecessarily heightened risk to the safety of persons/property. Nor does it appear that there were competing demands on ESB's resources as, *e.g.*, would be the case with a public authority owing multifarious duties to various persons throughout its wide area of operations.

924. **[32] That a person who takes action to deal with an accidental fire should not be worser placed as regards civil liability than one who does nothing is a consideration of importance not to be overlooked when stating a rule regarding liability.** (*Goldman*, Lord Wilberforce, 659).

925. Observation #12: The implication of this is that the question whether a landowner is under a duty to intervene to eliminate a hazard threatening his neighbour's property should not depend on whether he tries. The policy reason is obvious: if a landowner who tries and fails is worser placed than one who does not, inactivity becomes the more rational decision; the law encourages altruistic acts that do not worsen matters.

926. **[33] The strict duty that Lord Cairns held to exist in *Rylands*, which was not dependent on negligence, did not apply to natural user of land. It is not always easy to identify 'non-natural' user, or whether something has been brought onto land that was not 'naturally there'. The law is replete with anomalies and exceptions in this regard.** (*Leakey*, Megaw L.J., 520; see also *Read*).

927. **[34] In some circumstances a qualified duty of care might arise to prevent flood-water crossing from one's land into a neighbour's land.** (*Leakey*, Megaw L.J., 524).

928. Observation #13: It is manifest from *Leakey*, applying *Goldman* in nuisance, that there can be liability in nuisance for failure to abate naturally occurring phenomena. Because such liability lies, there must be *a fortiori* liability in respect of damage caused by non-natural release of water. Admittedly, application of *Leakey* to the riparian context is not without difficulty, *e.g.,* it is not clear that Megaw L.J. necessarily contemplated two riparian proprietors. Regardless, the principle identified in *Leakey* is clearly of wider applicability when brought to bear in another context such as that now presenting.

929. **[35] If, thanks to nature, there is, poised above my land or house, a boulder or rotten tree, which is liable to fall, perhaps destroying my house, perhaps killing or injuring me or members of my family, am I without remedy? In such circumstances a remedy of going on my neighbour's land to abate the nuisance would, or might, be an unsatisfactory remedy. But if there were such a right of**

abatement, it would be because my neighbour owed me a duty. There is ample authority that, if I have a right of abatement, I have a remedy in damages if the nuisance remains unabated and causes me damage or personal injury. (*Leakey*, Megaw L.J., 523–524; see also *Job Edwards,* Scrutton L.J., 354; *Sedleigh Denfield*).

930. **[36] The scope and extent of the measured duty in *Goldman* is a duty to do what is reasonable in the circumstances to prevent or minimise known risk of damage or injury to one's neighbour or his property. There falls to be considered, *inter alia*, (i) extent of the risk; (ii) what, so far as reasonably can be forseen, are the chances that anything untoward will happen or that damage will be caused, (iii) what is the possible extent of damage if risk becomes reality, (iv) whether it is practicable to prevent/minimise the happening of any damage, (v) If so, how simple/difficult are the measures which could be taken, how much and how lengthy work they would involve, and what is the probable cost of same, and (vi) whether there was sufficient time for preventive action to have been taken, by persons acting reasonably in relation to the known risk, between the time it became known to, or should have been realised by, the defendant, and the time the damage occurred.** (*Leakey*, Megaw L.J., 524).

931. **[37] A defendant's duty is to do what is reasonable for him to do. The criteria of reasonableness include what the particular man – not average man – can be expected to do, having regard, *inter alia*, to his means where serious expenditure of money is required to eliminate or reduce the danger. This can only be in the way of broad assessment. A similar broad assessment may be relevant as to the neighbour's capacity to protect himself from damage, whether by barrier on his**

land or by providing funds for expenditure on agreed works on the defendant's. (*Leakey*, Megaw L.J., 526).

932. [38] **If there can be liability in nuisance for failure to abate naturally occurring phenomena, there is no logical basis for distinguishing between types of natural hazard.** (*Leakey*, Megaw L.J., 514).

933. [39] **A context of statutory duties/powers is important in ascertaining what (if any) measured duty of care arises.** (*Bybrook Barn Garden Centre Ltd.* v. *Kent County Council* [2001] L.G.R.329, Waller L.J., para. 20; see also *Stovin* v. *Wise* [1996] A.C. 923).

934. [40] **Any imposition of a common law duty, must have regard to statutory context.** (*Marcic* v. *Thames Water Utilities Ltd.* [2004] 2 A.C. 42, 57).

935. [41] ***Goldman* and *Leakey* ended the misfeasance/non-feasance distinction; they established that land occupation carries a concomitant duty to neighbours to do what is reasonable in the circumstances to prevent hazards on one's land, howsoever arising, from harming one's neighbours.** (*Marcic* v. *Thames Water Utilities Ltd.* [2002] Q.B. 929, 986 (C.A.)).

936. [42] ***Goldman* and *Leakey* exemplify the standard of conduct expected today of a land-occupier to his neighbour. But Thames Water was no ordinary occupier. The public sewers vested in it, pursuant to statute. Thames' obligations could not sensibly be considered without regard to that statute. The law of nuisance did not**

impose on Thames obligations inconsistent with statute. To do so would run counter to the intention of the legislature as expressed in statute. (*Marcic*, Lord Nicholls, para. 33).

937. Observation #14: Maintaining water-levels to TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35), a level that ESB considers to conform with industry/professional practice and whose persistent and deliberate contravention, it seems to follow, must reflect a contravention of such practice – is an entirely reasonable thing for ESB to do to prevent or minimise known risk of flood-damage to UCC from heightened discharges. It is clear there can be a liability to abate naturally occurring phenomena. ESB contends that *Marcic* established that in deciding whether the *Leakey* measured duty applies, the statutory scheme must be considered. ESB also contends that the duty UCC contends to arise is inconsistent with the Act of 1945 because: (1) it is inconsistent with ESB's obligation under s.10 to use the reservoirs for hydro-electric generation; (2) UCC's reliance on Condition 19 of the generation licence subverts the scheme established by the Act of 1945. As to (2), this is not accepted by the court for the reasons given in Chapter 49. As to (1), the court is unconvinced by this logic. ESB has long identified the optimal level of hydro-electric generation at the Lee Dams: that optimal level is TTOL. Moreover, *Marcic* was concerned with a radically different statutory scheme: Thames Water was a sewerage undertaker subject to elaborate regulation involving an independent regulator with powers of enforcement, subject to judicial review and a regulator-run complaints scheme. Here, there is no statutory scheme allowing persons affected by ESB's activities to make complaint. ESB mistakenly seeks to extract from *Marcic* a proposition that the silence of the Oireachtas in not conferring a flood alleviation 'mandate' bars action in nuisance.

938. **[43] For a measured duty to arise the defendant must know or be presumed to know of the defect or condition yielding the hazard; and he must know how to abate it.** (*Holbeck Hall*, Stuart Smith L.J., para. 39).

939. **[44] In instances of non-feasance, where the defendant does nothing to create the natural danger arising, the scope of the duty is restricted; it is defined in *Goldman* and *Leakey* as a 'measured duty'.** (*Holbeck Hall*, Stuart Smith L.J., esp. para. 46).

940. **[45] A defendant's measured duty comprises an obligation to take care to avoid damage to the plaintiff's land that was foreseeable without further geological investigation. There may be other operative limitations; it is not necessarily incumbent on a defendant to carry out extensive/expensive remedial work to prevent damage he ought to have foreseen; the duty may be limited to warning neighbours of such risk as he is aware of, or ought to have foreseen, and sharing such information as he has acquired regarding same.** (*Holbeck Hall*, Stuart Smith L.J., esp. para. 54).

941. **[46] A property-owner owes a duty of care to adjoining property-owners/occupiers to take reasonable care to prevent his property becoming dangerous or a nuisance. Such duty includes an obligation occasionally to inspect the property and carry out necessary repairs. A non-resident owner must arrange for someone to carry out**

such inspections/repairs for him. (*Larkin* v. *Joosub* [2007] I.R.521, para. 17; see also *Victor Weston*).

942. **[47] A land-occupier 'continues' a nuisance if with knowledge or presumed knowledge of same he fails to take reasonable means to end it, though he had ample time so to do.** (*Sedleigh-Denfield*, Viscount Maugham, 894; see also *Larkin*).

943. Observation #15: *Larkin* is not, strictly speaking, a *Leakey* case. However, it involves an orthodox application of *Sedleigh-Denfield* and exemplifies the convergence between negligence and nuisance. Notably, there was no liability without failure to exercise reasonable care. There is no doubt ESB knew the risk posed to UCC by operating to water-levels exceeding TTOL ("*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35), a level that ESB considers to conform with industry/professional practice and whose persistent and deliberate contravention must therefore reflect a contravention of such practice), knew how to abate heightened water-levels arising, and knew, without further investigation, that by operating to TTOL it would reduce/obviate prospective damage to UCC's properties. Instead, over years, ESB continued the nuisance occasioned by its consistent accumulation of waters in excess of TTOL, and did not take reasonable steps to reduce to TTOL despite ample time so to do.

944. **[48] *Sedleigh-Denfield* decided this: if a nuisance was caused or a potential nuisance became apparent, even if not created by the occupier of the land from**

which nuisance emanated, he became potentially or *prima facie* under a duty to his neighbours. In *Sedleigh-Denfield* a failure to abate the nuisance yielded the finding that nuisance was continued. *Sedleigh-Denfield* recognises that, even though a defendant may be able to say a nuisance was not created by him, still he may have a duty to abate, at least if abatement is simple to do. (*Bybrook*, Waller L.J., esp. paras. 39–41).

945. Observation #16: ESB's constant refrain that it did not create the flood is of no avail when one considers the assertion in *Bybrook* that one can be liable for a nuisance that one does not create.

946. **[49] There is no sensible distinction between unreasonably allowing fire to escape onto a neighbour's land (as in *Goldman*) and unreasonably allowing floodwater to do so.** (*Green* v. *Lord Somerleyton* [2003] All E.R. (D.) 426, Jonathan Parker L.J., para.84).

947. **[50] It is not the case that no *Leakey* duty arises regarding naturally flowing water. Such an exception would be anomalous, undesirable and inconsistent with current authority.** (*Green*, Jonathan Parker L.J., para.100).

948. **[51] *Thomas* is not authority for the proposition that no *Leakey* duty can arise regarding naturally-flowing water.** (*Green,* Jonathan Parker L.J., para.100).

949. **[52] It is not sound law that no *Leakey* duty arises where land is restored to its natural state.** (*Green*, Jonathan Parker L.J., para. 101).

950. [53] **If a claimant and defendant will benefit equally from works they should each, all else being equal, contribute equally to the cost. If they will derive unequal benefit, they should each contribute in the same proportion as they will each derive benefit.** (*Abbahall*, Munby J., para. 41). Here, the Court of Appeal answers the question posed by Bankes L.J. in his generally dis-favoured judgment in *Job Edwards*, *viz.* as between two innocent parties, why should the one in whose interest expenditure is required to abate danger not be the person to bear that expenditure?

951. [54] **If a claimant seeks to compel the defendant to repair her land for his benefit then fairness, justice and reasonableness demands that those who seek to enjoy the benefit should contribute to the burden.** (*Abbahall*, Munby J., para. 50).

952. [55] **A *Goldman-Leakey* claimant can in principle seek injunctive relief in two forms. First, a mandatory injunction requiring the defendant to do the appropriate repairs. Such an injunction can only be obtained on terms that the claimant pays, or gives an undertaking to pay, his proper share of the cost. Second, the claimant can seek an injunction giving him access to the defendant's property. In such case, the claimant can then recover from the defendant damages that meet the amount of the defendant's proper contribution. Injunctive relief against the defendant is justifiable only on the footing that the defendant is in breach of duty to the claimant. But if the defendant's duty is subject to the claimant carrying out the works or making appropriate contribution, no injunction can properly be granted unless it secures that the claimant contributes his proper share of the cost. If an injunction enables the claimant to carry out works he is willing to undertake, this**

will be because the defendant is in breach of his duty; in relation to that breach the claimant will be able to recover damages, in particular damages representing the defendant's unpaid contribution to the cost of the works. (*Abbahall*, Munby J., paras. 46–47).

953. Observation #17: *Green* is supportive of the application of a *Leakey* duty to ESB. ESB contends that *Abbahall* suggests that in a measured duty case, it ought generally be possible to formulate what the plaintiff wants the defendant to do as an injunction. If so, such a form of relief can be formulated in the within proceedings. Thus: ESB must never exceed TTOL and if, inadvertently, it does so, it must immediately take steps to reduce water-levels to TTOL. Or, a possible alternative mandatory form: ESB must treat TTOL as though it were MaxNOL.

954. **[56] Landowners owe a measured duty in negligence and nuisance to take reasonable steps to prevent natural occurrences on their land causing damage to neighbouring properties.** (*Vernon Knight Associates* v. *Cornwall Council* [2013] EWCA Civ. 950, Jackson L.J., para. 49).

955. Observation #18: In *Goldman*, *Leakey* and other cases on liability for naturally occurring nuisances considered by the court, the finding of liability refutes ESB's contentions that water, rainfall or the river Lee, rather than ESB's own want of reasonable care, caused flood-damage to UCC. The finding of liability in those cases refutes the contention that a defendant will have only caused damage where it worsens nature; this is because in those cases there was liability even though nature was not worsened (in *Goldman* it was improved). In those cases, the nature altered neither duty nor causation, though it had a bearing on what reasonable steps had to be taken in discharging the duty. If ESB were correct that nature was causative of the damage suffered by UCC, this would have sweeping implications for the law of negligence. *E.g.,* on ESB's causation analysis, many personal injury and medical negligence cases would never 'get past go', even if the illness could have been prevented/mitigated through the exercise of reasonable care by medical personnel or employers. Just as ESB says that flooding in Cork would have been the same or worse absent the Lee Scheme, a medical practitioner could resist liability for negligent diagnosis on the basis that the illness is due to natural causes and the patient would anyway have beome ill. Such reasoning would be nonsense in that case; to apply its parallel here would make nonsense of this case. What of the contention that in medical negligence/employment cases there is a relationship and duty to carry out the medical interventions which does not exist here? That, the court considers, is a duty of care question; merely to pose the question so affirms the importance of not conflating causation with duty of care; this last concept, consistent with applicable case-law, is assessed by reference to foreseeability, proximity and considerations of what is just and reasonable.

IX. Duty of Care: (1) General.

(See also Chapter 51).

956. **[57] Additional to [i] foreseeability of damage, necessary ingredients yielding a duty of care are [ii] that there exists, between the party owing the duty and the party owed it, a relationship of 'proximity' or 'neighbourhood' and [iii] that the situation be one in which the court considers it fair, just and reasonable that the law impose a duty of a given scope on one party for the benefit of another. The**

concepts of proximity/fairness are not susceptible of precise definition; they are little more than convenient labels to attach to different specific situations which, on a detailed examination, the law recognises pragmatically as yielding a particular duty of care (*Caparo plc* v. *Dickman* [1990] 2 A.C.605, Lord Oliver, 617–618).

957. <u>Observation #19:</u> Did *Caparo* modify *Goldman* and *Leakey*? ESB contends *Goldman* and *Leakey* are modified by *Caparo*, in particular, the 'just and reasonable' element of the three-stage duty of care test. This is stated in *Holbeck Hall* but in the context of deciding that it was not just and reasonable to impose liability for damages which is greater than anything foreseen or foreseeable without further geological investigation. Thus considerations of what is 'just and reasonable', at most, go to what the reasonable steps are that must be undertaken; they do not (cannot) alter the general principle that there is a duty of care on ESB not to cause unnecessary flooding, which finds practical expression in this case in not operating beyond TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – or to take reasonable steps not to cause flooding which can reasonably be avoided (which finds expression in this case in consistently operating to TTOL. That such a duty of care arises has been conclusively decided in numerous cases, and applied *e.g.* in *Bybrook*, *Green* and *Vernon Knight* (which post-date *Caparo*). In any event, *Goldman* and *Leakey* allow for what is just and reasonable in particular circumstances.

958. **[58] The three requirements for a duty of care are not wholly separate and distinct; they are convenient, helpful approaches to the pragmatic question**

whether a duty should be imposed in a given case. (*Marc Rich & Co. A.G.* v. *Bishop Rock Marine Co. Ltd* [1996] A.C. 211, Lord Steyn pp. 235–236, affirming the view of Saville L.J. in the Court of Appeal in this regard; see also *Capital & Counties plc* v. *Hampshire County Council* [1997] Q.B. 1004).

959. [59] *Caparo* elevates proximity to a separate heading. It suggests proximity is a separate ingredient, distinct from fairness/reasonableness, and capable of being identified by other criteria. But proximity is not legal shorthand for a concept with its own, objectively identifiable characteristics. It is shorthand for a relationship between two parties which makes it fair and reasonable that one owe the other a duty of care. This is another way of saying that, when assessing the requirements of fairness and reasonableness, regard must be had to the parties' relationship. (*Stovin*, Lord Nicholls, 932).

960. Observation #20: ESB complains of UCC's 'atomistic' approach to considering a duty of care, without viewing matters in the round. ESB contends that matters like proximity and foreseeability cannot be divorced from the related inquiry of whether it is fair, just and reasonable to impose a duty of care. However, one does not get to fission without splitting the atom; so it is with establishing a duty of care: atomistic analysis is required before judgment ensues in which all the applicable criteria are combined in a pragmatic analysis of whether a duty of care falls to be imposed in particular circumstances presenting.

961. [60] The bystander who sees a burning building and knows there are people inside foresees that if he awaits the fire brigade, rather than attempting a rescue, people

may die. But the law has never imposed liability in negligence on a person who fails to act as the more courageous might. A moral code might censure his timidity; the law of negligence does not. (*Glencar Exploration plc* v. *Mayo County Council (No.2)* [2002] 1 I.R.84, Keane J., 138–139).

962. Observation #21: ESB has made play of Keane J.'s observation in *Glencar*. However, it does not seem to the court an especially apt observation so far as the within proceedings are concerned. ESB is not some bystander. It controls two dams and associated reservoirs. It allowed reservoir-levels consistently to go beyond the level it itself calculated as optimal – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35). On 19th November, 2009, this resulted in flood-damage to UCC that would have been less or non-existent had ESB's practice been to seek to maintain reservoir-levels at TTOL. No strict moral code is required to censure ESB's actions: the suppleness of nuisance and negligence suffices.

X. The decision in *Sandhar*.

963. **[61] Exercise of a statutory power does itself yield a duty at common law. A judge must consider whether a common law duty arises from facts and circumstances presenting in the context of the statutory framework** (*Sandhar* v. *Department of Transport, Environment and the Regions* [2004] All E.R. (D.) 105 (Nov.), May L.J., para. 18).

964. **[62] The courts lean against the suggestion that by exercising powers which benefit the general public, a legal path to acknowledgement of a duty is created. Such a principle would likely inhibit the beneficial exercise of a power to improve in the general public interest; it would also approach denying the distinction between a duty and a power.** (View of trial judge quoted with apparent approval in *Sandhar*, May L.J., para. 21).

965. Observation #22: ESB places some emphasis on *Sandhar*. But a difference between that case and this is that ESB is a commercial entity conferred with an extraordinary statutory power to construct and operate river-dams to generate electricity at profit; *Sandhar* concerned the role of a local authority *qua* highway authority There is a public benefit to impounding and corralling river-flow to generate electricity; but the profit-making dimension to ESB's activities means ESB is not directly comparable to a local council discharging powers on a not-for-profit basis. It is love of profit, not love of humanity, which drives ESB in its actions. ESB also complains that having engaged in flood alleviation, it now faces a claim that it thereby incurred a duty to do more. This is one way of viewing matters. Another is that there is (and there is) a general duty of care which arises independently of what ESB does and that it was not properly discharged by ESB.

966. **[63] Where a public authority acting under statutory duty or power is allegedly liable for personal or physical injury, it is first necessary to determine whether statute, properly construed, provides a relevant private law right of action.** (*Sandhar*, Munby L.J., para. 36).

967. **[64] Statutory duties/powers which do not give rise to a private law right of action may constitute part of the relevant factual background; the existence of those duties/powers cannot reinforce parasitically the existence of a common law duty of care. Unless statute, properly construed, provides/excludes a private law right of action, existence of a common law duty of care depends on common law principles.** (*Sandhar*, May L.J., para. 37).

968. Observation #23: The court has considered the issue of statutory duty above; see also Chapter 48.

969. **[65] Personal/physical injury directly inflicted is the first building-block of negligence. Unless such injury is excused, it will almost always be a component of a breach of a duty of care owed by the person inflicting the injury. For personal/physical injury which the defendant does not inflict directly or for economic loss, it is usual to look to *Caparo* and *Henderson* v. *Merrett Syndicates* [1995] 2 A.C.145 for the common law principles.** (*Sandhar*, May L.J., para. 38).

970. **[66] Reliance is a necessary ingredient of a duty of care. For the rest, it is often helpful to ask whether the defendant assumed responsibility to the claimant to guard against the loss for which damages are claimed.** (*Sandhar*, May L.J., para. 38).

971. **[67] As to cases in which public authorities have done acts, entered into relationships, or undertaken responsibilities yielding a common law duty of care, the fact that a public authority acts pursuant to a statutory power or public duty need not negative the existence of such duty.** (*Sandhar*, May L.J., para. 38). *E.g.* in

Barrett v. *Enfield London Borough Council* [2001] 2 A.C.550, the council assumed parental responsibilities towards the plaintiff. It did so because of its statutory powers or duties, but it did so. In *Phelps* v. *Hillingdon Borough Council* [2001] 2 A.C. 619, a duty of care was owed by a local education authority, not because its powers derived from statute, but because its allegedly negligent psychologist impliedly undertook to exercise proper professional skill. In *Gorringe* v. *Calderdale Metrpolitan Borough Council* [2004] 1 W.L.R. 1957, Lord Hoffmann accepted that if a highway authority conducts itself so as to create a reasonable expectation about the state of the highway, it will be under a duty to ensure it does not thereby create a trap for the careful motorist who drives in reliance upon such expectation.

972. Observation #24: Here one has physical injury (flood damage), assumption of responsibility (establishment of warning-list; general touting of flood alleviation benefits) and reliance (participation in the warning-list process and reliance on general touting of dams as flood alleviants). ESB contends that UCC seeks to locate its case in the *Barrett-Phelps* domain, *i.e.* that ESB, because of what it has done, relationships it has entered and responsibilities undertaken, is under a duty of care to alleviate flooding for UCC. What is it ESB has done? What are these relationships and responsibilities? Why should ESB not be subject to a resultant duty of care? One thing ESB has done is adopted a MaxNOL that sees waters consistently rise beyond TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35). One relationship ESB has entered is its undertaking to provide warnings. Both of the foregoing embrace responsibilities undertaken, as is yielded too by ESB's persistent touting of the flood alleviation benefits of its dams.

973. **[68] *Barrett* and *Phelps* indicate that assumption of responsibility sufficient to create a duty of care normally requires a particular relationship with one or more persons.** (*Sandhar*, May L.J., para. 43).

974. Observation #25: ESB contends there is no evidence that any document emanating from ESB which purportedly evidences the performance/assumption of a flood alleviation duty was ever read by anyone from UCC, still less relied upon. The court has dealt elsewhere with such representations as were made by ESB regarding the flood alleviation benefits of the Lee Dams. Additionally (and again as considered elsewhere), in placing UCC on its warning list, ESB created a separate basis for liability. May L.J. noted in *Sandhar* that the case of the claimant there did not sustain the necessary element of reliance, observing, at para. 44: "*There is no evidence that the deceased...relied on an expectation that the road had been salted.*" Here, *e.g.*, any person included on the warning-list had the right to rely on the implicit undertaking that she, he or it would be provided with a meaningful warning.

XI. Physical damage and the just and reasonable assessment

975. **[69] In most cases of direct infliction of physical loss/injury through carelessness, it is self-evident that a civilised system of law should hold a duty of care has been broken.** (*Capital & Counties plc* v. *Hampshire County Council* [1997] Q.B. 1004).

976. **[70] For some categories of conduct, *e.g.* where it creates a risk of harm (personal injury), it is obvious, as a matter of commonsense and justice, that a duty should be imposed.** (*Perrett* v. *Collins* [1998] 2 Lloyd's L.R. 255, Hobhouse L.J., 263).

977. **[71] Any case must be decided taking into account applicable circumstances. Where those circumstances comply with established categories of liability, a defendant should not be allowed seek escape from liability by appealing to justice or fairness: the law cannot be re-made for every case.** (*Perrett*, Hobhouse L.J., 263).

978. **[72] There is no reason why courts determining whether a duty of care arises should consider themselves obliged to hold it does in every case where injury/damage to property was reasonably foreseeable and the test of 'proximity'/'neighbourhood' is satisfied, unless powerful public policy considerations dictate otherwise. No injustice is done if courts are required further to consider whether, in the circumstances, it is just and reasonable that the law impose a duty.** (*Glencar*, Keane J., 139).

979. **[73] Writing of the 'just and reasonable' test propounded in *Glencar*, O'Donnell J. noted in *Whelan* v. *AIB* [2014] IESC 3, 34 that this test is essentially a policy consideration and must be approached at a certain level of abstraction, to avoid yielding the wilderness of single instances criticised by Tennyson in *Aylmer's Field.***

Observation #26: It seems the court must still determine whether it is just and reasonable to impose a duty of care but at a level of abstraction that does not yield a succession of individually decided cases. In its assessment of this criterion, this Court yields to the compelling logic of *Perrett*, *viz.* that accumulation of water-levels beyond TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – and the subsequent entirely foreseeable flood-damage occasioned to UCC when those heightened water-levels yielded flooding that was unnecessary and capable of being minimised/reduced if ESB but operated to TTOL, involves a harm (physical injury) in the context of which it is obvious, as a matter of commonsense and justice, that a duty of care should be imposed.

XII. Dam-operator cases

980. [74] **In *Cordin*, the defendant, having decided to install a flood-prevention scheme, was under a duty in relation to its design, installation and operation. That duty was to take reasonable care to prevent such harm as the defendant knew or ought to have known was a reasonably foreseeable consequence of the scheme's design, installation or operation. The duty arose from the installation of the scheme on the defendant's land. It was owed to those downstream who in consequence of lack of reasonable care would, reasonably foreseeably, suffer harm.** (*M.J. Cordin* v. *Newport City Council* [2008] LTL AC012188, Jones J., para. 50).

981. <u>Observation #27:</u> *Cordin* shows that there is no practical difficulty with formulating a duty of care along the lines formulated by this Court.

XIII. Duty of care and naturally occurring phenomena

982. Note: *There are numerous cases dealing with a duty of care in the context of naturally occurring phenomena. This issue has also been touched upon in the context of* Goldman *above.*

983. **[75] There is no impediment to imposition of a duty to alleviate a naturally caused hazard. One looks to see were there "*special circumstances*", known to the defenders, or which they ought to have known, relating to the particular locus in question, and which required that the hazard should have been dealt with pre-accident.** (*Syme* v *Scottish Borders Council* [2003] S.L.T. 601, para. 21).

984. Observation #28: In this case, there were "*special circumstances*" known to ESB in the form of weather forecasts received, its knowledge of reservoir water-levels, and its knowledge of catchment saturation, coupled with its knowledge from previous floods, and inundation studies, of the flooding damage that high discharges from Inniscarra Dam would yield.

985. **[76] In Scotland, the defenders, as local authority responsible for streets, were under a duty to road users to take reasonable steps to make streets reasonably safe for use. The right in each road user was not to require that matters be done to his street immediately but to have it done without reasonable delay. (*Gordon* v. *Inverness Town Council* (1957) S.L.T. (N) 48)). In England, there is neither a common law nor statutory duty owed by roads authorities to individual pedestrians or drivers to keep pathways and roads free of snow, breach of which**

might sound in damages. (*Goodes* v. *East Sussex County Council* [2000] 1 W.L.R. 1356).

986. <u>Observation #29:</u> The above cases suggest that two among the jurisdictions closest to Ireland have a differing concept of the duty of care in the highways context. The court is hesitant to place undue reliance on these cases as they concern the liabilities of local authorities that operate on a not-for-profit basis, unlike ESB, an entirely commercial entity motivated entirely by profit.

XIV. Duty to prevent harm that one does not cause.

987. [77] **A person is not normally liable if he has committed an act of carelessness but the damage has been directly caused by the intervening independent act of another, for whom he is not otherwise vicariously responsible. Such liability may exist, where the damage caused by that other was the very kind of thing which the person was bound to expect and guard against and the resulting damage was likely to happen, if he did not**. (*Breslin* v. *Corcoran and MIBI* [2003] 2 I.R. 203, Fennelly J., 214; Stansbie *v.* Troman [1948] 2 K.B. 48).

988. <u>Observation #30:</u> Here, it is reasonable to conclude that the damage to downstream property-owners was foreseeable and was the very kind of thing ESB was bound to expect and guard against, with the resulting damage being likely to happen if ESB did not. One cannot distinguish *e.g. Breslin* on the basis that it concerned third parties, rather than natural phenomena. In *Goldman*, Lord Wilberforce, at p.661, rejects any such distinction: "*The fallacy of this argument is that...the basis of the occupier's* *liability lies not in the use of his land: in the absence of adoption there is no such use; but in the neglect of action in the face of something which may damage his neighbour. To this, the suggested distinction is irrelevant.*"

XV. Impermissible vagueness?

989. **[78] Once damage of a particular type is foreseeable, it is immaterial that the defendants could not anticipate the full extent of the damage.** (*Burke* v. *John Paul & Co. Ltd.* [1967] I.R. 277, 285).

990. **[79] The law does not require that the precise nature of the injury be reasonably foreseeable before liability for its consequences follows.** (*Reeves* v. *Carthy* [1984] I.R. 348, 367).

991. **[80] Type of damage must be foreseen. Precise details of the accident, the exact concatenation of circumstances, need not be foreseen. It is sufficient if the type, kind, degree, category or order of harm could have been generally foreseen. The question is, was the accident a variant of the perils originally brought about by the defendant's negligence?** (*Reeves*, 367).

992. **[81] In determining liability for the consequences of negligence, the test is whether the damage is of such a kind as a reasonable man should have foreseen. If so, it is irrelevant that no one foresaw the actual extent of the damage.** (*Condon* v. *CIE* (Unreported, High Court, Barrington J., 16th November, 1984), 20).

993. [82] Concepts such as serious negligence correspond to tests for the incurring of liability which are to apply to an indeterminate number of situations that it is impossible to envisage in advance; not to specific conduct capable of being set out in detail in legislative measures. (*Intertanko and Others* v. *Secretary of State for Transport* (Case C-308/06) [2008] E.C.R. I-4057, para. 73).

994. Observation #31: ESB has criticised as impermissibly vague the formulation of a duty of care in such terms as 'the prevention of unnecessary flooding.' However, the law has always made use of similar terminology; the phrase "*You must take reasonable care...*" is central to Lord Atkin's judgment in *Donoghue* v. *Stevenson* [1932] A.C. 562. The formula of using reasonable care is commonly used by the Oireachtas, *e.g.* in s.3(2) of the Occupiers Liability Act, 1995, and s.13(1)(a) of the Safety, Health and Welfare at Work Act, 2005. Thus there can be no objection to the use of such formulations on legal certainty grounds. It is incorrect for ESB to contend, as it has, that, if it is to be under a duty of care, that duty must be precise as to how much flooding it must not cause.

XVI. Statutory Authority and Duty of Care.

995. [83] As to defendants authorised under private Act to create a reservoir to ensure a continuous, adequate supply of water to linen works, per Lord Hatherley: "[T]***he true construction of all such powers is this: You* may *carry out your work to its full extent...in some cases you* must *carry it out to its fullest extent, in the manner provided by the Act, but in so doing you shall not create any needless injury – you shall use all those precautions against injury to others which you would use against injury to yourselves in carrying on a similar work, and if we find that in carrying out***

***your powers damage has been done by you, the law will say that the powers which you can exercise shall be exercised for the prevention of mischief.*" (*Geddis*, 450; see also *Stovin*).

996. [84] Per Lord Selborne, in *Geddis*: "[I]***f, by this Act…power is given to the defendants to convey by this particular channel…a supply of water which would not otherwise in the same manner naturally pass down that channel, and to do all things proper and necessary for…conveyance and regulation of such supply…that power does not enable or authorise them to flood the lands of…neighbouring proprietors, unless it would be impossible to avoid or prevent such flooding by any reasonable and proper use of their statutory powers.*** (*Geddis*, 452; see also *Stovin*).

997. [85] "[I]***f the appellants, in…exercising their statutory powers, had inflicted fresh injury on the respondents through lack of care or skill, they would be liable in damages for the consequences of their negligent act….But (apart from two minor matters, which it is agreed do not govern the main issue) nothing of this sort happened. The respondents would have gained if the flooding had been stopped sooner; their complaint…is that*** [the appellants]***…did not act with sufficient skill to stop it more promptly; but the respondents cannot point to any injury inflicted upon them by the appellant Board, unless it be the Board's want of success in endeavouring to stop the flooding…earlier….In order that the respondents succeed…it is necessary that they…establish, not only that the appellants were wanting in care and skill when exercising their statutory powers, but that they inflicted injury and loss upon the respondents by their negligence.*** " (*East Suffolk*

Rivers Catchment Board v. *Kent* [1941] A.C. 75, Viscount Simon, 84–85; see also *Stovin*).

998. Observation #32: ESB suggests that *Geddis* and *East Suffolk* support the proposition that, even in cases involving physical injury to property, a body exercising statutory powers must, to be liable in negligence, have actually caused injury by exercise of its power. The court struggles to see that there is much comfort for ESB in the above-quoted propositions. By consistently operating to levels beyond TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – ESB moved beyond the optimal into the excessive. Even applying the principles that ESB derives from the above passages, liability arises for ESB.

999. **[86] Whether there is a common law duty and, if so its ambit, is profoundly influenced by the statutory framework in which the acts complained of are done.** (*X* v. *Bedfordshire County Council* [1995] 2 A.C. 633, Lord Browne-Wilkinson, 739; see also *Smyth* v. *Railway Procurement Agency* [2010] IEHC 290, *Sandhar* and *Stovin*). This principle has already been touched upon above.

XVII. Duty of Care: (2) Assumption of Responsibility.

1000. **[87] Where loss is caused by the claimant's reliance on information provided by the defendant, it is critical to decide whether the defendant assumed responsibility**

to the claimaint for the accuracy, or use, of the information. The answer does not depend on what the defendant intended but on what would reasonably be inferred from his conduct against all the circumstances arising. The inquiry looks to whether there was, in relation to the loss, the necessary relationship or 'proximity' between the parties. Existence of that relationship and foreseeability of economic loss make it unnecessary to undertake further inquiry into whether it would be fair, just and reasonable to impose liability. The test is that (a) but for the alleged absence of the necessary relationship, there would be no dispute a duty to take care existed and (b) the relationship makes it fair, just and reasonable to impose that duty. (*Commissioners of Customs and Excise* v. *Barclays Bank* [2006] UKHL 28, Lord Hoffman, para. 35; see also *Henderson* v. *Merrett Syndicates Ltd.* [1995] 2 A.C. 154, 181).

1001. Observation #33: ESB contends it is not statutorily obliged to engage in flood alleviation. If so, it seems to follow that such flood alleviation as it undertakes results from voluntary assumption of responsibility. Such an assumption of responsibility seems sufficient in itself to create a duty of care (because inherent in such assumption of responsibility is a satisfaction of the *Glencar* criteria). Assumption of responsibility by ESB supports the existence of a duty of care because it reinforces the arguments as to why imposition of that duty is just and reasonable. An assumption of responsibility also provides its own free-standing basis for the duty, even if UCC could not otherwise establish existence of same under *Caparo*. This is because case-law suggests that where, as here, there has been a voluntary assumption of responsibility, a particularly close relationship arises such that assessment of whether it is 'just and reasonable' that a duty of care be imposed becomes entirely or largely unnecessary.

1002. **[88] A duty of care is ordinarily generated by something the defendant has decided to do: giving a reference, supplying a report, managing a syndicate, making ginger beer. It does not much matter why he decided to do it; it may be that he thought it would be profitable or that he was providing a service pursuant to statutory duty.** (*Commissioners of Customs and Excise* v. *Barclays Bank*, Lord Hoffman, para. 38).

1003. **[89] A duty of care can arise from performance of a gratuitous role. One does not have to go much further than *Hedley Byrne & Partners* v. *Heller & Co.* [1964] A.C. 465 to see how a bank can assume liability for advice gratuitously given. [93]** *Irish Life and Permanent plc* v. *Financial Services Ombudsman* [2012] IEHC 367, Hogan J., para. 52.

1004. Observation #34: Even if ESB's performance of flood alleviation is gratuitously done, this does not mean a duty of care cannot arise. In positing an assumption of responsibility, UCC is not asking of the court that it fashion an 'ought' from a 'might'. *I.e.* this is not a case it which is contended that ESB ought to alleviate flooding because it might; rather it is that ESB has taken a duty of care onto itself to alleviate flooding because it does. This latter proposition seems consistent with the principles laid down in the above-mentioned cases. Moreover, it is neither unjust nor unreasonable to impose upon a person a duty to exercise reasonable care in a task it already purports to perform. This is qualitatively different from requiring that person to perform a new task which that person has never engaged in, and to perform same with reasonable care.

1005. [90] **Even in situations falling short of control, an omission to exercise ability to take reasonable steps to reduce danger can yield liability. Liability is based not so much on control as on the knowledge that the hazard may be a potential danger to others, coupled with the power to take reasonable steps to reduce the risk presenting.** (*Pittman Estate* v. *Bain* (1994) 112 D.L.R. (4th) 257).

1006. Observation #35: The analogy to the present case is clear: even if ESB is correct that it did not enjoy complete control at the Lee Scheme it exercises significant control in a position where it has in-depth knowledge of the danger arising and the power to take reasonable steps to reduce the risk presenting.

1007. [91] **Express intention of a provider of information or advice that the third party rely upon same more strongly supports the existence of proximity. The desiderative element implicit in such intention is not always essential. Otherwise it would follow that where the provider of information/advice expressly intended that it not be relied upon, he would not incur liability. That is not the law. Such an intention could not prevail against the provider's actual or presumed knowledge that the information or advice was likely to be relied upon by the third party.** (*Royal Bank of Scotland* v. *Bannerman Johnstone Maclay* [2005] 1 S.C. 437, Lord Gill, paras. 49–50; see also *Commissioners of Customs and Excise* v. *Barclays Bank*).

1008. [92] **A relationship of proximity might arise without it being required that the defendant give actual assurances to the claimant that he would act carefully, provided the defendant knows the claimant is a member of a small group that is at particular risk if the defendant is careless.** (*Dorset Yacht Co. Ltd. v. Home Office*

[1970] A.C. 1004; see also Booth, C. and D. Squires, *The Negligence Liability of Public Authorities* (2006), para. 3–53).

1009. Observation #36: There is some question as to whether it is necessary to demonstrate reliance for there to be a duty of care based on assumption of responsibility. If necessary, it seems to the court that there can be no serious dispute but that UCC did reasonably rely on ESB (a) based on ESB's various utterances to the world at large as regards flood attenuation over the years, and (b) based on UCC's inclusion in the warning list.

XVIII. Relevance of insurance.

1010. [93] **Availability of insurance is not normally relevant to a duty in tort. If an occupier/landowner's claim is rejected on the ground he had insurance, the insurer may exclude applicable cover in the future. It is not appropriate for the court to inquire as to the insurance market in any case in which the question of a *Leakey* standard arises.** (*Vernon Knight*, Burnton J, para.70).

1011. Observation #37: ESB has suggested the court should have some regard to the availability of insurance in determining whether the duty of care posited by UCC arises. Case-law is clear that insurance is not normally relevant to this determination. If it were, this would yield the position that *e.g.* ESB could owe different duties of care to those able to afford insurance and those not. Such a distinction is unprecedented because it is absurd. In any event, the court understands that ESB has insurance for the potential liability arising for it in these proceedings. So even if insurance fell to be considered, and it does not, here it is a neutral factor because ESB stands insured.

XIX. Causation.

1012. [94] **A defendant's negligence can be causal in terms of a plaintiff's loss or injury even when natural conditions inflict the actual damage.** (*Larkin*, *Slater* v. *Worthington's Cash Stores* [1941] 1 K.B. 488, *Empress Car Company* v. *National Rivers Authority* [1999] A.C. 22).

1013. [95] **There are cases in which the duty imposed is to take precautions to prevent loss caused by third parties or natural events.** (*Empress Car Company*, Lord Hoffman, 31. In *Stansbie* v. *Troman* [1948] 2 K.B. 48, a decorator working alone in a house went out to buy wallpaper and left the front-door unlocked. For the purpose of attributing liability to the decorator, the loss was caused by his negligence because his duty was to take reasonable care to guard against thieves entering).

1014. [96] **'One source or original cause'. In *Municipal Mutual Insurance*, Hobhouse L.J. pointed to the 'one source or original cause' of acts of pilferage/vandalism at issue therein.** "*The Port had no adequate system to protect the goods from pilferage and vandalism; it was their want of care which was the consistent and necessary factor which allowed...pilferage and vandalism to occur....*[T]*he acts of pilferage and vandalism were a series of occurrences attributable to a single source or original cause.*" (*Municipal Mutual Insurance Ltd.* v. *Sea Insurance Company Ltd. & ors* [1998] C.L.C. 957, Hobhouse L.J., 967).

1015. Observation #38: There is a clear analogy to be drawn between the acts of third parties such as trespassers and the intervention of natural phenomena.

1016. [97] **Causation may be established by inference. Absent positive evidence of breach of duty, merely to show a claimant's loss is consistent with breach of duty does not prove same, if also consistent with a credible non-negligent explanation. But where a claimant proves a defendant was negligent and that loss ensued of a kind likely to have resulted from such negligence, this will ordinarily be enough to enable a court to infer it was so caused, even if the claimant cannot prove positively the precise mechanism. This is not a legal principle. Nor does it alter the burden of proof. It is a matter of commonsense. The court must consider alternative theories of causation advanced by the defendant before reaching its conclusion about where probability lies. If it concludes that alternative suggestions advanced by the defendant are on balance improbable, that is likely to fortify the conclusion that it is legitimate to infer the loss was caused by the proven negligence.** (*Drake* v. *Harbour* [2008] EWCA Civ. 25, Toulson L.J., para. 29).

1017. Observation #39: In the within case, an inference to be drawn, and which is drawn, by the court is that, on the basis of the evidence adduced, if ESB had exercised required reasonable care, if it had but operated consistently to TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – the damage inflicted on UCC on 19th/20th November, 2009, would have been obviated or reduced.

XX. Warnings.

(See also Chapter 18).

1018. [98] **There is no general duty to protect others against theft/loss. There is no general duty that a householder should act as watchdog, or that his house act as a bastion, to protect his neighbour's house. The fundamental reason the law does not recognise a general duty to prevent others from suffering loss/damage caused by deliberate wrongdoing of third parties is the common law does not impose liability for pure omissions.** (*Smith* v. *Littlewoods Organisation Ltd.* [1987] 1 A.C. 241, Lord Goff, 271; see also *Dorset Yacht*).

1019. [99] **Foreseeability of harm is not enough for imposition of a duty of care. The law does not normally impose a positive duty on a person to protect others. The common law does not impose liability for pure omissions. The law does not impose a duty to prevent a person from being harmed by the criminal act of a third party based simply upon foreseeability.** (*Mitchell* v. *Glasgow City Council* [2009] 1 A.C. 874, Lord Hope, para. 15).

1020. [100] "***If there had been a basis for saying that the defenders…assumed a responsiblility to advise the deceased of the steps… they were taking, or in some other way…induced the deceased to rely on them to do so…..*** [it] ***would then have been possible to say not only that there was a relationship of proximity but that a duty to warn was within the scope of that relationship.***" (*Mitchell*, Lord Hope, para. 29).

Observation #40: Here, there was an assumption of responsibility by ESB to issue warnings to persons on its warnings-list in designated situations. ESB contends that inclusion on the warnings-list merely entitled a person to receive specific information; no greater duty was undertaken. The court does not accept that this has the consequence that practically meaningless warnings of the type issued on 19th November sufficed to discharge the duty arising.

1021. [101] It is not sufficient to establish that a warning should have been given but was not, to entitle a plaintiff to recover damages. He must also establish that, had he been given proper warning, he would have opted to do otherwise. (*Geoghegan* v. *Harris* [2000] 3 I.R. 536, Kearns J., 550; see also *CIÉ* v. *Carroll* [1986] I.L.R.M. 312, *Duffy* v. *Rooney* [1997] IEHC 102).

Observation #41: ESB contends that even if UCC had been given better warnings in advance of 19th November, this would not have made any or any significant difference to the damage sustained: thus causation is not established. The court does not accept this proposition. The consistent thrust of the evidence from UCC's staff was that if they had known early on the 19th what was coming later on the 19th, there was more they could and would have done. The major reason why little was done was because ESB's warning was possessed of the many deficiencies identified elsewhere above. A timely and meaningful warning given on 19th November would have made difference to the actions taken by UCC on that date.

CHAPTER 51. DUTY OF CARE.

Section A. Overview.

1022. The correct analysis in deciding whether liability in negligence arises is well established: (1) is there a duty of care? (2) has there been a breach of the standard of care? (3) did that breach cause the damage at issue? ESB has urged upon the court that it adopt what seems an entirely novel assessment of negligence, by importing an analysis of causation into whether or not a duty of care exists. Possibly this is because ESB considers this will lead the court to conclude that 'Mother Nature', not ESB, is the cause of the flood-damage that occurred to UCC in November, 2009. But even if ESB were correct in importing the issue of causation into assessment of the duty of care, it is apparent from the case-law considered in the preceding chapter that persons can be and have been held liable in respect of failure to alleviate the effects of nature (or acts of third parties), and that damage can be 'caused' both by nature (and third parties) and by such negligence. Thus to ask whether nature caused what occurred at UCC in November 2009 is not the proper question and would divert the court from the proper, accepted analysis.

Section B. Duties of care contended for.

1023. Duties of care contended for by UCC. Two duties of care are contended for by UCC, the 'flooding' duty and the 'warning' duty. The 'warning duty' is considered in Chapter 18. As to the 'flooding' duty, UCC contends that ESB owes a duty of care to owners/occupiers of downstream property in its management and operation of the Lee Scheme not to cause unnecessary flooding. In its closing submissions, UCC has reformulated this as a duty to take reasonable steps not to cause flooding which can reasonably be avoided. It maintains this is but an alternative phrasing of the same question, and avoids the issue raised by ESB as to what is 'necessary'/'unnecessary' flooding. The court must admit to a preference for the previous formulation. This is because that formulation appears to offer a greater certainty of expected action for those subject to the duty of care. Assuming that a duty of care does arise, and the court considers that it does, it appears to the court from the evidence before it that the issue of what is 'necessary'/'unnecessary' flooding is easily determined: unnecessary flooding is that which occurs after ESB crosses the point of optimisation that it has itself identified as its top operating level, *viz.* TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35).

1024. Duty of care contended for by ESB. ESB states it has a duty of care: (1) to carry out its operations without negligence, (which must be judged by reference to hydro-electric scheme operation), and (2) to take care to ensure that operation of the Lee Scheme does not, by increasing river-flow, cause damage by flooding to persons/property downstream of the dams. ESB appears to accept it owes this duty to UCC, its being a person downstream; and ESB must be correct in this: patently one owes a duty of care to those who may be affected by one's conduct, regardless of whether or not one can precisely identify them at a particular moment in time. That said, the court has difficulty with the bifurcated duty of care contested for by ESB. This is because it seems to be: an unworkable yardstick for ordering ESB's conduct (never mind that of others); artificially narrow; and at variance with authority. Moreover, despite accepting it has a duty of care, albeit disputing the scope of same, ESB has throughout the proceedings posited a version of that duty which is self-negating. Thus ESB contends that its duty is confined to not releasing more water downstream than nature would have sent were the Lee Dams not in place. A moment's pause suffices to recognise the difficulty this presents: it is self-evident that release of more water downstream than nature would have sent imposes on ESB a strict liability at law, whether in nuisance or under *Rylands* v. *Fletcher*, even if it owed no duty of care. ESB seems to the court to equate the duty of care with independent and pre-existing legal obligations that would automatically attach to it independent of the tort of negligence. That is to negate the very existence of a duty of care; in truth, on this logic, the duty of care contended for by ESB collapses.

Section C. 'Do Not Worsen Nature'

1025. Overview. The second limb of the duty of care contended for by ESB is but another way of expressing ESB's 'do not worsen nature' rule. In this regard, the court notes that it is clearly established in case-law that there is a duty to take reasonable steps to abate the effects of naturally occurring events on one's land. Moreover, ESB has expressly accepted that it owes a duty of care to persons and property downstream of the Lee Scheme. Accordingly, it seems that there is no real issue in respect of to whom the duty of care is owed. The general nature of the duty arising, and those to whom it is owed, have been established in *Goldman*. To go further and formulate the duty arising (as opposed to its consequences) by applying ESB's 'do not worsen nature' rule departs from the "*appropriate level of abstraction*" urged by O'Donnell J in *Whelan* (at 34). Indeed, it would yield the 'wilderness of single instances' against which O'Donnell J. cautions. So, for example, ESB presents the within litigation as a 'dam operator' case to which separate legal principles apply. The court accepts that hydro-electric dams may fall to be run differently from flood reservoirs. However, there is no support in Irish or, *e.g.*, United Kingdom case-law, for the proposition that separate principles concerning the duty of care apply to dam operators. Yes, application of those principles may yield different results in the hydro-power context than when applied to flood-reservoirs. But, as a matter of principle, in terms of identifying the duty of care, not only does a distinction between hydro-power dam operators and other categories of dam operator find no support in Irish or United Kingdom case-law; more significantly, it would be at variance with O'Donnell J.'s approach in *Whelan* where he looked to the duty of care owed by a solicitor "*or indeed any professional advisor*" (at 34) without indicating that a duty of care had to be assessed separately for each profession.

1026. Inherent illogic? UCC contends that a duty not to worsen nature is inherently illogical where 'nature' no longer exists and the Lee Scheme represents the new *status quo*. The court accepts this. There are, in truth, at least five inherent deficiencies with the 'do not worsen nature' proposition: (1) little of our nation's landscape is 'natural'; as Mr Faulkner noted, it has come a long way from when it was natural; (2) the attempt to rely on such a proposition ignores the fact that the entire purpose of the Lee Scheme is to harness (alter) nature; (3) there does not seem to be any dispute on the evidence that the Lee Scheme has changed nature irrevocably, such that to refer to 'nature' in this context is meaningless; Mr Ramsbottom accepted in the course of his oral evidence that it is not possible to analyse the catchment without looking at the Lee Dams; Mr O'Mahony, ESB's Chief Civil Engineer, indicated in his oral evidence, that "*Building a dam across a river obviously does change nature*" (Transcript, Day 56, Q.355); Dr Pürer, the present chairperson of the EDSC, indicated that "*if you build a hydro power plant you worsen nature of course*". (Transcript, Day 64, p.81); in light of this evidence of ESB's own witnesses, it makes no sense to define the duty of care by reference to a condition that no longer exists; (4) even if one sets aside the difficulty of identifying 'nature', the concept of pre-existing nature is artificial and does not represent the expectations or understanding of downstream residents, occupiers and owners, or, the court would hazard, of our modern society. Downstream residents, occupiers and owners do not typically, if at all, know what effect a natural event will have as the Lee Scheme intermediates between 'nature' further upstream and them. ESB, through the Lee Scheme, has become a major influence on what happens downstream; and it is a hallmark of our legal system that with control comes responsibility, here in the form of a duty of care *vis-à-vis* the safety of downstream persons/property; (5) it does not seem to the court that the river-flow downstream of the Lee Scheme can now truthfully be described as 'natural'. By virtue of the operation of the Lee Scheme, as Mr Cawley agreed, "[W]*hen we get down as far as Inniscarra, we're now dealing with the outflow from a controlled river system*". (Transcript, Day 82, p.81).

1027. The *Elliott* and *Los Angeles* cases. In support of its argument that the benchmark for assessment should be the *status quo ante*, ESB relies on the American case of *Elliott* v. *City of New York* (CV 296, 2010 US Dist LEXIS 121334) (15th November, 2010), considered in Appendix C. ESB has suggested that, in *Elliott*, the U.S. District Court (Patterson J.), at 20, rejected the 'new *status quo*' argument because "*its application would appear to impose automatic liability on all owners of water-supply dams for damage caused by storms.*" A closer reading of *Elliott* suggests that what was being rejected was an equivalent of strict liability, but the imposition of such liability does not follow from acceptance of a duty of care akin to that posited by UCC and accepted by this Court to arise in the present case. It seems to the court that a more pertinent case is *People* v. *City of Los Angeles* (34 Cal.2d 695; 214 P.2d 1 (1950)), also considered in Appendix C. There Traynor J., for the Supreme Court of California, observes, at 698, that "*As between the city and the state's lessees on the lake bed such diversion was recognised as the new natural condition with respect to the waters of the Owens River*". Though ESB contends that the facts of *Los Angeles* are far removed from those here, the case nonetheless offers an example of judicial recognition of changed nature as the new condition to which regard must be had when considering the state of nature. All that said, the court considers that all U.S. cases to which mention has been made in the within proceedings can be distinguished on one or all of the grounds outlined in Appendix C.

1028. Is the 'new status quo' predicated on 'assumption of responsibility'? ESB has contended that UCC's 'new *status quo*' argument is predicated on UCC's 'assumption of responsibility' argument. The court does not accept this. The 'assumption of responsibility' argument arises out of how ESB manages the Lee Dams and how it holds itself out as operating them. The 'new *status quo*' argument arises out of the existence of the dams as a newly natural characteristic of the Lee Valley. The simple fact is that the Lee Scheme is now there. For the reasons identified above, it is folly to serve up a counter-factual which few people now remember as the basis on which a theory of present legal responsibility should be constructed.

1029. Is the 'do not worsen nature' threshold too low? ESB has been authorised to construct and operate the Lee Scheme for profit. This is a privilege conferred on it by the State. Its licence does not limit, or purport to limit, any responsibility it has at common law in respect of damage caused by passing more water than the natural inflow into the upper Lee. If the Lee Scheme released more water than would have flowed in the river Lee if the dams were not present, ESB would be strictly liable under *Rylands* and/or in nuisance. In other words the 'do not worsen nature' rule sets the lower limit of liability. It is a rule that derives from the building and ownership of a dam. It does not attempt to address the additional and distinct responsibility which attaches to harnessing and using river-flow in an industrial activity with the attendant water-control and management which that involves. It is a rule that does not reflect the development of the duty of care in the 20th century, or the rightful expectations of modern society. Moreover, it is not simply the case, as ESB claims, that during the flood of 2009 it merely allowed water to pass through the Lee Dams. ESB caused that water to accumulate in the Lee Reservoirs at levels above TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – and released it at a later point. To succeed in its 'do not worsen nature' argument, ESB must present itself as a 'passive agent' and nature as an 'active agent'. This is a distortion of the truth. As Lord Hoffman noted in *Empress Car Company Ltd.* v. *National Rivers Authority* [1999] A.C. 22, 28 "*Maintaining lagoons of effluent…is doing something*". So too is maintaining a reservoir of water for hydro-electric generation, albeit that the latter task seems likely to yield rather less of a bouquet.

1030. Natural attenuation. The Lee Valley, in and of itself, has an attenuating effect, even without the Lee Dams. There is no dispute about this. So for ESB to limit its duty of care to 'not worsening nature' identifies an extremely low duty. Be that as it may, if ESB's concern is not to make natural conditions worse, it follows that it is not enough merely to ensure that peak discharge from the dams is lower than peak inflow; it must ensure that peak discharge is less than the peak that would have pertained before the Lee Scheme. Instead, ESB puts forward the automatic attenuation that the Lee Scheme offers, combined with its 'do not worsen nature' principle, as a means of absolving itself of any duty to take positive steps to take reasonable care. In effect, it hollows out the duty of care to which it states itself to be subject to a practical nothing.

1031. A bright red line? The principle 'do not worsen nature' does not provide the 'bright line' or readily applicable standard ESB claims. To begin with, the benchmark of 'nature' is unsatisfactory as it seeks to rely on a state of nature irrevocably altered by the Lee Scheme. To hold that ESB's duty of care is satisfied by its releasing less water downstream than nature would have sent would permit ESB to rely on a practice to which the evidence indicates it does not in fact adhere. Examples of this last fact abound; a number of them are set out hereafter.

1032. [1] Basic operation of Lee Scheme (often) worsens nature. As Mr O'Mahony stated in his oral evidence "[O]*bviously any time, or a lot of times that the turbines are operating, they're worsening nature*". (Transcript, Day 55, 12th December, 2014, Q.401). Moreover, the rule fails to allow for natural attenuation. In this regard, it was not clear that ESB's dam operatives were aware of the scale of natural attenuation, as evidenced by the following exchange between counsel and Mr Jerry Browne, onetime Hydrometric Officer at the Lee Dams:

> "*Counsel* [UCC] – *When did you first hear about the principle of not worsening nature?*
>
> *Mr Browne* – *I suppose it was the basis of all our thinking. When you are trained as an operator in a dam, you are not worsening nature, the discharge will not exceed the inflow. You are not worsening nature because you are absorbing the difference within the dam.*
>
> – *Sorry, Mr Browne, is it your understanding of the rule, that as long as you are discharging less than the inflow you are not worsening nature?*
>
> – *On the rising flood, only on the rising flood. Because when the flood is rising you are retaining or absorbing that water in the storage in the reservoir. On the falling flood, this flood*

has now risen up, Judge, up to a peak, right. Now you can't stay there so as the flood falls, right, as the flood falls, that water has to be discharged but you have never exceeded the initial peak.

- *Okay. So...your view was is that you weren't worsening nature even if you made discharges greater than the inflow on the falling limb of the flood.*
- *That is correct.*
- *Were you aware, Mr Browne, that if the dams didn't exist at all that the river valleys, where the reservoirs are located, would attenuate the floods to some extent.*
- *That is correct too. There is natural attenuation in all kind of river systems I suppose...*
- *And did you have any idea as to what the natural attenuation of the river valleys was?*
- *No....I wouldn't have been aware of that as such. It's not part of...*
- *So were you aware, Mr Browne, that if your discharges were just below your inflows you could actually worsen nature?*
- *My procedure is to operate the procedures in that respect. They are mandated for me by the Chief Civil Engineer or, sorry, they are designed by the Chief Civil Engineer...*[I]*t's far beyond my brief...*
- *Were you aware that the operation of the dams could worsen nature if the discharges from the dams coincided with peak*

flows on the tributaries downstream when it wouldn't have done if there were no dams present?

– *That may or may not be the case...*" (Transcript, Day 87, pp.23–24).

1033. [2] Tides not meaningfully factored into discharge decisions. The impact of tides downstream appears not to be factored meaningfully into ESB's discharge decisions. *E.g.*, Mr Browne appeared unaware that the Lee Dams could worsen nature if peak discharge from the Lee Dams coincided with high tide:

"*Counsel* [UCC] – *Were you aware that the dams could worsen nature if the peak discharge from the dams coincided with high tide in Cork, whereas if the dams didn't exist the peak flow wouldn't have done so. Were you aware of the potential to worsen nature in that regard?*

Mr Browne – *Well, I suppose my experience of the '09 flood was, Judge, that the peak discharge from the dam coincided with the lowest tide.*

– *I am just asking were you aware of that?*

– *Hmm, no...*". (Transcript, Day 87, p.25).

1034. [3] ESB's advance discharge rule as operated worsens nature. That ESB's advance discharge rule, as operated, worsens nature is apparent from the oral evidence of Mr Tom Browne. He accepted, *e.g.* that when doing advance spilling of 150m^3/s, ESB is discharging more than nature would send down river in that instance:

"*Counsel* [UCC] – *...Mr Browne, we know, because we've been told repeatedly, that you can discharge up to 150 even if the peak inflow is less than 150, isn't that correct?*

Mr Browne – *That is correct, yes.*

– *...So you are discharging more than nature would send down the river in that instance, isn't that correct?*

– *Well, we are discharging within the river bank. And I mean, I think –*

– *Mr Browne, you know the question I'm asking you. You are discharging more than nature would send down the river in that instance?*

– *At that time, yes.*

– *Yeah. And you don't know, because you don't properly monitor, what the flows are at the downstream tributaries, isn't that correct?*

– *That's – yes...*

– *And you don't have real time information on the levels?*

– *That's correct, yeah.*

– *So when you discharge up to 150 CUMECS* [m^3/s] *down the river, you have no idea as to whether you are causing flooding down the river or not?*

– *No, I mean we – I wouldn't accept that, I wouldn't accept that approach or that interpretation. I mean, effectively we are discharging within the bank of the river and that is* *where, within the bank of the river, that is something that we can do. And we are discharging, we're not causing flooding. I mean, if there are large flows in the tributaries downstream, I mean that's not flooding that's caused by ESB.*

– Okay. So the combination of your discharges with the flows downstream could result in flooding downstream, is that correct?

–I think that, I mean, there could be some flooding downstream if we were discharging 150 and there was large flows in the Shournagh and the Bride, there could be some flooding downstream.

–...and that is a flooding that wouldn't take place in many circumstances if all you were doing was discharging the natural inflow?

–That's correct. But I mean we wouldn't be discharging 150 downstream unless there was reason for it." (Transcript, Day 81, pp.74–75).

1035. Mr O'Mahony accepted the possibility that the Lee Regulations contribute to the worsening of nature. He suggested that this was "*the only way that the dams can be operated*". (Transcript, Day 56, p.59). Mr Cawley, called by ESB, likewise accepted that because of discharges made on the falling flood, flooding was prolonged in the 'with dams' versus 'without dams' scenario. (Transcript, Day 97, p.31). Additionally, because of the time-lag that arises automatically from the existence of the Lee Scheme, timing of flows will vary from that in the 'no-dams' scenario, a point acknowledged by Dr Bree.

1036. All in all, the 'do not worsen nature' rule beloved of ESB is rather porous when it comes to its application. It entails at its core the proposition that, when considering on a day-to-day basis the issue of downstream flooding, ESB and its staff may turn the clock back to the late-1950s and assess the position as if there were no dams. The very unreality of the proposition assists in its refutation. As Hardiman J. remarked, albeit in a different context, in *Maguire* v. *Ardagh* [2002] 1 I.R. 385, 669, "*I do not find appealing a line of argument which sets up a distinction between a universally accepted state of fact in real life and a quite contrary state of law.*" The last major flood when the river Lee was in its natural condition, *i.e.* prior to construction of the Lee Scheme, is outside living memory. The proposition that downstream flood control may or must be undertaken by reference to the position 'as was' in the 1950s would likely have been more than a little disconcerting to any person in the City of Cork, had such person been aware of this back in 2009, though it may be that given ESB's long-time and widely-trumpeted pronouncements about the role of the dams in flood alleviation this fact went missed.

Section D. Foreseeability and proximity.

1037. Overview. ESB accepted in its opening submissions that it owes a duty of care. It appears to follow that issues of foreseeability and proximity have been conceded. Even so, ESB has agitated the issue of proximity. It is difficult to see how ESB can sustain this argument: one cannot owe a duty of care to persons downstream without being in a relationship of proximity, and it is accepted that a duty of care is owed. ESB has adduced no authority for the proposition that it may be proximate to people in one context, *i.e.* in fulfilment of its self-perceived duty 'not to worsen nature', but not in another, *i.e.* avoiding flood-damage to a defined extent. Accordingly, the legal dispute in these proceedings comes down to whether it is just and reasonable to impose the duty of care posited by UCC, and the court considers that it is. Even so, for the sake of completeness, the court considers foreseeability and proximity below.

1038. Foreseeability. ESB's admission that it owed some form of duty of care, albeit limited, appears effectively to concede the issue of foreseeability. Indeed, ESB appears to admit foreseeability in its opening submissions. It is, in any event, self-evident that release of water from the Lee Scheme had the potential to cause injury to downstream properties/persons. ESB controls 70% of the flow into Cork City. As Mr Tom Browne, Asset Assurance and Engineering Manager for ESB Generation, indicated, "[O]*bviously...if you get large volumes of water coming down a river system...you are going to get damage and the more water that comes down the more damage....I think that would be evident to most people.*" (Transcript, Day 81, p.61). It is common case that high discharges create a risk to life and property. The converse seems necessarily to follow, *viz.* that evident to most people, and undoubtedly to ESB, versed as it is in the practice of dam-management, is the fact that reducing discharges reduces the risk to persons/property downstream. As to this last risk, ESB was extremely well informed. Proof of this is the following exchange between counsel and Mr O'Mahony:

"*Counsel* [UCC]	–	...[Y]*ou and others within ESB knew that at particular discharge levels from Inniscarra... significant damage could be done to Cork City; isn't that correct? You knew that from the inundation studies...?*
Mr O'Mahony	–	*Well, of course if there are significant discharges it can cause damage.*

– ...[A]*m I correct in saying that anything over 300 CUMECS is certainly liable, maybe not definitely, liable to cause damage to buildings?*

– *Yes....*

– *And discharges over 500 CUMECS would cause very significant damage; isn't that correct??*

– *Yes...*

– *And that was known to the operators of these hydros..?*

– *It is something that would be known of course because of the inundation study*". (Transcript, Day 54, pp.82–83).

1039. It will be recalled that ESB's inundation studies examined various potential scenarios (return periods) and flow-rates. Additionally, ESB had experience of, and knowledge from, previous flood events. Again, Mr Tom Browne's evidence is of interest:

"*Counsel* [UCC] – *[T]he risk of major flooding was something...known to...ESB...not only by reference to the inundation studies but by reference to...various flood events...discussed in detail before the court, isn't that correct?*

Mr Browne – *...[T]here were flood events in the past and...ESB was aware of those flood events and, yes, I mean there was awareness of the fact that major flooding can occur.*" (Transcript, Day 81, p.66).

1040. In truth, these flood events provided ESB with copious historical information regarding the effect of discharges from Inniscarra Dam. Moreover, the risk of injury to downstream properties/persons was apparent to ESB from its involvement in the CFRAMS project which was commissioned in 2006 and well underway by November 2009.

1041. Proximity. ESB's admission that it owed some form of duty of care, however limited, seems effectively to concede that there was a sufficient relationship of proximity between the parties to these proceedings. Independently of that admission, UCC, as owner and occupier of a large swathe of land and significant number of buildings beside the river Lee, fell clearly within the class of persons who would be directly affected by high discharges from the Lee Scheme. ESB's focus in some of its submissions on the rights of riparian owners make it difficult for ESB to deny it had the necessary proximity with UCC to ground a duty of care.

1042. Some conclusions. ESB had extensive information regarding the risk of flood-events and the extent of the risk to property/persons downstream from Inniscarra. ESB knew, *inter alia*: (1) the rainfall inflows and discharges expected for various flood events; (2) that November/December was the time of year when large floods are most likely; (3) that the timing, intensity and temporal distribution of rainfall could vary significantly from one event to another; (4) that there could be wide variations in the percentage catchment run-off; (5) that there could be high percentage run-off; (6) that the Lee catchment was 'flashy' and rainfall could convert quickly into in-flows; (7) that there could be large rainfall events generating high inflows quickly; (8) of the impact of discharges of less than 250m^3/s, as well as the peak discharges during previous floods since the Lee Scheme was established; (9) from its inundation studies, the extent of inundation in Cork City at peak discharges between 100m^3/s and 500m^3/s; (10) about the scale of the 1916 flood and the significant threat to life/property from such flooding; and (11) that as discharges from Inniscarra Dam increase, the downstream risk to persons/property increases significantly. Given all the foregoing, the foreseeability of the risk to property/persons downstream as a result of discharges from the Lee Scheme seems beyond dispute. ESB had special, particular knowledge of the risk. It was aware, and its dam operatives should have been aware, that a large part of UCC's campus would flood following discharges in excess of $500m^3/s$.

Section E. Causation.

765. **Overview.** The legal principles in relation to causation have been considered in Chapter 50. In this chapter the court considers the evidence as to causation.

1043. i. Lower water-levels. Lower start water-levels would have had a significant impact on downstream flooding in November 2009, as evident, *inter alia*, from the following exchange between counsel and Mr Mangan:

"*Counsel* [UCC] – ...*You say* [in your witness statement]*: 'At the extreme, if the dams were empty at the start of the November 2009 event and large discharges were made prior to the reservoir levels reaching MaxNOL, the peak discharge could probably have been limited to less than 400 CUMECS* [m^3/s]*.' You see that?*

Mr Mangan – *I do, yes.... What I was trying to convey there, with the perfect knowledge in advance of the storm that was coming, with the perfect information retrospectively processing the data, you* *could come out with a discharge less than 400 cubic metres per second...*

- *You say that you could have got down to 400 only if you had, with the benefit of perfect hindsight, started at MinNOL and discharged something in the order of 250 in the run-up to the 19 November?"*
- *Mm hmm.*
- *...I am suggesting to you that this is not so and Dr Bree's own modelling establishes that if you started at TTOL...rather than MinNOL and if you limited your discharges to 150 CUMECS...you would have been able to reduce the discharges to 400?*
- *Yes...*[Y]*ou could have reduced them somewhat further if you started them at a lower level and discharged more, yes.*
- *Yes. So this idea that it is only at the extreme that you could have done that, it's not at the extreme. If you started at TTOL you get down to 400?*
- *And if you started at the extreme you get less than 400, that's what I am saying.*" (Transcript, Day 77, pp. 188–191).

1044. The evidence shows that if water-levels, at the start of the flood event, had been at TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) –this would have reduced the peak flow to about 400m^3/s. This is not in dispute.

ESB's own experts accept that starting from TTOL at Inniscarra would have made a difference to peak discharge. It would also have resulted in benefits downstream.

1045. ii. Advance discharges. Modelling done by UCC's experts suggests flooding would have been reduced if ESB had engaged in larger advance discharges. Even if the discharges had been made in accordance with ESB's own interpretation of the Lee Regulations, peak discharge on 19th November would have been reduced appreciably.

1046. iii. Storage of water at Carrigadrohid. More effective use of storage at Carrigadrohid, with conjunctive operation of the Lee Dams, would have reduced downstream flooding.

1047. iv. Warnings. Had there been more timely, effective warnings on 19th November, it would have been possible to warn of the risk of widespread flooding in Cork with a lead-time of several hours. The benefit and effectiveness of appropriate warnings given in a timely manner is acknowledged by ESB's witnesses, in particular Dr Hughes. Less damage would have been caused had there been proper warning on the morning of 19th November, 2009.

1048. v. Modelling. UCC's modelling of the November 2009 flood-events is sufficient for the court to reach a conclusion on causation. The model was developed using well-established procedures, based on an understanding of the characteristics of the river Lee, the catchment and the flood history of Cork, derived from the Lee CFRAMS model, and developed using local expertise.

1049. Elision of duty of care and causation? ESB has indicated it is not meaningful to speak of ESB as causing a flood that would have happened anyway. This, it maintains, can be viewed as a matter of causation or an aspect of the duty of care. So, per ESB, it did not cause the flood because it did nothing to worsen the natural conditions, or, it is not in breach of a duty of care to UCC because it did not worsen nature; either way, the legal outcome is identical. However, the assertion that a legal outcome is identical is not reason for dispensing with, or eliding the long-established process of looking to whether a duty of care exists, whether it has been breached, and whether the breach has caused the damage arising. If causation were now to be imported into the duty of care analysis, that would undermine the legal analysis and involve determining the scope of the duty of care by reference to causation. This is wrong as a matter of principle: it is the scope of the duty of care which impacts on causation and which, in many cases, determines it. The proper and well-established causation inquiry in negligence cases is whether a defendant's negligence or breach of duty caused the damage in issue. This proposition is supported by numerous cases. *E.g.* as Viscount Simonds observes in *The Wagon Mound (No. 1)* [1961] A.C. 388, 425: "*It is...proper when considering tortious liability for negligence to analyse its elements and say...the plaintiff must prove a duty owed to him by the defendant, a breach of that duty by the defendant and consequent damage*", *i.e.* damage consequent upon that breach. In *Charlesworth and Percy on Negligence* (11th ed, 2006), at para 5–01, it is indicated that the appropriate test is "[Is] *a causal link...proved between any negligence inferred and the injury, loss or damage which the claimant alleges*[?]" Effectively, ESB is seeking to centre all the issues in the negligence limb of the case against it into the existence of the Lee Dams, rather than the operation of those dams. Can this be right? Given that ESB has availed of the statutory privilege afforded it by the Act of 1945 and constructed the Lee Scheme, so transforming the Lee Valley and the river that runs through it, a serious question arises as to why it should be able to rely on a hypothetical scenario in which the Lee Dams do not exist when it comes to determining whether there is any liability towards its neighbours in non-hypothetical situations presenting in reality, particularly those which presented in November 2009. The only logical answer is that the Lee Dams are there, nature has been altered, water which flowed freely and at times and levels determined by nature is now managed by ESB; it is ESB's acts, omissions and rules that now govern the flow, timing and levels. So it must follow that ESB's acts, omissions and rules can only be judged by reference to this new state of affairs that ESB has brought into existence.

CHAPTER 52: BREACH OF DUTY.

1050. The decision in *Latimer*. In *Latimer* v. *AEC Ltd.* [1952] 2 QB 701, 710, Denning L.J. stated: "[I]*n every case of foreseeable risk it is a matter of balancing the risk against the measure necessary to eliminate it.*" Here, the damage UCC suffered in November 2009 is admitted to have been foreseeable and foreseen. On any view, the damage to UCC must be viewed as serious. Conversely, the measures UCC says ESB should have undertaken did not involve major expenditure and were simple. So when it comes to applying *Latimer*, the balance to be struck favours UCC.

1051. Duty proportionate to risk. In *Law of Torts* (2013), McMahon and Binchy observe, at pp.237–238: "*Where the potential injury is great, the creation of even a slight risk may constitute negligence....The question of risk must be determined according to the information reasonably available to the defendant.*" In the present case, abundant information reasonably available to ESB in 2009 included rainfall data, river data, tide-level data, reservoir level data, reservoir discharge data, reservoir inflow data, the inundation studies, forecast modelling, and the Lee CFRAMS.

1052. The decision in *Cosgrove.* In *Cosgrove* v. *Ryan* [2008] 4 I.R. 537, 567, a case concerned with the not incomparable context of where a harvester came into contact with ESB wires, Geoghegan J. states that: "*The electricity supplier...owes a heavy duty of care even if...not strictly liable under...*Rylands...". He continues, at para. 28:

> "*Although the onus of proof is always on a plaintiff to prove negligence the requirements of proof may vary....*[T]*hose requirements would not be high where a dangerous substance such as electricity or gas is involved....*[Q]*uite apart from any special principles relating to dangerous things, a plaintiff in a negligence action does not have to negative every possibility of absence of negligence.*"

1053. Continuing, at para. 32, Geoghegan J. observes:

> "[A] *plaintiff does not have to disprove every possibility on liability and that, in relation to dangerous things at least, the standard of proof will be reasonably low.*"

1054. Here, electricity is involved in the sense that the *raison d'être* of the Lee Dams is generation of electricity. However, the dangerous substance involved is the water stored in the Lee Reservoirs and passed through the Lee Dams in such quantities that, as ESB foresaw, it can and sometimes does, cause enormous damage. ESB admits it is engaged in an ultra-hazardous activity, presumably to bring itself within a very limited duty of care. But if it is engaged in an ultra-hazardous activity, there is a commensurate reduction of the onus of proof on UCC in the manner contemplated by Geoghegan J. in *Cosgrove.*

1055. Ability of ESB to act as UCC proposes. Before considering ESB's breaches of its duty of care, the court notes that notwithstanding ESB's various protestations about its statutory mandate and the 'hydroelectric generation versus flood alleviation'-dichotomy, ESB has indicated that it is possible to operate the Lee Scheme so as to avoid unnecessary flooding downstream. In an affidavit sworn by a solicitor for ESB on 8th October, 2014, it was stated that "*It is trite to say that ESB could have managed the 2009 flood differently....The question is...whether ESB had a duty to alleviate flooding and acted unreasonably – given the statutory purpose of its dams – in not giving such greater priority to flood alleviation.*" The significance of this text is if there is a duty to alleviate, ESB by its own mouth did not fully alleviate, so *ipso facto* has placed itself in breach of the applicable duty of care. Be that as it may, the court considers that there are in any event some eight grounds on which a breach of duty of care by ESB can be identified; these are considered below.

1056. Summary of breaches. ESB fell below the standard of a reasonably competent dam operator in eight respects. (1) Notwithstanding ESB's comprehensive knowledge and awareness of flood-risk, it failed to undertake any risk-assessment to identify steps available to minimise downstream-flooding. (2) Operation of the Lee Scheme was not reviewed and optimised to accommodate floods other than the design flood. (3) Water-levels at flood-start in November 2009 were at a level that created an obvious risk of serious flooding downstream, given the time of year, pattern of unsettled rainfall, risk of heavy rainfall, catchment saturation and advance discharge limitations. (4) ESB failed to react appropriately to the forecast received at 06:30 on 16th November, 2009, or subsequent forecasts, and to consider available options. (5) Given the high levels of water and extreme weather forecast, ESB ought to have discharged water earlier and in greater quantities in the days preceding 19th November; had it operated consistently to TTOL – "*the top operating level which the station shall endeavour to maintain* *during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – some such spilling would have occurred. (6) ESB ought to have stored more water in Carrigadrohid and operated the Lee Reservoirs conjunctively to reduce discharges from Inniscarra. (7) Having taken on (to whatever extent) a flood alleviation role, ESB failed to establish adequate hydrometric systems to perform that role. (8) ESB's warning-system was inadequate.

1057. No risk assessment. ESB failed to carry out any risk-assessment to identify steps that could minimise downstream flooding. Even a rudimentary assessment would have identified a number of ways the operation of the Lee Scheme could have been amended to reduce risk of downstream flood-damage. Such an assessment would also likely have identified the risk inherent in the high water levels above TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – that subsisted over October/November 2009. Risk management is an exercise that must be undertaken by an entity that operates facilities. As Dr Pürer observed, "[I]*t's state of the art to have risk management*". (Transcript, Day 65, p.122). Dr Pürer also appeared to accept that when safety presents as an issue for a facility operator, risk management of safety will follow. In this regard, the Institution of Civil Engineers in 'Advice on Ethical Conduct' initially made on 21st July, 2004, indicates, *inter alia*, that: "[M]*embers of the ICE have an ethical responsibility to take all appropriate measures to limit risk, in particular by ensuring that there is adequate risk analysis/assessment, and an effective management process both during the construction and post-construction phases in any project...*".

1058. Any suggestion that ESB must await statutory intervention before assessing/controlling risk is unsustainable. What arises is a question of risk-management and the simple, risk-related precept that a dam operator must reduce flood risk that emanates from what is under his control. It would have been straightforward for ESB to consider how to deal with lesser floods, by engaging in an iterative process similar to that used by it for calculating the design flood and formulating operating rules. The reality presenting at and below the Lee Scheme is that there is a risk to persons/property in Cork City from lower return period events, and that risk increases significantly as discharges increase. That risk emanates from the Lee Scheme, which is under ESB's control. Yet ESB did not respond to this risk by engaging in pre-planning that explored discretionary options in different scenarios. Mr O'Mahony conveyed ESB's position in the following exchange with counsel for UCC:

"*Counsel* – ...[The Lee Dam discharges] *are designed to meet the 10,000 flood proportionate to the volume at any particular time?*

Mr O'Mahony – *That's correct, yes.*

– *...The consequence of that is those rules force you into releasing a volume of water that you know is going to cause serious damage and potentially very serious injury even though this is nowhere near a one in 10,000 year flood?*

– *The rules, as I say, the rules are the safety standard. They do require discharges and it can be large discharges depending on the size of a lesser flood.*

– *And these are rules designed by engineers; isn't that correct?*

– *That's correct.*

– *From an engineering perspective?*

- *Well, it's from the perspective of safe operation of the dam.*
- *And did ESB ever consider getting any perspective from any other safety experts or risk analysis experts or risk assessment experts?*
- *Well, we got – I suppose we got external consultants to provide assistance but they were all dams consultants.*" (Transcript, Day 59, pp.19–20).

1059. When pressed, Mr O'Mahony observed that ESB has not maximised flood alleviation because its role is hydro-electric generation. This line of logic seems to flee from Dr Pürer's better sense. In terms of specific omissions in ESB's planning, ESB does not appear ever to have considered operating the Lee Reservoirs at generally lower water-levels, most notably to TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35). The failure to engage in risk-assessment and pre-planning resulted in ESB being presented with an emergency on 19th November, 2009, that it was not equipped to handle. It had no proper framework to address the dangers and believed the only safety issue it was required to, and could, address was dam integrity. The opportunity of optimising flood management was apparently never considered.

1060. Failure to review/optimise operations. Linked to the failure to do a risk-assessment, was ESB's failure to review the Lee Regulations and assess the options available to it to amend those Regulations to accommodate lesser floods. There are multiple deficiencies in the Lee

Regulations, when viewed from a flood-management perspective; these would have become apparent to ESB following meaningful review. Those deficiencies are as follows:

1061. [1] *Over-emphasis on water-levels.* Focusing on water-levels to the exclusion of other hydrometric data results in leaving it to the last minute to respond to a flood, and creates a delay (lag) between inflow/discharges. Even if it is accepted that mandatory discharges should be determined by water-levels, it does not follow that when managing/controlling water-levels, there should not also be appropriate regard to other factors and data which facilitate discharge of the duty of care owed to those downstream.

1062. [2] *Excessive operational water-levels.* The Regulations are focused on water-levels; there is insufficient emphasis on empty space for storage of incoming floods.

1063. [3] *Over-emphasis on water-storage.* The Regulations unduly focus on storing flood-water. The rule that peak outflow should not exceed peak inflow means operators are handcuffed in trying to maintain/gain empty space when needed.

1064. [4] *Operation of the Lee Dams and Reservoirs.* It seems from the Lee Regulations that the Lee Dams and Reservoirs fall to be operated independently of each other. However, the evidence suggests that they are operated conjunctively. It is bizarre if the Dams are typically operated conjunctively that the Lee Regulations posit the opposite as an ideal.

1065. [5] *Lack of integration with upper-basin tributaries.* There is insufficient detail in the Lee Regulations to what happens in upper basin tributaries and to where run-off will be generated.

1066. [6] *Lack of clarity.* UCC contends the Lee Regulations do not clearly define when the 'flood period' begins. The court considers the Regulations are clear as to when the period begins but are vague as to the basis on which commencement of a flood period is defined.

1067. [7] *Lack of flexibility.* The Lee Regulations do not encourage operators actively to manage the Lee Scheme in light of real-time events. They adopt a 'one size fits all' approach to storm events, despite the fact that management of the Lee Scheme during past floods demonstrates that occasional non-compliance with the Regulations has previously reduced total discharge.

1068. [8] *Lack of specificity.* The Lee Regulations lack specificity in terms of methods, procedures, reporting and documentation details.

1069. The fundamental difficulty with the Lee Regulations is they do not deal adequately with non-design floods. ESB maintains that the Regulations deal with all floods. This is literally true. However, the focus is on the design flood; the Regulations deal with lesser floods only as an incident of that. They do not address the safe passage of lesser floods save in the context of dam integrity.

1070. Water-levels. ESB's maintenance of high water-levels in the Lee Reservoirs was unreasonable given the following factors: (1) ESB's awareness of the critical impact that starting water-levels at flood-onset have on discharges; (2) weather patterns and catchment conditions in November 2009 were such that any reasonable dam operator would have realised the necessity to reduce water-levels; (3) the constraints ESB considered to apply to advance discharges were such as to render it even more critical that water-levels be lowered and held lower; (4) the water-levels were too high, being far in excess of TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35); (5) there were opportunities available to ESB pursuant to the Lee Regulations to reduce water-levels; (6) ESB's rationale for, and the relatively limited profit to it of maintaining the water-levels that it did, was inconsistent with its own determination of the optimally efficient reservoir level, *i.e.* TTOL.

1071. Critical impact of starting water-levels. This critical nature of start water-levels can be seen in the following exchange between counsel and ESB's Chief Civil Engineer:

"*Counsel* [UCC]	–	*...ESB know that November is the period when...large floods are more likely to happen, isn't that correct? November/December?*
Mr O'Mahony	–	*Well, it's one of the winter months, so larger floods can happen.*
	–	*We know...that in addition to water level, the saturation level of the catchment is a very big factor?*
	–	*Yes.*
	–	*And it doesn't come as a surprise to ESB to know that if the catchment is very highly saturated and a large rainfall event occurs that that is going to lead to a very large inflow into the reservoir?*

– *It can do, yes.*

– *And if the water levels are high, that, in a significant storm event, is going to lead to very high discharges?*

– *Yes, that's possible.*

– *That doesn't come as a surprise..?*

– *No.*

– *And neither does it come as a surprise that very high discharges are going to have a very serious adverse impact on persons and property downstream?*

– *Yes.*

– *Therefore any consideration of the safety of persons and property downstream does require ESB to consider those issues in the context of the operation of the dams, isn't that correct?*

– *It would do. But that's why, once a forecast was obtained for significant rainfall, that advance discharges were implemented to reduce levels.*

– *But on your evidence, there was…very little you could do at that stage even with three days' warning..?*

– *On my evidence?*

– …[Y]*ou said all…you could do was issue a warning and engage in…advance discharges up to 150.*

– *Yes, okay, that's what was done.*" (Transcript, Day 58, pp.66–67).

1072. The start water-levels in a flood situation have a critical impact on ultimate discharges. Start water-levels also determine empty space; and available empty space at flood-start will determine discharge-levels. High water-levels constrain a dam operator's ability to take pre-emptive action. As Mr Shibatani noted, "*The more empty space you have...the better propensity to maximise your downstream attenuative potential.*" (Transcript, Day 34, 21st October, 2014. Q.666). ESB appears, not least in the above-quoted evidence, to have been fully aware of the importance of starting water-levels on discharge levels. So even if the Lee Regulations made no mention of TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – it should have been obvious to ESB that its water-levels were too high in November 2009.

1073. Background catchment conditions. Maintenance of high water-levels at the Lee Scheme prior to November 2009 is surprising, given the time of year, weather patterns, and catchment conditions. ESB knew the importance of keeping water-levels lower at that time of year, as evidenced by seasonal downward variation of TTOL. ESB was aware of the seasonal risk of flooding, given that historically November/December are the major flood months, a fact known to it from experience and analysis. The 'flashy' nature of the Lee catchment offers another reason why it was prudent to keep water-levels lower. There were also specific background conditions in October/November 2009 which would have led any reasonable dam operator to maintain lower water-levels. First, rainfall figures from June to October 2009 were, per Mr Dale, somewhat exceptional. Second, as a result, the catchment was saturated. Third, the level of saturation was such that, combined with high water-levels, had the design storm occurred in November 2009, the Lee Scheme would not have been able to pass it. Fourth, if one accepts ESB's contention throughout the proceedings that at any instant a rainstorm could transform itself into the design storm, ESB's holding to the water-levels it maintained in November 2009 in the presence of saturation levels yielding, by Mr Cawley's reckoning, a percentage run-off of 82%, suggests a most serious failure on ESB's part. Fifth, compounding this failure is the fact that the forecasts ESB was receiving made clear it would be required to release large water-volumes from Inniscarra.

1074. Operational constraints. ESB maintains it can only properly discharge up to $150m^3/s$ when water inflows are at or below that level. This is because beyond that level it will flood other people's property. The court accepts this constraint applies; however, this has the necessary consequence that ESB should ensure its water-levels are lower and that it has other mechanisms to cope with floods. It was unreasonable for ESB to keep water-levels high and not to engage in greater advance discharges. By adopting this approach, ESB limited the options available to it and impaired its ability to exercise reasonable care for safety.

1075. Heightened reservoir levels. It is not disputed that in October/November 2009, water-levels in the Lee Reservoirs were kept above TTOL ("*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35)). Nor was this an isolated occurrence. Winter levels prior to 2009 were consistently above TTOL. Mr Cowie indicated under cross-examination that TTOL had only been attained at Carrigadrohid once in six years. This, despite the fact that, as mentioned, TTOL is defined in the Lee Regulations (at *iv*) as the level which operators "*shall endeavour to maintain*". Even the most charitable interpretation of ESB's actions is it did not endeavour too hard. The court rejects the notion of TTOL, as propounded by ESB in the within proceedings, as a marker that establishes an economic sub-band between it and MaxNOL. Even if the court were to accept ESB's interpretation of TTOL, it was unreasonable for ESB to maintain water-levels above TTOL in October/November 2009, having regard to the risk created. In short, ESB was negligent in keeping water-levels as high as it did, placing ESB in a position where its capacity to handle a large, reasonably foreseeable flood event was severely limited.

1076. Reducing water-levels. Regardless of how one interprets TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – there were mechanisms and opportunities available to ESB, compatible with the Lee Regulations, to lower water levels in advance of November 2009. There is no physical impediment to maintaining water-levels at lower levels. Indeed, the provision for advance discharges in the Lee Regulations is predicated on spilling taking place. Mr Buckley indicated in response to a query by the court that a Hydrometric Officer could spill all winter if conditions dictated. (Transcript, Day 84, p.85). Having regard to the plain wording of the Lee Regulations (para. 2.6.1) allowing for spilling as part of normal operations, it is surprising that ESB has contended it is not open to dam operatives to spill to achieve TTOL. Such a contention is not supported by the evidence. Mr O'Mahony indicated: "*I think it goes without saying it* [attainment of TTOL] *can, of course, be done by spilling.*" (Transcript, Day 58, p.60). Mr Jerry Browne, onetime Hydrometric Officer at the Lee Scheme, also accepted, in the following exchange with counsel for UCC, that he had a discretion to spill to TTOL:

"*Counsel* – *Mr Browne, during this period* [around 13th November 2009] *did you...consider whether you should spill down towards TTOL because of the flooding risk downstream?*

Mr Browne – *Judge, I considered everything. Every day I considered everything. I considered my forecasts, my previous rainfalls and I exercise my discretion when I need to.*

– *...Mr Browne, you said that you consider everything so, just to ensure there is no ambiguity...I am going to ask you to address one factor specifically. In this period of time did you give any consideration to spilling water to reduce water levels down towards TTOL because of the downstream flooding risk?*

– *I did and that's what I did, Judge, I did spill the water. I did exercise my discretion and I did do it. That's why I spill because I exercise, I considered that implication, yes.*" (Transcript, Day 88, p.21).

1077. Spilling to reach lower water levels is not inconsistent with ESB's hydro-operation purpose. Quite the contrary. Mr Stevenson, called by UCC, indicated that "*In the same way that likely floods are inevitable, so spilling is inevitable. It would be a rare hydroelectric operator that went through a year without spilling*". (Transcript, Day 51, p.25).

1078. Unjustifiability of high water-levels. There are at least six reasons why maintenance of high water-levels by ESB in October/November 2009 cannot be justified. (1) Maintaining water-levels at TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for* *power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – is consistent with maximising hydro-generation. (2) Given the evidence as to the rapid fill-up rate of the Lee Reservoirs, maintaining water levels at lower levels would have been consistent with hydro-generation. (3) It is simplistic to suggest that hydro-generation requires that water levels be kept as high as possible. It seems to the court that the more proper question is 'at what height do water levels need to be to optimise efficiency?' ESB has identified this level. It is TTOL. (4) Although the justification for ESB's holding water above TTOL appears to have been profit maximisation, this offered little enough reason for keeping water-levels high. Mr Matt Brown indicates that the value of the additional revenue earned by ESB by operating above TTOL during November 2009 was between €100,000 and €130,000. Moreover, it is simply not possible to ignore the other considerations to which the court has made mention: whatever the figure for lost revenue, running a real risk of flooding in the pursuit of additional profit in the circumstances arising was unjustified, especially when optimal efficiency could be attained by operating at TTOL. (5) Water levels as high as those maintained to November 2009 are not required for generation; lower water-levels have been maintained since November 2009. (6) It was unreasonable for ESB to maintain heightened water-levels in and about November 2009, given the likelihood of heavy rainfall during anticipated unsettled weather.

1079. Failure to react to forecast rainfall for 19th November. The rainfall forecast received by ESB, commencing with the forecast at 06:30 on 16th November, indicated there would be heavy rainfall on 18th/19th November. Dam operatives ought to have been aware that the forecasts were reliable. Notably, all forecasts received predicted a high level of rainfall for 18th/19th November. Expert meteorologists called by both parties agreed that forecasts for winter are usually more certain than those in summer. So, *e.g.*, the view of Mr Fleming, called by ESB, was that weather at the time "*was in a pattern*", the rainfall was "*much more predictable*" and it was "*very much less likely that any one of these weather fronts would take a sudden deviation to the north or south and miss*". (Transcript, Day 85, p.83). Thus it is reasonable to conclude that there was a high level of certainty there would be heavy rainfall on the 19th. Hence prospectively (and retrospectively) the weather forecasts were accurate, there was good reason to believe them so, and Met Éireann was at the other end of a phone-line if ESB operatives wanted updates. It was foreseeable large discharges would become necessary and that appropriate precautionary plans were required. ESB has laid great emphasis in these proceedings on the potential inaccuracy of weather forecasts. Forecasts may be wrong. However, they can be wrong either way and the risk of under-prediction is assymmetric to over-prediction. Moreover, if dam operatives were concerned about forecast inaccuracies, they might reasonably have been expected to run 'what if' scenarios. The court must also admit to a twinge of scepticism about the emphasis placed by ESB on the uncertainty of weather forecasts when it is evident that they are integral to the day-to-day operation of the dams. As to the proposition that the inaction of dam operatives was attributable to the unreliability of forecasts, this seems undermined by the fact that Mr Jerry Browne, Hydrometric Officer in November 2009, was unaware of the level of confidence he might appropriately place in the forecast ("*I wouldn't be aware of their level of, what they perceive to be their own level of confidence*". (Transcript, Day 87, p.41). He was also not aware of the area to which the forecast related ("*Well, my understanding was that it was west of Carrigadrohid....I suppose this was set up before my time...*". (Transcript, Day 87, p.41). He was not aware of the tendency of the weather forecast to under-predict rainfall because it excluded the mountainous western end of the catchment. In truth it seems ESB had little interest in the certainty of weather forecasts, apparently never having made any inquiry of Met Éireann in this regard. (*Counsel* [UCC] – *I just want to ask you, Mr Fleming, are you aware of anyone in the ESB actually querying with*

Met Éireann prior to this case what the band of uncertainty was in respect of the forecasts you were providing? Mr Fleming – I'm not aware of any such discussion." (Transcript, Day 85, p.80)). ESB's handling of rainfall forecasts received is compounded by its failure to contact Met Éireann for additional information, even though this facility was available and, Mr Dale suggested, an appropriate action for ESB to take. Instead ESB preferred to wait and see how events would unfold. Even if a weather forecast had a 50% chance of being wrong, that meant it had an equal chance of being right. Such a risk demanded action of a more proactive and effective kind than that undertaken. This information should have been used to draw up contingency plans and make due warning.

1080. Advance discharges a crucial element of operation. Advance discharges are a crucial element of operating the Lee Dams. This was recognised by ESB when it added the advance discharge provisions to the Lee Regulations, with the purpose of relieving downstream flooding. Advance discharges create additional space within the Lee Dams and help with eventual flood-mitigation. Reduction of water-levels through discharges at start-flood is, per Mr Shibatani, a critical step in ensuring maintenance of empty space. Advance discharges are particularly important when starting levels are high, as in November 2009. Where empty space potential is lost, the imperative to make appropriate advance discharges seems greater. Thus ESB's failure to make increased advance discharges compounded its negligence in maintaining high water-levels. Notwithstanding its awareness that large discharges would almost certainly be required on 19th November, ESB did not increase its discharge above $150m^3/s$ even where, as was accepted by Mr Mangan, inflow was higher than $250m^3/s$ for a few hours on 19th November and thus ESB could have discharged to that level without breaching its 'do not worsen nature' rule:

"*Counsel* [UCC] – *[I]f you wanted to understand...why the hydrometric officer did something, how do you ascertain that?*

Mr Mangan – *From examination of the data and comparing them to the regulations, if there was any case where it diversified from the regulations I would have sought clarification.*

- ...[T]*o take one example, Mr Mangan, I think this is accepted by the experts on the ESB side. On the morning of 19th November...higher advance discharges could have been made for a period of a few hours because there was a period of a few hours where the inflow was 250 or above and therefore you could have discharged up to 250?*
- *Accepted, yes.*
- *Is that something that you looked at..?*
- *Well, to be honest it's one area that I didn't examine because as far as I was concerned the flood had been passed safely through the reservoir in accordance with the regulations...*".

(Transcript, Day 77, p.180).

1081. Missed opportunities. It is significant that, even by reference to its interpretation of the Lee Regulations, there were a number of missed opportunities for ESB to make higher advance discharges that would have reduced eventual peak discharge. In particular, increased discharges could have been made on the afternoon of 16th November and on the morning of 19th November:

"*Counsel* [UCC] – [A]*gain, Mr Ramsbottom, looking at that hydrometric data I am suggesting to you that on 19 November there was a period of quite a number of hours when the operators would have exercised their discretion to make discharges in excess of 150 CUMECS* [m^3/s]*?*

Mr Ramsbottom – *Yes....*[I]*n this situation I do agree with this proposition because we are now on a rising flood. It is clearly a rising flood because the inflows are going up and the rainfall data is showing that throughout this period there is continued heavy rainfall in the catchment. So I accept this suggestion.*

– *So, therefore, Mr Ramsbottom, you agree that it is not correct to say that the operators made the maximum advance discharges that they could in advance of this flood?*

– *Yes, in my opinion, just looking at these data, there is scope to go up to 250 based on my understanding of the guidelines. So from about, well the first increase was nine o'clock and it is certainly true to say that from that point onwards, and possibly a little before, their discretionary action would have allowed them to go up to 250 in that period, yes.*" (Transcript, Day 80, pp.12–13).

1082. To the extent ESB failed, and it did fail, to make better use of advance discharges, it is difficult to fathom given that in previous floods, early/earlier spilling in deviation from the Lee Regulations assisted in flood alleviation. *E.g.* according to ESB's February 1997 flood report, water was spilled earlier than required for dam integrity purposes so as to alleviate flooding below Inniscarra Dam, producing a roughly 13% reduction in peak flow downstream.

1083. Flood forecast model. Various deficiencies in the operation of ESB's flood forecast model have been identified in Chapter 10.The understandable frustration of dam operatives with the model is captured in the following statements. Mr Shine described the model as "*cumbersome*" and a "*nuisance*" (Transcript, Day 92, pp.94–95). Mr Jerry Browne agreed that the model was not fit for purpose (Transcript, Day 87, p.84). Dr Bree conceded it was "*difficult to use*". (Transcript, Day 75, p.102). Even the EDSC expressed concerns about the model. Dr Hughes, an expert witness, opined that it was "*not a good model*". (Transcript, Day 63, p.77). Yet nothing was done to improve it. It is possible to impound and release vast quantities of water without using a flood forecasting model to determine the ensuing consequences. It is not sensible to do so.

1084. The Flood Forecast Model runs. The flood forecast model was run by Mr Jerry Browne on the morning of 16th November. Unusually, the model was not run in response to every weather forecast. That aside, the model predicted peak discharges of $375m^3/s$ or $349m^3/s$, among the highest discharges on record. It does not appear that these predicted discharge figures prompted any ESB response.

1085. Was it a failure not to hold back more water at Carrigadrohid? In deviation from the Lee Regulations, ESB decided to hold back water at Carrigadrohid Dam, on the evening of 19th November. This produced positive benefits, caused a reduction and delay in peak discharge at Inniscarra, reduced the peak inflow by approximately $100m^3/s$, yielded a benefit to the people of Cork, and demonstrates the value of storing water so as to avoid releasing higher flows. ESB's Chief Civil Engineer accepted in his oral testimony that his decision – for the decision was his – to hold back water at Carrigadrohid "*worked and it was favourable*" and "*in hindsight it was a good decision*". (Transcript, Day 55, p.44).

CHAPTER 53: RIPARIAN LAW.

1086. Overview. ESB's opening submissions suggested it was going to place some reliance on riparian law. However, ESB placed less reliance on riparian law than might have been anticipated. Even so, the issue of riparian rights remains live and must be addressed. Briefly put, the court does not consider riparian law relevant to the question of the scope of any duty of care arising. There are five reasons why this is so.

1087. [1] *Not all affected people were riparian owners.* Many persons in Cork affected by flooding in November 2009, and whom it was foreseeable would be affected, were not riparian owners. A duty of care owed to them could not be conditioned/restricted by the law on riparian ownership. Conversely, riparian owners could not be owed a lesser duty.

1088. [2] *Riparian rights are property rights.* The essence of riparian rights is that a riparian owner has, incident to his property in riparian land, a natural, proprietary right to have water in any natural water channel flow to him in its natural state. Invasion of this right causing actual damage entitles the party injured to seek and receive court intervention. The definitive riparian cases pre-date evolution of duty of care principles, are unconcerned with negligence, and are creatures of their time, reflecting then societal focus on property ownership and distribution of legal responsibility by reference to same. The law of negligence has developed independently of property ownership and reflects changes in societal standards. Accordingly, riparian authorities do not provide guidance as to the contours of the duty of care arising in these proceedings.

1089. [3] *Alleged obligation of downstream owners to receive upstream flow.* The central thrust of ESB's contentions regarding riparian rights appeared to be that downstream landowners have the obligation to accept flow from upstream. There are three immediate problems with this. First, how any such obligation could preclude a duty of care to manage the Lee Dams such that avoidable flooding does not occur is unclear. Second, the suggested obligation, as is clear from *Gartner* v. *Kidman* [1962] HCA 27, cited by ESB, arises to prevent flooding upstream for which there is no other lawful permission. The *Gartner* rationale is of no application to a downstream riparian owner who, because of the Lee Dams, cannot 'throw anything back' or cause flooding upstream. Third, *Wright* v. *Howard* (1823) 1 Sim. & St. 190, also cited by ESB, suggests it may be too late for riparian law to have any application in these proceedings. In that case the court stated, at 203, and it seems to remain good law that: "[N]*o action will lie for diverting or throwing back water, except by a person who sustains an actual injury, but the action must lie at any time within twenty years when the injury happens to arise, in consequence of a new purpose of the party to avail himself of his common law right.*"

1090. [4] *Use of water not to affect others.* The only recent riparian case relied upon by ESB is *Moore* v. *British Waterways Board* [2009] All ER (D) 161 (Mar). In that case the claim in riparian rights failed. It is notable in the context of the within proceedings because, in the Court of Appeal, Mummery L.J. did not disapprove an argument of the claimant that riparian rights allow all uses of water that do not affect others; here others (including UCC) were affected.

1091. [5] *Reasonable use of water.* Within riparian law there is a requirement to use water reasonably, including consideration of how releasing water will impact downstream owners. This has been good law since at least *Embrey* v. *Owen* (1851) 6 Exch. 353, 370–1, Parke B. stating:

> "*All…the law requires of the party by or over whose land a stream passes, is, that he…use the water in a reasonable manner…so as not to destroy, or render useless, or materially diminish or affect the application of the water by the proprietors above or below on the stream….He must not shut the gates of his dams and retain the water unreasonably, or let it off in unusual quantities, to the annoyance of…neighbours….*[T]*he owner of the upper stream must not raise the water by dams, so as to make it fall with more abundance and rapidity than it would naturally do, and injure the proprietor below. But this rule must not be construed literally, for that would be to deny all valuable use of the water to the riparian proprietors…*".

1092. If anything, *Embrey* seems supportive of the duty of care which the court finds to arise in this case. At the least, it provides no authority for limiting ESB's duty of care as an industrial undertaking harnessing nature for its own purposes.

CHAPTER 54: *NOVUS ACTUS INTERVENIENS.*

1093. ESB has referred the court to various cases concerning the principle of *novus actus interveniens* which, when applied to this case, it contends, have the conclusion that the want of care UCC manifested for the safety of its buildings is so startling, having regard to its state of knowledge of the flood-risk arising, that such want should be regarded as the sole proximate cause of the flooding UCC experienced. It is, to borrow from Sir Humphrey Appleby, a 'courageous' argument.

1094. In *Conole* v. *Redbank Oyster* [1976] I.R. 191, a marine company acquired a boat and put it to sea. During a trial on its first day, it let in water at an alarming rate. The boat-owner was frightened and ordered the boat tied up. Despite knowing of the danger, the same skipper took the boat out less than an hour later with 50 young people aboard. The boat sank with a loss of ten lives. The victims' families sued the boat operators, joining the suppliers as third parties. In its judgment, the court stated: "*When the defendants discovered...the boat was unseaworthy and, nevertheless, proceeded to put to sea...the defendants in effect decided to supplant...*[the supplier] *as tortfeasor....The direct and proximate cause of this accident was the decision of the defendants, acting through Mr Hugman, to put to sea with passengers when they had a clear warning that the boat was unfit....The defendants were the sole initiators of the causative negligence.*" The point to which ESB draws the court's attention is that because the defendant was acutely aware of a serious danger and chose to act as if it was not, it was not entitled to contribution/indemnity from the third party.

1095. *Redbank* was applied in *Crowley* v. *AIB* [1987] 1 I.R. 282. There the plaintiff, a child, sued the defendant for allowing him to play on the roof of one of its buildings when the roof was lacking a protective rail; the architect of the building was joined as a third party. Although the roof was not intended as a recreational space, it was established that it ought nonetheless to have been designed with a rail. Master Crowley recovered against the bank but was found 9% contributorily negligent. As between bank and architect, the latter was found 30% liable by the High Court. On appeal, the architect argued that his original negligence had been overtaken by the act of the bank and that he should be considered as occupying the same position as the boat-supplier in *Redbank.* The Supreme Court overturned the finding against the architect on the grounds that the bank's knowledge of the danger, coupled with its negligence in allowing boys to play on the unprotected roof, sundered meaningful causal nexus between architect and accident. The bank's negligence, the court concluded, was the sole proximate cause. Per Finlay C.J. at 287:

> "*I am satisfied that having regard to the express finding made by the jury that the defendant, its servants or agents, was aware of the fact that boys, including the plaintiff, were liable to play on this unguarded roof and to the absence of evidence (which was not tendered at any part of the hearing) that they had attempted to prevent or prohibit the plaintiff and the other boys from playing on this roof, it was not open to the learned trial judge to hold that a sufficient nexus or connection existed between any negligence or default on the part of the third party and the happening of this accident so as to constitute the third party a concurrent wrongdoer with the defendant and therefore liable to make contribution or indemnity.*"

1096. In *Felloni* v. *Dublin Corporation* [1998] 1 I.L.R.M. 133, a 15 year-old plaintiff injured her finger in a door in her aunt's Corporation house. The door had a defective knocker. The plaintiff had, as a result, developed a technique for slamming the door behind her. This involved putting her fingers in the path of the shutting door and snapping them out of harm's way at the last moment. Injury ensued; so did litigation. The court held the Corporation had not been negligent as the knocker initially provided was adequate; the defective knocker had been fitted later, unknown to it. Per Morris J. in the ultimate paragraph of his judgment:

> "[E]*ven if I were to find...negligence on the part of the Corporation and a failure to comply with their obligations under the Housing Act...I believe that that negligence would be overwhelmed and overtaken by the negligence on the part of Mrs Carroll and on the part of the Plaintiff...in allowing the state of affairs to continue whereby presumably a number of times a day they would voluntarily expose themselves to what must have been a risk of injury in the slamming of the door when the remedy was available to them at little or no expense, to remedy the problem by fixing some sort of handle onto the door be it whatever so inexpensive. I am satisfied on the authority of* Crowley...*and on the* Oyster Bank *case whatever negligence there was on the Corporation if there was any...was overwhelmed and overtaken by the continued negligence on the part of the Plaintiff herself...and on the part of the tenant...*".

1097. The last two cases to which ESB made reference in this regard were *KBC Bank Ireland plc* v. *Hanby Wallace & Ors* [2013] IESC 32 and the House of Lords' decision in *Corr* v. *IBC Vehicles Ltd.* [2008] UKHL 13. In *KBC*, the plaintiff lending-bank loaned large sums of money to two borrowers who defaulted. The defendant solicitors were engaged to ensure the borrowers' security was sound. The defendants made a case for contributory negligence against the bank for its decision to lend. This decision, it was argued, was unsound, it being alleged there was ample evidence which should have suggested to KBC that the borrowers were not good for the credit. The bank argued, essentially, that even if this was so, the sole proximate cause of loss was the solicitors' negligence in not ensuring the loan was adequately secured. This was accepted by the High Court. On appeal, Fennelly J. considered *Redbank Oyster*, stating, at paras. 87–88 of his judgment:

*"87. I cannot agree that...*Redbank*...is determinative of the present case. It is sharply distinguishable on the ground that the defendant, in that case was...fully aware of the dangerous condition of the boat, but consciously put the boat to sea in that full knowledge. The basis for the distinction is emphatically clear from the following further passage from the judgment at page 196:*

'If the defect becomes patent to the person ultimately injured and he chooses to ignore it, or to an intermediate handler who ignores it and subjects the person ultimately injured to that known risk, the person who originally put forth the article is not liable to the person injured. In such circumstances the nexus of cause and effect, in terms of the law of tort, has been sundered as far as the injured person is concerned.'

88. To make that case analogous with the present, it would be necessary to show that the appellant was aware of the financial unsoundness or dishonesty of the two borrowers at the time the bank entered into the lending transactions. That is not the basis on which the bank has made its case."

1098. In *Corr*, the victim suffered a work-related accident and developed resultant depression and post-traumatic stress disorder. He subsequently committed suicide. Lord Bingham considered whether this act of suicide could be considered a *novus actus interveniens*, stating, at para. 15:

"The rationale of the principle that a novus actus interveniens *breaks the chain of causation is fairness. It is not fair to hold a tortfeasor liable, however gross his breach of duty...for damage caused to the Claimant not by the tortfeasor's breach*

of duty but by some independent supervening cause (which may or may not be tortious) for which the tortfeasor is not responsible. This is not the less so where the independent supervening cause is a voluntary, informed decision taken by the victim as an adult of sound mind making and giving effect to a personal decision about his own future....I respectfully think that the British Columbia Court of Appeal...were right to hold that the suicide of a road accident victim was a novus actus *in the light of its conclusion that when the victim took her life 'she made a conscious decision, there being no evidence of disabling mental illness to lead to the conclusion that she had an incapacity in her faculty of volition':* Wright *v.* Davidson *(1992) 88 DLR (4^{th}) 698, 705. In such circumstances it is usual to describe the chain of causation being broken but it is perhaps equally accurate to say that the victim's independent act forms no part of a chain of causation beginning with the tortfeasor's breach of duty.*"

1099. There appears to this Court, with respect, to be more to a man's suicide than the mere "*giving effect to a personal decision about his own future*". Such a description seems to diminish the profound significance of a decision by a person to end his existence and the devastating consequences for so many that such a decision so often yields. That said, insofar as the issue of *novus actus interveniens* is concerned, the law as stated in *Corr* is in line with the Irish position.

1100. The above cases and the principles identified therein, ESB contends, yield the result that UCC, by virtue of its alleged heedlessness, falls to be viewed as the sole proximate cause of the flooding it experienced on 19th/20th November, 2009. In this, ESB has confused causation with the question of whether an act of God is a *novus actus interveniens* that breaks causation. Insofar as ESB claims that water causes flooding and cannot be responsible for flooding, the court's view is that natural phenomena of rainfall and flooding do not mean ESB's negligence has not caused damage. ESB's negligence, in the run-up to November 2009, in its consistent maintenance of heightened water-levels beyond TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – worsened the damage that would otherwise have befallen UCC, had ESB not so acted.

CHAPTER 55. CONTRIBUTORY NEGLIGENCE.

1101. ESB's contentions. ESB contends that UCC engaged in a reckless course of action in (a) failing to undertake analysis of the risk posed to its properties by fluvial flooding, (b) constructing low-level buildings in the flood-plain of the river Lee, and (c) failing to take steps to address the flood-risk presenting to those buildings and such older buildings as it acquired. The correct analysis of the issues arising depends on four key questions. First, what did UCC know and/or what ought it to have known of fluvial flood-risk presenting? Second, what could/should UCC have done to protect itself against same? Third, what was the consequence of any failure of UCC to take such steps as it ought to have taken? Fourth, what, insofar as the outcome of the within proceedings is concerned, is the effect of any such failure?

1102. Knowledge of fluvial flood-risk presenting. The accounts of the history of flooding in Cork City, as outlined in Appendix B, were undisputed at trial. Nor was it disputed that these historical accounts were based on publicly available information. It was accepted that UCC was aware that parts of its estate were vulnerable. It would have been surprising were matters otherwise. After all, many of the buildings flooded in November 2009 were located close to the river, on areas of reclaimed land. Moreover, in December 1978 and February 1990 one of UCC's buildings was flooded as a consequence of a fluvial event. And, from 1991, UCC received a blizzard of information advising it of fluvial flood-risk to its campus. Per Mr Poland:

> "*We were...aware that undeveloped parts of the campus, sites...recently acquired for example the Western Gateway site, the greyhound track site was subject to fluvial flooding. There was knowledge of...flooding on the Mardyke, on the playing pitches, which are...a low-lying part of the Mardyke. But beyond that – obviously the ERI building, the ERI site, when we acquired that site we were aware that the site flooded. So there was a knowledge, yes of certain sites being subject to fluvial flooding. There was no experience...of flooding of other sites. We obviously had a tidal flood situation in the Maltings Complex.*" (Transcript, Day 25, p.59).

1103. Mr Poland added later that: "*We were aware of...flood risk in low lying parts of the campus on undeveloped lands. There was no record of fluvial flooding on any of our other buildings. We were aware of the tidal risk in the Maltings.*" (Transcript, Day 25, p.91). How UCC could know that some sites flooded in the past, yet consider it proper to come to the view that other closely proximate properties, also in the floodplain, were immune from risk, is a mystery. How UCC could have assumed there was no risk when the historical information of which it was aware showed a more widespread risk is unanswered. Even if the court ignores Mr Poland's evidence, UCC as a body has come to court with Replies to Particulars in which it has pleaded a wide range of historical flooding affecting the relevant area, including flooding at the Western Gateway site (which it pleads flooded regularly). So it is fixed with that knowledge. A consequence of this is that the court concludes that UCC knew, or could have readily ascertained, that the sites of the Glucksman, the Tyndall Institute, University Hall, the Enterprise and Butler Building, and the Mardyke were, as Mr Cawley notes in his report (at para. 5.4.6), "*based on historical flood information... at risk of flooding*". As Mr Cawley's report makes clear, there was previous significant flooding at or near every location on which the various buildings in issue in these proceedings were constructed, a fact demonstrably known or which must have been known to UCC.

1104. Intervention of the Lee Dams. UCC has consistently advanced the proposition that it was entitled to assume that the effect of the Lee Scheme was to achieve such attenuation of flooding, that the history of flooding prior to 1957 was not relevant to flood-risk assessment. *E.g.*, the following exchange between counsel and Mr Poland indicates this to be so:

"*Counsel* [ESB] – *UCC's assessment of risk was based solely on what it understood to have happened following the construction of the dams..?*

Mr Poland – *....I would accept that.*

– *So, if somewhere flooded since the dams were constructed there was a risk of flooding there and if somewhere else did not flood since the dams were constructed there was no risk of flooding there?*

– *That's correct ...*" (Transcript, Day 25, p.106).

1105. There were points when Mr Poland appeared to suggest that although UCC was the body developing buildings in the flood-plain, it was ESB's role to analyse UCC's planning applications and advise UCC if proposed building-levels was such as to expose them to flood-risk. (Transcript, Day 26, p.98). (This suggestion is not accepted by the court as correct). Even as UCC learned more throughout the early-2000s about flood-risk presenting, nothing was done to assess the risk posed.

1106. Ignoring pre-dam history. There was scant support in the evidence for the contention that pre-dam history could be ignored in assessing the flood-risk to UCC's properties. The only expert who adopted this view was Ms McKendrick. The basis on which she did so was unclear. Ms McKendrick considered that the 1916 flood should not have been used to determine finished floor levels because "*it predates the dam, so it doesn't replicate what one would find today*" (Transcript, Day 19, p.44). She believed the 1986 flood-event was the appropriate event by which to gauge flood-risk because "*circumstances have changed since the construction of the dams and...the point of reference would be the August '86 flood on the basis that it's the most extreme flood that has historically occurred since the construction of the dams.*" (Transcript, Day 19, p.104). Her stated reason for ignoring the dams was "*because the dams exist and they are a structure on the river which impact – the inflow and outflow isn't the same as it would be if the dam wasn't there.*" (Transcript, Day 19, p.147). When asked to what extent it was different, Ms McKendrick said she did not know. (Transcript, Day 19, p.147). She was asked: "*How could a designer in 2000 decide that he or she was going to ignore history before 1957 because the dams are there unless he or she understood what the dams would do for a one in one hundred year storm?*" Her reply was: "*I'm not sure they needed to. Because there's the inflow and the outflow and all that anybody is concerned about is the impact of the flow in the river.*" She replied "*Correct*" when asked: "*Is it your evidence to the court that that is the* *standard or was the standard practice at the time* [to ignore history before the dams] *notwithstanding the fact that the engineer would not know the extent to which the dam would attenuate an extreme event?*" (Transcript, Day 20, p.46). It seems the only evidence Ms McKendrick had for the last-mentioned proposition was an article published by Mr Cawley. However, Mr Cawley's oral evidence was the opposite of what Ms McKendrick propounded:

> "*You can look to the events after a dam has been constructed, but you have to understand what the dam will do. So you need to look at the entire record that's available to you. The November 1916 flood was available. It would've informed levels near the Waterworks Weir, it would've informed designers as to what potentially could occur. But you have to consider the full record...*
> *...[Y]ou can't assume anything if you don't know what the dams are going to do or what they're supposed to do. And they didn't – I don't see any information or record to show that they understand what the dams did. So you would have to look at the scenarios pre and post, you'd have to understand what the dams do, how they would attenuate a flood and what are their limitations. And that means understanding – contacting the ESB, finding out exactly what the dams would do.*"
> (Transcript, Day 81, p.192).

1107. Asked about the article, Mr Cawley was clear it was not intended to say the post-dam situation was relevant and nothing else. The court cannot see how a flood risk-assessment done downstream of the Lee Dams could be constructed logically without an informed understanding of what the dams do.

1108. A chronology of missed opportunities. The evidence disclosed that from 1978, when UCC experienced fluvial flooding of one of its buildings, it was obtaining on an ongoing basis an increasing amount of specific information about flood-risk to its lower-lying properties. Armed with that information, UCC did nothing. The chronology set out below indicates the accumulation of information presenting from the late-1990s onwards which should have alerted UCC that many of its buildings were exposed to significant food-risk.

1109. [1] *December 1978.* Mardyke Pavilion floods. Constructed to a level of 3.1m, it floods to 4.5m. UCC never thereafter seeks advice as to whether this episode meant there was fluvial flood-risk to the balance of its properties. It does not appear the event was brought to bear in UCC's subsequent estate-planning.

1110. [2] *November 1986.* UCC is granted planning permission for works within the Maltings. This is the first of twelve permissions granted in respect of same. Flooding is not mentioned in the planning documentation.

1111. [3] *January 1990.* Hudson Associates, Architects, write to UCC in connection with the proposed Castlewhite Apartments, attaching a drawing showing the location is subject to flooding, UCC has produced no assessment of flood-risk to this property.

1112. [4] *February 1990.* The Mardyke, Mardyke Pavilion, Glucksman site, and University Hall site flood.

1113. [5] *August 1991.* O'Donovan and Associates, Consulting Engineers, prepare a building report regarding Lee Mills House. It observes that flood-risk should be recognised and allowed for.

1114. [6] *September 1994.* In the planner's report for a five-storey extension to the National Micro Electronics Research Centre, it is recorded that the applicants propose to build to the high-water mark, requiring erection of a new quay-wall.

1115. [7] *September 1998.* There are discussions between Horgan Lynch, Engineering Consultants, and the local authority regarding the construction of the Sports Centre, with the local authority re-iterating the 3.1m (tidal) flood-derived level. Bizarrely, yet acknowledged by Mr Brassil in cross-examination (Transcript, Day 29, p.97), the Sports Centre was the subject of an application for planning permission at a level which UCC knew would result in construction of a building with an increased flood-risk.

1116. [8] *April 1999.* Permission is granted to construct a three-storey building on the Butler Building site. Planning permission is granted a further three times for minor works. This site has flooded historically. Flooding receives no mention in the planning documentation.

1117. [9] *January 2000.* The first meeting of the Project Team for the Western Gateway occurs. Mention is made that the site is liable to flooding. It seems never to have occurred to anyone that if this site was vulnerable to flooding, others of UCC's properties might likewise be vulnerable.

1118. [10] *April 2000.* Scott Tallon Walker, Architects, issue a Stage One Report for the proposed Western Gateway. This observes that the site is subject to river-flooding. O'Donnell Tuomey, Architects, issue their lower ground-site report for the location of the Glucksman Gallery. Fluvial flood-risk is mentioned; it is indicated that further investigation is required. It is not apparent that further investigation was undertaken. UCC now has two developments ongoing in respect of which fluvial flood-risk has been identified.

1119. [11] *July – December 2000.* As part of the preparatory works for the Western Gateway, observations are undertaken of nearby river-flow. No attempt is made to connect this to the work undertaken at the Glucksman or UCC's properties generally. Nothing is done when it is drawn to UCC's attention that this period of monitoring is too short to conduct a proper assessment.

1120. [12] *September 2000.* O'Donnell Tuomey prepare a document entitled 'Lower Ground Site Further Analysis' regarding the location of the Glucksman. It includes a 19th-century ordnance survey map which describes the location as "*liable to flooding*". [13] Also in September 2000, a meeting of the Western Gateway design team takes place; it is indicated that preliminary analysis shows the site to have a high water-table and to flood occasionally.

1121. [14] *October 2000.* Arup, Consulting Engineers, issue an update on Stage Three Structural Design for the Western Gateway. It notes (a) that groundwater could be a serious issue and (b) the possibility of raising the building to put the basement above summer ground-water levels.

1122. [15] *December 2000.* O'Donnell Tuomey issues its Architect's Report for the proposed Glucksman development. This refers to: destruction of a nearby bridge by fluvial flooding in 1916; and 'interaction' between the river and lower grounds. [16] The site of the Western Gateway floods.

1123. [17] *February 2001.* Scott Tallon Walker issues its combined Stage 2 and 3 report in respect of the Western Gateway. It records that the existing site is prone to flooding and that the current scheme is to raise site-levels to minimise on-site flooding.

1124. [18] *March 2001.* Planning permission issues for the Glucksman. The first version of Arup's Environmental Impact Statement for the Western Gateway issues. The EIS records levels of 3.25m during extreme flood conditions; it notes that unrecorded levels may be higher. Nobody seeks to relate these figures to ongoing work at the Glucksman. Notably, this was the only flood assessment conducted in respect of a construction with a spend of circa. €100m at a location known by all as prone to flooding. No apparent attempt is made to quantify unrecorded flood-levels. [19] No attempt appears to have been made to gather the detailed information which Ms McKendrick suggested is good practice. (Transcript, Day 20, pp.115–116). Mr Brassil, called by UCC, expressed the view that, from UCC's perspective as developer, "*presentation of the information could have been more robust and more transparent*". He did not consider that it complied with then best practice.

1125. [20] *May 2001.* Mr Walsh, Senior Executive Engineer of Cork City Council, queries the EIS prepared for the Western Gateway, observing the history of flooding on-site. UCC has no evidence that the manifold deficiencies observed by Mr Walsh were ever addressed. [21] In May 2001, UCC's Buildings and Estates Office is furnished with objections raised by locals to the Western Gateway. These record that an area of ground is frequently underwater when the Lee is swollen/in flood.

1126. [22] *July 2001.* Locals advise the architect of Victoria Lodge that they requested an assessment of flood-risk for the proposed development and that one of them remembers flooding in front of Victoria Lodge and Bridge View House has occurred after heavy rain. No flood-risk assessment appears to have been done. No accommodation of flood-risk is reflected in the building-design.

1127. [23] *August 2001.* Mr Walsh writes to UCC in respect of the application for permission for a bridge at Perrots' Inch, noting a number of issues to be resolved, including flooding on the proposed bridge, flooding on proposed walkways, and safety of users. This is the fourth development in respect of which UCC is fully advised as to the need to address fluvial flood-risk.

1128. [24] *February 2002.* MCOS, Architects, issue a report on flood-level assessment for the ERI Building. The report notes the ERI site is liable to flooding. Uniquely, it seems, among UCC's advisors, MCOS contact ESB as part of its pre-report work. Based on their investigations, MCOS suggest a design floor level of 6.0m. Notably, the ERI building did not flood in November 2009. Notably, no-one in UCC appears to have considered the cross-campus implications of MCOS having gone to ESB. It was accepted by Ms McKendrick, in cross-examination that MCOS' practice in approaching ESB was best practice. (Transcript, Day 21, p.81).

1129. [25] *August 2002.* MCOS release the first version of its EIS for the ERI Building. This records that MCOS have reviewed an ESB flood inundation study. This document is read by a senior member of UCC's Buildings and Estates team and puts UCC on notice of the existence of at least one ESB inundation study that at least one of UCC's advisors considers relevant to assessment of flooding at UCC's properties. No attempt is made by UCC to obtain this study, to enquire about its contents, or to relate this information to other buldings. [26] In the same month, the same senior member of the Buildings and Estates team attends a Western Gateway planning meeting at which the riverside walk/flood levels/safety concerns are considered.

1130. [27] *September 2002.* In a letter of the 13th, ESB alerts UCC to the fact that the site of the proposed Western Gateway and consequent relocation of an ESB sub-station are on a site "*prone to flooding*". ESB urges UCC to "*factor this into the design of the substation*".

1131. [28] *February 2003.* Cork County Council writes and requests a more detailed flood-risk assessment of the proposed ERI building.

1132. [29] *April 2003.* MCOS prepare a further report in response to the Council's queries. The copy of this document before the court is stamped 'Buildings and Estates Office' and can be assumed to have been received by same. It makes clear that the proposed level of the ERI building has been reduced from the initial 6.0m suggested by MCOS to 5.5m. There is no evidence explaining why such reduction occurred.

1133. [30] *May 2003.* Professor O'Kane of the Civil Engineering Department of UCC writes to Dr Bree advising that he has obtained funding to make an integrated model of all man-made and natural waters on which Cork City depends. It is proposed to do this using the best software and measuring systems available. The correspondence makes clear the Department has already gathered data for Cork City, and specifically records information that Professor O'Kane knows ESB to possess regarding rain data, river flows, and reservoir levels. Professor O'Kane is, throughout this period, a member of UCC's Buildings Committee.

1134. [31] *July 2003.* Geotech Specialists Limited issues a report on ground investigation for University Hall. It is observed that the site's proximity to the river makes it likely that variations in groundwater level will occur with river/tidal fluctuations. It is noted that the river at this location is prone to flooding at high tide. There is no analysis done of historical flooding. This is the fifth project in three years in relation to which UCC has been advised of flood-risk arising. Again, no-one in UCC appears to have thought this might be an issue affecting all its lower-lying properties.

1135. [32] *July 2004.* A report from John O'Donovan, Associates, Engineering Consultants, draws UCC's attention to the fact that the levels of Lee Mills House are 19 inches below "*the recognized Cork Flood level*".

1136. [33] *September 2004.* Mr Barry of UCC's Civil and Environmental Engineering Department seeks information from ESB regarding water-levels and flows downstream of the Lee Dams for the August 1986 flood. These are provided. This points to an awareness in the Department of the reality of flood-risk presenting, a knowledge brought to the Buildings Committee in the form of the standing presence on same of a senior Department-member.

1137. [34] *October 2004.* Flooding issues occur on the Lee Maltings. Only through prompt action is damage kept to a minimum.

1138. [35] *January 2005.* A report by John O'Donovan Associates on Lee Mills House, following the events of the previous October, notes the ground-floor had flooded but that this was to be expected as the level is below "*the recognized Cork flood level*".

1139. [36] *December 2005.* A schedule of works for conservation and repair of Lee Mills House is prepared. This notes that existing ground-floor level is below the recognized Cork flood level.

1140. [37] *April 2006.* UCC wants to expand the still-proposed Western Gateway. Senior Buildings and Estates staff prepare a memorandum on whether to allow the existing planning permission to lapse. Among the 'cons' is that new planning risks such as flooding have come to the fore (making it more likely that counter-flood measures will feature prominently in any future permission).

1141. [38] *September 2006.* The first CFRAMS newsletter issues. [39] Also, a senior Buildings and Estates officer circulates a list of issues to be addressed in the new Environmental Impact Assessment for the Western Gateway. These include the flood-events of October 2004. In fact, those events are not addressed in the supplemental EIS.

1142. [40] *October 2006.* Planning objections to the Western Gateway permission are lodged. These record concerns about flooding and note that as recently as 21st October, 2006, there had been flooding at Victoria Cross. [41]. In the same month a chain of e-mails that emerged in discovery disclose the extent to which UCC was on notice of the risk of flooding to the Tyndall Institute, the levels of various buildings at Lee Maltings and the relationship between that risk and those levels. Nothing, it appears, was done, despite all this information, to address/assess the flood-risk posed. Nor does this knowledge appear to have prompted anyone in UCC to consider how UCC's properties generally were affected by flood-risk.

1143. [42] *December 2006.* Victoria Lodge is acquired by UCC. No flood risk-assessment is carried out. A consideration of the planning file would have demonstrated that locals had expressed concerns regarding flooding. Issues with this location were also raised in connection with planning for the Western Gateway. [43] In the same month, flooding occurs at the Western Gateway site and at Victoria Cross.

1144. [44] *February 2007.* A number of Cork City residents lodge a written objection to the proposed increase in the height of the Western Gateway. The objection refers to the area being prone to flooding. Flooding issues at Victoria Cross are identified. UCC does not appear to have taken any action pursuant to the objectors' information.

1145. [45] *February 2008.* A new planning application is submitted for the proposed Perrotts' Bridge. This application confirms that the proposed site flooded historically.

1146. [46] *End-2008.* Flood defences are installed at the Tyndall Institute. No consideration appears to have been given to taking similar precautions in relation to other UCC-owned buildings.

1147. [47] *March 2009.* Flood-water enters the basement mechanical plant-room, kitchen area and service corridor of the Western Gateway. This is described in an e-mail of 19th March to senior Buildings and Estates staff as "*the third near miss in a relatively short period of time.*"

1148. [48] *May 2009.* The CFRAMS maps are published and displayed in City Hall. Buildings and Estates staff visit City Hall. No concerns are prompted by the maps, which are later shown to have been wrong, though not so wrong as to justify taking no precautionary steps.

1149. [49] *September 2009.* Ms Horgan of UCC's Insurance and Claims Office e-mails a senior member of the Buildings and Estates team noting that the site of the Western Gateway has historically suffered from flooding and that UCC's insurers have sought assurance that flooding was factored into building-design. Some information is exchanged. Notably, there is no plan in place to deal with flooding of the building.

1150. [50] *October 2009.* The Flood Study Group of UCC's Department of Civil and Environmental Engineering prepares a detailed report with the object of determining the maximum expected water-level on the upstream site of a proposed bridge at the Glucksman site. This report recommends a soffit level for the bridge of 4.21m. (It will be recalled that the finished floor level at the Glucksman, 100m away, was 3.3m). Although a senior member of the Buildings and Estate team was aware of this report, it does not appear to have occurred to anyone that this report suggested there to be a risk of fluvial flooding to buildings close by the bridge.

1151. By the court's count there are fifty, and there may be more, instances identifiable in the evidence in which UCC was put expressly on notice of flood-risk at the buildings it constructed and/or acquired on the Lee floodplain. True, UCC may not have been on notice of the flood-risk to every single building it owned. But when a serious risk arises for several such buildings, any reasonable standard of prudence would suggest that one should check all other buildings in one's property portfolio. To borrow from Oscar Wilde, if once is misfortunate and twice is carelessness, when it comes to at least 50 failures to respond to a known flood-risk, one appears to the court to have strayed far from Lady Bracknell territory and well into the realm of significant and serious contributory negligence. Yet UCC has contended that, for three reasons, the onus of establishing contributory negligence (which, of course, rests on ESB) has not been discharged, *viz*: (1) UCC exercised reasonable care for its property by appointing leading professionals to design its buildings; (2) having failed to warn UCC of its risk from fluvial flooding despite ESB's knowledge of same, and having managed previous floods to alleviate that risk, it ill-befits ESB to criticise an emergency response developed against that background; and (3) UCC's reaction to events on 19th/20th November, 2009, cannot be faulted in light of the inadequate warnings that issued from ESB on the 19th. Items (1) and (2) are considered later below. On Item (3), see further Chapter 18.

1152. The Civil Liability Act and related case-law. The law of contributory negligence in Ireland is enshrined in s.34 of the Civil Liability Act 1961:

> "*Where, in any action brought by one person in respect of a wrong committed by any other person, it is proved that the damage suffered by the plaintiff was caused partly by the negligence or want of care of the plaintiff or of one for whose acts he is responsible (in this Part called contributory negligence) and partly by the wrong of the defendant, the damages recoverable in respect of the said wrong shall be reduced by such amount as the court thinks just and equitable having regard to the degrees of fault of the plaintiff and defendant.*"

1153. The applicable law was recently summarised and considered in detail by Fennelly J. at paras. 81–82 of his judgment in the *KBC* case, as referred to above. Having quoted the relevant provisions of the Act of 1961, Fennelly J. continued:

> *"In a negligence action, such as the present, the section applies provided it is shown that: a) the defendant has been proved to be negligent; b) the negligence of the defendant caused loss or damage to the plaintiff; c) the plaintiff had failed to take care for its own safety (here for its property); d) the plaintiff's want of care partly caused,* i.e. *contributed to the damage which it suffered as a result of the defendant's negligence. Thus, the section contemplates that there may be more than one cause of the loss. It is implicit that the negligence of the defendant and the negligence, more properly described as want of care, of the plaintiff are both causes of the loss."*

1154. So, at its core a claim of contributory negligence against a property-owner such as UCC comprises an analysis of whether UCC exercised reasonable care for its own property. Case-law in Ireland, and the United Kingdom, is clear that in determining whether reasonable care has been taken by a plaintiff, an objective test is applied by reference to what is reasonable in the circumstances. In *Hussey* v. *Twomey* [2009] IESC 1, Kearns J. stated that in determining the issue of contributory negligence, the court must approach the issue objectively, albeit that the test cannot be absolutely objective, in that the personal characteristics/circumstances of the plaintiff must be taken into account. In most cases, this approach corresponds to the standard of care in negligence identified by the House of Lords in *AC Billings & Sons Ltd.* v. *Riden* [1958] A.C. 240. Although contributory negligence does not depend on a breach of duty, it does depend on foreseeability of risk. A person is guilty of contributory negligence when he ought reasonably to have foreseen that, if he did not act prudently, he might suffer injury; he must take into account the possibility of others being careless. Thus, per Denning L.J. in *Jones* v. *Livox Quarries Ltd.* [1952] 1 Q.B. 608, 615:

> "*Although contributory negligence does not depend on a duty of care, it does depend on foreseeability. Just as actionable negligence requires the foreseeability of harm to others, so contributory negligence requires the foreseeability of harm to oneself. A person is guilty of contributory negligence if he ought reasonably to have foreseen that, if he did not act as a reasonable, prudent man, he might be hurt himself: and in his reckonings he must take into account the possibility of others being careless.*"

1155. The siting of UCC's Buildings. In its submissions, UCC pointed to an exchange between counsel and Mr Cawley in which Mr Cawley indicated, regarding the proposition that one cannot build in a floodplain and that it is something to be engineered around: "*I wouldn't say…we can engineer every floodplain, you may not able to engineer every floodplain. But in terms of developing a floodplain…I think, yes, it can be engineered, in a lot of cases can be engineered.*" (Transcript, Day 82, pp.119–120). In Cork, the fact that UCC's buildings exist on a floodplain seems conclusive proof that one can build on a floodplain. So the true question, UCC contends, is whether UCC exercised reasonable care for its property in the design and construction of its new buildings, and the protection of its acquired buildings. The court's answer is that UCC did not exercise such care as was reasonable.

1156. Engaging ostensibly competent professionals. UCC contends that it appointed leading design professionals to advise it in relation to the construction of its buildings and that this suffices for it to escape liability in contributory negligence. Looked at another way, what seems in issue is the radical proposition that ESB bear the liability for any wrong-doing of designers which UCC instructed and who acted for it. The court does not accept this as a sound proposition of Irish law for four reasons. (1) These were UCC's buildings. It was, first and foremost, UCC's responsibility to ensure it adopted an approach to its own campus which took account of the risks presenting. The most fundamental failure on UCC's part was its failure to conduct a flood-risk assessment in respect of its lower-lying buildings. This was UCC's failure, no-one else's. (2) As its various developments proceeded throughout the late-1990s/early-2000s, UCC was learning more about the flood-risk posed to its lower-lying properties. Yet it seems never to have deduced the obvious: that this flood-risk applied to all its buildings. Again, this was UCC's error. (3) UCC was in receipt of the Western Gateway EIS. It knew how little was done to assess the risk at the Glucksman. It knew that the City Engineer had raised significant issues. It knew that MCOS had obtained information from ESB about likely flood-levels at the location of the ERI Building. It knew that there were ESB inundation studies relevant to the ERI Building. It was uniquely placed to interrogate how its buildings were designed. Its Buildings' staff comprised qualified engineers. Its Buildings Committee included an expert hydrologist and engineer. Yet UCC failed to take stock on any unified basis of the areas in which UCC was proposing to develop. The fault for this rests with UCC. (4) When it comes to flood protection and having a system in place to address the risk of fluvial flooding, UCC has not identified any advice from anyone that its buildings were free from fluvial flood-risk. The failure to have protection measures in place was UCC's alone.

1157. As to the proposition that appointing an ostensibly competent professional advisor absolves the appointing party of any possibility of contributory negligence, at first glance this seems sensible. But general propositions do not decide individual cases. Logic exists in a vacuum; cases are decided on facts. Here the facts are that a major property-owner/developer in Cork City, a metropolis built on a floodplain, maintains it can develop where and as it wants, despite all the local knowledge that it possesses after over a century-and-a-half of being present in Cork City and witnessing some of the worst flooding in recorded history, provided it engages a competent professional advisor. Can this be so? What have statute and case-law to say?

1158. Section 35 of the Civil Liability Act, 1961, provides for circumstances in which a plaintiff will be made liable for the negligence of another where that other has been a causal agent in damage suffered. Section 35(1) provides a list of such circumstances, including that "*(a) a plaintiff shall be responsible for the acts of a person for whom he is, in the particular circumstances, vicariously liable*". UCC instructed the architects, designers and engineers of its flooded buildings. Those parties were its agents, acting under its authority when they negligently constructed buildings on UCC's specific instructions, in a notorious flood-plain, without adequate regard to the significance of floor-levels and other reasonable flood alleviation/avoidance measures. In all the circumstances, and having regard to s.35(1)(a), commonsense suggests that UCC should not escape all liability through the engagement of professional advisers; legal sense confirms this is so, as the court now shows.

1159. UCC has pointed to three decisions of the court – *Fox* v. *O'Carroll* [1999] 4 JIC 2901, *KBC* v *BCM Hanby Wallace*, and *Doherty* v. *Donohoe & Ors* [2014] 4 JIC 0104, as support for the proposition that appointing an ostensibly competent professional advisor absolves the appointing party of any possibility of contributory negligence. In *Fox*, the plaintiff claimed the defendant solicitors were negligent in failing to advise the plaintiff to sue a solicitor. The defendants were held not to have acted negligently in circumstances where they had taken the advice of two counsel on four occasions. Giving judgment, O'Sullivan J. concluded: "*[T]he Defendant…cannot be faulted in negligence or otherwise for consulting Counsel for advice. In those circumstances it is impossible for me to draw the conclusion that he was negligent or in any way at fault for accepting Counsel's advice…*". There is no evidence that UCC, a sophisticated property developer and designer ever exercised an analogous level of prudence in its dealings with its designers.

1160. In *KBC*, Fennelly J., at para. 89, states:

> "*89. The context of the present case is professional negligence. The…trial judge was especially influenced by the fact that 'the bank was entitled to rely on…assurances received by the defendant and did so.' That was…correct insofar as…liability in negligence of the appellant is concerned. It may also be relevant to any consideration of apportionment….It does not, however, dispose of the question of contributory negligence….*
>
> *90. A professional person is necessarily in a very weak position if he tries to say that his client should have seen that he was negligent. The professional person is engaged precisely to perform a particular task. In this case, it was the job of the appellant to obtain the security….However, it seems to me to be more relevant to bear in mind that the plaintiff in this case was a lending bank and that it was its function and its function alone…to appraise the borrowers and the lending transaction in contemplation. It was within the bank's area of skill and judgment to appraise the creditworthiness of…borrowers. I would adopt the reasoning in the following passage…*

'In the general field of professional negligence, contributory negligence as a defence has a limited role....This is because in the majority of cases it is the defendant, a professional, who is professing special expertise and the claimant is reasonably relying upon that defendant to exercise such expertise competently. The position is different in lender claims...because the process of lending is a profit-orientated business as well as a specific expertise in relation to which it is the claimant, rather than the defendant, who has the superior knowledge. The defendant professional's role in the process is typically specific and limited'".

1161. The foregoing does not represent some special rule of law. It is the application of general reasonableness principles. It seems to this Court that when a plaintiff is (a) not a so-called 'unskilled' member of the public, and (b) seeks to fix a defendant with the liability of the plaintiff's professional advisor, the balance of what is just and reasonable shifts. Indeed in *KBC*, at paras. 102–104, Fennelly J. made clear that responsibility of a party for negligence of a professional hired by it is not covered by a 'blanket rule' of absolution: "[I]*t is possible that, if the evidence showed that the errors of the appellant were known to the bank and overlooked or were so obvious that they could not be ignored, there was fault on the part of the bank.*" On the facts in *KBC*, Fennelly J. held that KBC was contributorily negligent in respect of its granting of the loan but not in respect of its failure to double-check the solicitors' assurance as to the security provided.

1162. As for this Court's decision in *Doherty* last year, one is never certain when presented with one's own previous judgment whether counsel is rightly having regard to a Damascene moment of judicial insight or seeking to hoist the judge by his own petard. Vanity might incline one to the former view; reality impels one to the latter. Regardless, the irrelevance of *Doherty* to the within proceedings is to be found in the fact that the circumstances presenting there were the exact opposite of those presenting here. In *Doherty*, a restriction application was brought against individuals who held directorships of a number of family-run, fast-food restaurants and who had taken advice of appropriately qualified tax and accounting professionals before entering into a relatively sophisticated corporate restructuring. It was, if the court might reduce matters so for the sake of clarity, a case in which persons 'unsophisticated' in corporate matters sought advice of professionals competent in such matters. Here, a sophisticated owner and developer of property which brings to its property dealings in Cork a local and historical knowledge that is perhaps *sans pareil*, sought advice of ostensibly competent professionals. This situation is so different to that which presented in *Doherty* that in truth there is no commonality between the two cases except that they sit at opposite ends of the one spectrum and have each fallen to be decided by the same judge.

1163. Conclusion. To the court's mind, the relationship between the experts on UCC's Buildings Committee and the external experts hired by UCC, whose work was ultimately supervised by that Committee, is not akin to the 'classic' relationships of doctor/patient and solicitor/client with which UCC has sought to identify itself. The Buildings Committee was a professional group, containing experts with both engineering and hydrology expertise, appointed on the basis of that expertise and dealing with another professional group. Having regard to the role of the Committee and the expertise of its members, it does not seem just or equitable that UCC should be able to rely upon a blanket application of a presumption that seems amply rebutted by reference to the facts of the case. The court does not accept as plausible the efforts of UCC to portray the Buildings Committee as a near-sinecurial non-entity that met regularly to do nothing much. It was comprised of serious-minded people with suitable expertise to be present and a supervisory task to discharge. If it discharged that task badly, and it is difficult to see how it could have done worse, that is not the fault of ESB. If ever there was a case in which a client might reasonably be expected to be wiser than its own professional adviser, if ever there was a case in which a client might reasonably be expected to ask of its advisor 'Are you sure?', 'Have you dealt adequately with flood-risk?' this is it.

1164. What UCC contends about its acquired buildings. UCC rejects the notion that it ought to have carried out flooding due diligence on buildings it acquired. UCC points to the fact that those buildings were generally above the 3.1m level recommended by Cork City for the construction of new buildings, and, where this was not so, UCC installed flood defences. UCC contends that the idea that it should have established defences adequate to cope with the flooding of 19th November is inexorably linked to the failure of ESB to give adequate flood-risk warning. The court must express surprise that a sophisticated property owner and developer that bought property sitting on a floodplain which it had seen flood repeatedly and badly over a 150-year plus period, and which purports to place a premium on staff and student safety, would not think to engage in due diligence as to flooding. The 3.1m level is a 'red herring': this relates to tidal flooding and in its 150-plus years in Cork City, UCC had seen fluvial floods that rose higher. UCC's 'anyone but me' approach to flood protection, *i.e.* that its competence was dependent on ESB's competence is not accepted. The unhappy truth of this case is that ESB stands guilty of wrong-doing, and so does UCC.

1165. Availability of academic expertise. Ms Maguire, Vice President for Research & Innovation at UCC, was called in effect to rebut the notion that information held by academic staff or arising from research projects undertaken by academic staff/students is readily available to UCC's operational staff. Be that as it may, the Buildings Committee featured persons drawn from the academic and operational sides of UCC and can only have been so constituted in order to bring a fusion of academic and operational knowledge to the Committee's deliberations and decisions. The court accepts Ms Maguire's evidence that the presence of the Professor of Civil Engineering on the Committee was not to substitute his opinions for professional advice obtained. However, he must have served some purpose, as must the Committee. Otherwise why establish it? Mr Prendergast, a Buildings Officer at UCC, indicated in his oral evidence that the Committee's function was "*to have the university corporate body discuss with Buildings and Estates major activities, to authorize purchase of or construction of new buildings,* [and] *to give the Buildings and Estates office direction as to how it should proceed on major issues*". (Transcript, Day 8, p.108). The Buildings Committee was not intended as a substitute for external advisors. It was there to ask informed questions. This it singuarly failed to do.

1166. Overall assessment of properties. Given that UCC knew or ought to have known that the areas in which it had acquired, constructed and/or was constructing properties had a history of flooding, it ought to have caused an overall flood-risk assessment of to be conducted of its properties. That one of its buildings flooded in December 1978 and February 1990 should have heightened that awareness. That UCC was aware in the course of 2000/2001 that the Western Gateway, the Glucksman, the ERI Building and Perrott's Inch Bridge had been identified by advisors or the local authority as requiring flood assessment, ought to have alerted UCC to: (i) the (obvious) fact that all lower-lying parts of its campus required a similar assessment, and (ii) the requirement that such flood-risk assessments as were carried out be conducted properly, with due regard to available historical information. Yet UCC, on notice of historical flooding, aware of the implications of same for its properties, never raised any question as to how expensive buildings were being constructed without proper regard to that flooding. Instead those buildings were constructed without computer modelling, without regard to the historical evidence of flooding, and in the teeth of an ever-accumulating body of information confirming the extent to which they were exposed to flood-risk. Information available to UCC was never 'joined up'. Instead, UCC appears to have believed it was up to ESB to tell UCC that the campus was at risk of flooding from the river Lee, so that UCC could then proceed to have a flood-risk assessment done. This is, with respect, a wild contention to which the court gives no credence. UCC ought to have realised the risk that existed and to have conducted its own risk-assessment.

1167. Occurrence of fundamental errors. UCC's failure to act as the court has posited resulted in fundamental errors at every level. Aside from the fact that UCC's properties were left vulnerable to flooding, the failure to engage with the risk exposed UCC, its students and staff to significant hazard. It is common case that UCC was unprepared for the flood events of 19th/20th November. However, it is difficult to see that it was prepared for any fluvial flooding. There was no unified campus-wide plan to deal with flood events. Such plans as did exist did not include fluvial flooding and were concerned with "*leaks*" and "*flash flooding*". (Transcript, Day 8, p.18, Mr Prendergast). In terms of flood preparedness, the university had but a hundred sandbags and no demountable barriers. (Transcript, Day 8, pp.20–21, Mr Prendergast). There were basements in three buildings but there was no plan for evacuation of valuable goods from those properties. (Transcript, Day 8, p.21, Mr Prendergast).

1168. UCC's response on 19th November, 2009. UCC has pointed to the fact that in Book 4, Tab 7, p.683 (Appendix 1 to Part 2, paragraph A1.17), Mr Brophy, an expert on emergency and crisis management, called by ESB, indicates in his expert report that the response actions taken by UCC on 19th November 2009 were "*very effective*". More fully, what he says is:

"*MP* [Mr Mark Poland] *says he set up an 'emergency response group' at some stage during the night of 19.20th – there is no indication of what time this group was set up or whether they were using any particular plan to respond to the flooding. This appears to have been an ad-hoc group rather than a team trained in flood response.*

The response actions taken at this stage appear to have been very effective, having prioritised the safety of students, particularly those returning from the city after a night out. An emergency shelter was set-up and a significant number of students and neighbours evacuated by tractor and trailer." (Emphasis added).

1169. However, the above extract from Mr Brophy's report ought perhaps to be viewed in the context of his summary comments at pp.539–540 of his report:

"*UCC is as well or better informed than ESB on the question of Cork city flood risk, and better able to assess and mitigate its own risks. UCC did not use the information available to it or which could have acquired to adequately manage its own risk in a known flood plain. The UCC risk assessments reviewed have an internal focus on laboratory hazards, and not a broader risk of external hazards such as severe weather, flooding etc.*

The UCC approach to emergency management at the time of the flooding in 2009 appears…disjointed. There does not appear to be one overall emergency management plan outlining the policy and structures on a college-wide basis. Rather, there are individual plans for individual facilities, and these vary in structure and content….

There appears to have been a lack of appreciation by UCC of the meaning and gravity of the warnings issued by ESB on 19th November 2009, and the UCC procedures for responding to such notifications of increased discharge from Inniscarra seem...inadequate. The UCC focus on the night of 19th November...appears to have been entirely concentrated on the potential flooding from high tide...not on the rising flood...notified to them by ESB hours earlier. As Cork city has a long history of river flooding it seems inappropriate that so little attention was directed toward this risk within UCC."

1170. The court does not agree with all that Mr Brophy states in this more fulsome extract from his expert report; however it considers it more representative of Mr Brophy's views, and rather less favourable to UCC's case, than the two-word extract to which it was referred.

CHAPTER 56: PRINCIPLES FOR APPORTIONMENT OF DAMAGES.

1171. Moral blameworthiness. Section 34(1) of the Act of 1961 makes clear that apportionment of damages is to be made having regard to the degrees of fault of the plaintiff/defendant. Our courts have emphasised that fault is equated to moral blameworthiness, not the potency of causative contributions. Thus in *O'Sullivan* v. *Dwyer* [1971] I.R. 275 at p.286, the Supreme Court stated that:

"[D]*egrees of fault between the parties are not to be apportioned on the basis of the relative causative potency of their respective causative contributions to the damage, but rather on the basis of the moral blameworthiness of their respective causative contributions. However, there are limits to this since fault is not to be* *measured by purely subjective standards. The degree of incapacity or ignorance peculiar to a particular person is not to be the basis of measuring the blameworthiness of that person. Blameworthiness is to be measured against the degree of capacity or knowledge which such a person ought to have had if he were an ordinary reasonable person*".

1172. This formulation was qualified in *Carroll* v. *Clare County Council* [1975] I.R. 221 at p.227, in which, commenting on the above passage, Kenny J. said:

"*I think that 'fault' in section 34 of the Act of 1961 means a departure from a norm by a person who, as a result of such departure, has been found to have been negligent and that 'degrees of fault' expresses the extent of his departure from the standard behaviour to be expected from a reasonable man or woman in the circumstances. The extent of that departure is not to be measured by moral considerations, for to do so would introduce a subjective element while the true view is that the test is objective only. It is the blameworthiness, by reference to what a reasonable man or woman would have done in the circumstances, of the contributions of the Plaintiff and Defendant to the happening of the accident which is to be the basis of the apportionment.*"

1173. The above analysis offers a basis of comparison for seemingly incommensurable wrongs. The blameworthiness of each party is to be compared not directly, but by comparison with a reasonable person in each party's respective position. Fault is then apportioned on the basis to which one has fallen from the standard expected.

1174. Nugatory fault. The degree of fault attributed to a plaintiff may be nugatory. For example, the child in *Crowley* who played on the unprotected roof was held a mere 9% contributorily negligent, reflecting a finding that his fault was not regarded as significant when considered beside the defendant's. In other cases, the lion's share of the blame may be attributed to a plaintiff. UCC contends that even if the court is minded to find UCC contributorily negligent (and it is), this is a case in which the court could determine that UCC's responsibility is so small by reference to that of ESB that it would not be just and equitable to reduce the damages. UCC points to the decision of the English Court of Appeal in *Sahib Foods Ltd.* v. *Paskin Sands (A Firm)* [2003] EWCA Civ 1982 1 at p.18, a case considered by the Supreme Court in *KBC*, in which Clarke L.J. stated that "*[I]t is open to the court to conclude that the share of the claimants' responsibility is so small by reference to that of the defendant that it would not be just and equitable to reduce the damages at all*".

1175. Reduction by 100%. ESB contends that UCC's negligence is at the extreme end of the spectrum, that UCC's departure from the standard of a reasonably prudent property-owner and developer (cognisant, *inter alia*, of the fact that the river upon which its property stands has historically been prone to flooding) is great. By contrast, it submits that any departure from the standard expected of a person in ESB's position must be of a lesser scale. In this regard, ESB raises the possibility that an award for negligence may be reduced by 100% on the basis of a plaintiff's contributory negligence. It points to the decision in *McCord* v. *ESB* [1980] I.L.R.M. 153. There, ESB discovered that the plaintiff's electricity meter had been interfered with. Mr McCord denied all knowledge of such interference but refused to sign the statement he made to this effect. As a result, ESB disconnected him. It was found that ESB had no right under its service agreement to terminate the contract on the basis of such a refusal. The plaintiff was awarded IR£50 for breach of contract; this was reduced to nil on the basis of his contributory negligence. The Supreme Court rested this decision on the phrase in s.34 of the Act of 1961 which refers to damages recoverable, being *"reduced by such amount as the court thinks just and equitable having regard to the degrees of fault of the plaintiff and defendant*". This availability of a 100% reduction accords with the decision of Denning J. in *Lavender* v *Diamints* [1949] 1 K.B. 585, and with the ratio in *Redbank*, which did not rely on foreseeability but on fairness and notions of fault. Similarly, since apportionment under s.34 does not rest on contribution to causation but 'fault', the court must be and is entitled to reduce a claim by 100%, or indeed by 0%, if this is what justice and equity demand. ESB in its submissions on apportionment of damages has referred to *Stapley* v. *Gypsum Mines Limied* [1953] A.C. 663, *Spreadex Ltd.* v. *Sekhon* [2008] All E.R. (D) 329, and *Stephen* v. *Peter and others* [2005] Scot. (D) 16/3. But perhaps the most relevant of the cases cited by ESB in this context is *Howmet Ltd.* v. *Economy Devices Ltd. and others* [2014] EWHC 3933 (TCC). That case involved a claim arising from fire damage in which the plaintiff property-owner was held greatly negligent. The fire resulted from the operation of a device purchased from the defendant for use in the plaintiff's industrial operations. The product was found to have been unsafe; the plaintiff was on notice of this owing to previous small fires. Contributory negligence was considered in a context where it was hypothetical only, due to the main findings of the court. However, the Divisional Court stated its view that the plaintiff was 75% responsible for the damage to its own property. The plaintiff was the owner of a sophisticated operation and had not acted reasonably to protect itself. Specifically, it had shown a want of care in its procurement process and its response to the smaller previous fires. Per Edwards-Stuart J., at paras. 294–295:

> "*[294] As between Howmet and EDL, I consider that the lion's share of the fault lies with Howmet. Not only was its procurement of the GEL open to severe*

criticism...but also its response to the fire on 12 December 2006 was fairly ineffective. Its conduct appears to have been even less satisfactory after the incident of 29 January 2007 although...the evidence does not tell the full story as to what happened.

[295] For its part, EDL put into circulation a device that should never have been allowed on the market. In addition, it appears to have carried out no satisfactory testing regime and the instructions supplied with the thermolevels were inadequate – almost to the point of being misleading."

1176. In the end, the plaintiff was adjudged 75% contributorily negligent. The case appears to present parallels with UCC's claim in this case. So, for example, the plaintiff in *Howmet* was a large corporate property-owner. Additionally, the case involved a specific failure to have in place protective measures to secure one's safety against harm of the sort which eventuated.

CHAPTER 57: ESB'S CONDUCT OF PROCEEDINGS.

1177. Overview. After a long and hard-fought battle on the central issues arising in this case, UCC elected to foray forth in one final regard, launching an attack on ESB's conduct of proceedings. For the reasons stated below, the court rejects the criticisms made by UCC in this regard.

1178. Refusal to furnish information? UCC maintains that ESB refused to furnish certain information to UCC in pre-action correspondence. UCC is also miffed that ESB, having refused to provide the information, continuously accused UCC of not knowing what UCC's case was. The court has no evidence before it as to what information was refused or why.

However, if UCC thought itself entitled to certain information it could have made whatever discovery-related or other application it thought appropriate. As to ESB's oft-mentioned allegation that UCC did not understand its own case, it seemed to the court that UCC's case from the outset was clear, and sufficiently persuasive that UCC has largely succeeded in its claim against ESB.

1179. **ESB's control of its operations.** UCC has complained that: (1) progress of the case has been impeded by how ESB conducts its operations; (2) ESB shrouds its operations in secrecy; and (3) ESB's in-house investigation of the November 2009 flood has been coloured by its anticipation of the present litigation. Re. (1), ESB is entitled to contend that a third-party's reading of its in-house operating rules is not correct and/or that those rules bear a different meaning in practice to that which third parties seek to accord them. Re. (2), ESB is a private commercial entity, not required generally to publicise its in-house workings/papers. Re. (3), there does appear to have been a shift in ESB's historical position as regards flood alleviation and that contested for in these proceedings.

1180. **Interruption of cross-examination?** UCC complained that it was sometimes interrupted by opposing counsel during its cross-examination. To the court, there did not seem to be any more of the gentle barracking between counsel than one typically encounters. As to the fanciful idea that answers were being fed by ESB to witnesses, the court does not recall a single express objection being made to it during trial that witnesses were being fed their answers. Any unmerited interruptions by either side were waved away by the court, generally with a nod to whichever counsel was on his feet that he should continue his questioning. And sometimes interruptions, though perhaps unwelcome to UCC, were nonetheless well-founded.

1181. Cross-referencing by ESB witnesses? UCC complains at the extent to which ESB's witnesses sought to re-interpret and/or correct the evidence of previous ESB witnesses. In truth, this case trawled different dimensions of the same basic facts so many times that it would be surprising if a witness who had, *e.g.*, read the daily transcripts, had not sometimes mentioned that a view being offered differed from another witness.

1182. Lack of attention and care on the part of ESB's experts? UCC alleges that there was a lack of precision and care in evidence furnished by ESB's witnesses. The principal persons at whom it levels this charge were Dr Hughes, Mr de Silva, and Mr Ramsbottom. By uncanny coincidence, these were among the most effective witnesses called by ESB. Dr Hughes, in particular, has been accused by UCC of being like the expert in *Pearce* v. *Ove Arup* [1997] 2 W.L.R. 779 who was criticised because he came to argue a case, rather than to discharge his duty to the court. The court's impression of Dr Hughes is that he came to court to tell the truth as he saw it, did so, and did not resile from his perception of the truth in the face of prolonged cross-examination. It will likely always be possible to point to some imperfection on the part of a witness. But counsel for UCC must attend elsewhere than this temple of justice if they seek perfection; for they will not find it here.

1183. Witness unawareness of crucial facts? UCC complains that some ESB witnesses were not aware of certain information when compiling their reports and presenting their evidence. It seems to the court that what UCC really purports to have expected was that ESB's witnesses would be aware of every last aspect of the facts of this case when preparing their reports, and never make the slightest slip in their expert reports or while giving oral evidence. Expert witnesses are not expected to attain or evince god-like omniscience. There is every chance that at some point an expert witness may err or evince lack of awareness of a fact which counsel may find critical but the witness did not. All of the stages, all of the parties involved in litigation are imperfect. It is, in truth, against such imperfection at which counsel for UCC now rail. In this regard, they rail in vain. There is, at best, only one bar of justice at which Perfection presents, and it is not to be found in Dublin.

1184. **Reliance by ESB experts on ESB information?** UCC purports to have been alarmed by the extent to which ESB's experts relied on information provided to them by ESB. UCC points to Dr Bree as the *eminence grise* who has been the source of significant elements of the evidence of ESB's experts. Dr Bree impressed the court as a knowledgeable and experienced professional gentleman who sought to tell the truth as he sees it. He may have been the 'go to' man within ESB on matters that required expert engineering knowledge, as well as a useful point of contact whom an expert witness engaged by ESB could liaise when in need of certain information. That does not mean that Dr Bree's influence was malign or Machiavellian. As to the expert witnesses called by ESB, all of them are serious-minded and competent individuals. The court's abiding sense is that UCC would have found ESB's expert witnesses more palatable as witnesses had they but agreed with UCC more often. But they did not and they do not; such is life.

1185. **Lack of awareness of duty of independence?** UCC complains that some of ESB's expert witnesses were unfamiliar with the duty of independence while others had interests which conflicted with this duty. Some of ESB's witnesses had such interests. Where this arose and had not been flagged in their reports it was brought out at trial and freely and honestly addressed. As to the notion that there were witnesses who were unfamiliar with the duty of independence, all of the expert witnesses consistently struck the court as competent professionals of considerable honesty and probity who understood what was required of them by court and law and went about their task honestly.

1186. Relevant case-law. UCC has referred the court to various cases concerning the duties of expert witnesses, *viz. Shell & Pensions Trust Ltd.* v. *Pell Frischmann & Partners* [1986] 2 All ER 911; *National Justice Compania Naviera S.A.* v. *Prudential Assurance Co. Ltd.* ('*The Ikarian Reefer*') [1993] 2 Lloyd's Rep 68; *Anglo Group plc* v. *Winther Brown & Co. Ltd* [2000] EWHC 127; *Field* v. *Leeds City Council* [2001] 2 CPLR 129; *Galvin* v. *Murray* [2001] 2 I.L.R.M. 234; *Re Colt Telecom Group plc* [2002] EWHC 2815; *R.* (*Factortame & Ors*) v. *Secretary of State for Transport* [2002] EWCA Civ. 932; *Toth* v. *Jarman* [2006] EWCA Civ. 1028; and *Emerald Meats Ltd.* v. *Minister for Agriculture* [2012] IESC 48. The court does not consider it necessary to engage in a detailed analysis of this case-law. In essence, all of these cases point to the ideal that is to be expected of an expert witness. But life is lived, and cases fought, in the real, not the ideal; and the approach of counsel for UCC in this regard seems a mite fantastic. It makes little allowance for the corrective influence that the process of litigation, including examination and cross-examination, plays in ensuring that the ideal is attained so far as possible. It makes as little, if not less, allowance for the fact that the court approaches the evidence of all witnesses with a critical wariness. And it makes no allowance for the fact that in this world the ideal is always to be pursued, but doomed never to be attained. Legal proceedings, like all human endeavours, are inevitably flawed. Expert evidence, it follows, is invariably deficient. The inexorable consequence is not that the evidence of the imperfect expert falls to be disregarded, or that justice is necessarily denied when such evidence is given due weight by the court when reasoning through to its conclusions.

CHAPTER 58: CLOSING.

1187. For the reasons stated above, the court finds that: (1) ESB could, and should reasonably, have reacted to the weather forecasts it received on and from 16th November, 2009, so as to spill water earlier and in greater amounts than it did, and thus created the space for more water at the Lee Reservoirs; (2) ESB could and should reasonably have maintained lower water levels than it did in the Lee Reservoirs in the period leading up to 19th November, 2009, specifically by operating consistently to TTOL ("*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35)); (3) the dam-discharge rules operated by ESB were neither necessary nor appropriate in the circumstances presenting in November 2009 and this was recognisable at the time; (4) had ESB operated consistently to TTOL, such discharges as occurred would have been neither necessary nor appropriate; (5) during the flood events of 19th/20th November, 2009, ESB failed in meeting the standard set by its own 'do not worsen nature' rule of operation; (6) during the said events, ESB operated a system of discharges intended to maintain dam integrity in the face of a storm that it was obvious at the time was not a design storm, but by failing to pre-plan properly was equipped only to release discharges that satisfied the demands of the design storm; (7) ESB failed to give to anyone, including UCC, adequate and/or timely warning about the events that ESB knew to be presenting; (8) ESB failed to undertake any adequate risk-assessment exercise that, if properly undertaken, would have quickly identified the manifold deficiencies that presented in the Lee Regulations and in ESB's operation of the Lee Dams and which were causative of the damage suffered by UCC in November 2009; and (9) UCC failed to take any of the many reasonable steps, not least in terms of its pitching of floor-levels and development of a campus-wide flood-response plan, that it could and should have taken in respect of the siting and safe preservation of those of its properties that were flooded in November 2009.

1188. In the waning hours of 19th November, 2009, and on into the early hours of the 20th, a great volume of water that had been released through the Lee Dams and flowed down the Lee Valley, entered Cork City and flooded the campus of University College Cork. The university claims ESB, as dam operator, is liable in nuisance and negligence for the damage caused. ESB claims the university is liable in contributory negligence. Both are correct. For the reasons stated in this judgment, the court finds that ESB is liable in nuisance and negligence; UCC is liable in contributory negligence. By way of apportionment of damages for negligence, having regard to the moral blameworthiness of the respective causative contributions of each of ESB and UCC, and such other principles regarding apportionment as are considered above, the court finds ESB 60% liable in negligence for the damage that occurred to UCC's properties on that stormy night, now almost six years in the past; UCC is 40% liable in contributory negligence.

APPENDIX A: UCC'S PROPERTIES (CONSTRUCTION AND ACQUISITION)

1189. *Table 1* below identifies (i) various of UCC's properties in Cork City affected by the flood-event of November 2009, (ii) which of those properties were constructed and/or acquired by UCC, and, (iii) insofar as buildings wholly or partly constructed by UCC are concerned, the key dates as regards the planning/construction of same. The table is based on information contained in two separate tables contained Ms McKendrick's expert report (at *ii* and *iv–v*).

	Building	**Constructed/Acquired?**	**Key Dates**
1	Western Gateway Building	Constructed	**Planning:** 2002; amended 2006. **Construction:** 2006-09.
2	University Hall	Constructed	**Planning:** 2004. **Construction:** 2004.
3	Glucksman Gallery	Constructed	**Planning:** 2002. **Construction:** 2004.
4	Castlewhite Apartments	Constructed	**Planning:** 1989. **Construction:** 1991.
5	Maltings Complex	Constructed & Acquired	**Planning:** 1994 **Construction:** 2004.
6	Butler Building	Constructed	**Planning:** 1999. **Construction:** 2000.
8	Granary Theatre	Constructed	**Planning:** 2004. **Construction:** 2004.

9	Connolly Building	Acquired	
10	Muskerry Villas	Acquired	
11	Victoria Lodge	Acquired	
12	Mardyke Pavilion	Acquired	
13	Western Road Houses	Acquired	

Table 1.

APPENDIX B: HISTORY OF FLOODING IN CORK CITY.

1190. **Mr Hickey's Masters Thesis.** The best collated review of flood events that have affected Cork City since the mid-19th century is a Masters Thesis done at UCC by Mr. Hickey in 1990, entitled "*Historical Climatology of Flooding in Cork City, 1841 -1988*". Mr Hickey reviews floods that affected Cork City and were reported in the *Cork Examiner* between the years identified. 292 events were recorded, most affecting low-lying areas. 32 floods mentioned Carrigrohane Road, 20 affected Victoria Cross, 17 were at Lee Fields, all places next to UCC's Victoria Lodge and University Hall. There were 15 floods at the Mardyke (UCC sports complex), and 15 at Western Road (next to all the buildings affected by flooding in November 2009). Streets around Washington Street and Grenville Place are also prominent (near Connolly Building and Tyndall Institute). The UCC lower-grounds (site of the Glucksman) and the greyhound stadium (site of the Western Gateway) get a special mention in some floods. As Hickey notes, actual flooding totals are higher as a number of *Examiner* articles do not mention specific sites flooded.

1191. **Some prominent floods before the Lee Dams.** Significant floods occurred on the river Lee in 1633, 1789, 1853, 1875, 1892, 1916 and 1948. In Hickey, K., "*Flooding in the City*", (in Crowley, J., R. Devoy, D. Lenihan, and P. O'Flanagan, eds. *Atlas of Cork City* (Cork University Press, 2005)), reference is made to accounts of a "*prodigious flood*" in winter 1633, "*which among other damage done…carried away the old North and South Gate bridges and the Castles on top of them*". These bridges sat about 300m downstream of the UCC buildings which are the focus of these proceedings. O'Callaghan, A., in "*Of Timber, Iron and Stone*" (Inversnaid Publications, 1991) considers, *inter alia*, the history of waterways in Cork City. In referring to the 1789 flood, mentions sources to the effect that "[O]*n…17th January 1789, a* *flood such as not had not been seen in the city in living memory swept through the valley, submerging everything in its path in a matter of hours. The entire city from the Mayor's residence...*[next to Tyndall Institute], *to the lower reaches of the harbour were completely covered.* A contemporary newspaper report reported that "*In most places it* [the water] *was near five feet...in many parts seven feet deep...*". The *Cork Examiner* of 2nd November, 1853, reports on extensive City flooding the previous day. On 4th November 1853, further articles appeared; the flood was described as the largest since 1789. Flooding apparently commenced on the evening of 1st November when the Mardyke area (near what is now UCC sports complex) began to flood. Before 20:00 that evening, water below Wellington Bridge (now Thomas Davis Bridge) rose higher until it covered the Western Road and Mardyke (where UCC buildings are now situate). The main flood-stream came along what is now Washington Street, close by UCC Connolly Buildings. By 22:00 the street was hopelessly flooded; water depth in the Mardyke (UCC sports complex) averaged eight to ten feet. Water levels where Tyndall Institute is now situated averaged about four feet; in nearby streets it was said to be six feet. The water-rush along Grenville Quay was nearly as rapid as along the Western Road and caused two large breaches there. The Quay was impassable due to a height of four/five feet of water. The next major incident was in 1879. Details of that flooding feature in the *Illustrated London News* ((1875), Vol LXVII, p.356). It describes how waters burst their banks next to where University Hall and Western Gateway Building now stand, sweeping over Western Road, *i.e.* next to all the UCC buildings that were affected by flooding in 2009. Every shop in Washington Street, near where UCC's Connolly Building now stands, had a couple of feet of water inside. The current passed 300m from where UCC's Connolly Buildings and Tyndall Institute are now situate. On Western Road, the water was so high that a boat was pulled down the street as far as the Courthouse. Near where Tyndall Institute is now situate, communication between houses was kept up by boats. The *Cork Examiner* reports of the flood state there were flood depths of three/four feet in the Mardyke and four/six feet close by where Tyndall Institute and Connolly Building are now situate. In a flood event of 1892, Hickey's Masters Thesis indicates all of the following areas were affected by four feet of flood-water: Victoria Cross; Coach Street (near where Tyndall Institute stands), the Mardyke and Mardyke Cricket Grounds (where UCC's sports complex now sits), Carrigrohane Road and the Glucksman Gallery-site. In November, 1916, a severe storm and heavy rain hit the city for numerous days. This resulted in a great flood. Farm animals were seen in the water, also trees, crops and park-seating. Main roads and paths were impassable; city access was cut off. Trams could not proceed beyond what is now UCC Connolly Building. What are now the UCC football grounds at the Mardyke were covered with four feet of water. Houses on the Mardyke Walk and Western Road (now UCC buldings) all suffered flooding of three/four feet. Flood-waters reached their peak at about five feet near where Connolly Building now sits, and four/five feet in the western and northern districts (where many UCC building are located). Photographs in the *Examiner* show flooding on Western Road (near what are now UCC buldings) and Lee Fields; the collapse of the then UCC entrance bridge (near the Glucksman-site) also appears; and a collapse of a wall where UCC sports complex now sits is depicted. ESB has estimated downstream flow from Inniscarra during the 1916 flood at about $500m^3/s$. During preparatory works for the Lee Scheme, water-levels and flows were monitored for a decade at the dam-sites. The highest recorded flood during this period was in December 1948 when two storms occurred in quick succession, one on the 2nd, the other on the 5th and 6th. ESB measured a peak-flow of $390m^3/s$ at Inniscarra during these episodes. The *Irish Independent* of 7th December states: "*Carrigrohane Road was flooded to a depth of two feet. The Mardyke soccer, rugby and cricket pitches in that areas were covered to a depth of a couple of feet....Healy's Bridge* [on the river Shournagh] *collapsed...*".

1192. Some prominent floods post-Dam construction. Key flood events from 1957 onwards are identified hereafter.

- *1957, 5th September*. Peak discharge at Inniscarra was $330m^3/s$. Hickey refers to flooding of "*low ground adjacent to the river*" and "*low-lying portions of the city*".
- *1960, 5th October*. Western Road flooded.
- *1960, 4th December*. Hickey refers to flooding on "*low ground adjacent to the river*"; there was three feet of flood-water on Carrigrohane and Lee Roads.
- *1961. late-January*. ESB data shows discharges at Inniscarra on 25th/27th January of $293/354m^3/s$ respectively. Once downstream flows from the rivers Bride and Shournagh are factored in, flow-rates were about $363m^3/s$ and $426m^3/s$ respectively.
- *1961, 22nd October*. Hickey refers to flood-water in "*low-lying portions of the city*" reaching three feet; at Patrick Street, flood-water reached half this height.
- *1964, 13th December*. Peak discharge at Inniscarra was $422m^3/s$, then the highest peak discharge since dam-construction. The *Irish Press* of 14th December refers to "*a disastrous situation in Cork City. The city greyhound track was flooded to a depth of four feet after water flowed onto the road at ESB reservoir....Near Carrigrohane the water reached...four feet*". Hickey indicates the following flood-waters at the places named: western districts (three feet), Carrigrohane Road (four feet), Western Road, the Greyhound track (three feet), and Lee Road (two feet).
- *1965, 2nd May*. Hickey refers to the Mardyke as flooded.
- *1966, 5th February*. Hickey refers to the following as flooded: Lee Fields, Carrigrohane Road, Victoria Cross, Oliver Plunkett Street.

- *1966, 15^h February*. Hickey refers to the following as flooded: western districts, Western Road and Carrigrohane Road (all to two feet), and flooding at FitzGerald Park, Mardyke, Victoria Cross and Spring Lane.
- *1966, 13^th October*. Hickey refers to Cork Greyhound Track as flooded.
- *1968, 10^th November*. Hickey refers to Cork Athletic Grounds as being beneath two feet of water.
- *1974, 10^th January*. Hickey refers to flooding on "*low ground adjacent to the river*", Carrigrohane Road and Lancaster Quay.
- *1978, 7^th February*. Hickey refers to Carrigrohane Road, Lee Fields and the Mardyke as being beneath four feet of water; Inchigaggin Road also flooded.
- *1978, 6^th December*. Hickey refers to one foot of flooding at "*low-lying portions of the city, Carrigrohane Road* [and] *Parklands*", and flooding at Inchigaggin Road, Lee Fields, Mardyke and the Greyhound Track.
- *1978, 8^th December*. Hickey refers to flooding at Lee Road and Carrigrohane Road.
- *1978, 27^th December*. Hickey refers to flooding at Carrigrohane Road.
- *1982, 14^th August*. Hickey refers to flooding on flat of the city and at Victoria Cross.
- *1983, 17^th July*. Hickey refers to flooding at Frenches Quay.
- *1985, 20^th March*. Hickey refers to flooding in low-lying suburbs and at Western Road, Wilton, and Victoria Cross.
- *1986, 6^th August*. Some flooding of Cork City occurred.
- *1987, 30^th December*. Some flooding of Cork City occurred.
- *1988, early-January*. On the 12^th, Inniscarra records a peak discharge of 220m^3/s. Hickey's review mentions Carrigrohane Road and Lee Fields as flooded. For the 18^th, Hickey refers to a flood-depth of two inches in western districts of the city, the flat of the city, and Sarsfield Road, Wilton and Carrigrohane Road.

- *1990, February*. Photographs show flooding at Carrigrohane Road, Lee Fields, Mardyke Sports Complex, the Greyhound Track, and a high level immediately upstream of where the Glucksman Gallery is now situated.
- *2000, 1st December*. Minutes of a meeting of UCC Sports Centre's team state: "*Flooding and high water tables have prevented the installation of the pumping station and the line from the pavilion this weekend.*"
- *2006, December*. The Lee CFRAMS Hydraulic Report Model 8 indicates flooding near UCC Connolly Building. Photographs show extensive flooding at Carrigrohane Road and the Lee Fields.

APPENDIX C: THE U.S. 'DAM OPERATOR' CASES.

Section A. Overview.

1193. Overview. Reference was made during the proceedings, principally by ESB, to an abundance of 'dam operator' cases from the United States. To the court, it seemed that considering various cases from numerous American states without any real sense as to the legal background within which those cases evolved was like being shown a series of interesting paintings without any proper understanding of what the artist was truly about. Unlike Commonwealth cases, which are informed by and inform United Kingdom jurisprudence, and thus come within a corpus of case-law that Irish judges and legal practitioners regularly encounter, American cases draw from an almost uniquely American well of precedents and thus need to be approached with considerable caution, lest they prove to be false friends. To borrow from Balzac, "*Il y a des amis qui sont comme des rosiers qui n'ont que des épines.*" In any event, each of the United States cases to which the court was referred could be distinguished on at least one of ten grounds, generally more. Thus: (1) none of the U.S, cases indicates that the relevant dam operators undertook a flood alleviation task similar to that which ESB has undertaken historically; (2) certain of the United States cases such as *Iodice*, indicate that if dams do not have a statutory mandate for flood alleviation, their duty will not go beyond a duty to worsen nature; but on this side of the Atlantic, *Dorset Yacht* is long-standing authority that having a statutory mandate to perform one function does not free one to be negligent in other spheres of activity. The court sees no rational basis why ESB's so-called 'statutory mandate' should screen it from liability for negligent performance of such flood alleviation as it performs; (3) the position regarding assumption of responsibility is stronger here than in the few U.S. cases, such as *Iodice* and *Bryan*, where arguments as to assumption of responsibility apparently derived from little more than that water levels in the relevant reservoirs were kept low for some time. That is different from the active flood alleviation in which ESB has historically engaged; (4) ESB has conceded that it is under a duty of care to carry out its operations without negligence; it is not apparent that a similar concession was made in the U.S. cases; (5) it is not apparent that any issue arose in the U.S. cases as to the practicality of a duty limited to not releasing more water than nature would have sent downstream. By contrast, the evidence here is that ESB staff do not have sufficient information at the time of discharge to make a comparison with the position pertaining if the Dams were not in place. It is not possible to have a duty of care which can only be tested *ex post facto*; (6) the Lee Scheme is only a short distance upstream from Ireland's second-largest city. Most of the U.S. cases concern radically different situations. Geographical proximity to a large city and the heightened gravity of avoidable flooding that affects that city means considerations of basic justice and reasonableness are more supportive of recognising a duty of care here than in the bulk of the U.S. cases; (7) many of the U.S. cases concern impoundments of water for drinking-water purposes. There is an implicit suggestion in some of the U.S. judgments that American case-law on liability of impounders may not always apply to dam operators. Hydro-generation is quite different from impoundment; hydro-generation involves an industrial process. It is just and reasonable to impose a more extensive duty of care on operators of industrial processes; [8] the U.S. cases are focused mainly on negligence. Some, such as *Accardi* v. *U.S.* (1979) 220 CT. Cl 347; 599 F. 2d 423, are concerned with a claim under the takings clause of the Fifth Amendment, *i.e.* neither nuisance nor negligence. Oftentimes, references to nuisance, when argued, are so brief as to be of little assistance, as in *Bryan*; [9] it is not evident that the development in the common law reflected by *Leakey* in nuisance or the duty of care in *Goldman* have a comparator in the U.S. or, if they do, that this comparator was put in issue. Several of the U.S. cases diverge from Irish (and British) legal principles. *E.g.* in

East Bay, there is an express reference to *Rylands* v. *Fletcher* not being followed in California; and (10) the U.S. is a very different jurisdiction to Ireland, not least in terms of dominant political philosophy. We too have a liberal democracy but one with a 'hands-on' government that has much in common with the continental European tradition; in legal terms, at least, we are often closer to Berlin than Boston. Consequently, societal expectations and the common law in Ireland may be quite different from the expectations and common law that pertain in individual states of the United States. Moreover, many of the U.S. cases date from decades ago when societal expectations, even in the U.S., as to the behaviours required of big industry were likely very different to those that now pertain. For the foregoing reasons, the court found, in the end, that a consideration of the U.S. cases added little, if anything, to the court's reasoning, merely lengthening the main body of the judgment and accreting the number of authorities, without advancing matters.Consequently, the court has generally not had regard to the U.S. case-law to which it has been referred. Even so, those cases form such a significant portion of the case-law to which the court was referred by ESB that it seems appropriate to make some mention of same; this follows hereafter.

Section B. Alabama.

1194. ***Bryan v. Alabama Power Co.*** (20 So. 3d 108 (Ala.2009)).The lands of the plaintiff farmers were flooded by overflow from Tallapoosa River during a period of heavy flow. The defendant controlled a number of river-dams, including Martin Dam, used principally for hydro-electric generation. The defendant did not have a clear flood control mandate, but in negotiations with objectors when its federal licence was up for renewal, agreement was reached that sought to balance the interests of upstream/downstream landowners. The Martin Dam was operated by reference to a set of organizational rules that formed a rule curve. During the flood, the defendant observed the rule curve. Outflow was less than concurrent rate of in-flow, except after in-flow peaked and accumulated water was evacuated. The Supreme Court of Alabama affirmed a decision granting summary judgment to the defendant and followed its decision in *Ellis* v. *Alabama Power Co.* (431 So. 2d 1242 (Ala. 1983)) that: "*The law in Alabama is clear that an action which asserts liability for damages for...release of water will not lie in the absence of negligence. This Court has consistently held that one who owns or operates a dam owes a duty to lower riparian owners only to exercise reasonable care in operating or maintaining the dam.*" There does not appear any inconsistency between the first line of this text and the conclusion that ESB is subject to the general duty of care identified in the main body of the within judgment. The second line seems but a formulation of the applicable duty in the context of the first. The farmers in *Bryan* contended for a heightened duty of care beyond what common law required. The Supreme Court of Alabama observed, at 118: "*The farmers...contend that APCo owed...a 'heightened duty' of flood control beyond that imposed by...common law....that, under this heightened duty, APCo was required to 'minimize' downstream flooding by maintaining 'adequate' storage capacity....The farmers do not cite...any Alabama law to support...such a duty. They do not define what they mean by 'minimizing' downstream flooding....*[T]*hey...decline to state what storage capacity would be 'adequate'*...". Here it is merely a common law duty that is contended for by UCC.

Section C. Arizona.

1195. ***Tumbling-T Ranches* v. *Paloma*** (197Az. 545; 5 P.3d 259; 2000 Ariz. App. LEXIS 65; 320 Ariz. Adv. Rep. 47). The plaintiff farmers suffered flood damage when the upstream dam-owner released large quantities of water during a flood. The dam-owner won summary judgment at first instance that the dam was not a causal actor in the damage suffered. This was reversed by the Court of Appeals of Arizona. It held the farmers had provided evidence that strike-out should not have been allowed. Noyes J., for the court, indicated that the issue presenting was whether the plaintiffs could show the dam increased flood damages beyond what would have occurred naturally. ESB relied on this case as supporting the contention that liability for flooding can only arise where dam-presence causes water to flow at a greater rate or causes damage additional to that which would have eventuated in a dam's absence. The court does not accept that one can, on the basis of the single snap-shot of Arizona dam law afforded by *Tumbling-T*, identify this as the only basis for imposing liability in the dam/flood context.

Section D. Arkansas.

1196. Arkansas Power & Light Company *v.* Beauchamp (184 Ark.698; 43 S.W.2d 234; 1931 Ark. LEXIS 257). The plaintiff farmers sued the power company for damages for destruction of crops occasioned by allegedly negligent operation of dam flood-gates that caused sudden water-release into the stream below in such quantity as to cause overflow/damage. The defendant averred the proximate cause of any injury was unusually heavy rainfall. Its witnesses indicated that no more water was allowed to pass than existing natural flowage, and that the quantity of water and resultant overflow were occasioned solely by rain. The jury found against the dam-owner. The Supreme Court of Arkansas concluded the plaintiffs' evidence was sufficient to justify the jury holding against the dam-owner.

1197. Arkansas Power and Light Co. *v.* Lewis Cash (245 Ark. 459; 432 S.W.2d 853; 1968 Ark. LEXIS 1226 [1968]). A sudden storm arose and was passed through the defendant utility company's dams, flooding the plaintiff farmers' lands. The plaintiffs recovered in the lower court. On appeal, the Supreme Court of Arkansas held the plaintiffs had not offered sufficient evidence of causation. This Court notes that it was a contention of UCC that additional damage occurred in November 2009 which would not have eventuated without the interference of the Lee Dams; this seems at one with the position under the law of Arkansas, or at least with the limited knowledge of same that the court possesses following consideration of *Beauchamp* and *Lewis Cash.*

Section E. California.

1198. Smith *v.* East Bay Municipal Utility District (122 Cal.2d 613; 265 P.2d 610 (1954)). In *East Bay*, the defendant was found liable for flood damage after diverting foreign waters into a watercourse. Kaufman J., for the Court of Appeal of California referred (at 614–615; 619–620) to a general U.S. rule that a dam-owner may permit flood waters to pass over a dam in such quantities as flow in. This Court respectfully notes that Kaufman J.'s observation does not appear to make allowance for the fact that the water-levels at which dam-water is maintained prior to storm in-flows may yield liability at common law.

1199. People *v.* City of Los Angeles (34 Cal. 2d 695; 214 P.2d 1 (1950)). The City constructed an aqueduct, which, between 1919 and 1937, diverted virtually the entire flow of the Owens River above Owens Lake. By 1921, the lake was dry and valuable mineral deposits exposed. Between 1937 and 1939, the City released large quantities of water onto the lake-bed, causing extensive damage to the mineral deposits and chemical plants thereon. The State sought an injunction defining the extent to which the City could release water onto the lake-bed. It was held by Traynor J., for the Supreme Court of California, at 697–8, that: "[T]*he city, by its long continued diversion of the waters of the Owens River, incurred an obligation to* *continue that diversion within the reasonable capacity of its aqueduct system, at least so long as it continued to maintain its aqueduct....*[S]*uch diversion was recognised as the new natural condition with respect to the waters of the Owens River.*" The foregoing observation appears unhelpful to ESB which has, throughout these proceedings, championed the notion that, as a matter of Irish law, when determining the state of nature at the Lee Dams, one must return to the halcyon days of 1957 when Mr O'Kelly was President, Mr de Valera was re-elected Taoiseach, Mr Maguire was Chief Justice, time stood still and nature was cast in aspic. Yet here is the Supreme Court of California holding that the diverted condition of the Owens River was the new natural state of nature.

1200. ***Kambish v. Santa Clara Valley Water Conservation District of San Jose*** (185 Cal. App.2d 107 (1960)). The defendant operated dams for water-storage. During a period of heavy rainfall, water was released into the creek downstream of Almaden Dam in unusual quantities, overflowing the banks and causing damage to the plaintiff's property. Draper J., for the Court of Appeals of California, said, at 110: "*The owner of a dam may permit flood-waters to flow over a dam in such quantities as naturally flow into the reservoir. Such owner is under a duty not to worsen the condition of a downstream owner, but...is under no duty to improve that situation...*". The plaintiff in *Kambish* complained that the defendant had not made adequate use of a canal linking Almaden Reservoir with the larger Calero Reservoir, to which water could have been diverted so as to create 'empty space'. This Court respectfully notes that Draper J.'s observation does not appear to make allowance for the fact that the water-levels at which dam-water is maintained prior to storm in-flows may yield liability at common law.

1201. ***Accardi v. U.S.*** (220. Cl. 347; 599 F.2d 423 (1979)). In *Accardi*, the U.S. Court of Claims rejected an argument that the plaintiffs' property had been subjected to governmental 'taking' due to flooding resulting from authorised governmental activity. As *Accardi* is concerned with the takings clause of the Fifth Amendment to the U.S. Constitution, not negligence or nuisance, the court considers it no further. ('Takings' clauses are a feature of the U.S. Constitution and many U.S. state constitutions whereby a government may be accused of having taken private property for public use, in this context by having flooded property on a regular basis such as to deprive the owner of its use).

Section F. The Carolinas.

1202. ***Key Sales Co.* v. *South Carolina Electric & Gas Co.*** (290 F. Supp. 8 (1968)). The defendant power company generated hydro-electricity at Lake Murray Dam. The plaintiff claimed the defendant was negligent in its failure to anticipate oncoming flood-waters and to reduce pond-level sufficiently to accommodate them. ESB has drawn the court's attention to the observation of Simons J., at 12, that "*Water is money to the defendant, for it is through the use of this water that the defendant produces...electricity which it in turn sells to customers. Naturally defendant attempts to conserve as much water as possible.*" Naturally. But when one finds that ESB has identified TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – a question arises whether a liability presents when it goes beyond that level. For the reasons stated in the main body of its judgment, the court considers that it has. In passing, the court notes the observation of Simons J. in *Key Sales*, at para. 25, that "*A dam owner may rightfully permit flood waters to pass over the dam in such quantities as flow into it. But a limitation on this right is that the water accumulated behind the dam must be discharged with ordinary care, or the owner will be liable for the resulting* *injuries.*" One can read this as indicating that the duty of care arising was not limited to 'not worsening nature' but went further.

Section G. Colorado.

1203. ***Ireland v. Henrylyn Irrigation District*** (113 Colo.555; 160 P. 2d 364 (1945)). There was a conflict as to whether the defendant dam operator increased river-flow by augmenting it with stored water. The flood washed away certain dams of the plaintiff downstream. The defendant contended its operation of the reservoir had mollified the flood. The Supreme Court of Colorado stated (at 365–366; 558–559): "*We are of the opinion that plaintiff could not acquire a right against defendant to have a system of flood control in storage works located above his property that would be any better than if defendant's reservoir had never been built...*". UCC has never contended that a right arose for a system of flood control at the Lee Dams better than if those dams had never been built.

Section H. Connecticut.

1204. ***Beauton* v. *Connecticut Power & Light Co.*** (125 Conn. 76; 3 A.2d 315; 1938 Conn LEXIS 264). Two lower riparian property-owners sued a dam-owner for flooding which caused destruction of their cottages during extreme weather. The plaintiffs failed and appealed to the Supreme Court of Connecticut on the basis, *inter alia*, that the lower court erred in its explanation of riparian rights. Avery J., for the Supreme Court, upheld the lower court's instruction, stating, *inter alia*, that: "[I]*f the flood that caused the damages was created solely by storm and weather conditions and the conduct of the defendant as alleged did not contribute substantially or essentially to cause it, the defendant would not be liable.*" Here, by contrast, a a substantial and essential cause of the eventual damage suffered by UCC was the consistent and deliberate maintenance by ESB of water levels above TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35).

Section I. Georgia.

1205. ***Baldwin Processing Co.*** **v.** ***Georgia Power Co.*** (112 Ga App 92, 143 SE 2d 761 (1965)). A riparian owner who operated a plant downstream from a hydroelectric dam sued the dam-owner for damages following inundation during a flood event. It was alleged that the dam operator was under a duty to anticipate floods and increase storage capacity to control foreseeable events. Pannell J., for the Court of Appeals of Georgia, approved a jury instruction reading: "*The city had in law a right to construct the waterworks and to dam up and obstruct the water so far as proper and necessary therefor…it was the plaintiff's right to have his land exempt from any more injuries and negligent overflow of his land by water than would have gone over it by laws of nature.*" This decision was followed in *Lee* v. *Georgia Power Company* (296 Ga App 719; 675 S.E.2d 465 (2009)). The court has addressed at some length in the main body of its judgment the interaction between what a body is empowered to do by law (in the present case by virtue of the Act of 1945 and the Order of 1949) and any related common-law liability that may arise and has found both nuisance and negligence to present in ESB's behaviour.

Section I. Idaho.

1206. ***Kunz* v. *Utah Power & Light Co.*** (526 2d 500 (1975)). The U.S. Court of Appeals for the Ninth Circuit, applying the law of Idaho, upheld a jury decision imposing liability on the defendant in circumstances where it was not in dispute that the natural river-flow had not been increased. The court accepted Utah Power's proposition that the law does not generally require one person to act affirmatively to prevent harm to another unless he has brought about the condition threatening the harm. It qualified this by saying that an exception has often been found when one person has voluntarily undertaken to assist another. In *Kunz*, the court held there was such a relationship (see 503–504). There are a few points of note about *Kunz*. First, Utah Power had several months' notice that run-off was going to be high. Here, the window of notice was more constrained; even so, there was an opportunity to issue meaningful warning. Second, Utah Power tried to eliminate/minimise flooding by maintaining sufficient capacity. Here, ESB touted publicly the flood alleviation effects of its dams. Third, Utah Power consulted with farmers downstream. Here, the 'warning list' here seems to create a similar proximity. Fourth, the court recognised that Utah Power's obligation to attempt to control floods had to be consistent with its other duties. There is no reason to consider a duty to operate to TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – as inconsistent with ESB's power generation role.

1207. ***Burgess v. Salmon River Canal Co.*** (119 Idaho 299; 805 P. 2d 1223 (1991)). The defendants were two highway authorities and the Salmon River Canal Company (SRCC), which operated an irrigation dam on Salmon Falls Creeks. The Supreme Court of Idaho rejected the trial court's finding that, having impounded the total flow of Salmon Falls Creek for over 70 years, SRCC assumed a duty of flood control. The court held, however, that SRCC was under a duty of reasonable and ordinary care in controlling Salmon Falls Creek. Per McDevitt J. (at 306; 1230):

> "*The first and most important factor to be considered in determining what is reasonable is the purpose or purposes for which the dam was constructed....There are, however, other factors...such as recreation, fish and wildlife, flood control, and power generation....*[W]*hile the operator of the dam must give primary consideration to the primary purpose for which the dam was constructed, it must also give some consideration to other factors ....SRCC asserts that since it did not release any more water than was flowing into the reservoir...it cannot be held liable for any flooding. The determination of reasonable conduct cannot be turned into a simple mathematical test....The fact that the amount of water released does not exceed the amount flowing into the reservoir does not* per se *establish reasonable conduct.*
>
> *All relevant factors of reasonableness must be weighed together giving emphasis to the purpose of purposes for which the dam was constructed. It is not possible for this Court to enumerate all factors to be considered, nor their relative importance.*"

1208. UCC can point with justification to *Burgess* as supportive of its case.

Section K. Illinois.

1209. ***Reinke* v. *Sanitary District of Chicago*** (260 l. 380; 103 N.E. 236; 1913 Ill. LEXIS 1903). This case concerned a claim for flooding of the plaintiff's land resulting from the defendant's dam discharges. The defendant sought to refute the plaintiff's theory, showing that the lands had flooded to the same degree even before the dams existed. The lower court disallowed the evidence on the basis that the defendant's witness had no direct knowledge of the position prior to the dams' existence. Davis J., for the Supreme Court, held this evidence should have been allowed. One can construe this more than one century-old case as supportive of the 'do not worsen nature' rule touted by ESB. Whether it continues to be representative of Illinois law is unknown to the court.

1210. ***Graham* v. *City of Springfield*** (23 Ill App 3d 427; 319 NE 2d 252 [1974] Lexis 1856). The plaintiff sued Springfield for damage to crops caused by flooding, claiming flooding was caused by negligent operation of a dam that impounded an artificial lake. Smith J., for the Appellate Court of Illinois, noted, as part of his conclusion and, per ESB, "*seemingly*" as a necessary element to finding negligence/causation that the evidence supported a finding that more water flowed out than in. The court cannot place weight on a case when even the party proffering it appears unsure as to whether it stands for a particular legal principle.

Section L. Indiana.

1211. ***Todd* v. *Badger*** (134 Ind. 204; 33 N.E. 963; 1893 Ind. LEXIS 109). The court at first instance found against a defendant dam-owner and awarded damages for flooding of the plaintiff's downstream property. The dam-owner appealed, claiming the verdict was irreconcilable with jury answers to interrogatories. The Court of Appeal agreed, overruling the lower court. The Supreme Court reversed this decision, Coffey C.J. noting that the interrogatory merely admitted some flooding would have occurred and "*it was perfectly competent...for the appellants to have proven...that their lands were overflowed to a greater extent by reason of the dam, and that their damages were greater than...in the absence of the wrongs alleged*". One can construe this 122 year-old case as supportive of the 'do not worsen nature' rule touted by ESB. Whether it continues to be representative of the law of Indiana almost a century-and-a-quarter after it was decided is unknown to the court.

Section M. Kentucky.

1212. ***Winchester Water Works Co. v. Holliday*** (241 Ky. 762; 45 S.W.2d 9). In *Winchester*, the Court of Appeals of Kentucky considered the case of a dam which was designed with 'flash boards' that would break off and release impounded water in extreme conditions. Giving judgment for the Court, Commissioner Drury appears to have decided matters by by reference to Kentucky riparian law. The court has already considered the position of the parties by reference to Irish riparian law and, respectfully, does not consider that it assists to pray in aid the riparian laws of Kentucky in this regard.

Section N. Maine.

1213. ***Michalka v. Great Northern Paper Co.*** (116 A.2d 139 (1955)). This case involved a claim against a dam-owner for the release of impounded waters which it was alleged had caused ice to become dislodged, such that ice and water flooded the plaintiff's land. The Supreme Court of Maine held that the standard of care owed by a dam-owner at common law was defined by the rights and obligations of the riparian owner. Fellows C.J., for the court, stated: "*The owner of a dam is entitled to permit the natural flow of the water to pass....There must be negligence alleged and proved to make a defendant dam owner liable to a longer riparian proprietor, and the defendant's negligence must be the proximate cause of the plaintiff's injury.*" The court has already considered the implications of Irish riparian law for the within proceedings and, respectfully, does not consider that it assists to invoke Maine case-law in this regard.

Section O. Michigan.

1214. ***Rockford Paper Mills*** *v.* ***City of Rockford*** (311 Mich. 100, 18 N.W. 2d 379 (1945)). Here, the Supreme Court of Michigan upheld dismissal of the plaintiff's claim for damages said to have been caused to his property by discharges from the defendant's upstream dam. The court noted (at 105–106; 382): "*The proprietors of the upper dam are not...insurers of the...lower dam.....*[T]*here must be negligence or some intention on their part to suddenly release impounded waters so that damage to the lower dam will follow. They cannot be held responsible for a superfluity of waters coming from a flood condition arising above their dam without any negligence on their part.*" In the within case, both nuisance and negligence have been alleged, and found to pertain.

Section P. Minnesota.

1215. ***Chabot*** **v.** ***City of Sauk Rapids*** (422 N.W.2d 708; 1988 Minn. LEXIS 89). In *Chabot*, the plaintiff's house sat across the street from a natural ditch which functioned as a holding pond as part of the city's storm-drainage system. The contours of the land appeared naturally to direct the flow of surface-water from the pond across the plaintiff's land. During a heavy rainstorm, the holding pond overflowed and the plaintiff's property was flooded. ESB contends *Chabot* is of note because Yetka J., for the Supreme Court of Minnesota, indicated that whereas a liability could have arisen for diverting the natural flow onto Chabot's property, it was not part of Minnesotan tort law that a failure to divert or hold back natural flow was a basis of liability. The case offers no insight as to liability where downstream flood-water levels are caused or raised as a result of deliberately accumulating reservoir-water to a level beyond the optimal operational level, *i.e.* TTOL, "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35).

1216. ***Alfred Wadman v. Trout Lake Lumber Company*** (130 Minn. 80; 153 N.W. 269; 1915 Minn. LEXIS 520). This century-old case was concerned with a repaired dam. The repair resulted in raising of water-levels in a lake. When heavy rain descended, the lake overflowed, causing flooding. The central issue was whether the dam was a contributing factor to the damage that eventuated. Hallam J., for the Supreme Court of Minnesota, indicated, *inter alia*, that: "*There is evidence to sustain the contention...that the acts of defendant in repairing and maintaining this dam increased the stage of water of the lake and caused damage which plaintiff would not otherwise have sustained*". This text can be read as supporting an imposition of liability where water-levels are held beyond the threshold required for optimal level (TTOL) with the result that downstream flooding is worse than it would have been.

Section Q. Missouri.

1217. ***Ferguson v. Union Electric Company of Missouri*** (305 S.W.2d 401; 1957 Mo. LEXIS 659). The plaintiff farmers' lands were flooded during a period of heavy rainfall by overflow of a dammed river. The case was fought on the issue of causation: the defendant claimed its dam did not worsen natural flood conditions. The jury imposed liability. Westhues J., for the Supreme Court of Missouri, affirmed this decision, finding there was ample evidence on which the jury could conclude that the presence of the dam had worsened the flooding.

1218. ***Breshears* v. *Union Electric Company of Missouri*** (373 S.W.2d 948; 1964 Mo. LEXIS 854). It was alleged that flooding had been caused by the construction, operation and maintenance of a dam. The instruction to the jury, approved by the Supreme Court of Missouri, listed the factual elements necessary for the jury to hold the defendant liable but concluded with the express statement that there could be no liability if the injury would have eventuated even in the state of nature.

1219. Both cases are *prima facie* supportive of a 'do not worsen nature' approach to liability contended for by ESB. For the reasons identified in the main body of this judgment, especially Chapter 52, the court identifies why it considers that the 'do not worsen nature' rule is legally and logically deficient.

Section R. Nebraska.

1220. ***Cooper* v. *Sanitary District No. 1 of Lancaster County, Nebraska*** (146b. 412; 19 N.W.2d.619; 1945 Neb. LEXIS 96). The plaintiff farmers sued the defendant sanitary authority for negligence arising from the construction/maintenance of drainage channels which failed to protect the plaintiffs' land from flooding following heavy rain. Quoting an earlier case involving flooding allegedly caused by a railway embankment, Carter J., for the Supreme Court of Nebraska, stated, at 627: "*If...some damage would have occurred, even if the railroad embankment had not been built, the company would only be liable for such damages in addition thereto as were caused by the damming or obstruction of the waters to a greater height or for a longer time than would otherwise have occurred.*" As a statement of law, this appears not unsupportive of the court's conclusions as regards TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35).

Section S. New Hampshire.

1221. ***Goddard* v. *Berlin Mills Company*** (82 N.H. 225; 131 A. 601; 1926 N.H. LEXIS 11). The defendant mill-owners were sued by the upstream plaintiff land-owner for damage to land caused by flood-waters backed up by the defendant's dam. The dam-owner sought to assert the flooding was an act of God. The court held him liable on the ground that presence of the dam increased the amount of flooding suffered. Peaslee J., for the Supreme Court of New Hampshire stated: "*The plaintiff's complaint relates to flowage at times of unusual floods...the defendant argues that the damage was caused by...act of God....But if the defendant's illegal act in maintaining the dam increased the flowage under such circumstances, it is manifest that liability for such increase would be incurred.*" To paraphrase *Goddard*, ESB's actions yielded increases in flowage: it deliberately accumulated waters beyond TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – when through generation or spillage it could have reduced to TTOL.

Section T. New Jersey.

1222. ***Tower Marine, Inc.* v. *City of New Brunswick*** (175 N.J. Super. 526; 420 A.2d 1029; 1980 N.J. Super. LEXIS 672). This case involved a claim brought by a downstream marina-owner in respect of the City's operation of a dam during a one-in-a-hundred year storm event. The main point of contention was the status and scope of immunity claimed by the City with respect to tortious claims. Furman J.S.C., for the Superior Court of New Jersey, noted that "*Public and private owners of dams have been adjudicated liable in tort to downstream proprietors for opening dams or otherwise increasing...downstream flow*". In the present case, a criticial focus is the initial, deliberate accumulation of water at levels beyond TTOL which led to eventual downstream flow in excess of that which would have occurred had ESB just operated to TTOL, "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35).

Section U. New Mexico.

1223. ***Gutierrez* v. *Rio Ranches Estates*** (93.M. 755; 605 P.2d 1154; 1980 N.M. LEXIS 2629). The defendants constructed retention dams and drainage systems which discharged waters on their neighbour's land. Federici J., for the Supreme Court of New Mexico, approved a jury instruction that included the following: "*An upstream...landowner has a duty to the lower and downstream landowner not to collect in an artificial channel...reservoir or pond, surface water and discharge it upon his neighbor's land to his injury in a different manner from that which it would naturally flow...or to cast it in a greater volume or permit it to escape thereon in a more dangerous way.*" To use the language of *Gutierrez*, the court has found that ESB, in November 2009, and as a result of its storing waters to levels beyond TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – cast water in a greater volume than would otherwise have occurred and permitted it to escape onto UCC's property in a more dangerous way.

Section V. New York.

1224. ***Iodice* v. *State of New York*** (102 Y.S.2d 742; 277 App.Div. 647 (1951)). In *Iodice*, the claimants were awarded damages at first instance for damage caused to their property by flooding of the Mohawk River. The claimants' case was that New York State was negligent in maintaining a particular level at Delta Dam Reservoir and permitting discharge of water into the Mohawk in such amount that it overflowed its banks. The appellate court allowed the appeal, stating, at 744: "*There being no statutory duty to operate the dam for flood control purposes, any duty to operate the dam for the purpose of bettering natural conditions must be found in some rule of...common law.... We know of no principle of common law which imposes any such duty.... We simply have the question...whether a dam owner has the right to let nature take its course.... We think the question must be answered in the affirmative.*" The court notes the reference to "*bettering natural conditions*" and has considered in the main body of its judgment the issue as to what is 'natural' in the context of a scheme of dams that have seized control of nature and where all discharges downstream of the dam appear no longer to be natural. Again the court would note the initial, deliberate accumulation of water at levels beyond TTOL as a basis for liability in the within proceedings.

1225. ***Allen* v. *City of New York*** (855 N.Y.S.2d 279; 409 A.D.3d 1126 (2008)). The plaintiffs claimed that the defendants were responsible for flood damage to properties, located downstream of Pepacton Reservoir, and that the defendants could and should have lowered the reservoir-level before certain rainstorms. The Reservoir was created to establish drinking-water supply for New York City. The claim was dismissed *in limine*. This was upheld on appeal, the Appellate Division of the Supreme Court of New York stating, at 1128:"*In addition to…*Iodice, *we note…that the defendants submitted documentary evidence establishing that during the storms at issue, the amount of water flowing into the reservoir…exceeded the amount flowing out, that the storm water was released over a longer period of time than it would otherwise have been without a dam and that, therefore, the reservoir and dam had an ameliorative impact…on the subject flooding.*" In the present case, if water-levels had consistently been held to TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – the level of water that went down the Lee Valley on 19th/20th November 2009 would have been reduced or obviated.

1226. ***Stormes* v. *United Water New York Inc.*** (901 N.Y.S.2d 707; 74 A.D.3d 784 (2010)) In *Stormes*, the Appellate Division of the Supreme Court of New York stated: "*Since there is no evidence that the defendants' dams-reservoirs were designed for flood control purposes, the* *defendants had the right to let nature take its course...*". Notably, in *Stormes* there was no evidence that the dams/reservoirs were built for flood-control purposes, so it was held they could let nature take its course. However, the court stated, *inter alia*, that *Allen* and *Iodice* "*did not carve out a blanket rule, however, that so long as the dams/reservoirs were built for water supply storage purposes, the owner never has a duty to regulate or minimise the outflow of water therefrom.*" At best, *Allen* and *Iodice* are not as sweeping in ambit as ESB might wish for. Moreover, their focus appears to be on outflow. Here, a criticial, though not the only, focus of censure, is the initial, deliberate accumulation of water at levels beyond TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35).

1227. ***Elliott* v. *City of New York*** (06 C.V. 296, 2010 U.S. Dist. LEXIS 121334, November 15, 2010). The plaintiffs were owners of property located downstream of Neversink Dam. The dam and impounded reservoir were owned by New York City. The reservoir was designed and built as a water-supply reservoir. The plaintiffs alleged, *inter alia*, negligence in connection with flooding that occurred from Neversink River downstream of the dam, after a period of heavy rain and warm spring conditions. The U.S. District Court for the Southern District of New York (Patterson J.) summarised, at 15, the requirements to establish liability in negligence under the law of New York: "*Under New York law...to hold a defendant liable for negligence, the plaintiff must establish that the defendant owed them a duty, breached that duty, and that their breach was the proximate cause of the plaintiff's injuries....In the absence of a duty, there is no breach, there is no liability.*" This conforms with the Irish law of negligence. Patterson J. continued, at 15: "*Under established New York precedent, there is...no responsibility by or duty on a dam owner 'to make flood conditions better for a lower property owners than they* *would be if the river flowed naturally.'* Iodice....". The issue of the natural flow of a river was addressed 'head-on' in *Elliott* because the plaintiffs argued that when it came to evaluating whether a dam attenuated or exacerbated a rainstorm, the basis for analysing natural flow should be by reference to the way the river had flowed under non-storm conditions following dam-construction. This was rejected by Patterson J., at 19–20: "*The appropriate legal standard for evaluating whether a dam attenuated a flood...is whether the volume of water that flowed into the reservoir during the storm exceeded the volume that flowed from the dam. In other words... imposition of liability on a dam owner is appropriate where negligent operation of a dam results in water being released at a faster rate than...would be released naturally*". This standard was approved on appeal by the U.S. Court of Appeals for the Second Circuit. (See *Elliott* v. *City of New York* 497 Fed.Appx.108; 2012 U.S. App. LEXIS 19735 (U.S.C.A. 2nd Cir.)). This Court, respectfully, does not accept the legal standard propounded by Patterson J., at least not without caveat. This is because Patterson J.'s standard does not seem to allow for the fact that the water-levels at which water in a dam is maintained prior to storm in-flows may yield liablity at common law.

Section W. North Dakota.

1228. ***Aasmundstad* v. *State of North Dakota*** (2008 ND 206; 763 N.W.2d 748; 2008 N.D. LEXIS 236). The plaintiff farmers sued North Dakota for inverse condemnation, *i.e.* a taking without compensation, following failure of a drainage system that was installed to prevent flooding to farm lands. Sandstrom J., for the Supreme Court of North Dakota, considered the question of causation where damage by inundation is alleged. The court considered the issue of causation previously above and, with respect, does not consider that it assists matters to have regard to a decision rendered in the context of a takings suit brought in the State of North Dakota and which falls to be considered in the context of U.S. 'takings' jurisprudence.

Section X. Oklahoma.

1229. ***City of Henryetta* v. *Runyan*** (1952 OK 348 249 P.2d 425; 207 Okla 300). The issue of causation was central to *Runyan*, a decision of the Supreme Court of Oklahoma. The case involved an action for damages for injuries to land that allegedly resulted from overflowing water and sedimentation caused by erection and operation of a dam and related works. The plaintiffs failed to show that the flooding would not have occurred to the same extent had the dam never been built. The court considers causation in the main body of its judgment and considers, respectfully, that analysis of this issue is not assisted by having regard to the snap-shot of Oklahoman law afforded by *Runyan*.

Section Y. Oregon.

1230. ***Crawford* v. *Cobbs & Mitchell Co.*** (121 Ore. 628; 253 P. 3 (1927)). Brief reference was made by ESB to the decision of *Crawford*, in which the Supreme Court of Oregon referred (at 632; 4) to the right of the defendant dam operator "*in case of a flood or unusual high water...to permit flood waters to pass through or over the dam in such quantities as flowed into it*". This decision was affirmed by the Supreme Court of Oregon in *Hawkins* v. *City of La Grande* 315 Ore.57; 843 P.2d 400; 1992 Ore. LEXIS 235). Again the court notes that, in the present case, a criticial, though not the sole, focus of censure is the initial, deliberate accumulation of water at levels beyond TTOL, "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35). The maintenance of waters so comes at a moment previous to that which appears to be in focus in *Crawford* and various of the other United States cases referred to above.

Section Z. Pennsylvania.

1231. ***Shamnoski v. PG Energy*** (579 Pa.652; 858 A. 2d. 589 (2004)). Here an assumption of responsibility appears to have been found solely on the fact that a dam operator drafted an emergency warning systems plan, an approach which undermines ESB's contention that finding an assumption of responsibility requires an elaborate assessment process. In *Shamnoski*, the plaintiff homeowners filed a negligence claim against the defendant alleging its management and control of dams was responsible for damage to their property caused by flooding attributable to certain rainfall. The dams impounded reservoirs for drinking-water. The defendant argued that its obligations were to ensure that the dams could pass the volume of water descending upon them without their failing, and not to add to the natural flow. The lower courts accepted the defendant was liable for having breached a duty to construct, maintain and operate the dams in a manner that would have protected downstream homeowners from floodwaters, and that the homeowners' losses were the proximate result of that breach of duty. The plaintiffs in *Shamnoski* proposed an approach to the defendant's duty reminiscent of that proposed by UCC in these proceedings. Thus, per Castille J. (at 670; 600): "*Appellees take an expansive view of the duties that dam-owners owe, as a matter of law to downstream homeowners. Appellees argue that, from a design standpoint, there is no difference between water supply reservoirs/dams and flood control dams: each must be engineered so as to protect downstream landowners*...[F]*rom appellees' perspective, a dam is 'unsafe' and 'fails'* *whenever it fails to protect downstream homeowners from flooding.*" Continuing with the court's judgment, Castille J. observes (at pp.678–679; 605):

> "*The duty that appellant owed to downstream homeowners and to the public generally was to design, maintain and operate its dams in a fashion that ensured that their structural integrity would be maintained safely even in a storm of the predictable (if rare) intensity of Hurricane Gloria....Because the dams did not fail and the damages which appellees sustained were a result of the natural effect of the storm, appellant did not breach any legal duty to appellees.*
>
> *The damages that appellees suffered resulted not from a rush of water released through the breach or failure of a dam, but from the natural effect of a storm of this magnitude inundating this sort of severe downhill watershed, where landowners had unwittingly and tragically built their homes in the natural floodplain of the watershed. We note that our understanding of appellant's duty to appellees, both under the statute and under common law, comports with the traditional approach to the respective rights and duties of landowners when water run-off is at issue.*"

1232. In the present case, a cause of the damage suffered by UCC was ESB's initial, deliberate, pre-flooding accumulation of water at levels beyond TTOL, "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35).

Section AA. Tennessee.

1233. ***De Kalb County* v. *Tennessee Electric & Power Co.*** (17 Tenn.App. 343, 67 S.W.2d 555 (1933)). The decision in *De Kalb* was relied upon in *Key Sales*. The plaintiff in *De Kalb* was the owner of a bridge washed away in a flood allegedly caused by the negligence of the defendant upstream dam owner. The Court of Appeals upheld the dismissal of the claim, pointing *inter alia* to the fact (at 352; 360) that "[T]*he company had the right to maintain the dam and to permit flood waters to pass through or over it in such quantities as flowed into it*". Again, the focus appears to be on outflow. But in the within proceedings a criticial, though not the only, focus of censure, is the initial, deliberate accumulation of water at levels beyond TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35).

Section BB. Texas.

1234. ***Tarrant Regional Water District* v. *Gragg*** (151 S.W.3d 546; 2004 Tex. LEXIS 590; 47 Tex. Sup. J. 707). This is a case predominantly focused on causation in the context of a case involving the 'takings' clause of the Texan Constitution. The court has addressed the issue of causation in the main body of its judgment and considers, with respect, that nothing is added to its analysis by having regard to a discussion of causation in the context of the takings clause of the Texan Constitution.

Section CC. Virginia.

1235. ***Lake Barcroft Estates, Inc.* v. *McCaw*** (17 Va. 386; 84 S.E. 658; 1915 Va. LEXIS 46). The plaintiff downstream property-owner sued the defendant dam-owner for his discharge of water during a flood. The Supreme Court of Virginia imposed liability on the basis that outflow exceeded in-flow. The court sees nothing in the foregoing beyond the fact that *Lake Barcroft* supports a finding of liability in instances where outflow exceeds in-flow; that conclusion does not preclude a finding of liability on another basis.

Section DD. West Virginia.

1236. ***Mayes* v. *Union Carbide & Carbon Corporation*** (143 W. Va. 336; 101 S.E.2d 864; 1958 W.Va. LEXIS 10). The judgment in *Mayes* arose from the death of a fisherman on a river into which a large volume of water had been discharged by the defendant dam-owner. ESB suggests that *Mayes* is notable for two reasons. First, the Supreme Court of Appeals of West Virginia applied *Winchester*, a decision of the Kentucky courts considered above. But *Winchester* was a case predominantly concerned with riparian law; and the court, with respect, does not consider that it assists matters in the within proceedings for the court to pray in aid the riparian laws of Kentucky in its considerations. Second, ESB pointed to the fact that Given J., for the Supreme Court of Appeals in *Mayes* included among the ways in which negligent operation of a dam could cause injury, the permitting of waters impounded in the dam to combine with flood waters so as to create additional hazard. But this finding is not inconsistent with a finding of liability on the part of ESB in the within proceedings.

Section EE. Wisconsin.

1237. ***Trout Brook Co.* v. *Willow River Power Co.*** (221 Wis. 616; 267 N.W. 302 (1936)). In *Trout Brook*, the Supreme Court of Wisconsin stated (at 626–627; 306): "*Subject to its reasonable use,* [the power company] *was under a duty to pass the flow of the stream….Certainly it cannot lawfully be required to discharge the contents of its millpond in addition to the flow of the stream upon lower riparians and so make itself liable for resulting damage….It was its duty to pass water through its dam as fast as it received it.*" In the present case, of course, it is the initial accumulation of water at levels beyond TTOL – "*the top operating level which the station shall endeavour to maintain during non-flood conditions*" (Lee Regs, *iv*), and a level aimed at "*optimising availability for power generation and minimising unnecessary spilling of water from the reservoirs*" (O'Mahony Affidavit, 35) – that form one focus for censure.

APPENDIX D: BRITISH AND CANADIAN 'DAM OPERATOR' CASES.

1238. Overview. In its opening submissions, ESB sought to rely on various 'dam operator' cases in English, Scottish and Canadian law, specifically *Wegenast* v. *Ernst* [1858] 8 UCCP 456, *Greenock Corporation* v. *Caledonian Railway Co.* [1917] A.C. 556, *Kerr v. Earl of Orkney* (1857) 20 D 298, *Smith* v. *Ontario & Minnesota Power Co. Ltd* (1918) 45 D.L.R. 266, *Canadian Westinghouse Co. Ltd. v. Hamilton* [1948] 2 D.L.R. 571, *Pemberton* v. *Bright* [1960] 1 W.L.R. 436, *Stirling* v. *North of Scotland Hydro-Electric Board* [1974] S.C. 1, *R.* v. *Henderson* (2008) 292 D.L.R. (4th) 114. The court considers that ESB cannot extract support from these cases for a duty of care limited to a duty not to worsen nature because, with the exception of *R.* v. *Henderson*, those cases are concerned with strict liability. That an operator might be strictly liable if it worsens nature is distinct from, and unrelated to, the proposition unsuccessfully contended for by ESB in the within proceedings, that its duty of care under the law of negligence is limited to 'not worsening nature'. However, for the sake of completeness, and notwithstanding that the court is of the view that the foregoing authorities fall to be distinguished for the reason just stated, they are considered in this Appendix.

1239. *Wegenast* v. *Ernst*. In *Wegenast*, the plaintiff, in an action for injury done to his mill-dam, proved that the defendant, who owned an upstream mill and dam, opened his dam on the night of the accident. The defendant proved the plaintiff's gates were all closed, and splash-boards up at the time of and after the accident. It also appeared that there were heavy rains for some days beforehand. No notice of the raising of the gate was sent to the plaintiff. The Upper Canada Court of Common Pleas held that: opening of the defendants' gates woud not render them liable for an accident to the plaintiff's dam unless they admitted a larger quantity than would naturally flow down the stream; it was the plaintiff's duty to guard against natural flow of the stream; and unless the defendants let the water flow faster than was supplied by natural causes, they were not liable for damages resulting. Per Draper C.J., at 460: "[T]*he plaintiff had to guard against any flow of water which proceeded from natural causes....*[S]*o long as the defendants let down no more from their pond than natural causes were...supplying...they would not be liable. And there would be some increased quantity, perhaps quite appreciable, in the course of seven or eight hours, which would, during heavy rains, increase the water which came into the plaintiff's pond beyond the quantity which escaped from the defendants'*." The difficulty that ESB's reliance on *Wegenast* faces is it does not appear from the case-report to have been argued on the basis of negligence/nuisance. Instead it appears to have been argued on the ground of strict liability. As such, *Wegenast* appears only to be authority for the limited proposition that strict liability will not attach where flooding is not worse than would have been caused by natural flow.

1240. ***Greenock Corporation* v. *Caledonian Railway Co.*** *Greenock* came before the House of Lords from the Scottish Court of Session. The defender municipal authority, in laying out a park, constructed a concrete paddling pond in the bed of a hill burn. In doing so, it altered the course of the stream and obstructed about half the flow of water that would otherwise have passed down the burn. Before the works the burn passed through a capacious channel at a level lower than the adjacent street. During a period of heavy rain the burn rose rapidly and the culvert was inadequate to accommodate the water-volume, which overflowed into the street and caused damage to the pursuer railway companies' property. The House of Lords determined that the municipal authority was liable for the damage caused because its actions exacerbated the natural event. An analysis of the speeches in the House of Lords suggests the following legal principles to arise: (1) a person who places artificial works in the course of a natural stream, which dam or obstruct the flow, must ensure those works are proof against even extraordinary events; (2) by carrying out such works, the owner of a dam creates a danger that was not present beforehand and must ensure that the works are such that others are not exposed to a danger any greater than they were exposed to before the works; (3) the dam-owner must ensure his works are as effective to carry off the water brought down even by extraordinary rainfall as was the natural channel; (4) the person claiming damages must be able to show that but for the works the natural phenomenon represented by the flow of water down the stream caused by extraordinary rainfall would have passed without causing injury; (5) where works do not interfere with the natural water-flow in the stream but damage occurs, there is no liability because (i) the person seeking damages cannot show that were it not for the works he would not have been injured, and (ii) the owner of the works has not subjected those downstream to any danger to which they were not already exposed.

1241. Finlay L.C. referred with approval to the decision in *Kerr v. Earl of Orkney* (1857) 20 D 298, in which a dam had been constructed on a stream for the purpose of collecting water and in which Clerk-Hope L.J. stated, at 302:

> "[I]*f a person chooses upon a stream to make a great operation for collecting and damming up the water for whatever purpose, he is bound, as the necessary condition of such...operation, to accomplish his object in such... way as to protect all persons lower down the stream from all danger: He must secure them against danger. It is not sufficient that he took all the pains which were thought at the time necessary and sufficient. They were exposed to no danger before the operation. He creates the danger....he must secure them against danger, so as to make them safe notwithstanding his dam as they were before. It is no defence...to allege the dam would have stood against all ordinary rains – it gave way in an*

extraordinary and unprecedented fall of rain....The dam must be made perfect against all extraordinary falls of rain – else the protection is not afforded against the operation which the party must accomplish. An extraordinary fall of rain is a matter which, in our climate, cannot be called a damnum fatale – *supposing the doctrine so denoted by that term to be applicable...to a dam for collecting water....*[A]*gainst such a state of things the party forming such dams must completely provide, so as to secure safety to those lower down the stream. When an operation...involves great risk to the safety of life and property, the condition on which alone that can be allowed which causes such risk is complete protection.*"

1242. ESB relies on *Greenock* as authority for the proposition that a defendant dam operator is only liable for damage caused by a natural event if he exacerbates it. It is undoubtedly the case that passages in *Greenock* are consistent with there being a duty on a defendant 'not to worsen nature'; however, it seems to the court that there is nothing in *Greenock* which indicates that this is the only duty of such a defendant. Considered in more detail, ESB's reliance on *Greenock* (and on *Earl of Orkney*) seems misplaced for at least four reasons. (1) *Greenock* is a *Rylands* v. *Fletcher* case. *Earl of Orkney* is likewise a strict liability case. (2) It was proven in *Greenock* that the flooding was worse than would have been caused by the natural flow. So anything the Law Lords said about whether liability could attach where flooding was not worse than would have been caused by natural flow is *obiter*. (3) Although Lord Shaw in his speech indicates that a person damming up a stream must make persons downstream as secure against injury as they would have been had nature not been interfered with, there is no indication that the duty of the person who dams the stream is limited to 'not worsening nature'. (4) ESB relies on the reference in *Earl of Orkney* case to the applicable standard being one of "*complete protection*" and divines therefrom that a dam operator is justified in focusing its attentions on dam integrity. Dam integrity is a paramount consideration. However, that does not mean that there cannot be other considerations; neither *Greenock* nor *Earl of Orkney* support the contrary proposition.

1243. ***Smith* v. *Ontario & Minnesota Power Co. Ltd.*** In *Smith*, it was held at first instance that Minnesota Power was responsible for a rise in Rainy Lake by which the plaintiffs suffered damage. Minnesota Power had, under legislative authority, constructed a dam with the objective of holding back the river and lake. In 1916, there was an unusual flood, caused by heavy rainfall in October and November 1915, heavy snowfall in winter 1915–1916 and a cold spring, which kept almost all the snow on the ground, turning suddenly warm, so that the snow disappeared in a few days and snowmelt rushed over the frozen ground into the lakes, with very little taken up by absorption. Riddell J., giving judgment for the Ontario Supreme Court, held that while this concatenation of circumstances was unusual, it was not unforeseeable and could not be regarded as *vis major* or an act of God. The statutory authorisation was considered, the court concluding, at para. 22, that the relevant order in council had been obtained "*based upon the proposition that 'a clause in the Act of incorporation of the company...makes all damages to lands caused by their works a charge to be borne by them.'*" The result was that the defendant had, per para. 24, "*no power to damage land without paying compensation*". In *Smith*, a number of plaintiffs were squatters who were not entitled to compensation for damage to land they occupied. For other landowner-plaintiffs, the court followed the decision in *Greenock,* holding that the obligation on a person who interferes with a stream's natural course is "*to see that the works which he substitutes for the channel...are adequate to carry off the water brought down even by...extraordinary rainfall*". Absent a defence based on prescription, the onus on the injured party was to show that, but for the works, the flood would have "*passed him scathless*". The court held that the plaintiff landowners would not have been unscathed, that the dam's presence raised the water-level from what it would have been by about 1.3 feet. The court concluded, at para. 31: "*It would appear that part of the damage complained of would have been done had the dam not been in existence, but apparently not all – the plaintiffs…are entitled to recover for the difference between the whole and what would have occurred in the absence of the dam.*"

1244. If one were to summarise the *ratio* in *Smith*, it might be put thus: the presence of the dam made the flood worse than it would otherwise have been, and the owners of the dam were, under the statutory authorisation, liable for any damage caused by marginal increase in flood-level. The difficulty for ESB in relying on *Smith* is that it was a strict liability case with no allegation/evidence of negligence. So, although there was (strict) liability in respect of the defendants making flooding worse than otherwise, the case does not support the general proposition that if the dam had not worsened nature, there could have been no liability: *Smith* does not exclude the applicability of other duties to take reasonable care.

1245. ***Canadian Westinghouse Co. Ltd. v. Hamilton.*** In *Canadian Westinghouse*, the defendant altered a creek-channel by changing its course and diverting flow into a culvert. As a result, debris deposited in the creek-bed and on the defendant's lands, made its way onto the plaintiff's lands, from which it had to be removed at the plaintiff's cost. Per McCruer C.J.H.C., at paras. 30–31 of the court's judgment:

> "*[30] The defendant was entitled to alter the watercourse passing through its lands…so long as it did not, by reason of the alteration, increase the burden on the plauntiff's lands or interfere with the water as it flowed on to its lands….The*

evidence given on behalf of the plaintiff was that until the defendant altered the watercourse...the amount of debris and stones coming down was negligible. This is convincing proof that the alteration of the creek from its natural course to the course now established...has greatly increased the burden on the plaintiff's lands, and the plaintiff has suffered substantial damage.

[31] The proprietor of land on the bank of a river has, as an incident to his property in the land, a proprietary right to have the stream flow in its natural state, neither increased nor diminished...".

1246. So far as ESB seeks to rely on this case, it appears to the court to be quite distinct. The only authorisation for the defendants' construction of a culvert was contained in a council resolution which contained no authority to divert/alter creek-flow. Moreover, the case appears to have been decided on strict liability, rather than negligence/nuisance.

1247. *Pemberton* v. *Bright*. In *Pemberton*, Devon County Council widened a road, and extended a culvert. There followed rainfall which, though unusual, was not such that it could not reasonably have been anticipated. It led to flooding of the plaintiffs' land. The pipe entrance had been left uncovered and unprotected and the plaintiffs argued that a grid should have been placed over the entrance to prevent blockage. The Court of Appeal upheld the trial judge's finding in favour of the plaintiffs. Per Sellers L.J., at 441, "[R]*easonable foresight should have foreseen that blocking...the culvert might divert the stream on to the plaintiffs' premises*", and, at 442, "[The Council] *created a potential nuisance which became an actual and actionable nuisance when, by reason of the entrance to the culvert being negligently left unprotected, it became blocked so that it dammed the water flowing in the stream and diverted* *it on to the plaintiffs' land.*" The Court held the council liable for its failure to install a grid, and held the defendants liable as occupiers.

1248. *Stirling* v. *North of Scotland Hydro-Electric Board.* The decision in *Greenock* was applied in in *Stirling*. There, the defender, under authority, had by 1954 constructed/operated a dam and hydro-electric station on the river Conon at a point upstream of the confluences of the rivers Conon, Blackwater and Orrin. The water that passed through the dam/power station included not only the water of the Conon, but also, introduced by artificial means, water from the upper reaches of the Blackwater and Orrin, and other sources. The pursuer's estate had a history of flooding before the development of the hydro-electric works, and an embankment had been constructed along the Conon river-bank that formed the estate-boundary. In February 1962, there was a night of high-water in and out of the dam and power station, the discharge from which overflowed the embankment, causing extensive flooding of the estate. The pursuer sought compensation. In giving judgment, Lord Avonside, at 8–9, repeated the proposition from *Greenock* that a person who interferes with the natural course of a stream or diverts its flow is liable in damages to an injured proprietor, provided (leaving prescription aside) "*that but for it the phenomena would have passed him scathless.*" Lord Avonside continued, at 9: "*In carrying out their operations the defenders were exercising powers necessary to the performance of their statutory duty. It is nowehere suggested that they exceeded their statutory powers or were negligent in the exercise of them.*" Although the action in *Stirling* was framed as one for compensation under the relevant schemes by which the works were executed, Lord Avonside concluded that the schemes provided for compensation only when the injury done was actionable at common law, stating, at 14:

"[N]*o compensation is due under the...relevant clauses in the schemes of the defenders unless it be proved that the damage of which complaint is made would have afforded a ground of action had the schemes not been in existence. The person claiming damages is not put in a special position by reason of the existence of the schemes. Where his claim relates to damage by flood alleged to have been caused by an* opus manufactum, *he is put to the proof proper to such...claim, and an essential part of that proof lies in showing...the flood would not have occurred had nature been left undisturbed. The 'damage' of the schemes is 'actionable damage' and compensation is payable on proof of such damage and not on some ground equivalent to insurance.*"

1249. One can see why *Stirling* gets a mention from ESB. However, ESB's reliance on the case seems misplaced for at least three reasons. (1) As Lord Avonside states, at 9, "*It is nowhere suggested that*...[the Hydro-Electric Board] *exceeded their statutory powers or were negligent in the exercise of them*". Here, negligence is alleged. (2) *Stirling* was presented in strict liability. But UCC contends that ESB is liable in respect of damage which could have been avoided by taking reasonable care. (3) To the extent that the case draws in the common law, as opposed to the applicable statutory scheme, it seeks guidance from cases such as *Greenock* concerning strict liability. As such, *Stirling* provides no useful guidance outside the strict liability context, and cannot be read to suggest that a duty in negligence cannot arise for dam management.

1250. ***R.* v. *Henderson*.** In *Henderson*, following heavy rain, Parks Canada released water from affected lakes and allowed it run downstream. This included water from Gull River. Water from the river flooded the plaintiff's property and washed his dock and two speedboats downstream. Four causes of action were pursued: negligence; nuisance; the rule in *Rylands* v. *Fletcher*; and riparian rights. It was held in relation to negligence that there was no breach of a standard of care. The claim in nuisance succeeded. The claims on *Rylands* and riparian grounds failed. The Appellate Court accepted the evidence of lack of negligence. The judgment does not expressly cite or apply *Greenock*, *Smith*, or *Wegenast.* The main criticism of the trial judge's decision on appeal was that he had not independently determined causation in respect of the nuisance claim. The court rejected this criticism on the basis that the trial judge had made a finding of causation in respect of the negligence claim, which would suffice. Parks Canada was held not to be negligent because the course of action it chose was the lesser of two evils in that, although certain persons were flooded, a different course of action would have caused worse flooding to others. There was therefore a balancing of responsibilities which is absent in the present case where ESB's compliance with the duty of care contested for by UCC would have yielded less flooding. Despite choosing the lesser of two evils and not being negligent, Parks Canada was liable in nuisance. As the Appellate Court noted, at para. 22 of its judgment: "*Parks Canada recognized that...water flow would be increased downstream and that properties might be flooded. However, they had an even bigger problem upstream...and...chose the lesser of...two evils, in balancing their responsibilities to everyone. That may not make them negligent...but it does not change causation. There is a direct causal relationship between Parks Canada releasing water from the upper lakes and the damage to Mr Henderson's property downstream.*" On the facts of *Henderson*, the nuisance arose from an increase in the volume of water. However, this does not have the consequence that the case stands for a general principle as to the circumstances in which a flow of water may constitute nuisance, or limits liability scenarios. The Apellate Court's finding focuses on causation rather than a general principle as to liability for increased flow of water.

Approved:
P-P.A
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